Thesis Project Portfolio

Assessing the Potential for Renewable Energy Development in Appalachia

(Technical Report)

Solar Energy Development in Appalachia and the Barriers that Stand in its Way

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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Sociotechnical Synthesis

The premise of both the STS project and Technical Project is to assess the potential for renewable energy in the Appalachian region of Virginia. For the Technical project, this involved a more comprehensive study of different kinds of renewable energy technologies: Solar energy, Wind energy and Hydropower. The STS project solely focused on Solar energy, and provides a more in-depth analysis of the technology and what it stands to gain in the region. Renewable energy is a growth opportunity in the Appalachian region of Virginia due to its historical reliance on the coal industry. Over the past two decades, the industry's decline has left once thriving communities struggling, and many do not know how to revitalize the region. The opportunities that come with building renewable energy offer a solution, by creating jobs and increasing tax revenues, an investment in renewable energy could be the solution for these towns.

To analyze how renewable energy could fit into the region, the Technical project began with a full literature review. The review covered all three technology options and explored public policy and economic trends in the region. Each of the five topics sought to uncover how renewable energy was generally thought of and if there was a viable path forward with these technologies. Outside of performing a cost analysis for each technology, the group became familiar with legislation in the region that could influence the growth of renewable energy. Through this, we began to collect data using a mapping software, ARCGIS, to physically map out data over the counties in the region. This data included maps of average sunlight, average wind gusts, and locations of dams in the state. Additionally, voting metrics from the 2020 election were used to learn more regarding public sentiment towards renewable energy and economic data was used to identify areas where investment could build up struggling regions. To further our analysis, we

used a weighting scheme that used tradeoffs to select weights for individual metrics. This weighting scheme ultimately was used to help choose counties that were the most promising for site selection. The primary goal for choosing a site was to find an area that was primed for both solar and wind technologies to build a “hybrid site”. After concluding our analysis, we chose Floyd and Carroll County to focus on. The group continued by analyzing the energy needs for each county and from that, we performed a financial analysis on the cost of developing a site in specific areas of these counties. Ultimately, the group identified a region within each county that matched the criteria we were looking for, and mapped out the costs required to develop in these areas.

The STS Project operated under a similar scope as the Technical Project, but the primary focus was on the development of Solar energy in the region. Specifically, the STS project looked at potential problems facing the development of solar energy in the region and if there were any solutions that could solve these issues. Like the Technical Project, a full literature review was conducted to understand how solar energy was perceived in the region. The primary issues that were uncovered included education issues, political issues, and efficiency issues with the technology. The ultimate conclusion was that the technology behind solar energy was not holding development back, but rather it was the public’s understanding of solar technology that limited its growth. The lack of accurate educational information given to the public in the Appalachian Region has created biased views that are uninformed of the benefits that solar technology can bring to the region. These biases then are turned into policy that shames the development of solar and ultimately pushes renewable energy away. The paper discusses how solutions like better education and unbiased representation can help change the historical

sediment surrounding solar energy, and how this region can encourage renewable energy sources, rather than tear them down.