Wind vs. Solar

A Comparison of Renewable Energy Sources in New Mexico

New Mexico Supercomputing Challenge

Final Report

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Team 108

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<u>Introduction</u>

The problem that was investigated concerned two contrasting sources of renewable, clean energy: wind and solar power. There are too many risks concerning the U.S.'s reliance on our current main source of energy, including: an increased dependence on foreign oil and the political and international tension it brings, an escalating strain on our world's environment, and the depletion of non-renewable energy. Allowing the nation's energy consumption to be composed of renewable energy sources would resolve every one of these issues, as well as helping America's economy by creating new jobs.

While it can be agreed that there needs to be more renewable energy sources in the U.S., part of the reason why the U.S. is still dependent on fossil fuels is because it is a more convenient source of energy. Being able to harness renewable energy sources does cost money, and while this does not diminish its importance, many consumers are hesitant to become dependent on a resource that they may not believe is the best deal.

 Because of this, the goal of this project is to find the best deal out of two of the most important and prominent sources of energy: wind and solar. With this project,

both will be analyzed by terms of energy input-output, as well as money

input/output. From this the best investment will be found.

Statement

The intention of this project is to find out which renewable energy source, solar

farms or wind farms, are the better investment, using input/output data based on

New Mexican standards.

Summary & Conclusion

As the price of oil steadily rises due to everything from scarcity, to global

markets reacting to unrest in oil-rich regions, it becomes clear that the United

States needs to invest in green, renewable technologies. With the many options in

green technologies the two most popular and rapidly advancing technologies are

wind energy and solar energy. In this project, these two technologies were

compared from every possible angle, from initial investment, yearly maintenance

cost of large-scale plants, to predictions of how quickly these two technologies

could advance and improve. These two technologies have great potential in

improving The United State's woefully inefficient, and fossil- fuel based energy

infrastructure. The goal set throughout this project was to see through the eyes of

the investor, be it the tax payer or a private source providing the initial investment.

Without the financial backing of investors, any technology is doomed to be nothing but an idea, never to be widely implemented.

This project focused on proving, conclusively, which of these two technologies was superior form a financial standpoint, therefore the most attractive candidate to invest in, and implement into the United States' energy infrastructure. Two programs were set up to simulate both a wind farm, and a solar farm, with local weather patterns and energy rates programmed into each, with initial investments costs, maintenance costs, all included into the programs. The results proved conclusively that wind energy despite higher maintenance costs proves to be the more financially efficient of the two technologies, due to solar panels not producing nearly enough energy to negate the initial investment as fast as wind turbine technology.

This project proved that at this point in time it seems that wind turbine technology would be preferable over solar energy from a financial standpoint, but the results of these programs do not take into account future improvements made to each of these technologies, with solar panels becoming cheaper to purchase, and easier to implement, the rapid pace of technological development could render the results of this project inaccurate in a matter of years. The United States is in great need of an energy infrastructure overhaul, and every small investment, every small

development would contribute to a small reduction in the United States'

dependence on foreign oil.

Description of Method Used:

This project was achieved by using two different NetLogo models to

simulate two different energy farms. The wind farm was based off real world

weather averages from the Las Vegas, New Mexico, area. The GE 1.5 MW turbine

was used to model the individual wind turbines. Using data from this area, along

with data from other wind farms, the size, cost, and input/output data of the wind

farm was created in NetLogo.

The weather aspects of our second NetLogo model were created by taking

local weather data. The solar panel technology was modeled from a real

Southwestern solar farm, one of the largest in the United States. The program holds

350 solar panels in a grid of 10201 patches, approximately 25 acres. Each tick is

equal to one day, and each day is separated into hours of sunlight.

Results

Graph Concerning Solar Farm:
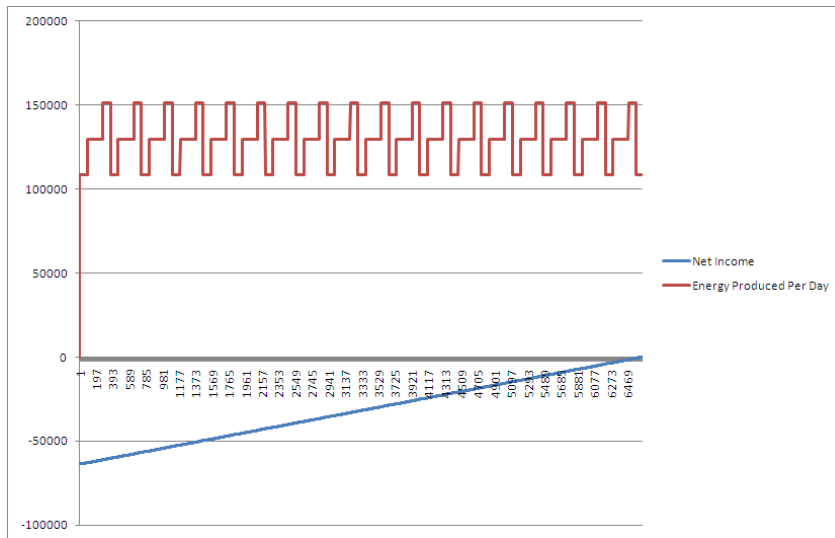
Graph Concerning Wind Farm:
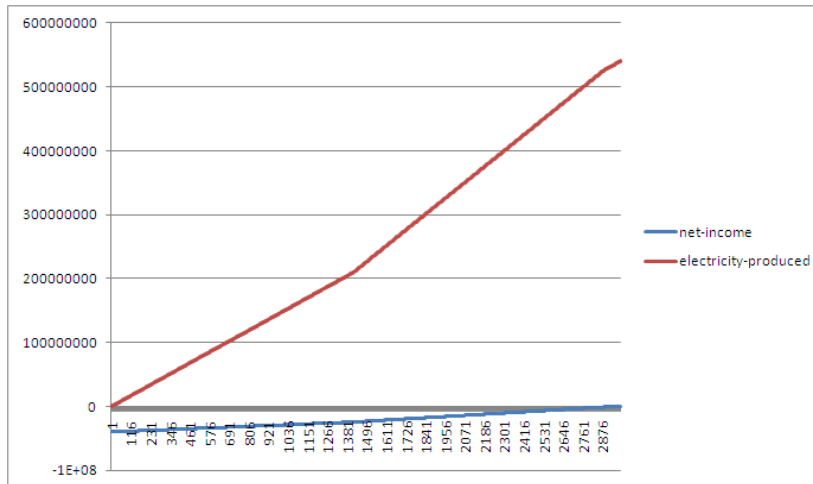
See Attached Data for Full Results

Most Significant Original Achievement

      In the team's opinion, the most significant original achievement of this project was coordinating real-world local weather data and technologies, and being able to incorporate everything into an accurate simulation.

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