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Evaluating Viable Models For Community Solar Projects in the State of California

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PROJECT OBJECTIVES

- Examining energy policies and regulations as they pertain to community solar in California.
- Providing insight regarding solar development in California through a spatial analysis of suitable community solar areas in Santa Barbara, San Luis Obispo, and Ventura Counties.
- Examining the prospect of a community solar installation for Rancho Embarcadero Community in Goleta, CA.
- Examining the financial aspect of community solar installations.
- Investigating community solar business models.

Background and Problem Statement

Presently, solar-powered electricity is utilized by individuals either through the installation of solar panels on commercial and residential rooftops or through utility-owned solar farms that generate hundreds of Megawatts of electricity. While these two options have their own sets of benefits, they also have several drawbacks. Solar arrays mounted on residential and commercial rooftops have at times been perceived to be too costly, aesthetically undesirable, or structurally unstable. With regard to utility-scale solar farms, the areas in which they are placed are often undisturbed or environmentally sensitive and thereby generate community-wide resistance. In light of these issues, an intermediate option of generating and supplying solar-powered electricity at the community scale may prove expedient. Such a project could occupy less space, encourage community participation, lower transmission costs, and decentralized power distribution. Even though there are a few installations based on variations of this idea in existence today, they often don't meet their objectives of providing clean, environmentally friendly energy that is affordable for the community stakeholders.

Policy Drivers

It is currently mandated by California law that 20 percent of the state's electricity be generated by renewables by 2010. Recently, Governor Jerry Brown signed legislation in April 2011 that requires California to now obtain 33 percent of its energy from renewables by 2020. The passing of the Global Warming Solutions Act of 2006, or AB 32, sets a cap on the state's greenhouse gas emissions at 1990 levels by 2020. These mandates, along with the numerous federal tax incentives for renewable energy investment, have focused attention on the merits and potential of renewable energy, particularly solar. The Community-Based Renewable Energy Self-Generation Program or California Senate Bill 843 is currently being considered and will give an electricity customer the option to own solar or renewable generation in a shared facility built on degraded or idle land, or community friendly rooftops near preferred distribution points. The bill depends purely on economics, does not require any state subsidies, and effectively makes community solar a reality in CA.

ANALYSIS CRITERIA

An ideal site for community solar project would have the following attributes:

- The project site (land or rooftop space) would be situated near cities and communities. This would mean that there will be grid transmission lines close by and costs for the transmission of generated electricity will be minimal. For the analysis, population densities of the three counties were calculated and the 20-80 density percentiles were termed as the ideal population density. The Census Tract 2010 shape files from the U.S Census Bureau website for the three counties were used to calculate the population densities.

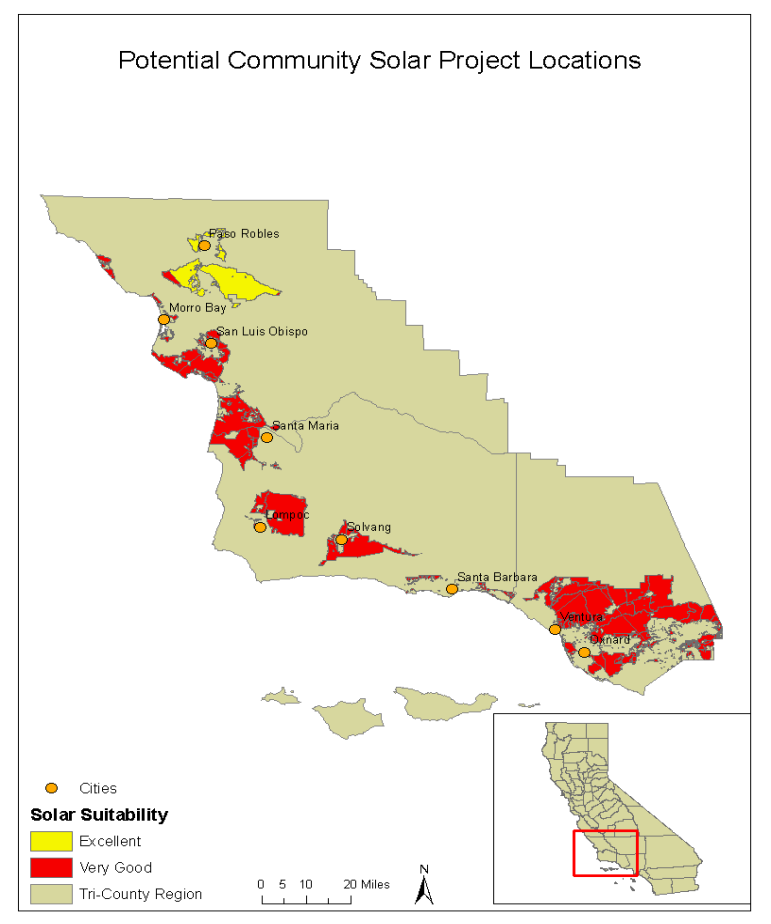
- The project site should not be situated on federal, military or national and state park lands. It should either be privately owned or belong to the Bureau of Land Management (BLM). The base map 'USA Federal Lands' by ESRI was used to determine the areas that could not be used to install community solar arrays.

- There should be adequate amounts of sunlight throughout the year to generate the required amount of electricity. National Renewable Energy Laboratory (NREL)'s Solar Energy Potential data was used to analyze the amount of solar radiation received by the three counties. This data represents the annual average solar resource potential, in kWh/m2/Day, for a flat plate collector, such as a photovoltaic panel.

Spatial Analysis

The key objective of the spatial analysis was to find the location and size of suitable areas for community solar projects in the state of California. To find these locations, certain "constraints" needed to be defined. When applied to the spatial analysis, these constraints would produce the required results. For this section, we chose to run a GIS analysis on three counties in California – Santa Barbara, San Luis Obispo and Ventura, collectively called the Tri-County Region.

FIGURE 1: SUITABILITY MAP FOR TRI-COUNTY REGION



GIS Spatial Analysis Results

Overlapping the three datasets and applying the constraints showed that the total area suitable for community solar projects is 599,356 acres for the three counties. The total area of the three counties of Santa Barbara, San Luis Obispo and Ventura is 6,152,207 acres. Therefore approximately 10 per cent of the total area in these counties has suitable land for community solar projects.

FIGURE 2: NUMBER OF COMMUNITY HOUSEHOLDS INTERESTED IN PARTICIPATING IN A COMMUNITY SOLAR PROJECT

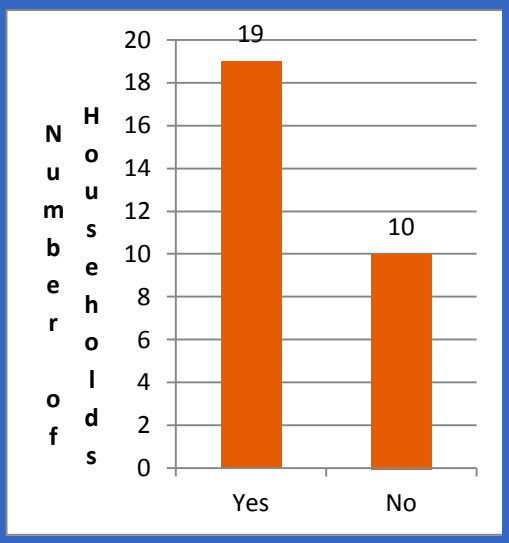
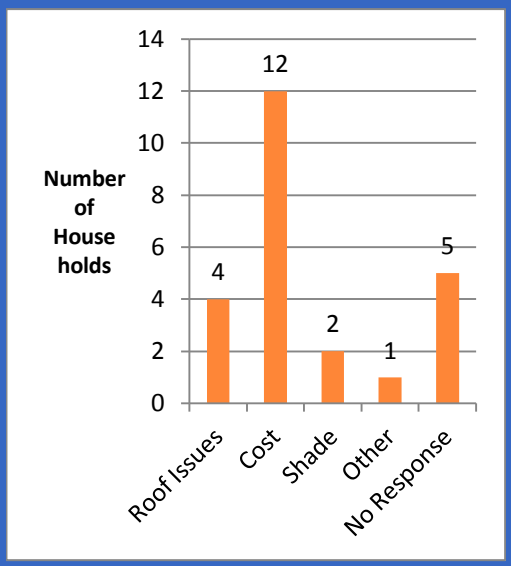


TABLE 3: REASONS CITED PREVENTING ROOFTOP SOLAR INSTALLATIONS



Case Study - Rancho Embarcadero

In order to gain a deeper understanding of the process of creating a community solar installation, it became necessary to identify and solicit a local residential community to take part in the project as a case study. The Rancho Embarcadero Community was identified as a potential candidate for a community solar because it possessed a number of characteristics conducive to the implementation of a community solar project. The most important aspect of the community that set it apart as a good candidate for community solar was its ownership of a parcel of empty land suitable for a solar installation of sufficient size to handle the energy demand of the community. The 20 acre parcel is suitable for development since it is low grade Agricultural-II land with few restrictions, is not a species corridor, and is easily accessed for installation. The presence of a homeowners association facilitates the mobilization of the community for a community solar project. Also, the community is not located in an isolated rural area and therefore would not require any additional transmission lines. Finally, because the community has shading and siting issues, a community solar installation could serve the needs of those homeowners desiring rooftop solar but who are constrained from doing so.

Survey for Rancho Embarcadero Community

After identifying Rancho Embarcadero as a suitable community, it became necessary to gather data from the community in order to gain further insight regarding the feasibility of community solar for the Rancho Embarcadero. The data was collected through the use of a survey that was sent to the roughly 150 households that make up the community. The survey that was created contained 15 questions and a cover letter that explained the purpose of the study and instructions for filling out the survey. The qualitative information obtained from the survey was used to gage community interest in such a project, while the quantitative data was used for project modeling purposes. After sending out the surveys in December 2011, by February 2012, 29 out of 150 surveys were received, signifying a response rate of 19.3 percent. Possible reasons for this response rate are the intangible nature of the proposition and the unfamiliarity of the concept.

Analysis of Survey Results

The survey results show that over 50 percent of respondents are interested in participating in a community solar project. These figures show that a significant portion of the community are interested in community solar being used to supply energy to their community while a large proportion cite high costs as a reason for not installing solar themselves. Additionally, the survey revealed that the overall average monthly energy use for 2011 for the community was 893.6 kWh.

RECOMMENDATIONS AND CONCLUSIONS

There are several existing and upcoming Federal and State incentives for a community solar project. Some of the incentives can be used only if the communities form a business entity. From our spatial analysis we know that there is a good potential for community solar projects. We did not take rooftop space into consideration which suggests that there is greater potential for it than we calculated. With regard to Rancho Embarcadero, a combination of energy efficiency improvements and community solar would be the best option. A first step to developing community solar would be to build consensus amongst the community regarding the benefits of a community project of this scale. We would recommend the community perform energy audits to better understand where energy efficiency measures could offset energy demand. The community would expect to see some discussion over the perceived benefits of the array site. ***In conclusion, under SB 843, the legal and financial framework will exist so that a community owned solar installation is possible not only for Rancho Embarcadero, but viable for the state of California.***

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Financial Models for Rancho Embarcadero

Without SB 843

One option would involve a Solar Service Provider or a third-party developer owning and constructing an array. A Solar Service Provider would lease the land from Rancho Embarcadero and the generated electricity would be fed to the local utility. Solar Service Provider will make money from selling energy to grid or to the Embarcadero Municipal Improvement District as a Power Purchase Agreement. However this cannot truly be considered a community solar project because they do not directly own the installation.

The second option is the Co-operative model. Under this model, there are no associated tax breaks because EMID is a non-profit entity and is therefore tax exempt. A Co-op can make use of Renewable Energy Certificate's, but given the high cost, this is not likely to provide a return on investment or, if it does, it may be very far into the future. The return on their generation from the relatively low feed-in-tariff rates will likely be consumed in part by distribution charges on the energy produced

With SB 843

The two clearest options are for the installation to be co-owned with a developer or solely owned by the community. In both models community members will become participants and buy the right to consume a certain number of kWh's of electricity at a fixed price to be credited against their bill. In the former model, the benefits are shared with the developer, while in the latter model, they will remain in the community. In both scenarios, the LLC will be responsible for metering customers and forwarding the data to the utility for credit.

FIGURE 4: THE COST AND CREDITS ASSUMING 100% OFFSET BY PV ARRAY

	Typical Cost of electricity per month (IOU)	Cost 20-year period (IOU)	Initial Cost of community solar Installation Without tax credits	Credit per month SB-843	Value of REC's over 20 years	Value of Credit 20 years SB-843	Credit 20 year Feed-In-Tariff (IOU)
Per Household 1 HH	$152	$51,916	$30,344	$179	$7,928	$43,775	$19,263
33% of Community 50 HH	$7,526	$2.57M	$1.50M	$8,860	$396,422	$2.17M	$0.95M
100% of Community 150 HH	$22,809	$7.79M	$4.55M	$26,850	$1.18M	$6.56M	$2.89M