

Geothermal at 217 Stonington Rd

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SEPT 2021



Agenda

Introductions

What is Geothermal (Geo) heat pump

How does it work

Why it differs from standard heat pump (air)

Why go Geo

How much does it cost

Is it comfortable

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Introductions

Dan – Engineer

Patricia – The primary user

What is Geothermal (Geo)

The technology relies on the fact that the earth (beneath the surface) remains at a relatively constant temperature throughout the year, warmer than the air above it during the winter and cooler in the summer, very much like a cave.

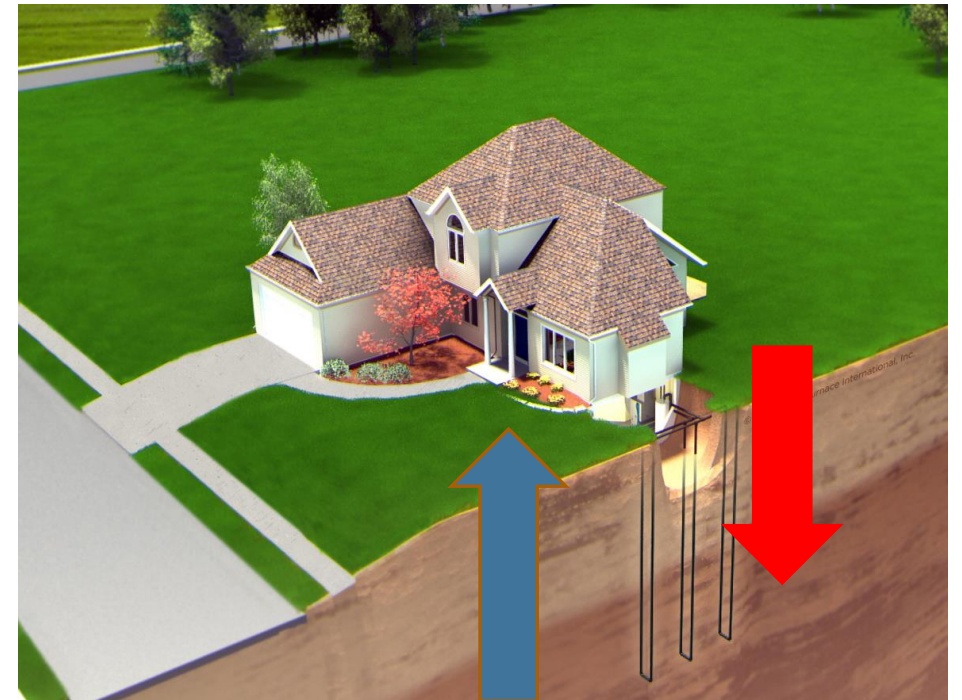
The geothermal heat pump takes advantage of this by transferring heat stored in the earth or in ground water into a house during the winter, and transferring it out of the house and back into the ground during the summer. The ground, in other words, acts as a heat source in winter and a heat sink in summer.

How does it work

During the Summer –

The heat is extracted from the house and the compressor is cooled by the fluid coming up from the loop and what ever heat is no longer required for DHW is then pushed down into the wells. In our case the fluid comes up @ x and returns 6 degrees hotter.

Due to the physics of the system and the ground water coming up @ 60 , the Cooling coils yield about 48 degrees.



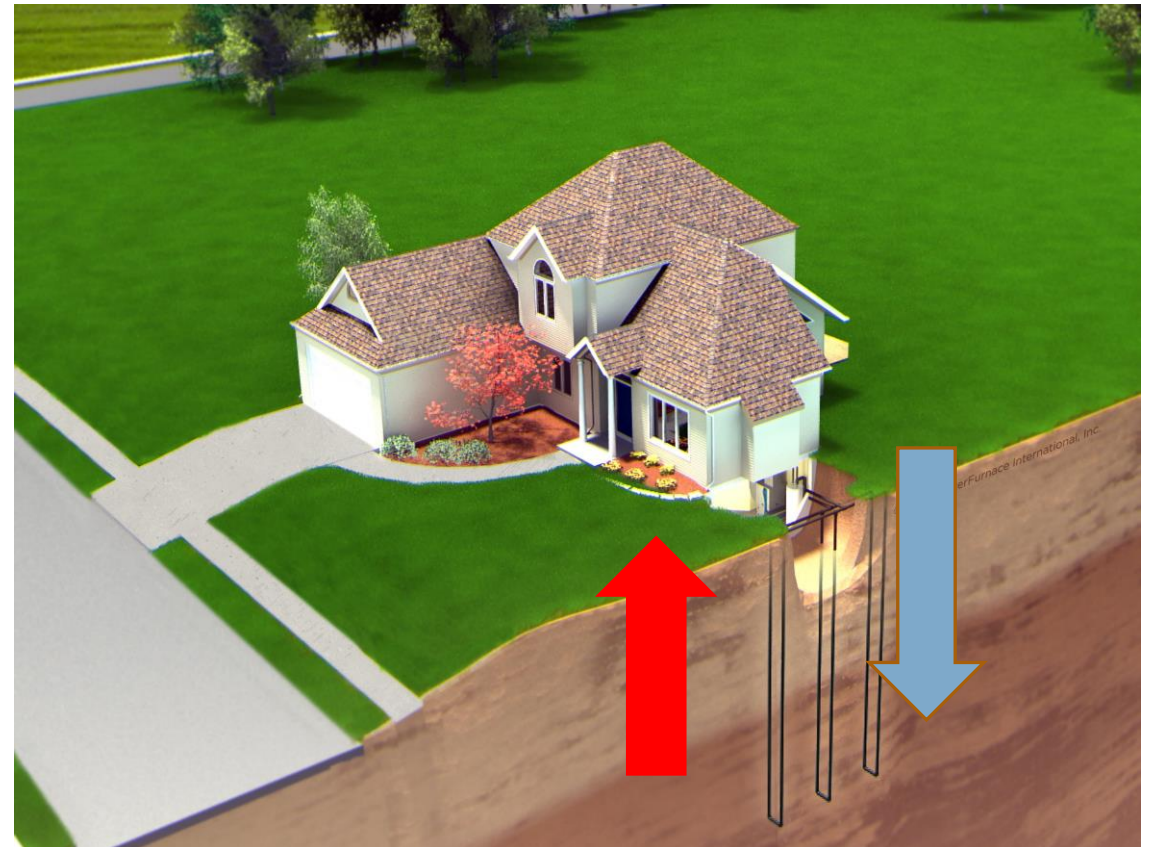
How does it work

During the Winter –

The heat is extracted from the ground and the compressor utilizes that heat from fluid coming up from the loop and at the same time the heat generated by the compressor is pushed into the Hot water tank. Uniquely to our system once the DHW is full the remainder of the hot water is used to warm the basement slab.

In our case the fluid comes up @ x and returns 6 degrees cooler.

Due to the physics of the system and the ground water coming up @ 60 , the warming coils yield about 100 degrees.



Today

Live Diag

Geothermal Heating / Cooling

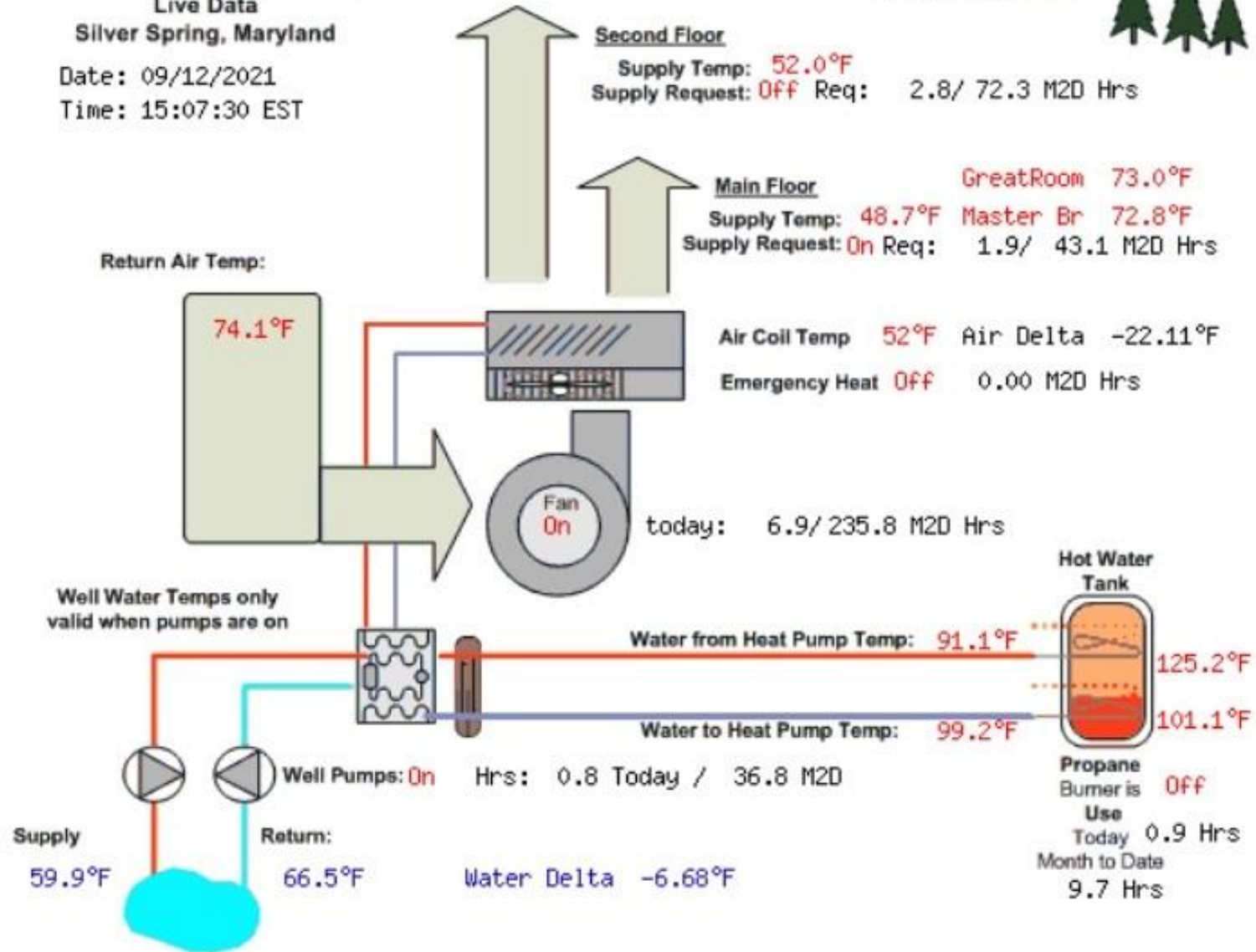
Live Data

Silver Spring, Maryland

Date: 09/12/2021

Time: 15:07:30 EST

Outside Temp: 82.4 °F



Why it differs from standard heat pump or AC

The systems are not that far apart:

Both are heat pumps- in that they extract heat from one side and push it to the other.

The physics and thermodynamics of the heat pump process are very efficient when the exchange between the two temps are small and as they get to more than 20 degrees the efficiency drops dynamically.

In the simplest form- A Standard Air cooled heat pump is fine given you are trying to maintain an internal temp of 72 as long as the outside temp stays between 60 and 80, outside of that range the cost of operation rises greatly.

Why it differs from standard heat pump or AC

At this point the minor cost of additional features and higher quality due to the cost of the system starts to sweeten the deal. Some are:

- The use of high end scroll compressors – rather than just one speed they are variable and burn less power at the slower speed.
- The recovery of the compressor's operating heat and directing into DHW needs (rather than just dumping it to the air).
- Intelligent air management systems to reduce energy demands
 - (ex. In summer drawing air from cooler areas and attempting to satisfy cooling demand from warm areas before turning on the compressor to cool them.)
- All of these additions result in less energy demands and increased savings

Why go Geo ?

A few are:

- Savings – the only resource you are buying while running the system is electricity, no oil, no gas.
 - One might say why not just use electric heat?
 - Electric heat is 98% efficient which is good but a scroll compressor can generate 8 times its power requirement so it gives you 8kw of heat/cooling for every 1kw it uses.
 - In cooling mode the best ratings and ideal conditions yield far less than that, and we do not live in the ideal temp band.
- Environment – in the summer using AC generates more outside heat just in own operation for it to push the heat out of our houses. That adds heat to an already warm earth. No additional Co2 from burning fossil fuel.
- Noise – there is none other than the interior fan.
- My favorite – reduced demand for middle east oil, less money to fund wars!

How much does it cost ?

That's a hard one to answer as every installation is different, but I can tell you what mine costs.

First my engineering background says always go overkill, so although the vendor said 2 wells would be fine I opted for 3 adding \$4k extra into the project. They said a 5 ton unit would be fine I went 6.

All in the system which was a total install from wells to duct work was approx. \$50k and my builder gave up \$25k out of his budget for the house for us to take on that part of the build. So with my overkill approach it was \$25k.

What is cost to run ?

First some data:

- House Temps – We keep the house at 73 degrees days and 69 overnight, all year round.
- Our house is highly insulated with Bib insulation which reduces our needs.
- The system has an 10KW electric emergency heat, that has only been activated once in 14 years and only for 10 mins (and that was in error).

Dollars:

- At the peak of summer months our electric bill rises by \$120 and winter about \$100. over the shoulder seasons.
- The original cost estimates for alternatives such as propane, oil or electric heat pump operation ranged between \$750/mt for oil or propane heat for winter and \$300/mt for AC in summer. Or about \$5k vs. \$900 so approx. savings of \$4k/year so 7 years to break even.
- Tax savings – Both Fed/State/County offer tax credits and grants for GEO systems.

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24 Hours Energy "Burn" report covering

9/11/2021 3:13:20 PM	9/12/2021 3:12:30 PM
Period Temp Range Low/ High	61.2° / 82.5° F
Degree Days Heating/ Cooling	1.0 / 5.0
Waterfurnace Fan ON	11.77 Hrs
Waterfurnace Burn time Total/ Heating/ Cooling	3.57/ 0.27/ 3.30 Hrs
Hours of water Burn per degree day H/C	0.267 / 0.660
Aux. Water Heater need and Propane usage	0.95 Hrs (0.75 gals)

Close

Definitions

Waterfurnace - The [Waterfurnace](#) Geothermal Heating/Cooling system.

Burn - using a gas term to indicate geothermal compressor operation.

Degree Day - the number of degrees in a day is defined as the difference between a reference value of 65°F (18°C) and the average outside temperature for that day.

Fan ON - The system uses the fan to move air from one zone to another as well as supplying warm/cool air. When Fan time on exceeds Burn time the system is saving energy use moving air within the house to where it is requested without firing up geothermal unit.

Aux Water Heater - When the Geothermal system is not able to meet Domestic Hot Water needs, the propane heater is utilized. Highest demand occurs when no heat/cooling are required.

Is it comfortable ?

Ask Patricia !

Data

Live Diag

Geothermal Heating / Cooling

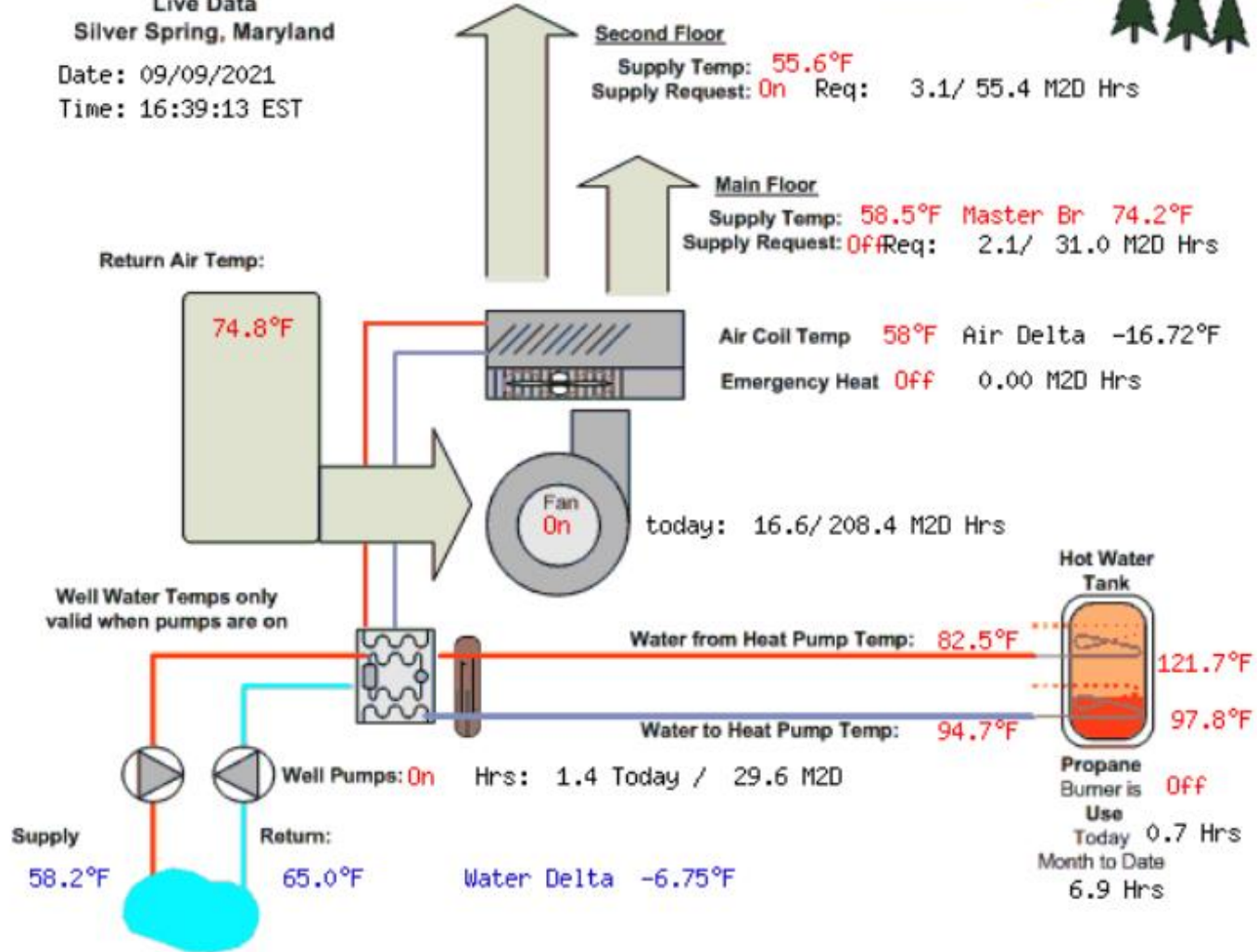
Live Data

Silver Spring, Maryland

Date: 09/09/2021

Time: 16:39:13 EST

Outside Temp: 71.5 °F



Wells (3)

Wells were drilled to max depth available 400'

Plastic pipe inserted in "U" configuration 800' per well

- 50 year replacement warranty

Well filled with a solid grout with high heat transfer qualities

Fluid is mix of water and Ethel glycol

Cost:

- Each movement of truck \$500
- \$10/ft drilling fee
- Total cost of wells \$13.5k (included in the system cost of \$50k)

Pictures of System

Installed by Ground Loop Heating
[\(410\) 836-1706](tel:4108361706)



Well Pumps 1/6 hp



Well Pictures



Jones Wells going down
400'



Ground Loop connecting
well pipes and burying
connections to house.



Q & A



Contacts

Best Vendor we found:

- Ground Loop Inc www.groundloop.com 410-836-1706

Our House web site:

- 217.done-that.com
- Myself: dan @
- done-that.com