

Energy House Five – Update

Geothermal – Drilling is completed

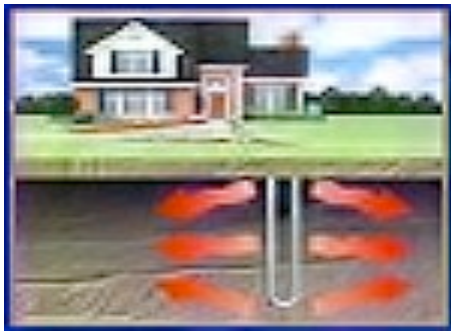


Energy House Five installs geothermal wells. The last update of this exciting project was the announcement that the foundations had been installed and things were moving quickly on the building of this Energy Star 3.0 home in Alexandria. Our next important step is to report on the well drilling that was done in order to provide the heating and cooling for the home.

Geothermal History

"Many people think geothermal is a new technology, which makes builders and homeowners reluctant to use it," says Jim Bose, executive director of the International Ground Source Heat Pump Association (IGSHPA), a nonprofit that promotes ground source heat pump technology. "Actually, it's an idea that's more than 150 years old."

You might not realize it but there is quite a rich history of geothermal energy. The ability for the earth to produce heat has always been around. People have been utilizing geothermal heat for centuries. Sure, it wasn't in the form of advanced power plants and efficient air conditioning systems, but people have visited hot springs for cleansing and bathing since ancient times.



While the residential geothermal industry is booming, it needs to be stated that the systems make almost no noise once they are installed. Homeowners, architects, and builders recognize the wisdom of this decades-old alternative to fossil fuel and are rushing to incorporate it into their new home construction and now more than ever into their energy upgrades of existing structures.

According to the Department of Energy these efficient and durable systems are installed in approximately 50,000 homes per year.

Geothermal Basics

Geothermal takes advantage of one of nature's wonders—the earth's nearly constant underground temperature of 45–75 degrees Fahrenheit—to provide year-round heating and cooling. Geothermal systems exchange heat with the earth using an underground network of pipes filled with water or refrigerant. In winter, the fluid pulls heat from the ground and transfers it to the house through a heat exchanger. An indoor fan system circulates air through the house. In summer, the system deposits heat from the house into the earth and brings cool air back in.

Geothermal equipment lifespan averages range from 25–30 years while most traditional fossil based systems have a lifespan expectation of 12–15 years. Currently there is a 30% tax credit provided by the Federal Government for the installation and equipment of this renewable energy alternative.

The Geothermal Process – Three Basic Steps

- 1) Study & Annalysis – Heat loss/gain of the project is the first step in producing a successful geothermal installation in either new construction or in the energy upgrade of an existing home. The determination of a heating/cooling load is one of the critical parts of the system design.

- 2) Geothermal does not work well in drafty homes, for that reason the EH conducts a full energy evaluation of the property. Once the the drafty areas are defined and sealed, weatherization and insulation are added and the home's energy efficiency is improved. In the current Energy House Five project the attic insulation is projected to be an R49, its walls R21, and basement R19. The entire house is going to be air sealed with a product call the Zip System – more on this product in our framing issue. This advanced insulation system will not only add an R2.5 but will also air seal the exterior walls around the entire house. In Energy House Five the standard house would have required 9 tons of heating and cooling but after the energy design was improved to even greater than an Energy Star 3.0 standard, we were able to reduce the heating and cooling loads to just 4 tons. This resulted in a more than 50% reduction of the geothermal system for the home. This not only cut the owner's equipment cost by more than half but also reduced the homeowner's cost of operating the smaller equipment used over the next 30 years.



- 3) Find an experienced contractor who has a proven track record installing geothermal systems. This will include a contractor that understands that a forced hot air ducting system in a home may need to be modified in order to facilitate geothermal heating and cooling. This contractor will be able to help the homeowner determine if the system should be in a vertically drilled field or with a horizontal field. The contractor will also determine if the property has the room for a horizontal system and where the best locations on a site are for the geothermal installation.

Energy House Five – Geothermal System

As stated above, the first step in energy efficiency is to properly size the heating and cooling loads for the home. A number of factors are also connected to these calculations that need to be reported.

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency.

ENERGY STAR 3.0 – All homes built after January 1, 2012 are eligible to seek ENERGY STAR certification which identifies their new home as being energy-efficient, delivering better performance, greater comfort, lower utility bills, and highlights their home as one of the elite homes built. ENERGY STAR standards are measured and then the home is rated on a scale of 0–100 with the upper score equal to a house built according to code. Energy House Five is projected to be more than 60% better than a normal home built to code standards.

Passive Solar – This is always the first consideration on any project taken on by the Energy House team. By taking into account the orientation of the site and the building, passive solar will supply an initial round of heating in the winter time. The existing landscape of mature trees is incorporated into the passive solar design and will help significantly. Adding these passive solar features to the window schedule was done by Anderson Window & Door and PWD Windows of Harrisonburg VA. The glass glazing of each window was designed to maximize the solar potential of the project.

Air Sealing – Throughout the house air sealing is probably the most affordable method of reducing energy consumption and comfort in a property. Proper air sealing can reduce energy consumption by as much as 20% in a home.

Energy House Five air sealing areas:

- All rim joints between floors
- Top plate of basement walls
- Picture frame all exterior walls before fiberglass insulation is installed
- Doors & windows
- Vapor barrier in crawl space

Insulation – Insulation keeps your home warm in the winter and cool in the summer. There are several types of insulation — fiberglass (in both batt and blown forms), cellulose, rigid foam board, and spray foam. Insulation performance is measured by R-value — its ability to resist heat flow. Higher R-values mean more insulating power. Different R-values are recommended for walls, attics, basements, and crawlspaces, depending on your area of the country.

Energy House Five insulation levels

Attic – R49

Exterior Walls – R21

Basement Walls – R19



Energy House Geothermal – Four tons of heating and cooling has been drilled into the driveway area of the site.

Two Closed Loop Wells

REHAU – RAUGEO ground loop heat exchange system

Well depth – 297ft and 317ft

