

Public Safety Facility  
Wilmington, VT

Comparison of Geothermal vs. Conventional Heating System

The following information is provided by Dan Dupras of Engineering Services of Vermont, LLC and Mary Jane Poynter from Efficiency Vermont for comparative operating costs of a conventional LP-boiler system vs a geothermal system. Dan estimates the operating cost of a geothermal system to be \$9,633 more per year than a conventional boiler at today's energy prices. Mary Jane's model indicates the geothermal system would be \$400 or 0.7% less per year to operate than an LP boiler system.

**From:** Mary Jane Poynter <[mpoynter@veic.org](mailto:mpoynter@veic.org)>  
**Sent:** Monday, June 15, 2020 3:43 PM  
**To:** Chuck Clerici <[cclerici@veic.org](mailto:cclerici@veic.org)>  
**Subject:** RE: Wilmington HVAC System Comparison

Equest model using wizard for DX and boiler vs. ground source Cop 3.8

Baseline: 167,000 KWH and 977 MMBTU = \$28,400 + \$26,700  
Ground source: 321,000 kWh = \$54,700

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**From:** Daniel Dupras <[daniel.dupras@esvtllc.com](mailto:daniel.dupras@esvtllc.com)>  
**Sent:** Monday, June 15, 2020 12:06:23 PM  
**To:** Chuck Clerici <[cclerici@veic.org](mailto:cclerici@veic.org)>; Ralph Nimitz <[rnimitz@nbfarchitects.com](mailto:rnimitz@nbfarchitects.com)>  
**Subject:** RE: Wilmington HVAC System Comparison

Yes I included ERV in both.

The usage was modelled using the 3.6 COP on the heat pump, compared to a 95% efficient propane boiler.

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**Subject:** RE: Wilmington HVAC System Comparison

Hi Dan,

Thank you. This is very useful and informative. And surprising. Net zero cannot trump lower operating cost in my opinion.

Why will the geothermal system use 12% more overall energy in the same shell? And did you include heat recovery (ERV/HRV) in the geothermal analysis?

Thanks.,  
Chuck

**From:** Daniel Dupras <[daniel.dupras@esvllc.com](mailto:daniel.dupras@esvllc.com)>  
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**Subject:** Wilmington HVAC System Comparison

Chuck:

We have looked at the estimated operating cost for the proposed Wilmington Public Safety Facility using the following HVAC system Options. These systems are based on a code compliant building envelope:

I used \$0.17/Kwh for electric and \$2.50/gallon of propone.

Ø **Option 1 – Base System**

- o Propane fired hot water boiler system
- o Air cooled split system cooling with heat recovery
- o Radiant heating in apparatus bays

Estimated Annual Operating Cost: \$23,026

Annual Energy Usage: 641,793 KBTU

Annual Electrical Usage: 70,736 Kwh

Annual Propane Usage: 4,400 Gallons

Ø **Option 2 – Geothermal System**

- o Geothermal Heat Pump System
- o Radiant heating in apparatus bays

Estimated Annual Operating Cost: ~~\$32,201~~ corrected \$32,659

Annual Energy Usage: ~~720,059 KBTU~~ corrected 655,442 kBTU

Annual Electrical Usage: ~~189,417 Kwh~~ corrected 192,110 kWh

The propane system actually is lower operating cost, but if your goal is work toward a NET zero building, the all-electric geothermal system will allow this.

**Daniel Dupras, P.E.**

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