Solar Panels in the Modern World

Exploring the relationship between both Industry and Farmers

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor guidelines for Thesis-Related Assignments.

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As solar panels are important as an alternative method for energy demand, can farmers and large industry corporations understand their reasoning for land use while addressing both of their needs? Concerns over big industries switching to renewable energy sources while having certain watt output will forever change the essence of land development as time prevails. This is important as large corporations must compete with farmers for land, but due to high funding, they normally win the case for the selected land area. As energy corporations are backed up and funded by other organizations, this leads to a decline in farmers being able to find reasonable and affordable land and instead leads to an agricultural decline as it will increase the cost of food. This leads to concerns such as foods using more growth hormones/pesticides, an increase in food cost, and shortage of farmers in the work force. This is in difference to the development of solar panels as they bring renewable energy to communities and lowering monthly bills and protecting people from deadly airborne particles. Overall, this means that to ensure that the environment remains protected as well as the community, on the implementation and development of solar panel farms, both farmers and energy sectors' voices and opinions matter as well as the research that goes into installing these devices as they affect everyone in both the urban and rural areas. *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*. Within this analyzation, we will be looking at potential solutions on how to resolve tension between farmers and large corporations switching to renewable energy as they both utilize land. Both parties have strong opinions about their case, and through specific location we can work towards a situation and understand the underlying conflict a little better.

The development of a solar panel facility that optimizes and homes in on voltage output, while being environmentally conscious under municipality and state guidelines for renewable energy, stormwater runoff, and sediment control is important for the future of energy sectors. The mass production of solar panels has led to the destruction of personal and corporate owned property through erosion and runoff from the rain of these devices **(Kameli & Shen, 2022).** Large companies are responsible for providing energy in every aspect of our daily lives. When designing and picking out the right tools and people for the job we must determine the most appropriate location for placing these panels as they could cause erosion, sediment buildup, runoff and discharge entering local waterways as impervious surfaces increase. Understanding the layout of the terrain and hiring people to mark noticeable sights is a detrimental step into the planning phase of installing solar panels. Hiring geotechnical engineers can prevent accidents from occurring in the future, but they can also play an important role in determining what type of soil is in the region and the porosity and strength that it may possess. When placing or installing solar panels, determining if the soil is strong enough to hold it in place with minimal addition of impervious surfaces as possible is the goal. It plays a role in whether the soil would be strong enough to support the solar panels or cause damage to the ground even further. The soil in Virginia, specifically the Piedmont to the Blue Ridge regions, contains up to 40 percent of residual clay **(Plaster & Sherwood,)**. While it may not seem that important, this alongside autocading, can help determine the amount of fill and grading that would be necessary on the surface for the installation of solar panels. Also, studying the soil allows for electrical/civil engineers to come in and plan for wiring as they have their own

form of challenge. Solar panels require a lot of mechanics such as protection from lightning, grounding, and having a storage unit for sending power and charge controllers too **(Sonawane et al.).** Solar panels are essentially a bunch of different components that come together to utilize solar rays and convert them into electrical, renewable energy. They require highly skilled technicians and an electrical room where energy can be transported to the community. As studying the installation process through the geotechnical and the technical wiring side, panels also must be in agreement with the law. Studying municipalities and state guidelines must be taken into consideration as disobeying federal laws could have financial and local consequences. This would have major drawbacks for both the customer and the project manager. Solar Panel development has a lot of steps and processes that influence certain motives and decision-making intentions **(Bandaru et al, 2021).** Understanding the reasoning behind why certain decisions were made can provide context of how larger corporations operate and think. Thus, an adequate number of contractors and shareholders and project managers all need to be aware of limitations of what can be done or used on the land as it is vital for the overall growth in the utilization of solar energy from far to local communities. This is in the same awareness that the needs of the communities, by which the company who takes over the solar panel farm will also have to be aware of, since there are so many restraints on the sizing and installation of these devices and their energy quotas that they need to provide as well. As solar energy are considered "a more efficient and clean energy source" it also "impacts large areas of land….and place development pressure…in rural areas" (Berryhill, 2021). This issue plays a vital role in the development of farmers, reinventing the land for the use of agricultural reproduction as they forced to adapt. Community engagement is the most important step in the developing process as people simply want to know what is happening to their home.

Looking into reopening and closing the dynamics between solar panels and farmers can better shape the outcome of infrastructure in rural areas. While there are many pros to switching to **solar panels** sources such as cleaner air, protection of the ozone layer, and less greenhouse gas being emitted from industrial sites for energy, cons still exist. In the race for implementing more solar panel farms comes the race for land and the impact it can have on local communities. By looking at a specialized location, we can pinpoint and analyze the socio dynamics between the corporation/governmental affairs and that of agriculture-based work. *As both solar farms and farmers need to utilize the land for both the communities' benefits, could a solution be established where both parties can fulfill their roles successfully without fear in competition over land?* For specific research on the issue, Virginia will be the state where we focus our attention on. Farmers are in competition with many people as land and its use are the main key drivers that everyone is fighting over. Their job is to ensure that the rest of the country has enough fresh green produce, with little to no pesticides, so that we can eat a lot healthier. Every year, Virginia is losing more of its natural fields with figures projecting at 2000 acres and more (Hollingsworth, 2022). Farmers are not the only jobs sector being displaced by contractors, but the economy and job sector of the state is also changing, at the same time becoming more urban and industrialized. However, there are big energy sectors that need to keep up with production cost meaning that switching to renewable energy, such as solar power, can help lower monthly expenses to operate business at maximum

capacity. Virginia, for example, while utilizing solar energy has produced "1.9 million gigawatt hours of solar" which is around seventeen times the average total that the entire state uses (Pitt and Michaud, 2014). Corporations give homeowners the opportunity from the utility companies leading to an influx of new solar converters (MassCec, 2021). There are people who like the thought of having a green energy fueled home and love having solar power smart homes that work for the owner. There are also people who like the thought of living in the country and are against the solar panels due to 'aspirational ruralism' (Moore et. al, 2022). However, all this fuels society shifting from agricultural dependence to a hyper-formulated system where urbanization rises. Planning for the future includes each state having laws and regulations that allow for the development in industry to take place while protecting the livelihoods of its citizens that abide (Kameli & Shan, 2022). It even goes on to establish how it is the company's best interest to promote health and safety unto members of that specific community. Under this law, farmers are protected as they are part of the community. However, while there are property rights created to help homeowners, they are 'not created equal' (Ashwood, et al. 2019). Verizon spends up to one-hundred million dollars towards the development of solar panels (Frankel & Ostrowoski & Pinner, 2014). Meaning that as long as big corporations push for the development of solar panels, farmers most often times will end up with land lost. This topic moves on to the issue of space as land is the big issue between both parties. Solar panels take up a lot of space and land as they need space for wiring, protective cover for the ground in case of runoff and discharge, and a wide surface area to take the UV rays from the sun and convert it into electrical energy and can be as wide as 1500ft (Battersby, 2023). Solar panels damage the land and can make it unusable because of the installation process leading to a "21.8% reduction in farmland price" (Chang & Lin, 2023). This is in correlation with farming techniques as some of their land has been bought for this mass installation. In fact, on a study of farmers in the modern world, farmers are readily selling their land for green energy production to gain access to corporate funding and financial stability (Hoffacker & Allen & Hermandez, 2017). This leads to an increase in growth hormones in plants as well as new partnerships between corporations and farmers to occur but at the expense of the consumer due to low land supply and financial backing. Nutritionists speak on the issue that as technology becomes more modernized, food also modernizes by taking out 'necessary nutrients' (Graci, 2010). New supplements of approved growth agents have already been tested and utilized on our nation's agriculture scape (Lurasabishvili & Karkashadze & Dolidze, 2015). This leads to the question of how can the two come to carry out their responsibilities while dealing with land use? Through extensive planning and creating an open environment where people feel acknowledged would establish effective policy making and the future of land development for both sides (Cogan, 2000). In fact, looking into utilizing solar energy, in the form of plant growth production, can combine both industries and open a new way for the two industries to become partners. There is technology that can "filter blue light", while passing a "red spectrum on to crops" promoting its growth for both job industries (Nitta, 2023). This technology aids in partnership. In fact, multiple groups have expressed how it will cost more money, but it builds connections between Solar Panel corporations and Farmers with 80% saying agrivoltaics can aid in saving money and trust (Pascaris et. al, 2021). In Southwestern Virginia, where there is an influx of shadows created from the mountains, utilizing agrivoltaics panels could aid in both lack of feasible space for land and growth in agricultural

production since it can aid in warming plants in the winter time, protect plants from over exposure to the sun and drying out, and aid in land utilization for both major industries. Utilizing these concepts would aid and promote the economic and livelihoods of those in rural areas. For global reference, Japan is an advanced nation, with a large population of 124.5 million, located on an island that is smaller than that of California (Das, 2024). To maintain their space and energy they combine most industries and are a large partaker in agrivoltaics panels (Das, 2024). Rural Virginia needs this. Alongside communication, utilizing agrivoltaics technology can address underlying issues on land use for both solar panel fields and address energy production and agriculture production in the state simultaneously.

Through the deep analyzation of the relationship between corporations and farmers, on the issue of land, the underlying conflict of people's livelihoods proves to be at stake. Farmers have to produce agricultural goods to provide for the country, while solar panels produce efficient and general good long-term effects for renewable energy and lower monthly expenses. Technological advancements in both farming and the issue of land space consumption have encouraged a behavior where voices and opinions are not addressed. Farmers and large corporations are important and detrimental to both the current and future of the environmental sectors that lie in our country. Through active pre-planning and researching the technology to combine both job industries, ensuring that both farmers and solar panel companies can fulfill their roles in rural Virginia can be achieved.

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