Thesis Project Portfolio

Title of Technical Report
Ivy Solar Landfill Final Design Report

Title of STS Research Paper
Emergence of Agrivoltaics in Rural America

An Undergraduate Thesis

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Tables of Contents

Executive Summary

Energy demand is one of the most important factors when contributing to rising populations in urbanized areas and the slowly integrating linkage between rural America and the suburbs. To combat these issues on energy demand, solutions on how to become more environmentally conscious must be enacted through both development and community engagement. Thus, looking into technologies, such as agrivoltaics, can mitigate both harmful environmental impacts while combating the issue of persistent land development in rural communities. Posing the questions of how analyzing *the situation between Farmers and Solar Panel Corporations can underline deeper rooted conflicts on the issue of space and land use between the two parties* while also asking what is truly happening with the spacious land and what development is taking place? This is important as populations are only going to continuously grow and expand outwards. Thus, bringing concerns on energy utilization increasing and food production decreasing as rural communities are giving up their land, which is used for agricultural production, for big corporations and the slowly expanding suburbs.

Understanding the mechanics of the agrivoltaics systems is critical to the rapid expansion that needs to be implemented into American society. This includes analysis on the topography of the area, to the certain type of panels needed for maximum optimal energy, and electrical components associated with the panels as well. This comes with studying municipalities guidelines and studying state codes when determining the full effect of development that can be taken upon the land. Through the analysis of these systems, it will determine the full effect of what can be taken upon the land and the people needed to maintain these sectors. This will determine adequate size for the panels and the amount of agricultural production that farmers can produce. This aligns with my capstone, building and designing a solar farm that is under the constraints of VCEA (Virginia Clean Economy Act) that permits only 3 MW to be generated in the designated confined area. By picking the appropriate solar panels, study the topography of the land, determining the sheer size of runoff and protection implications, and creating a stormwater report to protect local waterways should be utilized when adhering to research to better understand agrivoltaics systems and their implications in American society.

The main reasoning for the implementation of the said devices is that it will combat the growing epidemic of suburbanism. Rapid expansion of city populations causes max migration to the outskirts where communities have already been established. This fuels tension between longtime residents on the issue of land development, especially of those with agricultural basis. With multiple opinions on NIMBY (not in my back yard), it does cause questions on how those people can protect and keep their livelihoods while combating the loss of land that they are facing. Through the installation of agrivoltaics, one can achieve both energy optimization towards these localized communities, creating cheaper utility bills, and agricultural production through unused/available land. By analyzing systems already being used in different countries, such as Japan, the scope of its success can be understood and used in America where land concerns are a growing concern in certain communities.

My work this year was an accumulation of an environmental system that I thought could be used in American society. Many countries around the world already use this system on a larger scale and have seen many helpful environmental impacts such as a reduction in greenhouse gas and the lack of dependence on fossil fuels. This is even more impactful when going off the fact that the United States is the fourth largest country in the world but is a huge contributor to carbon emissions. I wanted to write about a potential solution that can combine both industries while mitigating uncertainty being brought into rural communities. Throughout this process, I have achieved and found facts that can highlight potential solutions to these questions listed while also learning for myself the laws, the electrical components, the people who need to install and maintain these systems, and the people it will benefit and ultimately help. My project is something that I am enthusiastic about and would love to contribute more findings and implementation soon. My results mostly had no negative reaction and were in fact welcomed due to the many benefits and using the land for two industries while letting farmers keep their jobs, and corporations being next door without disturbing communities. The only problem would be about the issue of NIMBY and how people's opinions might not change just based on their own personal preference. Recommendations I would offer would be to include more community engagement and creating a financial plan for installing these devices, getting the zoning requirements for land use and a description of the purpose for agrivoltaics in a specific location, and including distribution of farmers, with adequate pay, to maintain the fields and work alongside the engineers maintaining the panels. This involves a community, and everyone will need to be involved. Incorporating these systems into American Society is highly beneficial and can save the issue of both optimal energy and an increase in agricultural production.