

# Air Source Heat Pumps

## Air Source Heat Pump (ASHP) Highlights

- **Energy efficient** - Using the science of refrigeration, they provide heating during colder months by pulling heat into your home from the air outside.
- **Air conditioning** - They also provide air conditioning during warmer months by pulling heat out of your home to the outside.
- **Cost effective** - Cold-climate heat pumps often cost less to operate than traditional heating systems, especially fuel oil, propane, or electric resistance heat.
- **Easy installation** - ASHPs are relatively easy to install with little disturbance to your home or property.
- **Adaptable** - They are modular and can be used to heat your whole house or a new addition, or to supplement heating and cooling in an underserved room.
- **Whole home solution** - With proper design, a cold-climate ASHP can supply 100% of the heating needed on the coldest winter days.
- **Combustion free** - Because nothing is burned in the home, heat pumps heat and cool while giving you cleaner air to breathe compared to combustion heating methods.
- **Climate friendly** - ASHPs can be run using renewable electricity and can be a big step toward carbon-neutral home heating and cooling.

## Types of ASHPs

- **Ductless mini-split:** This has an outside unit that includes the compressor connected to an inside air handler that releases heat into or pulls heat out of the room. No air ducts are involved. There are single-zone and multi-zone types, depending on whether the application is room-by-room or whole home.
- **Ducted:** ASHP units can also be connected to various kinds of ducted systems including centralized forced air.



## ASHP Incentives

- **30% Federal tax credit** up to \$2,000 max. through 2032 (must have tax liability)
- **NYSEG rebate:** Whole-home system: \$800-\$1,200/10,000 BTUs (that's \$2,000-\$4,800 for a typical home)
- **Municipal Electric IEEP rebate:** \$1,200/system for a whole-home system or \$800/system for a partial system

State financing options are also available.

Additional incentives for income-eligible residents may be available. Contact a [Community Energy Advisor](#) to learn more about your options.



Contact us:

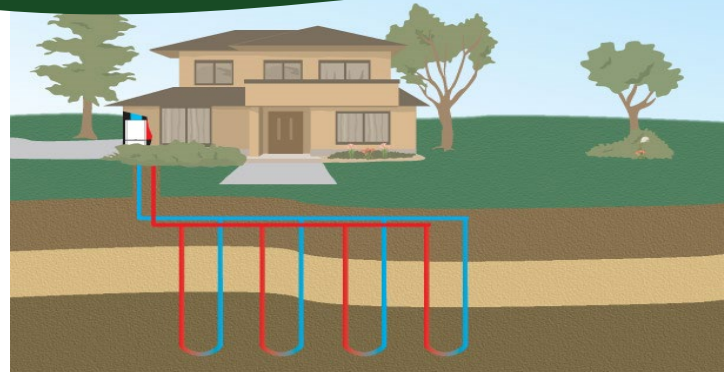
**SmartEnergyChoices.Org**

smartenergychoices@cornell.edu | 607-366-0833

# Ground Source Heat Pumps

## Ground Source Heat Pump (GSHP) Highlights:

- **Energy efficient** - Using the science of refrigeration, GSHPs provide heating during colder months by pulling heat into your home from the ground.
- **Air conditioning** - When replacing a furnace, GSHPs give efficient, effective air conditioning too.
- **Cost effective** - Cold-climate heat pumps often cost less to operate than traditional heating systems, especially fuel oil, propane, or electric resistance heat.
- **Adaptable** - GSHPs can replace both furnaces and boilers and can often make use of the pre-existing distribution system within the home.
- **Reliable** - Six to eight feet below the surface, the ground remains at a relatively constant ~50-55°F in upstate NY. In the wintertime, the ground is relatively warm and allows a refrigerant to work efficiently to provide hot air or water to the house. In the summer, it's relatively cold, and the cycle reverses, providing efficient cooling. Plus, the system life is about 25 years for the indoor compressor and 50-100 years for the underground loop field, so GSHPs are built to last.
- **Whole home solution** - They can supply 100% of the heating needed in New York's coldest winter days. They can also supply hot water.
- **Combustion free** - Because nothing is burned in the home, heat pumps heat and cool while giving you cleaner air to breathe compared to combustion heating methods.
- **Climate friendly** - GSHPs can be run using renewable electricity and can be a big step toward carbon-neutral home heating and cooling.



## GSHP Incentives

- **30% Federal tax credit** through 2032 (must have tax liability)
- **25% State tax credit, up to \$5,000** (must have tax liability)
- **NYSEG rebate:** \$1,500/10,000 BTUs (that's \$3,750-\$9,000 for a typical home)
- **Municipal Electric IEEP rebate:** \$2,000/system

**Combined incentives** may cover about half of the total cost, so this may be similar to the total cost of a whole-home air source heat pump system before incentives.

State financing options are also available.

Additional incentives for income-eligible residents may be available. Contact a [Community Energy Advisor](#) to learn more about your options.

## Components of a GSHP system:

- A ground loop field is located outside, underground, and can either be drilled vertically or trenched horizontally. Then, a water solution with antifreeze circulates in a closed loop between the ground and the heat-pump station. This solution picks up heat from the ground and enters the house at its warmest. The heat pump extracts heat from the circulating fluid of the loop field and then releases it to either an air or radiator-based delivery system to the rest of the house. The now cooler solution returns to the loop field to be warmed back up to soil temperature. And in the summer, the same system can provide cooling through ductwork in the house.
- The heat pump compressor/exchanger is typically located in a basement. It might measure 3 feet wide by 6 feet tall, similar to a conventional furnace. It interfaces with the loop field at one end and the heat delivery system at the other.
- A thermostat can be wall-mounted like conventional systems and programmed remotely.

Contact us:

**SmartEnergyChoices.Org**

smartenergychoices@cornell.edu | 607-366-0833

# Insulation and Air Sealing

## Why insulate and air seal?

- **Energy efficiency** – Heating and cooling account for more than half of the energy used by homes in upstate NY. In some cases, up to 30% of this energy is wasted in unnecessary heat loss due to poor insulation and air leaks.
- **Improve comfort** – Stop drafts and air leaks to stay warmer in winter and cooler in summer. Insulation also improves the home's moisture barrier, preventing water from condensing on cold surfaces in attics, crawl spaces, or inside wall cavities.
- **Save money** – Sealing and insulating a home's "shell" or "envelope" (i.e., its outer walls, ceiling, windows, doors, and floors) can be the most cost-effective way to reduce bills.
- **Lasting investment** – Insulating a home is generally done once, be it updating an older home or during new construction. Done correctly, this investment will pay you back for as long as you live in your home.



## Cost and Financing

- **NYSERDA** offers incentives through EmPower+ designed to help income-qualified New York State residents with home energy improvements.
- **Additional grants** for income-qualified households may be available.

Our experienced participating contractors will help determine appropriate steps and will facilitate access to these programs and for your home. Contact a [Community Energy Advisor](#) for more information.

## Start with air sealing if needed

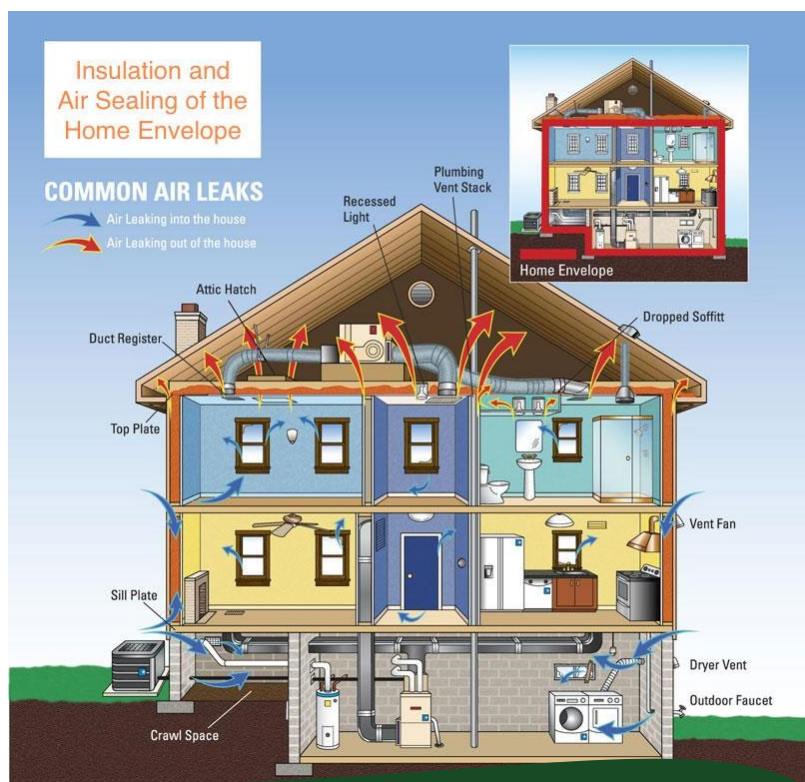
Air leakage, or infiltration, occurs when outside air enters the home or inside air exits a home uncontrollably through cracks and holes. These processes reinforce each other leading to the 'stack effect' (see figure, lower right) when warm air moves upward in a building.

Insulation works best when air is not moving through or around it, so it is important to seal air leaks before installing insulation.

## Insulation Products

Insulation is made from several different materials: most commonly, cellulose (shredded recycled newspaper), as well as various urethane foams, recycled cotton fibers, mineral fiber, and fiberglass.

Each has its most appropriate application, but many work well in attics, walls, floors, basements, rim joists, band joists, and foundations.



Contact us:

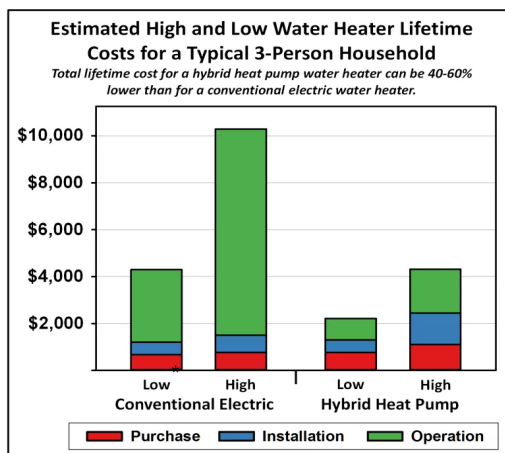
**SmartEnergyChoices.Org**

smartenergychoices@cornell.edu | 607-366-0833

# Water Heating with Heat Pumps

## Heat Pump Water Heater (HPWH) Highlights

- Provide reliable hot water for your home.
- Reduce energy use (water heating is typically the second-largest energy expense in a home).
- Have an overall annual performance for operation that is up to 2 to 3 times more efficient than conventional storage or on-demand water heaters.
- Inexpensive to operate. Often pay for themselves through energy savings and are a cost-effective way to reduce the greenhouse gas footprint of a home.



Source: Natural Resources Defense Council, Nov. 30, 2016

\* "Low" and "High" represent low and high electricity rates, respectively



## How do they work?

- HPWHs use electricity to move heat from one place to another instead of generating heat directly. This makes their operation far more energy efficient than conventional resistance electric heaters or those fired by natural gas, oil, or propane.
- Heat from the air is transferred to water in a tank, which is heated to 130-135°F by taking advantage of a refrigerant. This is the process of a refrigerator, in reverse.

## Where can they be installed?

- HPWHs work best in a location where the temperature remains 40°–90°F (4.4–32.2°C), but most can function like a traditional electric water heater if conditions get colder.
- Location needs to have at least 1,000 cu ft. of air space around the heater; heat pump unit is on top, so the required floor-to-ceiling clearance is higher than conventional models. The best location is in a basement or in a place with a separate utility room.
- Operation of the unit both slightly cools and helps dehumidify the space it is in.
- Installation is comparable to traditional electric storage water heaters; a drain for condensate is required.

## Financing

- **Federal tax credit:** 30% up to \$2,000 max. through 2032 (must have tax liability)
- **NYSEG rebate:** \$700 rebate (can be self-installed)
- **Municipal Electric IEEP rebate:** \$750 rebate (can be self-installed)

Additional incentives for income-eligible residents may be available. Contact a [Community Energy Advisor](#) to learn more about your options.

Contact us:

**SmartEnergyChoices.Org**

smartenergychoices@cornell.edu | 607-366-0833