EPA ranks U No. 8 for green power use among universities

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The Green Power Partnership Top 30 College & University ranking (https://www.epa.gov/greenpower/green-power-partnership-top-30-college-university-1), released Jan. 27, 2020, lists the U as No. 8, with 49% of its energy supplied through geothermal and solar power purchase agreements. The U stands out among those listed for its use of geothermal energy. The Green Power Partnership Program (https://www.epa.gov/greenpower/green-power-partnership-top-partner-rankings-0)—a voluntary EPA program—encourages green power use to reduce the environmental impacts associated with conventional electricity use.

"In terms of total kilowatt hours per year, the U is now second in the nation for largest long-term contracts among colleges and universities," said Chris Benson, associate director of Sustainability & Energy in Facilities Management. "This accomplishment for our campus has been a collaborative effort across departments. We are committed to using sustainable energy at the U and this geothermal purchase brings campus that much closer to reaching our carbon neutrality goal before 2050."

As of Nov. 1, 2019—through a partnership with Utah-based Cyrq Energy (https://www.cyrqenergy.com/) and Rocky Mountain Power (https://www.rockymountainpower.net/)—a geothermal plant in Nevada now supplies campus with 20 megawatts of geothermal energy and will do so the next 25 years.

With this contract and the power generated by existing on-campus solar projects, the U's annual green power purchase rises to 161,671,969 kilowatt hours (kWh). This is the equivalent to powering almost 19,000 homes in Utah.

This is the first time in its history the University of Utah will receive over half of its electricity from clean renewable sources. Total carbon emissions will be reduced by 23%.

"We are very fortunate to have the support and expertise of Cyrq Energy and Rocky Mountain Power," said Keith Diaz-Moore, interim chief sustainability officer. "Their expertise paired with our Sustainability & Energy Management team in Facilities have allowed us to reach this benchmark. Improving energy efficiency on our campus is an ongoing effort and the University of Utah is dedicated to identifying new opportunities and partnerships to meet its carbon neutrality commitments."

Carbon neutrality

In April 2019, President Ruth Watkins signed the Presidents' Climate Leadership Commitments (https://secondnature.org/signatory-handbook/the-commitments/) and joined UC3 (https://secondnature.org/initiative/uc3-coalition/) (University Climate Change Coalition) renewing the U's commitment to carbon neutrality by 2050 and placing the institution on a path toward resilience and adaptation.

Reaching carbon neutrality is a complex process requiring a coordinated, multipronged approach. Steps include increasing the energy efficiency of existing assets, replacing targeted assets, in addition to ensuring that energy is coming from clean and renewable sources. The university is shifting away from the use of natural gas for heating systems in buildings and moving towards greater use of electricity.

When 100% of our electricity on campus is renewably sourced this creates the potential for zero-emission, carbon-neutral buildings.

Why geothermal energy?

Geothermal power plants (https://www.youtube.com/watch?v=xykeic1RG9E&feature=youtu.be) harness heat that occurs naturally underground. The heat is pumped out of the ground in the form of hot water or steam and used to drive a turbine that generates electricity.

With all of its classrooms, labs, and healthcare facilities, the University of Utah needs power 24 hours a day. In Utah, most electricity is generated by natural gas and coal-fired power plants. Despite advances in technology, coal-fired power plants remain a significant source of air pollution and emissions. Solar and wind generated electricity are great alternatives but when the sun doesn't shine and the wind doesn't blow, energy must be provided by other sources like coal. Geothermal energy produces a constant "baseload power source" with no gaps in energy production. For this reason, geothermal is an excellent complement to wind and solar.

"This visionary commitment to convert to renewable energy sets a valuable precedent for universities around the country," said Nick Goodman, CEO of Cyrq Energy, the company providing the geothermal power for the University of Utah. "This groundbreaking project shows a significant dedication to geothermal energy, 100% renewable and green. Cyrq Energy is proud to be providing this renewable energy and helping the university meet its goals."

To read more about the Soda Lake Geothermal Field and Plant, click here (https://d26toa8f6ahusa.cloudfront.net/wp-content/uploads/2020/02/10153235/Soda-Lake-Geothermal-Field-and-Plant-Model_final.pdf).

FAQS

What is geothermal energy?

Geothermal energy (https://www.youtube.com/watch?v=xykeic1RG9E&feature=youtu.be) harnesses the heat that naturally occurs hundreds of feet beneath the Earth's surface in a closed loop system. Wells are drilled in areas where natural hotspots are closer to the surface and easier to access. Pipes are inserted and cooler surface water is injected into the earth and then pumped to a power generating facility on the surface as hot water—around 400 degrees Fahrenheit. The heat from the water vaporizes a secondary liquid (usually isobutane) with a lower boiling point. This vapor drives a turbine which generates electricity. In this type of plant, both the water and the secondary liquid are continually recycled.

Where is the facility?

The Soda Lake Geothermal Field is located on the northeast flank of the Soda Lakes volcano, west of the city of Fallon, Nevada. The first Soda Lake geothermal power plant came online in 1987. The power plant generating power for the University of Utah is new but uses the existing well. Compared to the original plant, upgrades in technology substantially increased capacity and reduce downtime.

What are the benefits of geothermal energy production?

Geothermal energy produces a constant "baseload power source" with no gaps in energy production. With all of its classrooms, labs, and healthcare facilities, the University of Utah needs power 24 hours a day. In Utah, most electricity is generated by coal-fired and natural gas power plants. Despite advances in technology, coal-fired power plants are still a significant source of air pollution and emissions. When the wind isn't blowing and the sun isn't shining, renewable energy sources like solar and wind aren't producing electricity and energy must be provided by other sources like coal. For this reason, geothermal is an excellent complement to wind and solar.

Does the University of Utah actually get the electrons?

No, the electrons produced are delivered to the regional electric power grid. The University of Utah has signed a power purchase agreement (PPA), which from an accounting perspective, means the university is buying these electrons. All buildings, organizations, companies, municipalities and cities receive electrons from the electrical grid that is closest to their physical location. However, because new renewable energy is being provided to the grid, less energy from other non-renewable sources like coal needs to be produced. As a system, this means fewer greenhouse gases are emitted. Power plants are held accountable for every electron generated to make sure that it correlates to the usage of the customer.

What is a power purchase agreement?

A power purchase agreement (PPA) is a legal contract between an electricity generator (provider) and a power purchaser (buyer). The university has entered into a 25-year PPA with Cyrq Energy to purchase 20 megawatts (MW) of power that offsets approximately half of the electricity used by the University of Utah. This is actually a three-way contract that includes our partners at Rocky Mountain Power.

Why is this power purchase agreement (PPA) significant?

This purchase agreement will reduce the university's carbon emissions by 23%. This is the first and largest long-term geothermal power purchase agreement for an educational institution such as the University of Utah, a tier-one research institution and hospital with significant electricity needs.

Who are the partners and what are their roles?

Rocky Mountain Power (https://www.rockymountainpower.net/) continues to be a vital partner for the University of Utah as the regional utility that provides all of the electricity to the University of Utah Campus. RMP owns and maintains the infrastructure that transmits power throughout the State. Rocky Mountain Power also ensures that the university experiences no interruptions in power and continues to deliver electricity from other generators within its network.

CYRQ Energy (https://www.cyrqenergy.com/) is a developer, owner and operator of geothermal plants in the western United States. They own and operate the Soda Lake Plant in Fallon, Nevada which is generating the power purchased by the University of Utah.

Is geothermal energy more expensive than electricity produced by other means?

Yes, by a negligible amount. However, this PPA guarantees the University of Utah a long-term source of renewable energy at a fixed rate. If the price of coal or natural gas rises in the future, this PPA will help insulate the university from a rise in electricity costs.

Where does this place the U in terms of rankings?

In terms of overall kilowatt hours, the U is ranked No. 8 for largest green power users among higher education institutions in this program. The U also holds the second largest long-term contract among higher education institutions that participate in the Green Power Partnership program.

Is this related to the U's research in geothermal energy or the Utah FORGE project?

No, the Cyrq plant is not related to the Utah FORGE project (https://utahforge.com/). Utah FORGE is a U.S. Department of Energy-funded project based in Milford, Utah, that is developing and testing innovative geothermal energy technology with the goal of expanding application across the U.S. Click here (https://www.energy.gov/eere/forge/forge-home) for more information from the DOE website.

The experimental Utah FORGE project is implemented by the Energy & Geoscience Institute (EGI) at the University of Utah. EGI is recognized worldwide as a leader in geothermal science and as a center of excellence. EGI has conducted more than $800 million in geoscience and engineering research in oil and gas, geothermal, and carbon management since 1972.

What happens if the plant shuts down or has technical problems?

There will be no interruption in service to the University of Utah if the Cyrq plant shuts down for routine maintenance or repairs. Because there are many sources of back up electricity that can supply power to the grid, single plant shutdowns do not have any direct impact on the overall electricity supply. Rocky Mountain Power has an adequate supply of power to continue uninterrupted service to compensate for routine shutdowns.

Do geothermal power plants cause earthquakes?

Any underground activity, such as drilling new geothermal wells or pumping water out of a well has the potential to create small seismic events. During the first year or two, new wells can experience small seismic events of magnitudes around 1.0, typically not felt at the surface. This is a result of the pressurized water flowing in new patterns. The Soda Lake Geothermal Field has been online for 30 years and is well-studied and closely monitored. Safety procedures are in place to minimize the seismic impact of geothermal energy production.

Do geothermal power plants pollute groundwater?

The water used in the closed loop system pumped in and out of geothermal wells is not drinkable. Geothermal power plants are designed to return the water to the ground without the addition of any chemicals or pollutants so as not to introduce contaminants into geothermal aquifers.


Cyrq
Soda Lake
geothermal

Soda Lake Geothermal Field and Plant

This 3-D model represents the Soda Lake Geothermal Plant, which will be providing 20 megawatts or nearly 50% of the electricity used at the University of Utah. The U entered into a 25-year power purchase agreement with Utah-based Cyrq Energy, which owns and operates the geothermal plant and Rocky Mountain Power, which owns and maintains the infrastructure that transmits power to the U.

The underground part of the model is at a scale of 100:1, while the power plant is at a scale of 50:1. Soda Lake is located in west central Nevada and has two geologic characteristics that make it ideal for geothermal energy production. First, the Earth's crust is relatively thin there, which adds extra heat to the subsurface. Second, young faults provide conduits for hot water to bring that extra heat closer to the surface of the Earth. Thanks to these ideal geothermal conditions there are over 15 geothermal projects within 100 miles of Soda Lake.

The oldest rocks shown in this model are at the bottom, and become younger towards the top. Rocks like those in the subsurface at Soda Lake are exposed in the mountain ranges of Nevada, but are buried two miles below the surface here. These color-coded subsurface layers represent volcanic (green and brown) and sedimentary rocks (yellow and blue) that were emplaced over the past 30 million years. These layers are fractured and tilted along normal faults (shown in gray) that form where the Earth's crust is extending or pulling apart, which is actively happening across the basin and range from Salt Lake City westward to Reno, Nevada.

At the Soda Lake Geothermal Field, the normal faults provide pathways (red arrows) for hot water to flow upwards from the older rocks into younger, shallower rocks. The Soda Lake Geothermal Field contains another buried geologic surprise—a 5.1-million-year-old cinder cone (the brown blob). Although the heat brought by this volcano has long since dissipated, this feature shows that the area has experienced high heat flow for millions of years.

Heat in the subsurface is converted into renewable electricity that powers the University of Utah. The narrow red tubes extending downwards from the land surface represent geothermal production wells that are pumped to produce hot water at the surface. These four wells ranging in depth from 805-9,000 feet, pull hot (from 290˚ F to >365˚F) water out of the faults and rocks and bring it to the surface where it is piped to the geothermal plant. There, the hot water passes through heat exchangers to transfer the water's heat to a secondary fluid (isopentane), which boils and is sent to the turbines which spin a generator to make electricity. This electricity is then sent to Utah along NV Energy and Rocky Mountain Power transmission lines. A geothermal plant that uses a second fluid in this way is called a binary plant. The isopentane is then condensed using air cooled condensers (the tall structures in the model) that use 56 fans to drive away the waste heat. The cooled geothermal water is reinjected underground using the geothermal injection wells, represented by the blue tubes connected to the surface. From there, the water is reheated by the hot rocks and eventually returns to the production wells via underground pathways. The binary plant at Soda Lake was manufactured and assembled on site by Ormat Technologies Inc.

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