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Feasibility of Renewable Energy in America

In the past, water wheels harnessed the movement of water to generate energy and turn millstones. Today, people still capture nature in the form of wind, sun and more to generate energy. Solar panels can be used to charge a cell phone or light a house; wind turbines can generate enough electricity to supply a town with power. Many European countries, like Germany, have massive capacities of power that are produced by renewable sources. In America, renewable energies are not nearly as prevalent, despite the vast potential for renewable sources.

Photovoltaics (PV), more generally known as solar panels, generate electricity from the energy of the sun's rays. In a 2016 study performed by Sandy Rodrigues and colleagues of the University of Madeira in Portugal, the United States (U.S.) was ranked fifth in the world in total installed PV capacity (83). Although being ranked in the top five is normally an indicator of success, as a well-known world power with cutting edge technology, one would expect the U.S. to be ranked first. Germany had a total installed PV capacity per capita of 462.2 watts per person, while the U.S.'s per capita PV capacity was 156.7 watts per person (Rodrigues et al., 83). As solar energy capacity can be indicative of a country's technological progress, the U.S. could be falling below the international standards. Fortunately, the U.S. has great potential for increasing renewable resource use.

The most common thought about renewable resources is that they are more expensive than fossil fuels like coal. However, the total cost of renewable energies is much more complex than simply "more expensive than coal." Ralph Sims and colleagues, of the Centre for Energy Research in New Zealand, performed a study in 2003 that compared various energy sources in cost and efficiency, finding that while renewable resources are generally more expensive than their non-renewable counterparts, wind energy costs in high wind areas are competitive with other energy costs, at about 3-5 cents per kilowatt-hour (kWh) (1318). While the installation

costs may be initially higher for renewable resources, if the cost of the energy produced is comparable then progress is being made. Furthermore, as technology improves and efficiencies increase, the cost of installation and production of renewable systems will decrease.

In the meantime, while companies improve technology and efficiency, there are many ways to lower the cost of renewable resources. There are tax credits available for a company interested in producing energy from renewable resources. Brian Snyder and colleagues, of the LSU Center for Energy Studies, provided a comparison of various countries' wind resources, including a summary of tax credits and subsidies available from the respective governments. Primarily, the U.S. government provides a production tax credit (PTC) for companies that use renewable resources to harness and distribute energy (Snyder, 1850-1851). Such a tax credit would help offset the higher cost of installation for renewable sources and allow companies to continue producing energy while maintaining a more sustainable system. Along with the PTC, there is also a federal tax credit specifically targeted at PV installations. This tax credit is worth up to 30% of the cost of the PV system, and could greatly help companies increase their renewable resource use (Rodrigues, 85). Although such a tax credit would be costly to the U.S. government if many companies were to need this aid, a 2 cent per kWh PTC, which Snyder and colleagues calculated to be a reasonable credit for many situations, would only use one ten thousandth of the U.S. federal budget (1853). Thus, such a tax credit is not only a benefit for companies, but also maintainable for the government.

Additional benefits of renewable energy include direct profits, contrary to common belief. Rodrigues and colleagues calculated a "profitability index" (PI) for 13 countries, indicating the country's potential profits from using a renewable energy project. On a scale of zero to six where a PI greater than two was deemed "viable," the U.S. had the highest score with

approximately a four (Rodrigues, 86, 91). Despite the highest theoretical investment costs, the U.S. had the greatest potential profit from renewables. Although renewable resources are more expensive than traditional resources, the potential benefits outweigh the necessary investments and give the U.S. great potential for their renewable energy market.

One of the main downfalls to renewable energy sources is that they tend to take up a large amount of land. In a growing country, additional land needs are alarming. Vasilis Fthenakis and colleagues, of the Center for Life Cycle Analysis at Columbia University, performed a study in 2009 on the viability of solar power in America, including the land requirements for solar power. Furthermore, in the southwest region of America alone, there is at least 640,000 square kilometers of land that is suitable for solar energy harvesting (391). According to Land Use Requirements for Solar Energy, the U.S. could be powered on solar plants alone if 75,815 square kilometers were dedicated to solar energy production. The land needed makes up less than 15% of the available land in the southwestern U.S. Although solar panels would take up valuable land, the space is available and the panels would greatly benefit the U.S. as a country. As well as solar panels, compressed air energy storage (CAES) is a viable renewable energy source. With CAES, electricity compresses air and pumps it underground for storage in large open spaces. To generate electricity, the air is released on command to turn a turbine. Storage of compressed air makes use of otherwise wasted space, such as an abandoned mine; conveniently, appropriate geological spaces exist in 75% of America (Fthenakis, 389, 393). In this way, CAES is a very efficient and sustainable energy source that does not use large amounts of land. By transitioning from fossil fuels to renewables, the U.S. could profit both financially and environmentally.

Additional solutions to land restrictions include placing wind turbines offshore, so they do not use any land whatsoever. Early European wind projects were limited to shallow waters

near the shore, but technology has improved significantly so that American wind projects could move to deeper offshore waters (Snyder, 1850). Placing wind turbines far offshore offers a double solution: first, to keep the wind turbines from obstructing any scenic views, and second to place wind turbines where the winds are stronger and can generate more electricity. So although some renewable energies can take up large amounts of land, other viable renewable sources do not and should be taken advantage of to improve the USA's renewable resource options.

As is commonly known, renewable energy sources reduce the amount of carbon emissions into the atmosphere. What is not as commonly known is the scale by which renewables can reduce emissions. According to Sims and colleagues, global electricity supply accounts for 7700 million metric tons of carbon dioxide released into the atmosphere. However, using renewable energy technologies instead of older systems could reduce carbon emissions by about 80% (Sims, 1315, 1324). As a greenhouse gas, carbon dioxide acts as an insulator for the planet, causing global temperatures to rise; therefore, reducing carbon emissions is vital to the health of the planet. Additionally, CAES, though still in need of natural gas to heat the compressed air, uses 60% less gas than other energy sources (Fthenakis, 389). So even if emissions cannot be cut down completely, the potential to reduce emission of gases is huge.

So although there is great monetary, geographic, and environmental potential for an increase in renewable resources in America, the U.S. is still sadly subpar. Yes, renewables are costly, but they can also bring great monetary return. Yes, they may take up some land area, but not all renewable energies need astronomical amounts of land. Yes, renewable energies are better for the environment, but the U.S. still is not keeping up with European countries. Renewable energies must become more prevalent in America, both for the benefits to the country as well as for the benefits to the planet as a whole.

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