Ball State has eliminated the use of coal and switched to geothermal energy, saving $2 million in operating costs each year with the nation's largest geothermal energy system.

Geothermal Energy

Moving Toward 100% Clean, Renewable Energy on Campus

Geothermal energy systems on campus can help America's colleges and universities to shift to 100 percent clean, renewable energy. Campuses across the U.S. are installing geothermal power systems to save energy, provide learning opportunities for students, and achieve their climate goals.

Geothermal Energy Is a Key Building Block of a Clean Energy Future

Geothermal energy is derived from the heat of the earth, which we have learned to harness to heat and cool buildings, and to produce electricity. Virtually pollution-free, inexhaustible, safe and efficient, geothermal energy is a truly clean source of power that is also dependably constant. With an estimated conventional geothermal potential capacity of 38 gigawatts nationwide, or the energy needs of approximately 23 million homes, geothermal energy is a key piece of the puzzle to help our society shift away from today's energy system built on polluting fossil fuels.

How Does Geothermal Energy Work?

According to a 2011 report by the National Wildlife Federation, 160 campuses in 42 states use geothermal energy for heating and cooling. Thanks to geothermal technologies like heat pumps, campuses can use the heat of the earth or water to:

- Provide space heating or cooling across a network of buildings,
- Save energy by situating new buildings partially underground,
- Generate electricity from steam fields or hot water underground,
- Store thermal energy in aquifers for later use.

Geothermal Energy Presents Challenges and Opportunities

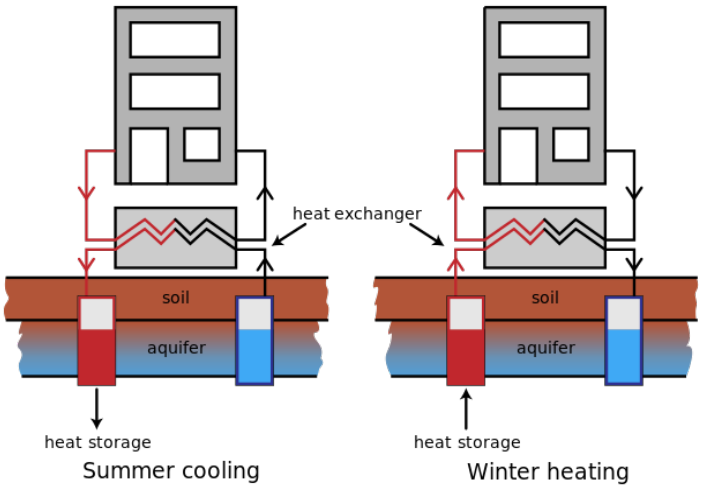
Geothermal technologies can benefit colleges in different ways:

- **Low Operational Costs:** Geothermal energy systems have lower operating and maintenance costs than some other conventional heating systems, which colleges use to recoup the cost of installation.
- **Scaling:** Geothermal technology may also be scaled to benefit individual buildings or whole campuses.
- **Educational Tools:** Energy dashboards have proliferated to help students and faculty monitor the performance of geothermal installations.

Colleges and universities are reducing barriers to geothermal energy:

- **Installation disturbance:** Creating a geothermal heat network may require tearing up streets to lay down piping. For example, Lake Land College in Illinois is taking it one building at a time, and performing major projects during the summer break or at night, to avoid affecting normal campus operation.
- **Innovation:** Universities research and test innovative geothermal energy applications. For example, Cornell University's research has alleviated concerns about the ecosystem impact of heat exchanges with aquifers and lakes, based on studies of its own "Lake Source Cooling" system.

Geothermal heat pumps use the earth as a heat source in the winter or as a heat sink in the summer, benefiting from the earth's stable temperatures for renewable temperature control.



Ball State Replaces Coal-Fired Boilers with One of Nation's Largest Geothermal Energy Systems

At Ball State, a public university in Indiana with more than 20,000 students, heating historically came from four coal-fired boilers that emitted carbon dioxide, sulfur dioxide and particulate matter pollution, contaminants linked to global warming, acid rain and respiratory problems, respectively.

In 2012, those boilers were replaced by one of the nation's largest geothermal energy systems. Water travels through pipes underground, where the stable temperatures heat water in the winter and cool it in the summer, and through campus, where heat exchangers and fans regulate indoor air temperature in more than 5 million square feet of space in 47 buildings. The system improves air quality and saves the school $2 million each year.

To pay for the initial phase of the project, Ball State repurposed $40 million in funds for replacement boilers, along with $5 million in federal grants and additional savings generated by the first completed section of the geothermal system. They are also selling their carbon offsets to help provide revenue through Second Nature's C2P2 program, using the revenue to further invest in energy reduction programs. When sales end in 2021, Ball State can claim the emissions reductions towards its clean energy goals, and move closer to its goal of achieving carbon neutrality by 2030.

Allegheny College Powers Three Buildings with Geothermal Energy Thanks to a Junior Seminar

Students have played a leading role in helping Allegheny College reduce energy consumption. In addition to undertaking energy efficiency measures as part of the U.S. Department of Energy's "Better Buildings Challenge," Allegheny College has installed clean, geothermal energy on its campus. During the design of a new campus residence hall, a junior seminar of 14 students studied ways to make the building more energy efficient, ultimately suggesting measures including a geothermal heating and cooling system. Student analyses of costs and payback periods, along with case studies of similar systems at comparable facilities, convinced university faculty and facilities officials to include a geothermal system in the new building, along with energy efficiency measures. After the project was completed, the benefits of the geothermal system convinced university officials to include similar systems in two additional campus buildings.

This factsheet is one of a 10-piece series. For citations, and to read the other factsheets, please visit EnvironmentAmericaCenter.org/Campus101

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List of Resources

To start your campus' push to adopt geothermal energy:

- Understand the principles underlying geothermal energy: www.energy.gov/eere/videos/energy-101-geothermal-energy
- Read the National Wildlife Federation's geothermal energy guide, Going Underground on Campus: Tapping the Earth for Clean, Efficient Heating and Cooling (2011): www.nwf.org/pdf/Reports/Geothermal%20Guide%20FINAL%203-1-11.pdf