Wind Energy in the United States

New Mexico

Supercomputing Challenge

Final Report

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Team 107

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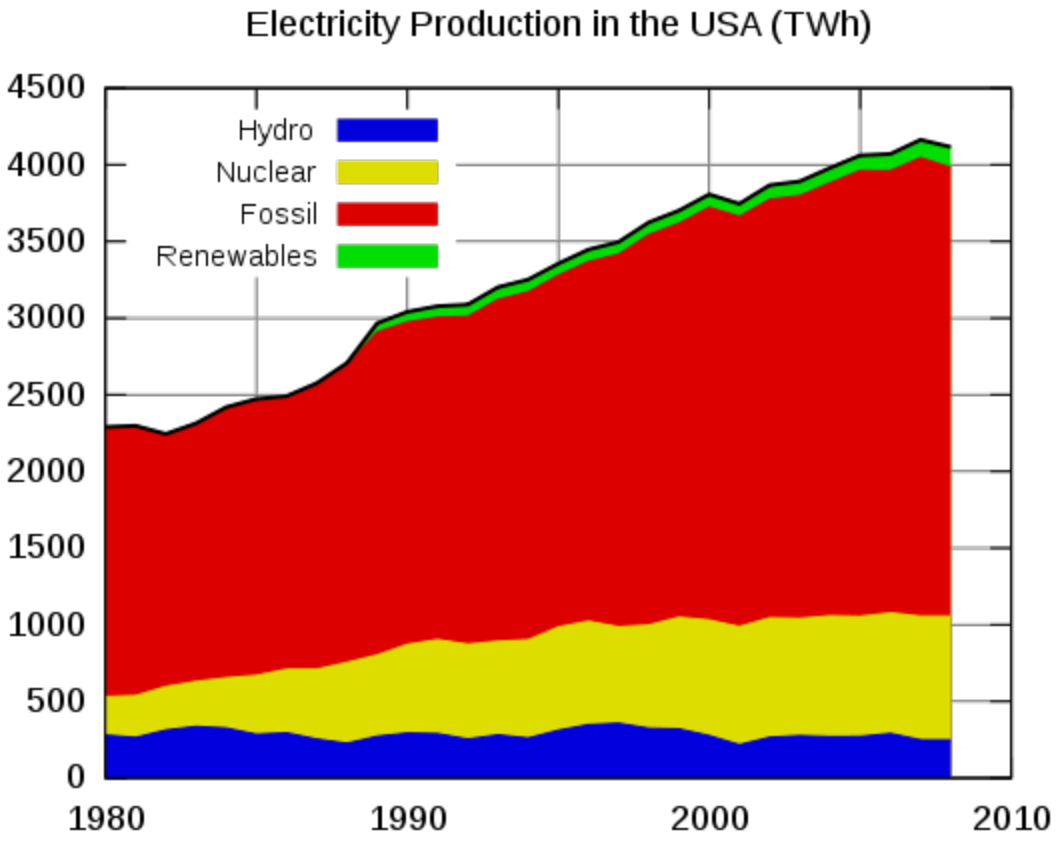
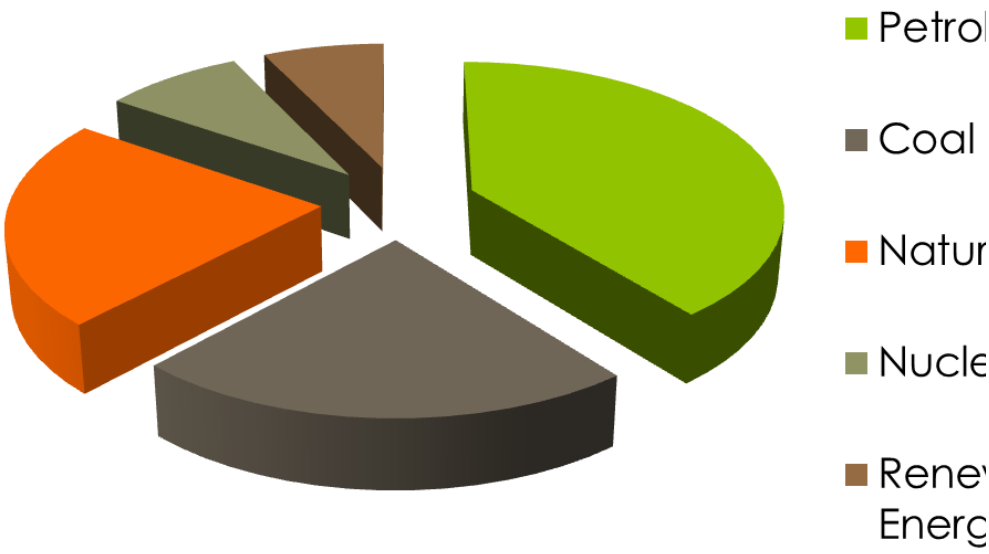
As the unrest in the Middle East continues to spread, the prices of fossil fuel in the rest of the world skyrocket. This reminder that most of our energy comes from foreign sources is not comforting to either the typical American family, or to the typical American investor. The resounding lesson that we fail to learn after each energy crisis, is that our energy infrastructure is in need of drastic improvement. Not only are our sources of energy a problem, but the type of energy we use is also a problem. Most of the U.S.'s energy comes from non-renewable, pollution producing sources. In turn, the U.S. relies on imported, non-renewable, environmentally damaging energy. It is obvious that we need improvement. There are many ways to improve our energy infrastructure and decrease our reliance on foreign sources of energy. From geothermal energy to wind energy, there are several potential solutions to our energy problem. When we first picked wind energy as the subject for our project, we knew that we picked a great alternative energy source that could substantially improve the energy infrastructure of the United States. The information we found did, to say the least, surpass our expectations of the potential wind energy. According to the National Renewable Energy Laboratory, the continental U.S. has the potential to produce 10,459 GW of wind energy, an inexplicable amount. To put the 10,459 GW in perspective, that is nine times the U.S.'s current energy consumption, and enough power to meet the entire world's energy needs. While it was no question that wind energy had great potential, there are constraints that pose a problem when thinking about investing significant amounts of money in wind energy. Our model involves perhaps the most significant problem, the investment vs. revenue return problem. While wind farms have great potential, if they are not a positive investment it is unlikely that we will see wide spread implementation. The average cost of a wind turbine is one million per megawatt of capacity installed. Depending on current energy costs and the annual average wind speed, the windmill will produce roughly 200,000 dollars per year of energy. Our program to test the revenue return of a wind farm uses several real world components to generate the most accurate answer. We are using net logo to accomplish this. To start off our program we needed to pick a location for our supposed wind farm, and we decided on fort Sumner, a real-world site of a wind farm. We selected the GE 1.5 MW turbine for our model, the most widely used wind turbine in the world. Using data from fort Sumner we will predict exactly how long it would take to return the investment on a wind farm, changing the location, the country's energy cost, and the size of the wind farm. Using this we have found that in New Mexico's current electrical budget (10.05 cents per kwH) it would be most beneficial for a wind farm to have 99 windmills on their farm as it would take only 2 years to completely refund their investment into these windmills.



Two comparisons of the U.S.'s sources of energy



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