Sociotechnical Synthesis
(Executive Summary)

Addressing the Lack of Solar Energy by the Development of Solar Tracking and the Analysis of Solar Power's Technological Culture for Developing Countries.

By Joshua Michael Starr

When looking at research for my technical project, data showed that only 3% of the earth generates electricity with solar power (Qazi, 2019), so I asked myself whether this was due to technological or social reasons. This question led me to pursue my prospectus topic on integrating solar power into existing energy systems to try and understand what kept solar power from being a primary energy source. I first did preliminary research using a sociotechnical system(STS) approach to find the technical, social, and organizational limitations of integrating solar power into existing energy systems. When putting together my problem domain, my group was unsure if our solar power product would be more beneficial for developing or developed countries. I, at first, thought that solar power was too advanced for developing countries to use. Later, I discovered that some countries, like Vietnam, with lower GDPs and development, have been pushing for more solar power usage. Research into the Vietnamese energy network led me to the (STS) thesis topic of looking at solar power's viability for developing countries.

My technical project group's goal was to determine a way to power an off-grid zero-emission home at the UVA Milton Airfield. It was quickly concluded that the best option was to use solar power by using photovoltaic cells (PV). In order to implement solar power efficiently, our group wanted to not only integrate solar power for the house but also to design the PV panels to track the sun throughout the day. The PV cells needed to be mounted on a rig controlled by microelectronics that track the sun. In theory, this could provide more energy

collection from the sun, improving its efficiency. A full-scale solar tracking rig was simulated, designed, built, and tested for this project. The deliverables for the project include a full-scale solar tracking rig and data proving the changes in its efficiencies. The project had the added purpose of giving a better understanding of solar PV cell installation and efficiency.

My sociotechnical project topic came about due to the worrying discovery of the limited amount of solar power usage while I was researching the technical project. With so little global adoption of solar energy, my Sociotechnical topic transitioned into trying to understand the issues that plagued the implementation of solar energy into existing energy systems by comparing developing and developed countries. The STS project used a methodology that compared and contrasted the technological culture between the US and Vietnam. This approach gave insight into the social problems that follow integrating solar power and determining the validity of solar power integration for developing countries. The conclusion is that technological culture is more of a hurdle than the technical limitations when integrating solar power into power grids, with a central claim that developing countries can effectively utilize solar energy.

The takeaway from both projects was the importance for an engineer to understand the technological culture surrounding technology. Technological culture connects to the social aspect of STS; technological culture is the human behavior, values, and trends that emerge alongside technology. My thesis course (STS 4600) has taught me the importance of understanding complex problems by not just focusing on the technical aspects but also the organizational and human actors. As I move on into graduate school, I will have to develop research and a thesis in my field of study. While professors and colleges may only want to focus on the technical aspects of my research, I should also make a point to exemplify the social issues surrounding it.

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