

Thesis Project Portfolio

Assessing the Potential for Renewable Energy Development in Appalachia

(Technical Report)

Public Influence on Environmental Decisions

(STS Research Paper)

An Undergraduate Thesis

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Abigail Hogan Dawley

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Department of Systems and Information Engineering

Table of Contents

Sociotechnical Synthesis

Assessing the Potential for Renewable Energy Development in Appalachia

Public Influence on Environmental Decisions

Prospectus

Sociotechnical Synthesis

The Appalachian region of the United States has historically relied on coal and natural gas, not only for energy, but for their economy. As the country moves towards cleaner energy alternatives, Appalachia has been left behind with depleted resources and impoverished communities. Renewable energy is a viable solution to Appalachia's condition, but is threatened by the distinct sociopolitical values of the region.

In the Capstone element of this project, my team conducted research and analysis resulting in the design for a hypothetical renewable energy facility in the Appalachian region of Virginia. To locate a site, we created a list of metrics and weights to assign to each county in the region. These metrics were related to solar, wind, hydropower, power grid, economy, and political atmospheres. From this, we narrowed down to three counties and analyzed specific areas based on their capacities for solar and wind (pumped storage hydropower was ruled out due to lack of dams eligible for conversion). We selected optimal locations within two of the three counties based on land usage, wind speeds, and sunlight intensity. Additionally, we analyzed the population density and energy demand in these areas to assess the costs associated with meeting different levels of demand. This resulted in four possible combinations of wind and solar technologies in Floyd and Carroll County, VA.

In this project, the technical and social dimensions are very intertwined. The implementation of such a facility is not possible without the cooperation of local communities and organizations. To navigate this challenge, organizations such as Appalachian Voices exist. Appalachian Voices is a nonprofit that supports clean energy and economic development in the region. They lobby for energy policy and keep citizens informed of projects that may affect

them. Appalachian Voices is an example of Public Participation and Engagement (PP&E), a theory outlined by Science, Technology, and Society scholars that argues for an informed and engaged citizenry.

To understand Appalachian Voices' impact on PP&E, I conducted interviews with three members of their team. I found that they employ a wide swath of engagement methods and that different projects require different levels of interaction. I also found that App Voices has successfully combated what is known as the "knowledge deficit trap," where scientific experts downplay stakeholders' needs and values because of their perceived lack of scientific understanding. Their collaboration and advocacy throughout the region have successfully pushed Appalachia towards a brighter future.

The path towards an equitable energy transition in Appalachia requires ongoing cooperation between technical experts, advocacy groups, and community members. This project highlights the role that interdisciplinary efforts play in creating lasting sustainable solutions.