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## You Light Up My Life: Energy Sources of The Future

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# You Light Up My Life

*Energy Sources of the Future*



Written by Lauren Rhodes  
Illustrated by Emilia Omerburg

**C**limate change is real. Our overconsumption of fossil fuels emits greenhouse gases like carbon dioxide into the atmosphere and has raised the Earth's temperature by 1.5 degrees over the past century. This overall change in the Earth's climate has led to current negative effects around the world, including rising oceans and expanding deserts. The United States is a highly consumptive society, so it is imperative to figure out what energy sources we can safely and reliably use to power our future. We logistically cannot continue to use fossil fuels in the same ways that we have in the past because of climate change, global justice issues, and physical limitations on the amount of fuel available. Unfortunately, it seems that many current and incoming U.S. government officials support the continued use of fossil fuels, although renewable energy sources — including wind, solar, and geothermal — are currently available and the ways of a sustainable future. Nuclear power is also an alternative energy source, though not technically renewable. Some renewable sources, like biomass, can also be used in ways that negatively affect the environment. This article is an informational piece on the uses, positive and negative effects, and reliability of different kinds of energy sources, focusing on the United States.

## FOSSIL FUELS

**Coal** is mined from mountains, particularly in the Appalachian area of the United States. It is very old organic matter that has been condensed by pressure and heat over millions of years to become a carbon-rich sedimentary rock. Power plants burn coal to produce heat, which then

creates the steam that spins turbines that generate electricity. Because the process of burning coal currently produces greenhouse gas emissions, the U.S. Department of Energy is developing ways to increase power plant efficiency and to capture carbon dioxide from the air, which they call, somewhat misleadingly, “clean coal.” They put energy into this initiative because coal is one of the main fossil fuel sources found and used in the U.S. However, even if its research succeeds in creating a zero-emissions coal plant, there is a finite amount of coal to be burned. Additionally, mining methods like mountaintop removal are bad for communities and local ecology.

**Oil**, in its refined state, is what we use to power our vehicles. Crude oil is found underground in liquid form with a similar origin as coal — composed of old organic materials and hydrocarbons. Oil is drilled from the ground where it exists in reservoirs, within rocks, and in tar sands. Crude oil is then refined into different products like gasoline. Burning oil releases carbon dioxide into the air, leading to climate change effects and also impacting people's health at a more local scale. This is probably one of the energy sources most easily changed by popular behavior and street and community design, because we can set up streets to make biking and walking easier and improve public transportation, all of which minimize oil use.

**Natural gas**, mostly made up of methane, is found underground trapped in rocks and in different materials. Natural gas also is made up of very old organic material. Hydraulic fracturing, or fracking, is one method of accessing natural gas, in which pressurized liquids are shot into the ground



in order to break up shale and release gas. Hydraulic fracturing has a lot of social and political issues, including a general lack of regulations on fracking and unknown content of the liquid pumped into the ground. When natural gas is burned, it emits less greenhouse gases than coal and oil, but methane leaks are much more potent than carbon dioxide emissions. Natural gas is used mainly to heat buildings and generate electricity.

## RENEWABLES

**Solar** power is an underutilized market, as the sun provides a huge amount of free energy. A solar panel is made up of individual photovoltaic cells; when sunlight hits the cells, the photons become charged, similarly to a battery. The electrons are drawn towards the surface of the panel, and this difference in charge generates electricity. Solar power is emissions-free and accessible as long as the sun is out, which makes it a relatively reliable and sustainable energy source. The process of creating the panels themselves is far from healthy for the environment, but in the United States' transition to solar energy, production of panels would be high at the start of the process and then level off, which would be less environmentally detrimental. Solar panels are best used in sunny areas and covering a large surface area.

**Wind** turbines are another renewable way to generate electricity. Though coal plants also use turbines, the only input in this method is wind, which spins the turbine to generate electricity. Wind turbines are best located in open water, open plains, on the tops of hills, or in mountain gaps to utilize the daily patterns of cool air flowing toward land from bodies of water or unbroken access to wind. This energy source is emissions-free, but the turbines are huge, loud, and made of plastic. They can have some unintended but negative effects on people who live near a wind turbine and on flying organisms, and general maintenance of these large turbines uses up resources. Despite these drawbacks, wind power is a reliable energy source.

**Geothermal** energy uses the heat that is naturally produced by the Earth itself in order to produce heat or generate electricity. Depending on the depth of a well, geothermal can be used to create steam, which can be used to generate electricity. Geothermal energy is used in three ways: through direct use of hot water near the surface and district heating systems that pump hot water through buildings; to generate electricity through power plants; and geothermal heat pumps, which heat and cool buildings because the temperature underground is stable and not affected by weather patterns — underground temperature is warmer than above ground in winter and the opposite during the summer. Geothermal power has little to no negative impact on the environment, is cost-effective, works on all types of buildings, and is reliable because the earth's heat is stable and constant.

**Hydropower** dams use the power of moving water in rivers and other water sources to generate electricity. A dam is constructed with a turbine that generates electricity when turned by the water. There are local issues associated with this process, like disrupting fish migrations, disrupting the river and local environment, and potential conflict with local communities during construction projects. Greenhouse gases may form in the reservoirs themselves, and material production uses fossil fuels, similar to most other production. However, there are no additional carbon emissions with hydropower, and this technology has been around for hundreds of years in different forms, like a mill. Fish ladders can help mitigate the impacted fish migrations as well.

**Biomass** fuels are another form of renewables and include wood, landfill gas, alcohol fuels, crops, and garbage. These are burned for heat, used to generate electricity, or converted to biogas or biofuels. Biofuels, like ethanol and biodiesels, are used for transportation. Though technically a renewable energy source, using wood from the source has not worked to fuel the world at a large scale. We need the trees that we still have to continue capturing carbon dioxide and creating oxygen. Wood waste and biogas from landfills are better to use, although burning organic matter in order to create energy still a carbon dioxide byproduct. However, these processes use a resource that would be considered trash otherwise, and if the materials are plants like switchgrass that quickly repopulate, the new plants continue to capture carbon dioxide.

## OTHER

**Nuclear power** is a now widely used yet potentially unsafe energy source. It is not technically a renewable energy source, because uranium and other radioactive materials are finite, but only a small amount of the resource is needed in order to generate electricity. The power in nuclear energy comes from splitting uranium atoms via nuclear fission, which produces heat that is used to generate electricity. The issues of nuclear power plant safety and long-term storage of nuclear waste pose the question of whether nuclear is the best alternative to fossil fuels, despite the fact that recently, nuclear power has provided approximately 20 percent of electricity generation in the United States. It could be considered a reliable option because of its current wide use, but it is not actually renewable; uranium is a limited resource that needs to be mined, which presents many safety issues.

**Hydrogen Fuel Cells** produce electricity and are mainly used as rocket fuel by NASA. Within a hydrogen fuel cell, oxygen atoms combine with hydrogen atoms to create an electrical current. The byproducts of this process are water and energy, which is almost ideal for an energy source. There is research in progress on how these cells can be used to power everyday vehicles. However, widespread use faces availability and cost barriers; currently, around 500 vehicles use this technology in the U.S., and fewer than 50 refilling stations exist. Hydrogen fuel cells could be a reliable fuel source in the future, but it is currently unclear if they will be marketable anytime soon.

## CONCLUSION

Now that you have this information about the science and social implications of available energy sources, you can see that no energy source is perfect. My recommendation for the United States is to use a combination of renewables because of their overall sustainability and to restructure societal behaviors in order to consume less energy. Even if the federal government does not decide to put an emphasis on continuing the transition to using renewable energy sources, decisions made at the state and local level will still make an impact. There are things you can do to make a difference in the energy sources that we use, like attending meetings at your school to discuss what further actions you can take on campus. Vote in elections at a local, state, and national level in favor of renewable energy sources. You have the power in your community to effect change, whether it be joining a student organization, learning more about renewable energy sources, or reminding your friends to turn off the lights when they leave the room. ●