

Earth River Geothermal, Inc.

GSHP Design Report

Sample Operating Cost Summary
- 4-Ton Geothermal Retrofit

Prepared: 25-Feb-2013

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Equipment Schedule

Based on the provided loads, the recommended heat pump schedule for this system is as follows:

High Cap.		1 kBtu/hr = 1,000 Btu/hr				
Low Cap.						
Zone	GSHP	QTY	Heat ¹ Cap. (kBtu/hr)	Cool ¹ Cap. (kBtu/hr)	Water ² Flow (GPM)	Air ³ Flow (CFM)
Zone 1	Waterfurnace - Envision ND049	1	41.62	48.73	12.0	1,550
			34.70	40.88		
High Capacity Totals			41.62	48.73	12.0	
Low Capacity Totals			34.70	40.88	-	

1. All capacities shown are total.
2. For water-to-water equipment, source and load water flows are assumed equal.
3. Air flow rates are reported on a per heat pump basis. For total air flow in a zone, multiply the reported air flow by quantity.

Energy Prices

Standard Electric Rate	0.120 \$/kWh	Natural Gas Rate	1.000 \$/ccf
ASHP Electric Rate	0.120 \$/kWh	Propane Rate	4.000 \$/gal
GSHP Electric Rate	0.120 \$/kWh	Fuel Oil Rate	4.000 \$/gal

Energy Price Inflation Rates

The following inflation rates are applied to long term economic analyses to give a more realistic evaluation of the long-term cost benefits of using GSHP.

Electricity	0.000%	Propane	0.000%
Natural Gas	0.000%	Fuel Oil	0.000%

Equipment Efficiencies

The following efficiencies are for air systems, hot water generation efficiencies can be found on the hot water generation page.

NOTE: GSHP efficiencies shown below are system wide averages which include pumping and applicable resistance energy. Efficiencies for individual GSHP zones can be found on the zone pages.

Heating

GSHP (COP_{AVG})	3.87
Electric Resistance (COP_H)	1.00
ASHP (HSPF)	6.54
Natural Gas (AFUE)	90.00%
Propane (AFUE)	90.00%
Fuel Oil (AFUE)	80.00%

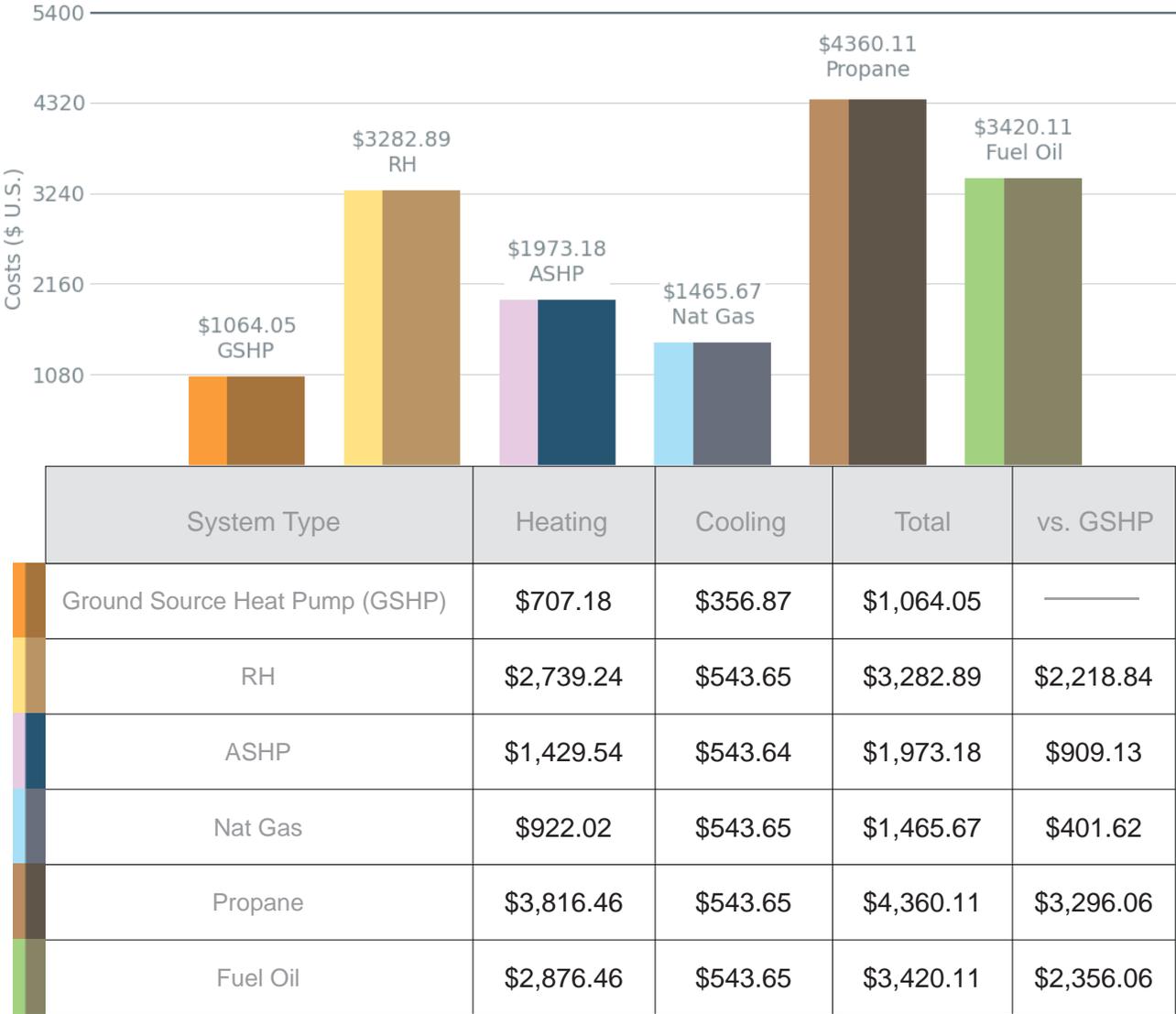
Cooling

GSHP (EER_{AVG})	18.25
A/C (SEER)	11.98
ASHP (SEER)	11.98

Economics: Operating Cost Summary

Actual costs and savings may vary from those reported. The methods of calculation and the data used are designed to approximate the total cost and savings of the GSHP system based on the weather conditions for an average year in your area. Additionally, the assumed rates of inflation and the unit prices for energy are subject to change according to the economy and your energy provider.

Annual Operating Cost by Technology



Economics: Operating Cost Summary

Annual CO2 Emissions by Technology

Geothermal heat pumps generate NO DIRECT EMISSIONS however, even “green” heating and cooling technologies like GSHPs produce “upstream” carbon emissions. The amount of these emissions depends on the power generation method in your area.

In areas where the primary power generation technology is nuclear, hydroelectric, wind turbine or solar, the upstream carbon emissions are minimal. However, the majority of the power in the United States is generated by coal fired power plants which emit a relatively higher volume of CO₂.

The emissions shown in the graph below are adjusted based on the mix of power generation methods in your region. Note that for natural gas, propane and fuel oil, only the point of use carbon emissions from the combustion of the fuel is considered not the upstream emissions resulting from their production.

