

How does Oregon use its geothermal resources?

The first commercial geothermal plant has been added to the Oregon's power generation inventory. U.S. Geothermal is generating nearly 23 MWe (megawatts) of electricity (1 MWe of electricity is enough to power 1000 households) from its Neal Hot Spring geothermal plant located near Vale. Oregon joins eight other states that produce commercial power from geothermal plants.

Locally, since the 1960s, geothermal energy has played a significant role in direct-use applications. For example, in Klamath County there are 19 locations where hot geothermal water is used for district/space heating, snow melting, and

or greenhouse/aquaculture operations. The Oregon Institute of Technology (OIT) in Klamath Falls uses wells on the campus to heat all of OIT's buildings. In 2010, OIT dedicated its geothermal electricity generation plant with a maximum capacity of 1.2 MWe gross power using existing wells on the campus.

To the east in Lake County, the new Warner Creek Correctional Facility uses a geothermal system; four other places in Lakeview use geothermal water. Hot geothermal water is located in other parts of the state as well and has been used for similar direct-use applications, including spas, industrial, and agricultural drying.



(top) Neal Hot Spring geothermal power plant near Vale, Malheur County, operated by U.S. Geothermal. Looking northwest into Cottonwood Creek with Cottonwood Mountains in background. The power plant was put online December 2012 and will operate between 17 and 23 Mw. (Photo: Jason McClaughry, DOGAMI.) (bottom) U.S. Geothermal, Inc.'s first commercial geothermal well (located to the right of the plant in the top photo).

Geothermal Permitting

The State of Oregon, through the Mineral Land Regulation and Reclamation program (MLRR) at the Oregon Department of Geology and Mineral Industries (DOGAMI), regulates the drilling of wells for the discovery and production of high-temperature geothermal resources (greater than 250°F) in a manner necessary to safeguard the life, health, property, and welfare of the people of this state, to safeguard the air, water, and other natural resources of this state, and to encourage the maximum economic recovery of geothermal resources.

Types of Geothermal Exploration Activity Requiring Permits

- **Geothermal Well:** permits the drilling of a well that will encounter the geothermal resource in order to produce fluids. One well covered under one permit.
- **Geothermal Injection Well:** modifies a Geothermal Well permit to allow for the reinjection of geothermal fluids.
- **Prospect Well:** permits the drilling of a well or hole only in order to collect information and that does not encounter the geothermal resource. Up to five holes can be covered under one permit.
- **Seismic Programs:** permits the drilling/excavation of wells or holes conducted for the proposes of exploring for geothermal resources.

MLRR bonding requirements

- **Financial Security:** Geothermal well = \$25,000; Prospect well permit and Seismic Programs: \$50,000.

Other State and Federal Agencies Responsible for Regulation of Geothermal Exploration and Development

- Oregon Department of Environmental Quality (ODEQ)
- Oregon Department of Energy (ODE)
- Oregon Water Resources Department (OWRD)
- Oregon Department of State Lands (ODSL)
- State Historic Preservation Office (SHPO), an office of Oregon Parks and Recreation Department (OPRD)
- Oregon Department of Fish and Wildlife (ODFW)
- U.S. Bureau of Land Management (BLM)
- USDA Forest Service

Applications are circulated to these natural resource agencies and to local land-use governing bodies for comment.

For more information refer to Oregon geothermal statutes (ORS 522) and rules (OAR632-020).

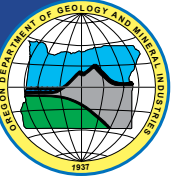


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Nature of the Northwest Information Center

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DOGAMI Fact Sheet: Geothermal Exploration & Development in Oregon



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The Oregon Department of Geology and Mineral Industries (DOGAMI) is the state agency responsible for regulation of geothermal exploration and production. American Recovery and Reinvestment Act of 2009 (ARRA) funding has allowed DOGAMI to compile all its legacy geothermal information and make it available to the public via several outlets. ARRA funding has also provided DOGAMI with the opportunity to drill geothermal temperature gradient wells in previously unexplored areas in order to capitalize on Oregon's varied geothermal resources.

For more information on geothermal...

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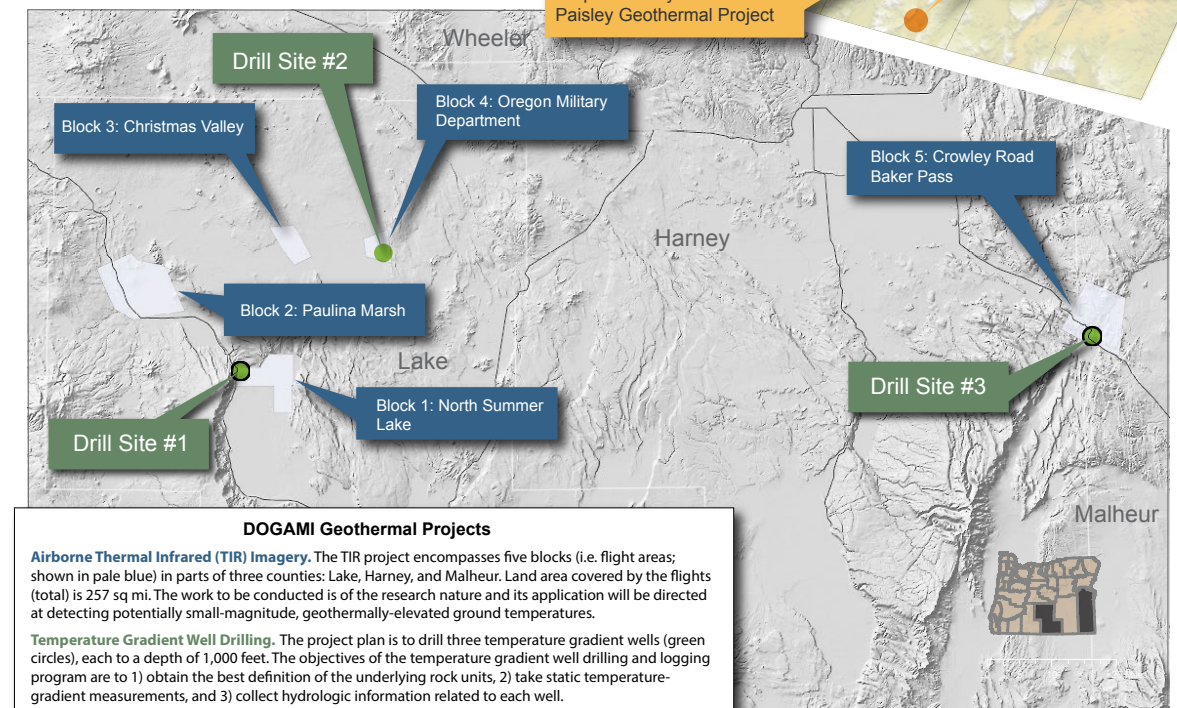
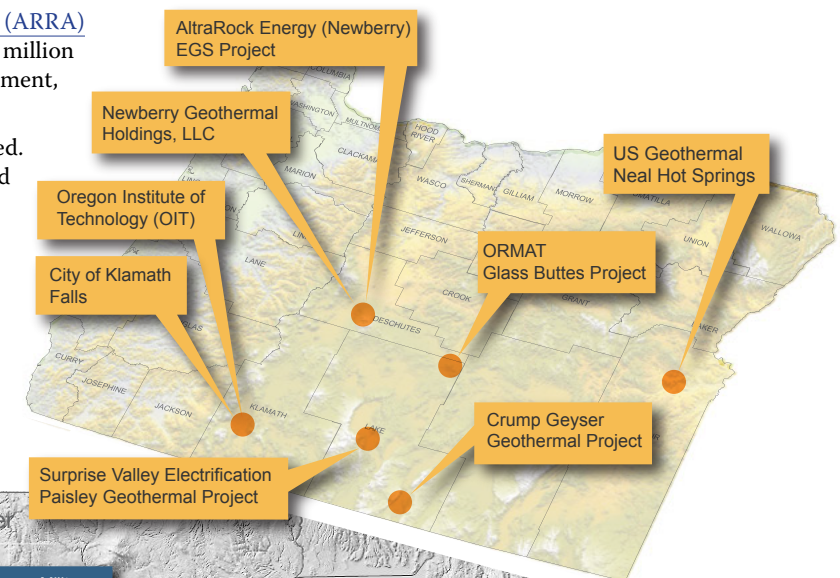
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ARRA Projects Underway

The [American Recovery and Reinvestment Act of 2009 \(ARRA\)](#) through the Federal Department of Energy provided over \$39 million in new funding for Oregon's geothermal research, development, demonstration, and deployment activities.

(right) Eight different geothermal projects were funded. DOGAMI received nearly \$1 million over a 3-year period to prepare its legacy geothermal data for inclusion in the [National Geothermal Data System \(NGDS\)](#) and to collect new data.

(bottom) Two projects are underway to collect new data: 1) explore the use of use airborne thermal infrared (TIR) imagery to detect small-magnitude, geothermally elevated ground temperatures, and 2) drill temperature-gradient wells with a related mapping and logging program.



Oregon's Geothermal Resources

This map, based on the Oregon Geothermal Information Layer for Oregon, release 2 (DOGAMI GTILO-2, 2012) shows areas in Oregon that have been investigated for geothermal resource potential or that show potential.

Hot and Warm Springs

690 thermal springs are represented. Oregon's thermal springs are produced by the emergence of geothermally heated groundwater and are defined in most cases as springs having temperatures greater than 20°C (68°F). This map categories springs as “warm” (yellow greater than 18.3°C/65°F), “warmer” (orange 69-95 °F), “hot” (red 95-210 °F), or as temperature unknown but above 20°C/68°F (green). A characteristic of thermal springs in Oregon is that they usually represent a group of affiliated springs.

Geothermal Wells

66 boreholes were drilled as geothermal wells for producing geothermal resources. This category includes any geothermal re-injection wells.

Low-Temperature Geothermal Wells

These wells represent various types of low-temperature wells (e.g., domestic/irrigation/other water supply wells) throughout Oregon. Low-temperature wells are defined as those wells within which there is water in the borehole having a temperature greater than 18.3°C (65°F) and are at least 60 ft (18.3 m) deep.

Geothermal Prospect Wells

1,019 points represent geothermal prospect wells in Oregon. A geothermal prospect well is defined as any well drilled as a geophysical test well, seismic shot hole, mineral exploration drilling, core drilling, or temperature gradient test well, less than 2,000 ft (667 m) in depth, and drilled in prospecting for geothermal resources.

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Get the geothermal data on CD-ROM:

Geothermal Information Layer for Oregon,
release 2 (GTILO-2) by Niewendorp and others,
2012, \$30, from the Nature of the Northwest
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View the data on this map at:

<http://www.oregongeology.org/sub/gtilo/index.htm>

Basemap: World Topographic Map. Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, and the GIS User Community

