Thesis Project Portfolio

Assessing the Potential for Renewable Energy Development in Appalachia
(Technical Report)

Applying the Social Construction of Technology to Public Support of Renewable Energy
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

U.S. energy consumption is increasing every year and has yet to peak. We currently rely on fossil fuels, with about 79% of U.S. energy coming from coal, petroleum, and natural gas. 29% of global warming emissions come from the energy sector, mainly from coal and natural gas. As we recognize the problems from our current energy methods and move towards renewables, Appalachia is being strongly impacted. From the 1880s to 1970s, Appalachia led the country in coal production, but between 2001 and 2021 coal production dropped 64%. Appalachia has historically been and is currently a key region for energy in Virginia, and this creates an opportunity for it to lead the way in renewable energy development.

To address the lack of renewable energy in Appalachia, my technical project evaluated the capacity for solar and wind energy in the region, and then identified favorable spots for renewable energy development. I used data on slope, current land use, conservation areas, and specific cost and energy production metrics for wind and solar. I then considered population, energy needs, and land area to see how much energy could be produced at the chosen sites.

All people will benefit from how renewable energy will lessen climate change impacts. However, this is not directly felt by most citizens. Other effects such as disruption to land use and viewsheds impact the community more. Understanding how people living nearby will be affected by the renewable energy facilities is a crucial implementation step to ensure that the community will support the project. To examine public support and opposition, I applied the Social Construction of Technology (SCOT) framework to analyze how different social groups perceive renewable energy projects. I researched the decision-making process for prior solar and wind projects that were both approved and denied.

I identified 4 social groups: citizens against renewable energy projects, citizens in support of renewable energy projects, local government, and developers. Those against renewable projects disliked developers from bigger cities and felt that their rural land was being exploited. Those supporting renewable projects felt passionately about the need to address climate change and the problems with current energy generation. Local governments usually voted for what they felt was best for the citizens and the county's vision. Developers' primary concern was for their projects to get approved, so they changed development plans to address concerns from citizens.

As I examined the feasibility of implementing renewable energy with my capstone project, it was important to also consider how the people in the community will be impacted. Together, my work provides insight into how clean energy can best be developed in Appalachia in order to address environmental concerns and be favorable in the region.