PERMITTING REQUIREMENTS FOR GEOTHERMAL HEATING & COOLING SYSTEMS

ACREL FALL MEETING

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I. What are geothermal heating and cooling systems?

A. 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 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 in 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. [1]

1. Geothermal Heating: During the winter, a geothermal heat pump uses a piping loop to extract heat from the ground. Water or a water/antifreeze mixture is typically pumped through a pipe into the ground, which is then heated. The heating system pulls heat from the loop and distributes it within a building through a conventional duct system as warm air.

2. Geothermal Cooling: In warmer months, a cooling system can pump water through the subsurface to cool water for air conditioning operations.

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[1] New Hampshire Department of Environmental Services, Environmental Fact Sheet, 2011.

Instead of extracting heat from the ground, heat is extracted from the air in a building and either moved back into the loop or used to preheat the water in a hot water tank.

B. Types of Systems

1. Open Loop: An open loop system withdraws water from the subsurface and discharges the same water back into the ground after it has been circulated through the heating/cooling system.

2. Closed Loop: In a closed loop system, water is not discharged from the system. Rather, water is pumped into the subsurface to be heated or cooled, passed through the heating/cooling system, and then re-circulated within the system. No water is withdrawn or discharged from the subsurface in a closed loop system.

II. Federal Permitting Requirements.

A. EPA classifies a variety of injection wells at 40 CFR Part 144.

B. Geothermal wells are regulated by EPA under the Safe Drinking Water Act, Underground Injection Control ("UIC") Program. Open loop geothermal wells are typically considered Class V wells pursuant to 40 CFR 144.6 and 144.81.

C. Federal Primacy – In states where authority is not delegated to the state UIC program (See 40 CFR 144.1(d)), 40 CFR 144.31 requires a permit from EPA for an underground injection well classified as a Class V well.

1. States that require an EPA permit (may not be all inclusive and there still may be state specific requirements in some cases) include Alaska, Florida, Kentucky, Indiana, Louisiana, Michigan, Minnesota, Nevada, New York, Pennsylvania, Tennessee, Virginia, District of Columbia.

2. Tribal lands are regulated by EPA.

D. Applicant must file an application with EPA where EPA has primacy. Materials required include:

1. The activities conducted by the applicant which require it to obtain permits under RCRA, UIC, the National Pollutant Discharge Elimination System (NPDES) program under the Clean Water Act, or the Prevention of Significant Deterioration (PSD) program under the Clean Air Act.

2. A list of up to four SIC codes which best reflect the principal products or services provided by the facility.

3. A statement whether the facility is located on Indian lands.

4. A topographic map (or other map if a topographic map is unavailable) extending one mile beyond the property boundaries of the source depicting the facility and each of its intake and discharge structures; each of its hazardous waste treatment, storage, or disposal facilities; each well where fluids from the facility are injected underground; and those wells, springs, and other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within a quarter mile of the facility property boundary.

5. A brief description of the nature of the business.

6. For EPA-administered programs, the applicant shall identify and submit on a list with the permit application the names and addresses of all owners of record of land within one-quarter mile of the facility boundary. This requirement may be waived by the Regional Administrator where the site is located in a populous area and the Regional Administrator determines that the requirement would be impracticable.

7. A plugging and abandonment plan that meets the requirements of 146.10 of the above-referenced chapter and is acceptable to the Director.

E. Large Scale Geothermal Projects

1. Large scale geothermal projects may require compliance with NEPA or state equivalent.

III. State Permitting Requirements.

A. Practice Pointer – The applicant and/or attorney must determine first whether EPA or state has primacy.

B. Each state is different. Even if EPA has primacy, the state may have separate requirements for who may install wells, licensing of well installers, and requirements for well installation and design.

1. Generally there is a requirement for a permit for open loop systems. Closed loop systems generally require only a registration or notification to the state.

C. State Survey (examples only and not illustrative of every state)

1. Massachusetts

a) Massachusetts Department of Environmental Protection ("DEP"), Drinking Water Program regulates underground injection wells pursuant to 310 CMR 27.00

b) The Guidelines for Ground Source Heat Pumps dated December, 2013 issued by the Massachusetts Department of Environmental Protection Bureau of Resource Protection Drinking Water Program provide a simple review of requirements.

c) Only MA Registered Well Drillers are permitted to construct, alter or decommission geothermal wells in Massachusetts.

d) Open Loop Systems

(1) A UIC registration is required for open loop systems where the system reinjects ground water for the purpose of transferring heat to or from the earth and/or to provide potable hot water.

(2) If the applicant proposes to add any additive to the discharge from an open-loop system, it must file for a Ground Water Discharge Permit (314 CMR 5.00), not a UIC registration. This category does not include cooling of process water (see Other - Non-Contact Cooling Water).

(3) Open loop systems must sample the aquifer at registration for a variety of constituents and the discharge at startup and 90-120 days after startup.

(4) If discharge is to a different aquifer, DEP reviews discharge and approval is on a case-by-case basis. The diversion of water to a different aquifer is a significant regulatory concern.

e) Closed Loop Systems – requires a registration pursuant to 310 CMR 27.00.

(1) Owner/operator must file a UIC Registration Application for Closed-Loop Ground Source Heat Pump Well.

(2) As the system does not actually discharge, process is simplified and merely registers the wells. There may still be local requirements for permitting.

(3) There is no fee and registration does not expire.

2. New Hampshire

a) Registration is divided into residential and industrial/commercial/institutional.

b) Open Loop Systems must be registered with NH UIC program in accordance with Administrative Rule Env-Wq 402 Groundwater Discharge Permits and Registrations.

c) Closed Loop Systems, even though not considered injection wells, require registration pursuant to Rule Env-WQ 401 Best Management Practices for Groundwater Protection.

3. North Carolina

a) A permit is required for open loop system.

b) A closed system requires a well construction notification.

c) A pump and dump system that does not reinject water is regulated as a water supply well.

IV. Other Permitting Requirements to Consider.

A. Does the system discharge to another aquifer or use some percentage of the extracted groundwater during processing? If so, a water supply or water withdrawal permit may be required.

B. Local Board of Health – the municipality may have regulations regarding the siting, location and size of injection wells. For instance, in Massachusetts, most municipalities have a prohibition of discharges to groundwater that could detrimentally impact groundwater quality without the approval of the local Board of Health.

C. Conservation Commission (Massachusetts) or other natural resource protection requirements. For example, compliance with any regulatory setback requirements from wetlands or other protected natural resource areas may be required.

D. State specific drilling requirements where EPA has primacy. Despite EPA having authority to permit the injection well, states usually will have additional requirements for groundwater protection and well installation guidelines.