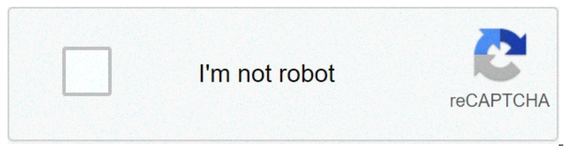

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Solar wind hydro and geothermal energy

Reading Time: 3 minutesInstalling a renewable energy system on your property is one of the best ways to save money on your electricity bills while reducing your impact on the environment. Often, your decision will be between solar energy and wind energy. If you're a homeowner weighing your renewable energy options, you already know that thorough research is the best way to find the right system for your home. Here's everything you need to know about the benefits of residential wind vs. solar so that you can make your decision with confidence. In general, solar makes much more sense for residential electricity customers looking to save moneyWind power is an effective tool for utilities looking to source more energy from reliable renewablesProperty owners can compare solar quotes on the EnergySage Marketplace to see how much you can saveThe big takeaway: solar makes more sense for residential propertiesIf you're interested in installing a renewable energy system on your property, solar is usually the best option. All things considered, solar isn't as popular as wind at the utility scale, but is generally a more practical renewable option for residential energy production. An experiment by Inland Power & Light, a utility in the Pacific Northwest, underscores the comparative benefits of residential solar. After fielding many inquiries about the benefits of solar vs. wind energy for homes, the utility actually installed both technologies at their corporate headquarters in Spokane, Washington to provide a definitive answer to their customers. Their result: Over the course of 14 months, the solar panels produced about five times as much electricity as the wind turbine.Wind vs. solar: comparing the top renewablesIn the United States, wind power is significantly more popular than solar. Out of all the renewable energy produced in the U.S. in 2019, 24% came from wind, while 9% came from solar power. Utilities and large scale operations heavily utilize wind energy while homeowners prefer solar energy.The primary benefit of wind over solar power for your home is that wind turbines aren't dependent on sunlight. This means that they have the ability to generate power 24 hours a day, whereas solar panels only generate power during sunlight hours. Wind comes with a significant caveat, however: in order to be effective, wind turbines need to be situated high above any obstacles that would block the wind.A typical wind turbine for residential use is about 80 feet tall, and it needs to be in the path of some serious wind to produce power efficiently. Most installers recommend sites with average wind speeds of at least 12 miles per hour. If you live in a rural, windy area with lots of open space and few obstructions blocking the wind's path, then installing wind turbines at your property can be a great option for renewable energy production. If you're looking for a supplementary power source, rather than a primary one, you can also find smaller wind turbines at a relatively low cost that will provide an extra 'boost' of electricity.In contrast, solar panels can be installed on almost any roof, as well as on the ground, and still produce enough power to meet the majority of your electricity needs. In the EnergySage Solar Marketplace, the average solar shopper meets over 95 percent of their annual electricity needs with solar in 2021.Wind turbines also have moving parts, which can result in more wear-and-tear and higher maintenance requirements. Unless you choose ground-mounted solar panels with a tracking system (a technology generally reserved for utility solar installations), your solar PV system will be stationary and require limited maintenance.What about renewable options other than solar and wind?There's no reason that a solar panel system has to be the renewable energy that you use in your home. Solar thermal technology, which can provide both heat and hot water for your home, is often installed alongside solar PV. If you're looking for a renewable heating and cooling system to pair with your solar panels, you can also install a geothermal heat pump to use the naturally existing heat underground to regulate the temperature of your home.Compare all of your options before making a decisionWhatever renewable energy option you're considering, it's always a good idea to compare multiple offers before making a final decision. Solar can save you thousands on your electricity bills. Want to see for yourself? Check out EnergySage's Solar Calculator to get an instant estimate of how much solar could save you. Once ready, compare quotes from solar installers on the EnergySage Solar Marketplace to find the best deal. Solar shoppers in the Marketplace generally save up to 25 percent off the costs of installing a solar panel system simply by shopping around first. There's no better way to go solar.This post originally appeared on Mother Earth News. Solar wind is a continuous stream of charged, subatomic particles emitted by the sun. To humans, the flow is kind of a mixed blessing. The GPS signals we now depend on can get disrupted by solar wind. But solar wind is also a driving mechanism behind those stunning northern lights — and their equally gorgeous southern counterparts.Earth isn't the only place that's affected by the streaming particles. Newly gathered data indicates that solar wind may have visibly changed the moon's iconic face. Plus it helps form a cosmic bubble that envelops our whole planetary neighborhood.Plasma ExtravaganzaHydrogen and helium are solar wind's two major ingredients. It's no coincidence that those two elements also represent about 98 percent of the sun's chemical make-up. The extremely high temperatures associated with this star break down large quantities of both hydrogen and helium atoms, as well as those from other assorted elements like oxygen.Energized by the intense heat, electrons start to drift away from the atomic nucleuses they once orbited. That creates plasma, a phase of matter that includes a mixture of free-ranging electrons and the nuclei they've left behind. Both carry charges: The roaming electrons are negatively charged while those abandoned nucleuses have positive charges.Solar wind is made of plasma — and so is the corona. A faint layer of the sun's atmosphere, the corona starts roughly 1,300 miles (2,100 kilometers) above the solar surface and protrudes far into space. Even by solar standards, it's blisteringly hot. Temperatures within the corona can far exceed 2 million degrees Fahrenheit (1.1 million degrees Celsius), making this layer hundreds of times hotter than the actual surface of the sun beneath it.About 20 million miles (32 million kilometers) away from that surface, portions of the corona transition into solar wind. Here, the sun's magnetic field weakens its grip on the fast-moving subatomic particles that comprise the corona.As a result, the particles start to change their behavior. Inside the corona, electrons and nuclei move around in a somewhat orderly fashion. But those who pass that transition spot behave more erratically after doing so, like the flurries in a winter storm. Upon ditching the corona, the particles go forth into space as solar wind.Starting PointsIndividual solar wind streams travel at different speeds. The slow ones cover roughly 186 to 310 miles (300 to 500 kilometers) per second. Their faster counterparts put those numbers to shame, flying by at 373 to 497 miles (600 to 800 kilometers) per second.The quickest winds come whizzing out of coronal holes, temporary patches of cool, low-density plasma that appear in the corona. These serve as great outlets for solar wind particles because open magnetic field lines run through the holes.Basically, the open lines are highways that shoot charged particles out of the corona and into the heavens beyond. (Don't confuse them with closed magnetic field lines, looping channels along which plasma bursts out of the sun's surface and then plunges right back down into it.)Less is known about how the slow winds form. However, their point of origin at any given time seems to be affected by the sunspot population. When these things are scarce, astronomers observe slow winds coming out of the sun's equatorial region and fast ones streaking out of the poles. But when sunspots become more common, the two kinds of solar wind appear in closer proximity to each other all across the glowing spheroid.Welcome to the HeliosphereNo matter how fast a gust of solar wind is moving as it bids the corona "farewell," it will eventually slow down. Solar winds exit the sun in all directions. By doing so, they maintain a capsule of space that houses the sun, the moon and every other body in our solar system. It's what scientists call the heliosphere.The seemingly vacant spaces between the stars in our galaxy are actually full of interstellar medium (ISM), a cocktail that includes hydrogen, helium and amazingly small dust particles. Essentially, the heliosphere is a giant cavity surrounded by this stuff.Rather like a super-sized onion, the heliosphere is a layered construct. The termination shock is a buffer zone far beyond Pluto and the Kuiper Belt where solar wind rapidly declines in speed. Past that point lies the heliosphere's outer boundary, a place in which the interstellar medium and solar winds become evenly matched in terms of strength.Auroras, Satellites and Lunar GeologyCloser to home, the particles in solar winds are responsible for the aurora borealis ("northern lights") and aurora australis ("southern lights"). Earth has a magnetic field whose twin poles are located above the Arctic and Antarctic regions. When solar wind contacts this field, its charged particles get pushed towards those two areas. Atoms in our atmosphere become energized after they contact the winds. Said energy triggers mesmerizing light shows.While other planets — like Venus and Saturn — also witness auroras, Earth's moon does not. And yet, solar winds might explain the existence of "lunar swirls," portions of our moon that tend to be darker or lighter in complexion than the surrounding turf.Their origins are a mystery, but evidence collected by an ongoing NASA space mission suggests that the discolored splotches are — in effect — giant sunburn marks. Parts of the lunar surface are shielded from solar wind by small, isolated magnetic fields. But other areas are exposed. So in theory, when the winds hit those spots, they might be setting off chemical reactions that alter the hues of certain rocks.Man-made devices are vulnerable to the traveling plasma, too. The electrical components on artificial satellites have been known to malfunction after getting bombarded by charged, subatomic particles of solar origin.Originally Published: Mar 29, 2019 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. This site may earn affiliate commissions from the links on this page. Terms of use. Wave energy systems generate electricity by harnessing the constant movement of the ocean.According to Ocean Power Fights Current Thinking "Recent advancements in the technology indicate that with a relatively small investment from the government, wave energy could soon compete with other renewable sources." And wave energy would compete to deliver a massive amount of energy: potentially as much as is currently produced by coal.The article offers an excellent introduction to the challenges to bringing such ocean powered systems to market, taking special pains to illustrate that the issues are as much political as technical. Case in point: wave energy is not currently being studied by the US Department of Energy. In the meantime, working systems are already undergoing trials in England, and several US companies are searching for permission to deploy prototype wave energy systems along US coastlines. Click here to read the full TechnologyReview.com story Ocean Power Fights Current Thinking.For more stories on bleeding edge energy sources, check out ExtremeTech's Emerging Technology section. 1 What Is the H-1B Visa Program? 2 The Symbolism and Spiritual Connection Behind White Feathers 3 Deep-Freeze Dinos: Why Oklahoma's "Alligator Popsicles" Practice Snorkeling for Survival 4 Just the Basics: Cricket 101 5 What Is 2/3 Cup in Ounces?