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Final Report

Incorporating Community Solar at the University of Richmond to Reach Sustainability Goals

Abstract

An analysis of the scale pertaining to sustainability efforts by the University of Richmond concerning the solar farm in Spotsylvania and alternative solar options is imperative to understanding and encouraging sustainability at the University of Richmond. Solar energy as a renewable energy has high potential to help institutions of higher education reach sustainability goals. Considering solar power at various scales will help understand if solar is a viable option to reach these goals. This project examines community solar under a lens of sustainability as a potential contender to meeting the sustainability and carbon neutrality goals of the University of Richmond.

Introduction

The environment is facing detrimental and degrading effects as a result of human impact and the damaging activities humans participate in involving the use of energy at high levels and high levels of consumption (Ehrlich and Ehrlich, 1997). We are challenged with finding solutions to reduce the damaging effects of humans on the earth and its ecosystems. Leaders of the environmental movement, such as the University of Richmond, are encouraged to explore sustainability as a way to diminish human impact on the planet.

To successfully combat and mitigate the impacts of climate change on the environment, the University of Richmond has pledged to be stewards of the environment by setting goals that will allow the campus to reduce its waste and offset carbon emissions through various sustainability plans (Office for Sustainability 2019). The most recent commitment was announced

to become the first institution of higher education in the southeast to match 100% of its electricity needs with solar energy, setting a high standard for sustainability (University of Richmond Newsroom 2018). In 2018, UR announced its commitment and partnership with sPower to construct a 20 MW solar array in Spotsylvania County, allowing UR to match 100% of its electricity needs with solar energy. Not only does this project represent an evolution in sustainability at UR, but it also "represents an evolution in energy management and greenhouse gas reduction at the University of Richmond," according to Rob Andrejewski, Director of Sustainability at UR.

In addition to allowing the University of Richmond to make great strides in the world of sustainability, Spider Solar demonstrates the University's dedication and commitment to environmental stewardship. Moreover, it will provide educational opportunities for students, faculty and staff on campus, while helping the University meet its long-term renewable energy goals. Although Spider Solar benefits the University, there has been some backlash in the construction of the 500 MW solar farm from community members and Concerned Citizens of Spotsylvania. Concerns of this utility solar project are environmental, social and economic.

These concerns have shaped the overarching question of our Environmental Studies and Geography Senior Seminar Capstone class: How can the University of Richmond reach their goal of achieving carbon neutrality by 2050? Is the sPower Spotsylvania solar farm offset approach the best option? More specifically, it helped define the Scale group’s research question which considers whether solar at a larger scale will be more or less conducive to reaching the university’s sustainability commitment than an alternative scale, such as community/rooftop solar. Keeping this in mind, I aim to explore the role of community solar under the lens of sustainability to see if

this is a viable option in the future for the University of Richmond to help meet the sustainability goals of the University.

Literature Review

The University of Richmond's Office for Sustainability defines sustainability as "creating environmental, social, and economic conditions that foster health and well-being for people and the natural world in this generation and generations to come" (UR Office for Sustainability, 2019). As an institution of higher education, the University of Richmond's Office for Sustainability has shown additional leadership and support to the University of Richmond community and the environment through pursuing sustainability campaigns campus wide that align with the definition of sustainability. This has provided the opportunity to critically analyze UR's impact on the environment and has allow UR to propose sustainable practices for current and future generations as well as initiating goals of carbon neutrality, waste reduction, and environmental stewardship for the near future. Two pivotal outcomes of this is the 2010 Climate Action Plan and the University of Richmond Sustainability plan.

The University of Richmond's Climate Action Plan articulates its proposed goals to promoting and reaching sustainability across campus. The plan outlines and establishes the University of Richmond's climate action goals. These climate action goals include reaching carbon neutrality by 2050. This will be achieved by reducing greenhouse gas emission by implementing interim targets: 30% by 2020; 65% by 2035; and 100% by 2050. In addition to the Climate Action Plan, the University has implemented the University of Richmond Sustainability Plan, which is a framework on how the University will achieve integrating sustainability into the blueprint of this campus. The plan includes goals of: incorporating sustainability into the curriculum; supporting

environmental management; promoting a culture of sustainability; and further integrating stewardship into administrative policies and procedures.

Furthering the University's environmental commitment to be leaders and stewards of the environment, UR implemented solar power in 2011 when a 2kW system was installed for the University Forest Apartments. The dedication to incorporating more renewable energy followed in 2016, when the University installed the first 204.8 kW solar array in the Virginia Commonwealth on the roof of the Weinstein Center for Recreation and Wellness. In 2018, the University of Richmond announced its commitment to become the first institution of higher education in the southeast to match 100% of its electricity needs with solar energy, setting a high standard for sustainability. This transformative solar agreement between the University and sPower puts UR on a fast track to reaching carbon neutrality by producing 41,000 megawatt-hours of solar energy. This will neutralize approximately 19,720 metric tons of carbon annually. Moving towards renewable energy is essential to reducing the reliance and negative impacts of fossil fuels on the environment, being the dominant source of GHG emissions and pollution. As stewards of the environment, the University of Richmond recognizes the role of renewable energy in terms of meeting the University's growing commitment to sustainability, and more importantly sustainable development which is defined in the Brundtland Report as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Report 1987). Analyzing alternative ways to incorporate solar energy at the University of Richmond under a lens of sustainability emphasizes the importance of ensuring that all can reap the environmental, social and economic benefits of a better future.

Methods/Background

To successfully answer my research question, is community solar a viable option in the future for the University of Richmond to help meet the sustainability goals, I mainly used a literature review and document research to explore community solar and the impacts/benefits it may have on communities. In addition, I extracted data from the National Renewable Energy Laboratory (NREL) on community solar projects in the United States. I then used this data to create a map on ArcGIS Online, a software that allows users to create, share, and analyze maps, to create a map depicting community solar in the United States. I then analyzed the data by doing a cluster analysis, which is when points are aggregated into groups based on location.

Results

Across the nation, there are over 500 community solar projects in 43 states (Solar Energy Industries Association (SEIA) 2019). I chose to depict this in an interactive map created on ArcGIS Online. After running a cluster analysis, it is clear that community solar is most prevalent on the East Coast, Mid-West, and North West. This distributed solar energy deployment model, which is also referred to as a shared renewable energy plant, is a solar power plant whose electricity is shared by a community. The United States Department of Energy defines community solar as a solar-electric system that, through a voluntary program, provides power and/or financial benefit to, or is owned by, multiple community members (Coughlin et al. 2010). Community solar allows participants to benefit from the electricity generated by the community solar farm, allowing people to go solar without having to install solar panels on their property (Coughlin et al. 2010). Moreover, it expands access to renewable energy for all, while providing equal access to the economic and environmental benefits of solar energy generation.

Community solar provides alternative models in which community members can participate in receiving electricity from solar. In addition, community solar design and type can

vary based on location, type of bill credit, contract length, cost of participation and financing options, eligibility, etc. The three main and most common models for community solar are the utility-sponsored model, special purpose entity (SPE) model, and the non-profit development model (Coughlin et al. 2010). The utility-sponsored model encourages participants to purchase renewable energy from a shared facility that a utility company owns or operates. Electricity can be purchased for a set amount at a fixed rate that may provide protection and stability against rising rates for grid electricity. Although the fixed rate may be slightly higher than the current rate, it is purchased for a term, ranging from as short as a kilowatt-hour block to as long as 20 years (SEIA 2019). Limitations of utility models include subscription restrictions to within distribution territories. The special purpose entity model (SPE) allows individuals and companies to form business enterprises aimed to develop (design, construct, and own) a community solar project (Irvine 2019). The business will work the local utility to allocate benefits to subscribers, which allows the business entity to take advantage of state and federal tax incentives. The last model, the non-profit development model, donors typically contribute to a shared renewables installation owned by a non-profit organization project to benefit members (SEIA 2019).

In addition to the types of community solar models, there are two major options for community members to participate through ownership-based projects and subscription-based projects (Community Solar 2019). Ownership-based projects are projects in which participants may purchase or obtain financing for their portion of project through purchasing panels up-front or financing them through a loan. This allows ownership of a set number of panels in the array or a certain number of kilowatts to meet their annual electricity usage. Additionally, ownership-based projects solicit credits to owners to match the project's output through the electricity bill. Subscription-based programs run through a system that is owned by utility or a solar company in

which they develop, own and extend the project. In this model, we find that electricity is bought at lower prices due to the fluidity in participation. This allows for little to no upfront fees. Some limitations include residing within the utility's network area and ensuring that a participant's share of power from the project will not significantly exceed their electricity.

Discussion

The University of Richmond is one of many universities throughout the nation to implement solar on campus. Solar at universities provides several benefits, offering opportunities for cost-savings, collaboration, innovation, and leadership. Benefits of community solar range from environmental benefits, to financial and social benefits (Solar Energy technologies Office 2019). A main component to community solar is providing a sustainable alternative to providing renewable energy for all. The benefits of community solar ties in with sustainability, as they hit on the three pillars of sustainability. Community solar promotes the use of renewable energy in an affordable and convenient way, which is environmentally beneficial. Additionally, community solar helps combat greenhouse gas emissions and reduces our dependence on fossil fuels, reducing overall pollution and reliance on nonrenewable sources of energy. Community solar provides financial benefits because shared solar programs can reduce the financial and technical barriers to going solar as it divides costs among all of the participants, making is accessible for a variety of budgets. In addition to this, the community can benefit from federal and state government incentives, including Federal Investment Tax Credit (ITC) and Renewable Energy Certificates (RECs). This incentivizes companies to finance the development projects and helps lower the cost of installing a system, making the electricity the solar system generates more affordable. Although the social benefits may not be as clear as the environmental and financial benefits, community solar provides wider solar accessibility for different electricity customer classes, especially low-

income customers. Community solar promotes local and community engagement while allowing individuals to produce their own electricity, fostering environmental and financial independence.

Analyzing the University of Richmond at a national scale allows us to put into perspective the importance of incorporating solar at universities. This unit of analysis and simplified representation of the world helps produce and understand the relationships of UR's role of a steward of the environment. Although UR is currently making efforts to introduce solar as a way to offset carbon emissions, we must continue to plan for the future and introduce new ideas on how to incorporate sustainable practices into the fabric of our university. Expanding solar beyond campus and integrating the Richmond community would not only promote sustainability, but also educates those who aren't aware of climate change the the things we, as humans, can do to combat drastic environmental changes. The University would benefit most from the special purpose entity (SPE) model as it allows the University to partner with a solar company and have the local community reap financial benefits. Although a model of community solar is utility, the difference between Spider Solar and community solar is that with community solar, the University will provide sustainable practices in the form of electricity through solar energy for the Richmond community rather than just offsetting carbon emissions and only benefiting the University. Implementing community solar also meets the University's sustainability commitment and could provide ways to reduce carbon emissions. Rather than implementing a Power Purchase Agreement, UR can invest with donors to provide solar energy generation to local community members over big companies. This has positive implications for improving our relationship with the environment as well as having positive economic benefits.

Conclusion

Promoting sustainability is more than offsetting one's carbon emissions or being carbon neutral. It is about finding practical solutions to reducing our overall fossil fuel emissions. Sustainability is about engaging with communities and exchanging information to better the planet. Community solar provides the platform in which we can ensure present generations and future generations engage with one another and our energy consumption, by giving opportunities to those (all people) who couldn't have or wouldn't have interacted with solar energy. Although there are many options for community solar one thing to consider is the cost and who will be paying for it. Any project at this scale will require an investment, however it is important to consider the benefits and opportunities community solar may bring to the University of Richmond campus community along with the Richmond Community.

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