EnLink geoenergy

Geothermal and Net Zero buildings

Geothermal heat pumps should be ground zero when you begin designing your "Zero Net Energy" building; if you use anything else to heat, cool and ventilate, your energy systems will be significantly larger, more expensive and will cost dramatically more over the life of the building.

Zero Net Energy (ZNE) is a term used to describe a building that uses no energy from the grid. Energy is generated on site using renewables like solar and wind while overall energy use is significantly reduced by using passive designs and energy efficient technology to operate the building.

by Greg Tinkler, CGD
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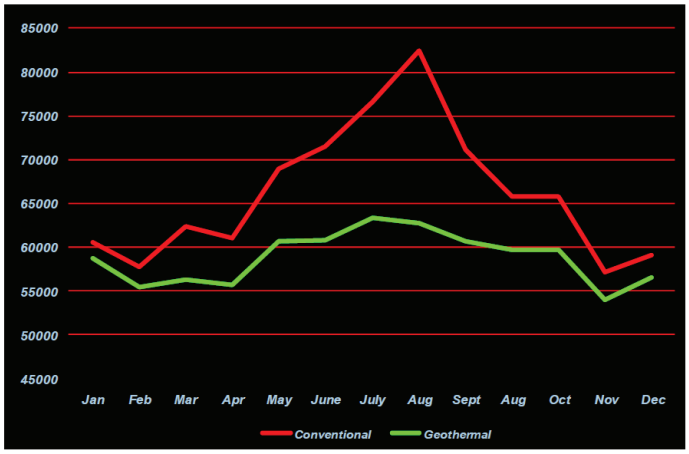
"Net Zero" is a relatively new term being used in several different markets including the architectural market, ASHRAE, renewable energy market and government facilities. For the purpose of this piece, we will define it as a site that produces as much energy (in kBtu) on the site as it consumes on an annual basis. In other words, even though buildings may have peak energy uses in the middle of summer or middle of winter (depending on where the site is in the country), you could potentially level out the energy use that was the same every month, and the site could produce that same amount.

Thus, it would be "net zero".

There are several ways to produce power on the site (Photovoltaic, Wind, CHP, Organic Rankin, etc.), but most of these have a power production rate that is somewhat stable or consistent. However, most building usage is not consistent. Therein lies the discrepancy which must be addressed. Look at the two buildings (energy use) shown below:



These two buildings are identical in size and nature of use. The one in red with the higher peak energy use in the summer is an air-cooled type air conditioning system in the southern U.S. The one in green is approximately 5 miles from the one in red(same utility), and exposed to the same weather and loading conditions. The difference between the two: the building indicated by the green line operates using a geothermal heat pump system (vertical closed loop).

If you wanted to apply an energy production technology to the mentioned site, you need to purchase a device that can produce approximately 58,000 units with the green building and a system that could produce approximately 67,000 units with the red building. This equates to nearly 18 % more energy production for the red building, which could also have significantly larger cost and maintenance associated with the larger system. If this same capital increase to produce more energy was used to reduce the baseline energy use, it might pay for itself in a much shorter term, provide a better "ROI," and meet another goal of the U.S. government— "*energy independence*."

Geothermal heat pump systems can be applied anywhere in the U.S. and provide the same results. This technology has been around for many years and has recently been the "go to" technology for many government facilities. In some states, geothermal heat pump systems have been declared both energy efficient, and renewable. This allows the technology to be eligible for many grant applications, tax incentives and "TPAs," or Thermal Purchase Agreements. The recent increase in the use of geothermal technology has birthed another rapidly growing market known as "Thermal Utilities." Thermal Utilities install and own the geothermal loopfield on a property in exchange for a utility agreement that allows the building owner to pay for the energy from/to the earth over time (much like how the U.S. electrical "grid" is being paid for). The successful application of this technology is very important because there is limited "turning back" once it is in the ground. It can be expanded on if properly designed and can go under parking lots, which is the preferred location in many cases. There are few limitations in terms of locations loops can be installed— they have gone under buildings with significant engineering coordination and have been installed in high density areas such as Manhattan, New York. Projects exist in many desert regions and inside the Arctic Circle.

This piece cannot cover all the possibilities or the engineering necessary. If "NET ZERO" is to become a reality for a site, the first step must be energy efficiency and leveling of the energy use profile curve as discussed above. If you are interested in talking more about geothermal, Net Zero, energy independence or a particular project, please do not hesitate to contact the author Greg Tinkler, CGD at RLB Engineers (gtinkler@rlbengineers.com) or EnLink Geoenergy (info@enlinkgeoenergy.com) to discuss.

ABOUT THE AUTHOR

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Greg Tinkler is a CGD (Certified Geothermal designer) and holds certificate #3. He is the Sr. Geothermal Designer for Redding Linden Burr Consulting Engineers in Houston Texas and the firm holds PE license in several of the lower 48 states and does business throughout the same area. EnLink Geoenergy and RLB Engineers are strategic partners in developing the geothermal market and work together to ensure properly designed and operational geothermal systems for all types of projects.

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