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**Geothermal Energy in the Mountain State**

The coal mining industry has had a rich heritage in West Virginia ever since it was discovered in what is now Boone County in 1742, more than a century before the Mountain State was established (McGehee, n.d.). It brought jobs to our state as well as wealth our economy, however the coal industry has a dark past. With previously dangerous workplace conditions, harmful environmental emissions from coal-burning power plants, and destructive mountaintop removal techniques that destroy the states’s beautiful natural landscapes, the coal industry has been the subject of national controversy and scrutiny both in the past and in the present. A study conducted by WVU in 2018 projects that the coal production in West Virginia will decrease over the next two decades (Lego, 2018), and this decreases output will likely have some negative effects on the state’s economy. Meanwhile, the world is pushing for increased use of renewable energy, and its important that our state adapts to the rapidly changing world by implementing new environmentally-friendly energy sources. Currently, only 5% of the energy produced in West Virginia is renewable (U.S. Energy Information Administration, 2018), yet one nearly untapped source of sustainable energy is waiting just beneath our feet.

This often overlooked option is geothermal energy, a very promising resource that is readily available in West Virginia. We are currently sitting on top of several patches of Earth that are hot enough to produce geothermal energy (about 200 degrees Celsius) and shallow enough (about 5 km) for wells to be easily drilled (Kintisch, 2010). The use of geothermal energy is not currently widespread, largely because it is not as well understood as other alternatives such as solar, wind, and hydropower. The implementation of this new technique and its technologies
could counteract the negative effects that the eventual decline of the coal industry will have on the state's economy and job market.

One could ask, what exactly is geothermal energy? Essentially, it's a process that uses hot water located in reservoirs deep below Earth's surface to generate electricity. There are several different designs for geothermal power plants, but the main principle of operation is that the naturally heated water is pumped up from the underground reservoir and expands into steam, and it provides rotational energy by turning a turbine which powers a generator; this simple yet effective turbine and generator system is the driving force behind geothermal energy. The used fluid is recycled back into the reservoirs to replenish the supply, allowing it to be reused later. With proper reservoir management, the rate of energy production can be balanced with the reservoir's natural heat recharge rate, making it a long-term sustainable source of energy. Geothermal plants are able to produce energy consistently, meeting baseload requirements that allow them to operate 24 hours a day, 365 days a year. This method of energy production is also very clean, with only excess steam being discharged from flash plants and minimal to no emissions coming from binary plants (the design that is expected to become the dominant technology in the future) (Office of Energy Efficiency and Renewable Energy, n.d.).

One example of how geothermal energy has been implemented successfully is its use in Iceland. The country is still very young geologically, and straddles one of the most active regions in the world, the Mid-Atlantic ridge, where the activity of divergent tectonic plates brings heat and magma closer to the earth's surface. In Iceland, several major geothermal power plants produce around 30% of the country's electricity. In addition, geothermal heating meets the hot water and heating requirements of 87% of the nation's housing (Iceland on the Web, 2012).
Although Iceland is a unique case of how geothermal energy can be used, it serves as proof that geothermal energy can be very successful on a large scale.

Almost all of the cost needed to set up the plant takes place during the initial setup, since there is no fuel required to keep it running. The pipeline system and the power plant itself must be constructed, and the well must be drilled to the underground water reservoir. All things considered, the average initial cost for building a plant in the U.S. is $2,500 per installed kW, and maintenance costs of about $0.02 per kWh (Office of Energy Efficiency and Renewable Energy, n.d.). These costs are comparatively much cheaper than other renewable energies such as photovoltaic solar panels, at $0.10 per kWh, or onshore wind farms, at $0.06 per kWh (Dudley, 2018), making geothermal an economically sound decision to use in West Virginia.

West Virginia University is pioneering the use of geothermal energy in our state, and received a $720,000 grant in 2017 from the Department of Energy’s Geothermal Technologies Office to determine how geothermal energy can be used around the Morgantown campus in the future (Anderson, 2017). If the Mountain State were to use geothermal energy, it might not be on a large scale at first. It could be useful for heating homes and potentially roads during the winter, and even exported through the existing power line system to supplement energy production in bordering states like Pennsylvania or Ohio, which would in turn stimulate our economy; also, the building of new infrastructure and operation of the new plants would also create jobs. The current outlook for geothermal energy in West Virginia is promising, and with increased funding, more efficient geothermal technologies, and more research on the energy itself, there is great potential for a new horizon of sustainable energy in our state.
References


