



IOWA CHAPTER

Geothermal Heating and Cooling

Geothermal heating and cooling involves using the temperature of the earth to heat and cool a building. Three technologies are used in geothermal units:

1. closed-loop geothermal
2. geothermal with reinjection wells
3. pump-and-dump geothermal or open loop geothermal

Closed-loop geothermal and geothermal with reinjection wells are both preferable to pump-and-dump geothermal.

Closed-loop geothermal

In closed-loop geothermal, water or chemicals circulate through pipes that are buried underground. The fluid in the buried pipes becomes the same temperature as the ground temperature. In the winter, the ground temperature is warmer than the outside air temperature while the ground temperature is cooler in the summer than the outside air temperature. The fluid in the pipes is then routed to a heat exchanger which cools the air in the summer and heats the air in the winter.

Geothermal with reinjection wells

With geothermal with reinjection wells, water is drawn from an aquifer and re-injected into the aquifer after the heat-exchanger has used the water. When water is drawn from an aquifer, the temperature of the water is warmer than outside air during the winter and cooler than the outside air in the winter. In the summer, the geothermal unit uses the cooler water temperature to air condition a building while in the winter the geothermal unit uses the warmer water temperature to partially heat a building.

Pump-and-dump geothermal or open loop geothermal

Pump-and-dump geothermal withdraws water from the aquifer, uses it to heat or cool a building, and then discards the water into a stream or storm sewer after the heat exchange process has been completed. Another name for pump-and-dump geothermal is open loop geothermal.

When large buildings use pump-and-dump geothermal, huge quantities of water are drawn from the aquifer. Long-term, the withdrawal of the water from the aquifer can result in lowering the water level in the aquifer or draining of the aquifer. If the water level is lowered too much, shallow wells will go dry. According to the February 17, 2008, *Cedar Rapids Gazette* article "Heated question," Kennedy High School in Cedar Rapids uses 720,000 gallons of aquifer water for geothermal heating during the winter. In Black Hawk County, more than 50 wells at the University of



Photo Credit: National Renewable Energy Laboratory

Northern Iowa, schools, hospitals and other businesses annually withdraw between 5 billion and 10 billion gallons of water for pump-and-dump geothermal.

Furthermore, the temperature of the water being dumped after it is used by the geothermal heat exchanger can raise or lower the temperature of the receiving water body. That, in turn, can affect the animals that live in the water. Some animals are very temperature sensitive, including trout. The mineral content of the water can also change the mineral content of the accepting stream, which can affect the wildlife using the stream.

For these reasons, the Iowa Chapter opposes pump-and-dump geothermal installations and supports mandatory modification of those systems to closed-loop systems.

Policy recommendations

The Iowa Chapter supports policies governing water withdrawal from aquifers that provide a sustainable, dependable source of water for current uses and for future uses. For this reason the Iowa Chapter:

- Opposes pump-and-dump geothermal installations and supports mandatory modification of those systems to closed loop systems.
- Supports funding the Department of Natural Resources to monitor the health of the aquifers in the state.
- Supports fees for cities and large businesses that withdraw large quantities of water with the fees used to monitor the health of the aquifer. This includes including ethanol producers and electricity generators who use the water in cooling towers.

Sources

Adam Belz, "Schools Urged to Avoid Pump/Dump Geothermal – Chief in C.R. Heeds Environmental Issues in his Recommendation," *Cedar Rapids Gazette*, May 8, 2008

Adam Belz, "Heated Question," *Cedar Rapids Gazette*, February 17, 2008