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Geothermal Energy

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This issue brief provides an overview of geothermal energy resources and policies in the United States and Colorado as well as recent legislation enacted to promote the use of geothermal energy in Colorado.

Geothermal Energy

Geothermal energy refers to heat found within the Earth. Some areas of Earth's crust are naturally hotter than others due to geologic differences, and crust temperature generally increases with depth. Applications for geothermal energy depend largely on the resource's temperature.

- Ground source heat pumps can be used in nearly all settings. They use the relatively constant ambient temperature of the shallow subsurface to transfer heat from the ground into buildings in the winter, a process that is reversed in the summer to cool buildings.
- Low-temperature geothermal resources can be used to directly heat buildings, where hot water near the earth's surface is piped into buildings. Multiple heat pumps and direct use systems can be aggregated into a thermal energy network to heat and cool multiple buildings simultaneously.
- Moderate and high-temperature geothermal resources can be used to generate electricty via steam from hot water reservoirs or injected water. Currently, seven states (California, Nevada, Oregon, Idaho, Utah, New Mexico, and Hawaii) have geothermal power plants, generating around 17 billion kilowatt-hours of electricity, equal to 0.4 percent of net U.S. electricity generation.[1] Colorado does not currently have any geothermal energy electricity generating facilities.

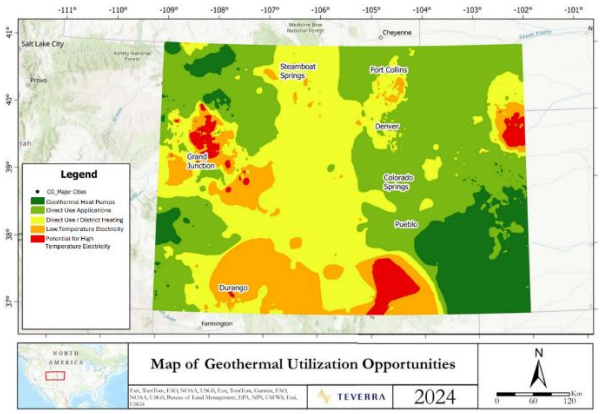
Historically, geothermal energy systems have drawn heat from conventional hydrothermal resources (steam or hot water) found near the Earth's surface. More recently, a field of developing techniques termed 'enhanced geothermal systems' (EGS) have allowed the recovery of heat from deeper, dryer, and hotter rock much further below the Earth's surface.

There are significant geothermal resources in the United States, particularly in the West.

[1] Use of geothermal energy - U.S. Energy Information Administration (EIA)

Figure 1 shows the accessible low- and high-temperature geothermal resources in Colorado and their potential applications.

Figure 1. Geothermal Utilization Opportunities in Colorado



Source: *Geothermal in Colorado: Resources, Use Strategies, and Impact Considerations*, Colorado Energy and Carbon Management Commission (2024)

Renewable Energy Standards and Net Metering

Colorado law defines geothermal energy as a renewable energy resource. Thus, producers of electricity from geothermal energy are eligible for renewable energy credits, which can be sold and traded to meet compliance requirements with renewable energy standards.

Most states with active renewable energy standards include geothermal energy as a qualifying energy source. Moreover, as of 2018, at least 25 states include distributed geothermal energy projects in net metering policies, which allow distributed generation customers to sell excess electricity produced on-site to their utility provider in exchange for a credit on their utility bill. In Colorado, current law allows net metering for customer-sited renewable energy generation facilities, which includes geothermal energy. To date, the Colorado Public Utilities Commission has not had a geothermal project seek to be treated as net-metered.

Colorado Regulations

Geothermal resources are regulated under the Colorado Geothermal Resources Act and administered by the Department of Natural Resources (DNR). Within DNR, administration of shallow geothermal resources (less than 2,500 feet below ground) is shared between the State Engineer within the Division of Water Resources (DWR) and the State Board of Examiners. Deep geothermal resources (more than 2,500 feet below ground) are administered by the Energy and Carbon Management Commission (ECMC). The DWR and ECMC have promulgated rules for geothermal well permitting, which establish minimum standards required to protect public health, safety, welfare, and the environment, and to promote its efficient use.

The majority of Colorado's geothermal resources are currently developed through springs as surface water rights or through geothermal water well permits. ECMC has not processed any deep geothermal production permits to date but has permitted two exploration wells.

Geothermal Leases

The State Board of Land Commissioners offers geothermal exploration permits and production leases through direct negotiation or competitive sealed bids.

Property Valuation and Taxation

Geothermal energy facilities are considered public utilities, and are assessed for property taxation by the Division of Property Taxation within the Department of Local Affairs.

Geothermal Energy Incentives

The federal government offers tax credits and grant awards for geothermal electricity generation, heat pumps, and thermal energy network projects; however some of these incentives will expire in 2026.

Within Colorado, the Colorado Energy Office is administering a $12 million grant program for businesses and local governments to invest in geothermal energy systems, including heating, cooling, and electricity generation. In 2023, Colorado also created refundable state income tax credits for the development of geothermal energy projects and the installation of heat pumps.

Recent Legislation

The Colorado General Assembly enacted four recent measures to promote and regulate the use of geothermal energy in Colorado.

- House Bill 23-1272, in addition to other matters, creates new refundable state income tax credits for several decarbonization initiatives, including the evaluation and development of geothermal energy resources for the purpose of electricity production, the production of geothermal electricity for sale or for own use, and the installation of heat pump technology or the development of a thermal energy network.
- House Bill 23-1252 addresses geothermal energy usage by expanding an existing grant program, creating requirements for thermal energy networks, and repealing the Geothermal Heat Suppliers Act, which required geothermal heat suppliers to obtain operating permits from the Public Utilities Commission (PUC).
- Senate Bill 23-285 changes the name of the Colorado Oil and Gas Conservation Commission to the Energy and Carbon Management Commission (ECMC) and expands the ECMC's regulatory authority to include energy generation and storage technologies in areas beyond oil and gas. The law gives the DWR authority to regulate shallow geothermal operations, and the ECMC authority to regulate deep geothermal operations.
- House Bill 25-1165 creates the Geologic Storage Stewardship Enterprise in DNR to fund the long-term stewardship of geologic storage facilities. The law also expands the authority of the State Engineer to regulate certain geothermal operations, aligning the regulation of geothermal wells with those of water wells.