Geothermal Energy Potential
State of Utah

Power Generation

Geothermal energy is heat from the Earth. It’s clean and sustainable. Resources of geothermal energy range from the shallow ground to steam, hot water, and hot rock accessed by drilling wells up to thousands of feet beneath the Earth’s surface. The extremely high temperatures in the deeper geothermal reservoirs are used for the generation of electricity.

Most electricity in the U.S. is generated using steam. The high-pressure steam spins a turbine that rotates a generator, producing electricity. The largest source of carbon emissions in the U.S. are the many power plants still burning fossil fuels to boil water for steam. Geothermal power plants, however, do not burn fuels to heat water to steam. Instead, they use natural heat found below the Earth’s surface to generate electricity.

New geothermal power plants produce near-zero CO₂ and emit very little air pollution.

And unlike solar or wind energy, geothermal energy is available around the clock.

BENEFITS

Jobs Boost. Geothermal power plants employ about 1.17 persons per MW. Adding related governmental, administrative, and technical jobs, the number increases to 2.13.

Economy Boost. Over the course of 30 to 50 years an average 20 MW facility will pay nearly $6.3 to $11 million dollars in property taxes plus $12 to $22 million in annual royalties. Seventy-five percent of these royalties ($9.2 to $16.6M) go directly back to the state and county.

Locally Produced. Geothermal power can offset electricity currently imported into the state, keeping jobs and benefits in state and local communities.

Near-Zero Carbon Emissions. Geothermal flash plants emit about 5% of the carbon dioxide, 1% of the sulfur dioxide, and less than 1% of the nitrous oxide emitted by a coal-fired plant of equal size, and binary geothermal plants – the most common – produce near-zero emissions.

Small Footprint. Geothermal has among the smallest surface land footprint per kilowatt (kW) of any power generation technology.

Reliable. Geothermal power can provide consistent electricity throughout the day and year - continuous baseload power and flexible power to support the needs of variable renewable energy resources, such as wind and solar.

Sustainable Investment. Energy resource decisions made now for sources of electric power have 40-50 year consequences, or longer. Using renewables like geothermal resources avoids “price spikes” inherent in fossil fuel resource markets. Geothermal energy is an investment in stable, predictable costs. Investing in geothermal power now pays off for decades to come.

Discover the geothermal power generation potential in your state.
Reliable, baseload power:
the potential could be about 2,000 MW$_e$.

Total annual power consumption in Utah in 2013 was 119,000 GWh. Geothermal potential in the state is as much as 12,400 GWh – 11% of the state’s power consumption, providing reliable baseload power.

Carbon emissions reduction:
10 Million metric tons

The EPA’s Clean Power Plan list 2013 emission levels for Utah to be 30 MMtCO$_2$. 2030 target levels for the state are set at 23.7 MMtCO$_2$. Developing geothermal power in the state can help Utah meet its target carbon emission levels, as new binary geothermal power plants will have no CO$_2$ emissions.

Locally produced power:
100% in-state electricity production

Geothermal plants can operate for many decades providing stable jobs to local communities and revenue to state and municipal treasuries.

Policies & Incentives
Federal and state policies and incentives helped catapult renewable energy technologies, such as wind and solar, into the billion dollar industries they are today.

State incentive programs that help developers reduce upfront risk and secure power purchase agreements can help to incentivize geothermal power development in the state.

Geothermal Power Projects in Development in Utah
- Thermo Hot Springs in Beaver County
- Drum Mountain in Millard County
- Cricket in Millard County
- Cove Fort II in Beaver & Millard County

Utah’s most promising Geothermal Resource Areas

Data sources for the information in this flyer can be obtained by contacting the Geothermal Energy Association
*depending on the power price, new technology advances, and reductions in the cost of development
Direct Use

Geothermal energy is heat from the Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock accessed by drilling wells up to thousands of feet beneath the Earth's surface. The hottest reservoirs are used to produce electricity, and the more common moderately hot reservoirs are a ready source of natural heat, without burning fossil fuels.

Direct, or non-electric, use of geothermal energy refers to the use of the energy for both heating and cooling applications. Fluids with temperatures of <300° F, adequate for direct use, are available throughout much of the United States.

Direct use of geothermal energy in homes and commercial operations is much less expensive than using traditional fuels; savings can be as much as 80%! Furthermore, direct use applications such as fish farms, greenhouses, microbreweries, fruit and vegetable drying, spas, pulp and paper processing, and lumber drying offer attractive and innovative opportunities for local businesses and entrepreneurs.

BENEFITS

Jobs Boost. Direct-use geothermal energy projects leverage existing workforces and companies within the state. Their simple design and construction from off-the-shelf parts can utilize local engineering firms, geologists, drilling operators, construction trades, pipefitters, technicians, and welders. A rough prediction of potential job opportunities created by installing direct use systems may be 3 temporary jobs per MWth during construction, with 1 full-time job per MWth for ongoing operation.

Economy Boost. Geothermal heated facilities have the potential to stimulate economies through increased tax revenues, the creation of new businesses and local jobs, tourism, agriculture, and enhanced community involvement.

Locally Produced. Directly using geothermal energy in homes and commercial operations, such as food production from local agriculture, can offset imported energy, keeping jobs, dollars, and other benefits in local communities.

Carbon Emission Reduction. Geothermal direct use projects produce near-zero emissions. Depending on the existing heating fuels being offset, this may result in annual emissions reductions of anywhere between 1,700 tons (if offsetting natural gas) to 9,300 tons (if offsetting inefficient electricity) of CO2 saved per MWth of installed GDU capacity.

Flexible Heating Systems. Applications of geothermal direct use may include district heating, snow melting, spas and pools, agriculture, food processing, and other uses. Within a single system these diverse applications can be “cascaded” and work together in the most efficient way possible to ensure the maximum benefit and lowest costs possible from direct use systems.

Reliable and Sustainable Heat Source. Geothermal heating projects last for decades—typically at least 25 years or more—providing reliable energy at a low, stable price. This can provide price certainty and insulate consumers (and the economy) from often unpredictable fluctuations in fossil fuel prices.

Discover the geothermal direct use potential in your state.
Carbon emissions reduction: 1.2 Million metric tons

Utah’s CO₂ emissions from heating is nearly 6.8 MMtCO₂ per year. Developing geothermal direct-use in the state can reduce emission by as much as 1.2 MMtCO₂, while providing reliable energy at a low, stable price.

Reliable, stable heat: 19 Trillion BTU

The total estimated annual heat consumption in Utah is 217 Trillion BTU. Developing the hydrothermal direct-use resources in Utah – as much as 19 Trillion BTU – could offset a significant portion of fossil fuel heat consumption in the state with clean, renewable geothermal heat.

Policies & Incentives
Federal and state policies and incentives helped catapult renewable energy technologies, such as wind and solar, into the billion dollar industries they are today.

State incentive programs that help developers reduce upfront risk can help to incentivize geothermal direct-use development in the state.

Geothermal Direct-Use Projects in Utah
One of the largest direct use geothermal systems in the country is located near Newcastle, Utah. The Milgro Nursery, one of the leading growers of potted plants, uses geothermal waters to heat their greenhouses, conserving an estimated 1,500,000 kWh of electricity per year.

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Heat Pumps

Geothermal energy is heat from the Earth. It’s clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock accessed by drilling wells up to thousands of feet beneath the Earth’s surface. Geothermal heat pumps use the natural insulating properties of the earth from just a few feet underground to as much as several hundred feet deep, offering a unique and highly efficient renewable energy technology for heating and cooling.

Most work by circulating water in a closed system through a “loop field” installed horizontally or vertically in the ground adjacent to or even beneath a building. Heat is taken from the building and transferred to the ground in the summer. The system is reversible, and heat is taken from the ground and used in the building in the winter. The system only moves heat, which is much more efficient than using energy to generate heat.

Geothermal heat pumps can support space heating and cooling needs in almost any part of the country.

BENEFITS

Economic. On average, a typical home of 2000 square feet will require 4 tons of heating and cooling capacity with an average system installation cost between $5,000 and $7,500 per ton.

Energy Efficient. Geothermal heat pumps use 25% to 50% less energy than conventional heating or cooling systems.

Carbon Emissions Reduction. One ton (12,000 BTU/hr) of GHP capacity over a 20 year operating cycle avoids 21 metric tons of CO₂ emissions. So a typical home system can avoid 80-100 metric tons of CO₂ emissions.

Improved Indoor Air Quality & Safety. There is no combustion in a geothermal heat pump; therefore there is no chance of carbon-monoxide poisoning. By adding high-efficiency air cleaners with geothermal, these systems can improve inside air quality.

Locally Produced. Everywhere. Unlike other geothermal technologies, heat pumps are not limited by geography or geology. They can be installed in almost any location in any of the 50 states or territories of the U.S.

Sustainable Investment. The lifespan of a geothermal system is usually greater than 24 years. A conventional furnace will last 7-10 years with regular maintenance. The ground loop of the geothermal system has a warranty of 50 years. These loops are made up of high-density polyethylene pipe, the same pipe which is used in city gas lines.

Quiet Operation. Unlike air conditioners, there is no outdoor unit. Geothermal units are very smooth and quiet in operation.

Discover the geothermal heat pump potential in your state.
Policies & Incentives

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States can use tax incentives, including property and sales tax incentives, and tax credits to provide an incremental motivation for geothermal development.

Geothermal Heat Pumps in Utah

Geothermal heat pumps are effective for all sizes of buildings from small homes to large buildings. For example, Canyon View High School, in Cedar City, installed a ground source system that costs approximately $729,000 less in upfront costs than a conventional boiler system and saves an estimated $58,300 per year in utility costs.

Household cost savings:
$100s in cost savings each year

Average annual savings when replacing a household system with a geothermal heat pump. When multiple systems are replaced (e.g. space heating and cooling and water heating), savings are additive.

Public & commercial buildings savings

Public and commercial buildings, such as schools, universities, prisons and hospitals, can be retrofitted with geothermal heat pumps and provide cost-savings to the state’s – and other utility rate payer’s – energy bills. The picture above is an example of a commercial size vertical loop system. These systems are quiet, last for several decades, and reduce the state’s dependence on fossil fuels for heating and cooling needs.

Carbon emissions reduction:
Over 50% for most systems

Percentage reduction of CO₂ emission from a geothermal heat pump (GHP) retrofit for a typical home in the Western United States. For example, a retrofitting a fuel oil furnace with a GHP system will reduce CO₂ emissions by 62%.

Utah Geothermal Heat Pump Benefits

Data sources for the information in this flyer can be obtained by contacting the Geothermal Energy Association.

Geothermal Energy Association
http://www.geo-energy.org

Geothermal Resources Council
http://www.geothermal.org

Geothermal Exchange Organization
http://www.geoexchange.org

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