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# ENVIRONMENTAL Fact Sheet

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## Requirements for Geothermal Systems in New Hampshire

### **What are geothermal heating and cooling systems?**

A geothermal heating and cooling system – also called geo-exchange or ground-source heat pump system – is one that uses heat stored in the ground to heat or cool a home or building. These systems work by circulating a fluid through a well or a trench in the ground and “capturing” the heat of the shallow earth. The fluid then transfers the heat into a structure where it is distributed by an air blower or through hot water piping. In the summer, these systems can commonly be operated in reverse, capturing the heat from the building and transferring it to the earth, thereby cooling the building during hotter weather.

Geothermal systems present the consumer with a unique set of benefits that are not commonly associated with most current heating and cooling systems. Although the initial cost for these systems may be greater than a conventional heating and cooling system, over time they generally provide a savings in cost to homeowners and businesses because they require less energy to operate and their operating costs are not directly tied to fuel prices. Their greatest advantage, however, is the fact that by concentrating heat that is naturally present in the shallow earth, rather than producing heat through the combustion of fossil fuels, they reduce greenhouse gas and other air emissions, which significantly impact the environment.

### **Types of Geothermal Systems**

There are essentially two types of geothermal systems used in New Hampshire. The most common type is referred to as an “open-loop” geothermal system, and includes a groundwater well (or wells), a water well pump, piping and a heat pump [compressor] installed in the building. In this type of system, groundwater is used as the heat transfer fluid and is pumped out of the well and circulated through the building’s heat pump where heat is extracted from or transferred into the water. Then the heated/cooled water is re-injected into the same groundwater well from which it was withdrawn or a separate well dedicated to re-injection.

The type that is used less frequently in the state is a “closed-loop” geothermal system. In these systems, an antifreeze solution or refrigerant is circulated through a continuous loop of plastic or copper pipe, which is installed in a drilled well, horizontal trench, pit or the bottom of a surface water body. Similar to the above, heat is either transferred into or extracted from the antifreeze/refrigerant by the heat pump, after which the fluid is re-circulated back into the loop of pipe installed in the ground.

A third type of system, commonly referred to as a “hydrothermal” system, uses very deep wells drilled into hot, dry rock formations to generate steam for electricity generation or a large-scale heat source.

Entities developing this type of system should contact the New Hampshire Department of Environmental Services (NHDES) before initiating a project.

### **State Registration Requirements**

Under federal law, EPA has established several classes of injection wells and requires states to inventory these wells. Open-loop geothermal wells as described above are designated as Class V injection wells, which must be registered with New Hampshire's Underground Injection Control (UIC) program in accordance with Administrative Rule Env-Wq 402 *Groundwater Discharge Permits and Registrations*. Closed-loop geothermal systems, although they do not commonly incorporate Class V injection wells, are included in the UIC registration process to ensure that these systems comply with Env-Wq 401 *Best Management Practices for Groundwater Protection* and other state laws.

The UIC registration process for geothermal systems is divided into two general groups based on type of use, as follows:

- 1. Geothermal System Registration for Single-Unit Residences:** This one-page registration form is for a geothermal system installed at a single residential home. The form can be filled out by the home owner, driller or designer and requests information on the system's type, location and whether or not it also provides drinking water. NHDES uses the information for inventory purposes and will follow up with the owner by providing recommended guidelines on private well sampling and disinfection procedures.
- 2. Geothermal System Registration for Industrial, Commercial and Institutional (ICI) Facilities:** This registration form is for a geothermal system installed at any ICI facility. Generally, this form is completed by the geothermal system designer/installer and requires submission of a facility site plan showing the location of the withdrawal and injection wells, system flow meters and sampling points, as well as an operational water balance that estimates volumes of water withdrawn, injected and rejected. The additional information is required to assist the UIC program coordinator in determining whether other DES permitting programs apply to the project and greatly simplifies the process for a registrant by providing a single form and point of contact. The registration issued for these systems will include conditions relative to the various DES programs involved, if necessary.

### **Well Construction Requirements**

Wells and boreholes drilled for use with both open- and closed-loop geothermal systems are required to meet certain siting and construction standards established by the New Hampshire Water Well Board. State law also places certain siting restrictions for open-loop geothermal systems installed in areas where groundwater would potentially be influenced by seawater, and establishes recording and reporting requirements for certain geothermal projects that install multiple deep wells at a project site<sup>1</sup>.

### **Notice for the Potential Need for a National Pollutant Discharge Elimination System (NPDES) Permit**

If the system design includes a bleed/reject water discharge to a surface water, a storm sewer discharge with an outflow to a surface water, or a detention/retention pond discharge with an overflow to a surface water, then the project may require a federal NPDES Non-Contact Cooling Water General

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<sup>1</sup> State Law [Laws of 2008, 19:1] states "Any person exploring hydrothermal or geothermal resources, or any person installing a geothermal energy system who drills at least 3 boreholes 1,000 or more feet deep on one site, shall report to the state geologist a description or log of the geological formations and materials encountered in the borehole that achieved the greatest depth. The report shall include any temperature measurements from fluids or temperatures measured at the bottom of one of the boreholes. Each report shall be prepared by a geologist licensed in this state within 30 days of the completion of drilling."

Permit. For more information concerning this permit, please contact the NHDES Wastewater Engineering Bureau at (603) 271-0671 or by email at [Haley.franz@des.nh.gov](mailto:Haley.franz@des.nh.gov).

For additional information on geothermal system registration requirements, contact the UIC program coordinator at (603) 271-2858 or by email at [mitchell.locker@des.nh.gov](mailto:mitchell.locker@des.nh.gov).

Note: This fact sheet is accurate as of June 2019. Statutory or regulatory changes, or the availability of additional information after this date may render this information inaccurate or incomplete.