

The Four Major Electrical Energy Sources: Their Carbon Footprint and its Impact on Global Warming and the Environment

The environment is continuously being affected by the actions of individuals in their quotidian lives. According to the U.S. Environmental Protection Agency (EPA); (2020a), global carbon emissions have significantly increased since 1900. This conveys that individuals throughout the world have increasingly released carbon emissions into the atmosphere over time. With 26.9 percent of greenhouse gas emissions being generated from electricity production, that makes it the second-largest producer of greenhouse gas emissions with about 63 percent of it being produced by burning fossil fuels for electrical energy (EPA, 2020b). Using fossil fuels such as coal and natural gas to produce electrical energy will continuously cause detrimental effects to the environment as well as contribute to global warming. However, other electrical energy sources are less of a threat to the environment. By understanding how the four major electrical energy sources (coal, natural gas, nuclear, and solar) impact the environment and global warming, further actions can be taken to ensure that governments and individuals use safer electrical energy sources.

Coal

According to the U.S. Energy Information Administration (EIA), coal is a brownish-black combustible sedimentary rock that is a nonrenewable energy source with high amounts of hydrocarbons and carbon (2020c). While there are numerous ways that coal can be used, one important use for it is the electrical generation in the United States. In 2019, coal generated 23.4 percent of all electricity produced in the United States (EIA, 2020d). Although a copious amount of electricity in the United States is generated by coal, it is presented with a plethora of environmental impacts including global warming.

According to the Union of Concerned Scientists (UCS); (2019), every year more than 100 million tons of ash from coal is produced from coal power plants with most of it going into bodies of water. The bodies of water include ponds, lakes, rivers, and streams. With the waste getting into the bodies of water, over time, drinking water and waterways may become contaminated (UCS, 2019). This conveys that water pollution can be caused by coal power plants. As water becomes polluted, there are many dangers that can be caused to the environment. This includes the suffocation of marine animals and plants due to the reduction of oxygen levels in the water, as well as ocean acidification (Denchak, 2018). This infers that water pollution has a destructive effect on the marine population and essentially, the environment. Although water could possibly be contaminated and polluted, it is not the only thing that could be impacted by the use of coal power plants.

The UCS (2019) states that pollutants and toxins are released into the air when coal is burned, which include “mercury, lead, sulfur dioxide, nitrogen oxides, particulates, and various other heavy metals.” This conveys that the substances that are released into the air from coal power plants may lead to air pollution. Air pollution can lead to acid rain which has the ability to change the soil composition and harm plants and crops, degrade the water quality in bodies of water crops, and buildings can decay (National Geographic, 2011). This concludes that air pollution may negatively affect the environment. Air pollution also has a significant influence on global warming. According to National Geographic (2011), global warming refers to the world’s increasing temperatures in the air and ocean which is partially caused by greenhouse gases increasing in the atmosphere. This alludes that as harmful substances are released into the atmosphere from air pollution, it can cause the global air and ocean temperatures to increase. Due to the global air and ocean temperatures increasing from global warming, the environment

has been negatively impacted by it. Global warming causes average temperatures to increase, more severe weather, and ice/glaciers to melt (Bradford, 2017). This illustrates that from the cause of global warming from air pollution, catastrophic events can occur further impacting the environment. All things considered, the use of coal as an energy source has a countless number of negative impacts on the environment.

Natural Gas

According to EIA (2020e), natural gas is a nonrenewable energy source primarily consisting of methane that is formed beneath the surface of the Earth. Natural gas is heavily used as a source of energy for the United States. In 2019, natural gas was the largest source of energy with 38.4 percent of all energy produced coming from natural gas (EIA, 2020d). Although natural gas does not have major effects on the environment compared to coal, it still has an impact on the environment.

Using natural gas is cleaner for the environment compared to other fossil fuels. According to the UCS (2014), natural gas produces an inconsiderable number of particulates, mercury, and sulfur. However, burning natural gas can produce nitrogen oxides which is a forerunner to smog, but at lower amounts compared to other nitrogen oxide producers (UCS, 2014). This supports the idea that burning natural gas may still contribute to air pollution when burned, even if it is not contributing much. Although natural gas is a fossil fuel, its contribution to global warming is much lower than coal with it producing less carbon dioxide when burned (UCS, 2014). However, extracting natural gas can greatly contribute to global warming and further impact the environment. When natural gas is drilled and extracted from wells and transported through pipelines, it can cause methane leakage which is 34 times stronger than carbon dioxide (UCS, 2014). This insinuates that natural gas can have a tremendous contribution

to global warming through methane leakages. Although natural gas does not release as much carbon dioxide into the atmosphere when burned, it can still greatly contribute to global warming and impact the environment.

Nuclear

According to the Nuclear Energy Institute (NEI); (n.d.), nuclear energy is when atoms split and create heat, which heats water to create steam, and the steam turn turbines to generate electricity. In the United States, nuclear energy produced about 20 percent of all electricity produced in 2019 (EIA, 2020d). While only 20 percent of all electricity was produced from nuclear power plants, it is considerably one of the most efficient and cleaner energy sources used today.

The use of nuclear power plants has many benefits to the environment with it being a clean energy source. Nuclear power plants do not release carbon dioxide into the atmosphere (Kivi, 2018). This indicates that using nuclear power plants as a source of energy does not contribute to the ongoing problem of global warming. While nuclear power plants do not directly produce carbon dioxide, mining and transporting uranium, and building the power plants can emit a great amount of carbon dioxide into the atmosphere and impact the environment (Kivi, 2018). Although nuclear energy does not directly contribute to carbon emissions and global warming, there are other concerns related to nuclear energy. Nuclear power plants produce radioactive waste that is harmful to the environment, however, the waste is regulated by the U.S Nuclear Regulatory Commission (NRC) to protect the health of humans and the environment (EIA, 2020a). This conveys that while radioactive waste may be a health and environmental concern, it is regulated by the government to assure that it does not impact the environment and citizens. While there are a few concerns related to nuclear energy, it is a relatively clean energy

source that can be used to minimize impacts on the environment and global warming. However, it is not the only clean energy source that can be used.

Solar

According to the Solar Energy Industries Association (SEIA); (n.d.), solar power uses energy from the sun to convert thermal energy to electrical energy to create electricity. Solar energy contributed to only 1.7 percent of all electricity generated in 2019 (EIA, 2020d). Along with nuclear energy, solar energy is also one of the most efficient and cleaner ways to generate electricity. Since solar power only uses energy from the sun to produce electricity, it does not produce air pollution and contributes to global warming (EIA, 2020b). This suggests that solar power has positive effects on the environment. While solar energy may not directly impact the environment, the material used to create the photovoltaic (PV) cells that convert the solar energy into electricity, as well as the construction of the solar panel sites can impact the environment (EIA, 2020b). This conveys the idea that while solar energy does not release anything harmful into the environment, it can still impact the environment. Although there may be a small level of concern regarding solar energy, it is reasonably a safer and cleaner source of energy.

Coal, natural gas, nuclear energy, and solar energy are all energy sources used in the United States to produce electricity. While each energy source has an impact on the environment, some have more detrimental effects. Out of the 4 energy sources, it is safe to assume that nuclear and solar energy are more beneficial to the environment.

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