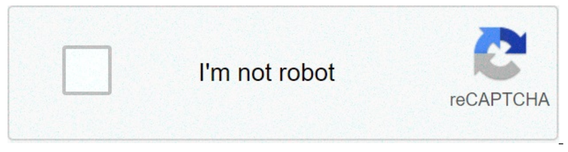

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Geothermal energy is which source of energy

Reading Time: 5 minutesTechnologies like solar and wind power are becoming more common across the globe, and are both examples of renewable energy sources. There are several ways to generate power from renewable sources. These alternatives to fossil fuels will become an even more important part of our power generation mix in the years to come. What are renewable energy sources?Renewable energy sources are sources of energy that is constantly replenished through natural processes. These resources are often also referred to as alternative or renewable energy, mainly because they are a fuel option that can replace conventional non-renewable fossil fuels. Fossil fuels, like oil and coal, produce energy when they are burned, but their supply is limited because they don't naturally replenish on a short enough timescale for humans to use.Renewable energy sources are beneficial because they have a very limited negative environmental impact when compared to fossil fuels. In the past, they were too expensive to be used widely. However, that's changing – many renewable energy sources are cost-effective, and some can even be a smart financial decision for homeowners, businesses, and governments. In particular, solar energy is a great option for property owners who want to reduce their environmental footprint while saving money. You can learn just how much solar will save you while helping the environment with EnergySage's Solar Calculator.The five main renewable energy examplesThere are five main technologies that are considered "renewable energy sources". We've put together an infographic below to compare the main five renewable energy options side by side":Five types of renewable energy resourcesRead on for even more detail on these renewable sources:Solar energyOne of the most popular types of renewable energy is solar power. Solar energy comes from the sun, which supplies our entire planet with the energy we need to survive. Using solar panels, we can harvest energy directly from sunlight and convert it to electricity that powers our homes and businesses. Solar energy can also be used to produce hot water or charge battery systems.Solar energy has benefits both for your bank account and for the environment. The cost of solar is constantly dropping, and installing solar on your home will almost always save you money over the lifetime of your installation. On top of that, producing solar energy doesn't pollute or release fossil fuels, which means you can dramatically reduce your environmental impact by installing solar.Wind powerAnother type of renewable energy that we interact with every day is the wind. When you feel the wind, you're simply feeling air moving from place to place due to the uneven heating of Earth's surface. We can capture the power of wind using massive turbines, which generate electricity when they spin. While not always a practical option for an individual homeowner, wind power is becoming increasingly popular for utility-scale applications. Massive wind farms spanning many square miles can be seen around the world. Like solar energy, wind power is essentially pollution-free and is a growing and important renewable energy source supplying electricity to grids around the world. In 2017, wind farms produced more than six percent of the electricity used in the U.S.HydropowerWe can produce renewable energy from moving water just like we can from moving air. Energy is generated when moving water runs through a turbine, spinning it to produce electricity. This often happens at large dams or waterfalls, where water drops significantly in elevation. Two important places where hydropower (also known as hydroelectricity) is produced are the Hoover Dam on the Colorado River and at Niagara Falls on the border between New York and Canada.Many renewable energy sources have yet to make a significant impact on the overall U.S. electricity mix, but hydropower is already a major player. Large hydroelectric facilities around the country contributed 7.5% of the electricity used in the U.S. in 2017, and that number is growing. In addition to massive projects like the Hoover Dam, hydroelectricity can be produced through smaller projects, like underwater turbines and lower dams on small rivers and streams.Hydropower is also a non-polluting energy source, as there are no emissions generated from hydroelectric facilities. However, hydropower does have a greater environmental impact than some other renewable sources of energy, because they can change water levels, currents, and migration paths for fish and other freshwater life.Geothermal energyEarth has a massive energy source contained within it. Heat trapped when our planet formed, combined with heat generated from radioactive decay in rocks deep beneath the crust, results in a massive amount of geothermal heat energy. Sometimes that heat escapes in large amounts all at once, which we see as volcanic eruptions on the surface.We can capture and use geothermal energy by using steam from heated water to spin a turbine. In a geothermal spring system, water is pumped below ground. Once it is heated, it rises back to the surface in the form of steam and spins a turbine to generate electricity. Additionally, geothermal heat can be used directly to provide heating or cooling to buildings. With this technology, known as a ground-source heat pump, a fluid is pumped below the ground surface to be heated or cooled, where the temperature is constant year-round at about 50 degrees.While still a small part of our energy mix, geothermal energy is a promising renewable energy source, with massive potential for energy supply. In Iceland, for example, geothermal energy already accounts for 90 percent of home heating needs and 25 percent of electricity needs. However, there are some concerns with geothermal energy, including the cost of constructing a power plant and its relation to surface instability and earthquakes.BiomassOne last example of renewable energy is biomass. Biomass energy refers to any energy produced from recently living organic matter like plants or animals. Biomass is a renewable resource because plants can be regrown relatively quickly, and they grow using renewable energy from the sun. Fuels like ethanol and biodiesel (both used for cars and trucks) also come from biomass.Biomass fuels are also considered to be "carbon-neutral," meaning they don't put any extra carbon dioxide into the atmosphere. This is assumed to be true because, in principle, as long as new plants are planted and grown whenever plants are harvested and burned for energy, those new plants will take up the carbon produced by combustion, leading to no extra carbon added to the atmosphere. However, regrowing plant life takes time, and the degree to which biomass fuel is truly carbon-neutral is up for debate.Solar energy is the most practical renewable energy source for homeownersIf you are looking to reduce your environmental footprint and save money in the process, you might want to look in to going solar. With solar prices continuing to fall, the time to start generating power from the sun is now.On the EnergySage Solar Marketplace, you can solicit quotes from high-quality, pre-vetted solar installers near you. By comparing solar quotes, you can be sure you are getting the best deal for solar. If you are in the early stages of shopping for solar and want a ballpark estimate for an installation, check out our Solar Calculator that can show you the up front costs and long-term savings you could see from a solar energy system. The future of geothermal energy can pretty much be summed up with a single word: More.Geothermal power is often considered the third or fourth most important source of renewable energy, behind solar, wind, and hydro. Right now, it accounts for just a small portion of the world's power capacity -- in 2010, it accounted for just around 10,709.7 MW of installed capacity -- but analysts expect geothermal plants to begin proliferating around the globe at a rapid clip.The technology is relatively simple; the basics have been understood for years. In fact, the first commercial geothermal power plant was built in Larderello, Italy a full 100 years ago, in 1911. As you'll recall from elementary school science class, heat is continually being generated by a layer of magma below the Earth's crust. That heat rises up to the surface; it's hottest above active volcanic regions and the seismically active spots between tectonic plates.Though there are different kinds of geothermal power plants, they all do the same basic thing: they capture rising steam or hot water and use it to power an electric generator.The reason that geothermal is expected to play an important role in the future is that we're getting better and better at doing this: we're now drilling geothermal wells with increasing efficiency, allowing more energy to be captured in each plant.Engineers have also devised and improved 'binary cycle' plants that release no emissions except water vapor. You see, traditional 'dry steam' geothermal plants emit greenhouse gases -- sure, the emit only 1/8th that of coal plants, but they're emissions nonetheless. Dry steam plants tap directly into the steam coming out of a hydrothermal convection zone, and some inevitably escapes. Binary cycle plants create a closed loop system that runs hot water through a heat exchanger that heats up another liquid, like isobutane, that boils at a lower temperature than water. The hot water is then sent back underground, while the isobutane runs the generator. Geothermal is also getting cheaper, as the technology improves. According to the Union of Concerned Scientists, since 1980, the cost of operating geothermal power plants has declined by as much as 50%. In some markets, buying power from geothermal plants will soon be as cheap as it is from its much dirtier fossil fuel counterparts.But the biggest looming technology is called Enhanced Geothermal Systems. See, as of now, only around 10% of the world's area is fit for geothermal power production. That's because you need hydrothermal convection systems -- places where hot water or steam bubbles up to the surface then sinks back down. If we're going to truly take advantage of the potential of geothermal, we'll need to begin injecting water deeper down, in 'hot dry rock' areas.Why would we want to bother with something like that? Well, as the USUCS notes, The amount of heat within 10,000 meters (about 33,000 feet) of Earth's surface contains 50,000 times more energy than all the oil and natural gas resources in the world."That's why.There are a host of researchers diligently pursuing this technology -- the US Department of Energy, Google, and, of course, vested interests in the geothermal industry. There are pitfalls, to be sure -- there's concern that such drilling will cause seismic activity, just as fracking has been shown to do (though no harmful chemicals need be blasted into our aquifers, thankfully). But the extent to which its been shown to stir up trouble has been deemed rather minimal indeed by scientists, and developing EGS could open up truly vast new stores of clean, renewable energy.Finally, there's been a lot of exciting talk about repurposing old, depleted gas and oil wells as geothermal plants -- those wells could serve as relatively easy infrastructure to repurpose as clean geothermal operations, as opposed to drilling brand new ones.Clearly, geothermal holds some pretty serious potential. In trying to predict what a clean energy future looks like, some, like the cleantech wiz Saul Griffith, figure geothermal will eventually account for around 1/6th of the world's power supply. Others, like the IPCC, think it will clock in at 4%. Either way, it will be an integral part of the renewable energy mix powering the world, as fossil fuels recede from view. Heat is sitting under the Earth -- we just need to tap it. Geothermal energy can be used in three ways:Direct geothermal energy. In areas where hot springs or geothermal reservoirs are near the Earth's surface, hot water can be piped in directly to heat homes or office buildings. Geothermal water is pumped through a heat exchanger, which transfers the heat from the water into the building's heating system. The used water is injected back down a well into the reservoir to be reheated and used again.Geothermal heat pump. A few feet under the ground, the soil or water remain a constant 50 to 60 degrees Fahrenheit (10-15 degrees Celsius) year-round. Just that little bit of warmth can be used to heat or cool homes and offices. Fluid circulates through a series of pipes (called a loop) under the ground or beneath the water of a pond or lake and into a building. An electric compressor and heat exchanger pull the heat from the pipes and send it via a duct system throughout the building. In the summer the process is reversed. The pipes draw heat away from the house and carry it to the ground or water outside, where it is absorbed.Geothermal power plant. Hot water and steam from deep underground can be piped up through underground wells and used to generate electricity in a power plant. Three different types of geothermal power plants exist:Dry steam plants. Hot steam is piped directly from geothermal reservoirs into generators in the power plant. The steam spins turbines, which generate electricity.Flash steam plants. Water that's between 300 and 700 degrees Fahrenheit (148 and 371 degrees Celsius) is brought up through a well. Some of the water turns to steam, which drives the turbines. When the steam cools it condenses back into water and is returned to the ground.Binary cycle plants. Moderately hot geothermal water is passed through a heat exchanger, where its heat is transferred to a liquid (such as isobutene) that boils at a lower temperature than water. When that fluid is heated it turns to steam, which spins the turbines.Historical HeatPeople began harnessing geothermal energy thousands of years before they had the technology to dig down into geothermal reservoirs. The ancient Romans used hot springs to heat their homes, bathe and cook. In 1892, the first modern district heating system was developed in Boise, Idaho. It used water piped from hot springs to heat buildings. The first geothermal energy plant was built in Larderello, Italy, in 1904. Today, geothermal energy is used in France, Turkey, New Zealand, the United States and Japan, among others. Iceland is one of the biggest users of geothermal energy -- virtually the entire city of Reykjavik is heated with water pumped in from hot springs and geothermal wells. Some cities -- like Klamath Falls, Ore. -- even pump hot water underneath their roads and sidewalks in the winter to melt snow and ice. Experts say geothermal energy is cleaner, more efficient, and more cost-effective than burning fossil fuels, and it can reduce our dependence on foreign oil.Geothermal energy is clean because it can be generated without burning fossil fuels. Geothermal plants release a fraction of the carbon dioxide produced by fossil fuel plants, and they create very little nitrous oxide or sulfur gases [source: U.S. Department of Energy]. Reykjavik, Iceland, which heats 95 percent of its buildings using geothermal energy, is considered one of the cleanest cities in the world [source: International Geological Congress Oslo].Because the energy is generated right near the plant, it saves on processing and transportation costs compared to other types of fuel. Geothermal plants are also considered to be more reliable than coal or nuclear plants because they can run consistently, 24 hours a day, 365 days a year.The initial costs of geothermal energy are high -- wells can cost $1 to $4 million each to drill, and installation of a home geothermal pump system can run as much as $30,000 [sources: REPP, Consumer Energy Center]. However, a home geothermal energy pump can cut energy bills by 30 to 40 percent and will pay for itself within 5 to 10 years [source: Consumer Energy Center].Geothermal energy is considered renewable because the heat is continually replaced. The water that is removed is put right back into the ground after its heat is used.The world uses about 7,000 megawatts of geothermal energy, about 2,700 megawatts of which is produced in the United States (the equivalent of burning 60 million barrels of oil each year) [source: Geothermal Education Office]. Still, we're not using nearly as much geothermal energy as is available. That has to do with the limited geographic availability of geothermal energy, and the difficulty and expense of drilling down far enough to reach that energy. More advanced techniques being developed could allow for deeper drilling, potentially bringing geothermal energy to more people in more places.For right now, geothermal heat pumps are the most viable option. They can be used just about anywhere in the world because the temperature beneath the ground always remains constant.Related HowStuffWorks ArticlesConsumer Energy Center. "Geothermal Energy." (Feb. 2, 2009) Information Administration. Energy Kid's Page. (Feb. 2, 2009) Education Office. "Geothermal Energy Facts." (Feb. 2, 2009) Energy Association. "All About Geothermal Energy -- Basics." (Feb. 2, 2009) Daniel. "World energy supplies are set to run out faster than expected, warn scientists." The Independent. June 14, 2007. (Feb. 7, 2009) out-faster-than-expected-warn-scientists-453068.htmlREPP. Geothermal Resources. (Feb. 2, 2009) Underground Heat." Canada and the World Backgrounder. October 1999, pgs. 21-25.U.S. Department of Energy, Geothermal Technologies Program. "Geothermal Basics." (Feb. 2, 2009) Jessica. "Clean Heat: The Geothermal Energy Beneath Our Feet." House & Home. January/February 2005, Volume 16, Issue 1, pgs. 44-45.