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Improving solar development policy and planning through stakeholder engagement: The Long Island Solar Roadmap Project

Chelsea Schelly[a,*], Jessica Price[b], Aimee Delach[c], Rupak Thapaliya[d], Karen Leu[e]

[a] Michigan Technological University, United States
[b] Landscape Conservation Ecologist, The Nature Conservancy New York Division, United States
[c] Senior Policy Analyst, Climate Adaptation, Defenders of Wildlife, United States
[d] Renewable Energy & Wildlife Policy Analyst, Defenders of Wildlife, United States
[e] GIS Specialist, The Nature Conservancy New York Division, United States

A B S T R A C T

The Long Island Solar Roadmap Project involves a collaborative research approach with multiple organizational entities and actors engaged in a stakeholder driven process. Long Island is a space-constrained region with a steep urban to rural gradient, resulting in a complex suite of local governments, development priorities, and utility, planning, and development actors. This project is integrating technological, economic, and social data into a spatial planning output that allows decision makers to see where mid-to-large scale solar development (capacity of 250 kW and larger) is technically, economically, and socially feasible. This spatial output involves innovative methods of evaluating site suitability based on criteria developed by stakeholders. The project's stakeholder and partnership driven approach allow the team to consider technological and economic feasibility across a wide variety of solar development forms and financial models. Social science data collected via a residential electric utility ratepayer survey is used to examine the perceptual barriers and opportunities for solar development as well as the sites and types of solar development that community members are most likely to support. The Long Island Solar Roadmap Project is an example of how research and community engagement can improve solar development policy and planning.

1. Introduction

The state of New York is leading the way in deployment of renewable energy (RE) resources (Roselund, 2019) including solar electric photovoltaic (PV) technology. New legislation sets ambitious targets for the development and use of renewable energy resources in the state, including specifically solar PV. One of the myriad benefits of PV is the flexibility the technology allows in terms of sizing and siting installations. However, solar energy development projects may face barriers related to public perceptions and concerns regarding siting and other issues. Further, solar energy development projects often face a complex web of zoning, permitting, and approval processes; this is especially true in cases where multiple, sometimes overlapping but sometimes contradictory decision-making entities are involved. This is the case for Long Island, New York, a space-constrained region with a steep urban to rural gradient, resulting in a complex suite of local governments, development priorities, and utility, planning, and development actors.

This paper reports on the Long Island Solar Roadmap Project, a collaborative research approach with multiple organizational entities and actors engaged in a stakeholder-driven process to explore solar energy development on Long Island. The project aims to explore the barriers and opportunities associated with mid to large-scale solar development on Long Island by integrating social science, economics, and spatial dimensions of solar development planning into one spatial output intended to help explore feasibility and suitability of potential development sites across the study region. The paper has two primary aims. The first is to contribute to the literature on public perceptions of renewable energy development by reporting the empirical findings from a ratepayer survey conducted with utility customers on Long Island and consider what these findings suggest regarding public perceptions of solar energy development, including both concerns and opportunities. The second aim of the paper is to reflect on the process of the Long Island Solar Roadmap Project and how collaborative stakeholder driven processes can improve and ultimately promote solar energy development.

2. Public perceptions and RE development

Renewable energy development is widely supported. In the US, national surveys regarding support for renewable energy report 88% support (NSEE, 2018). Others have found similarly high levels of support, specifically for large solar systems in California communities (90% support for development in their communities, 95% support for development in general, Carlisle et al., 2014) and in Canada (83%

* Corresponding author.
E-mail address: cschelly@mtu.edu (C. Schelly).

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support, Sherran et al., 2019).

Some recent work suggests that Americans are more supportive of wind energy development than solar energy development (Firestone and Kirk, 2019). However, while this recent work suggests that wind receives higher public support than solar, it is important to note that the survey sample was comprised of respondents who have wind energy facilities sited near their communities, suggesting a potentially more important finding: people who have experience with renewable energy technologies are more supportive of those technologies. This is supported by other research (Sherren et al. 2019), suggesting that experience with a technology increases support for that technology.

Conflict over renewable energy siting and development has often been characterized as an issue primarily related to aesthetics. However, people's level of trust in developers has been found to significantly predict support for solar development (Carlisle et al., 2015). For residential-scale solar technology adoption, environmental and economic factors both matter for adopters (Schelly, 2014; Letzelter, 2018), but perceived reputation of developer is the third most important factor shaping the decision to install solar panels at the residential scale (Letzelter 2018). Further, perceptions regarding the distribution of economic benefits are known to shape public support for renewable energy (Wolsink, 2007; Carlisle et al., 2015).

The Long Island Solar Roadmap Project included a social science research component intended to explore public perceptions of solar energy development on Long Island, utilizing a survey instrument designed to examine specific factors influencing perceptions (including those identified in the review above) as well as to examine support for specific solar array installation types (rooftop, parking lot, and ground-mounted installations) and financial models for mid- to large-scale PV projects. The project also examines economic, technical, and regulatory considerations. The project involves a collaborative, stakeholder-driven processes and aims to map areas of opportunity for low-impact solar development. The project considers the potential for use of various forms of land, including agricultural lands and parking lots, for multi-purpose and mixed-use development that includes PV systems, and integrates knowledge regarding spatial, economic, regulatory, and social factors. Others have developed reports and recommendations regarding local permitting processes in New York (NYSolar 2014), and this project is not intended to develop specific policy or modifications to existing policy. However, this project can inform permitting process development by suggesting what kinds of developments to prioritize.

The social science research results suggest, based on public perception and overall public support, a bright future for solar energy development on Long Island. Survey respondents reported support for a wide variety of development types and financial models that could be used for mid- to large-scale solar projects on Long Island. The project's process and structure also suggest that value of utilizing collaborative engagement in research processes to better understand and effectively promote solar energy development. The stakeholder driven approach revealed shared interests, opportunities for collaboration, and potential avenues for promoting solar energy development.

3. The Long Island Solar Roadmap Project process

The Long Island Solar Roadmap Project aims to advance the pace of solar installations on Long Island by identifying siting conflicts and lowering the barriers to installations in low-impact sites like parking lots, large rooftops, and previously disturbed sites. The project involves a consortium of stakeholders representing groups who can affect and are affected by the outcomes of solar energy development decisions on Long Island, and the project intends to:

1) Identify low-impact, low-conflict sites for mid- to large-scale solar installations (250 kW DC and larger) on rooftops, parking lots, and previously-disturbed lands and provide information on where permitting challenges and grid modifications may be needed to utilize additional solar resources.
2) Characterize the direct and indirect economic costs and benefits as well as other economic barriers or considerations to solar installations in different settings, such as commercial, non-profit, and municipal properties as well as space leased or purchased by independent power producers.
3) Perform social science research to better understand residents' perceptions of and preferences for solar energy installations in their communities and the factors that motivate their support or opposition.

The project structure involves a Leadership Team of professionals from the non-profit sector (The Nature Conservancy and Defenders of Wildlife) as well as a University researcher and a professionally trained facilitator. The project includes a Steering Committee with members from the local utility and local government entities and a larger Consortium that also includes planners, solar energy development professionals, agricultural land owners, and others. The Leadership Team meets frequently (weekly) and is responsible for generating the research and data used in the project. The Steering Committee and the Consortium are consulted frequently; initially, conversations centered on clear defining the aims and scope of the project, while discussions throughout the project focused on decision making, interpreting results, and translating results into recommendations. Working groups, consisting of members of the Leadership Team, Steering Committee, and Consortium, were formed to contribute to the three components (spatial, social, and economic) of the project.

The Leadership Team initially identified potential participants from the locally relevant stakeholder groups, including the electric utility, local governments, solar development, and community organizations. Members of the Leadership Team then reached out to each person identified as a potential participant to interview them about their perspectives regarding the potential opportunities and barriers associated with mid- to- large scale solar development in New York and on Long Island. Interviewees were then invited to participate in the project and asked about their interest in the varying levels of involvement. The Leadership Team worked to ensure balanced representation among the various stakeholder groups, although the voluntary nature of participation resulted in some individuals from some groups being less inclined to participate.

The social science research component of the project was developed through conversations with the Leadership Team and with the Steering Committee about the priorities, objectives, and goals of the research. Writing, revising, and finalizing the survey instrument involved collaborative work within the Social Science Working Group and across the Steering Committee. One of the initial considerations was the extent to which the survey should focus on knowledge about solar development versus focusing on preferences for development (if focused primarily on the latter) and whether or not the survey should ask about perceived consequences of solar development (it did). Some of the decision-making points involved discussion of the particular forms of development and financing to ask about, if and how to include aesthetic or visibility concerns, if and how to include commonly perceived misperceptions about the economic, environmental, or health consequences of solar development. The survey instrument is available in the Appendix.

The local electric utility company administered the online survey by sending it out to 50,000 customer email addresses randomly selected from within a pool of approximately 1 million residential utility accounts. The utility was responsible for administering the survey using its own online account platform and for collecting and managing response data; only anonymized survey results were shared with the Leadership Team. The introductory language to the survey clarified for respondents that the project itself is not being led by the local electric utility.

4. Case study outcomes and policy recommendations

The Long Island Solar Roadmap Project is ongoing, and the final spatial analysis is not yet complete. However, the social science research components, including interviews with Steering Committee members and the ratepayer survey, are complete and analyzed. The results suggest a residential ratepayer population that is supportive of mid- to large-scale solar. The section below presents some of the survey results. The process of collaborating to develop and implement a survey also revealed opportunities for improvement, and the section below also reviews the lessons learned as results from this project. Similarly, the stakeholder driven process itself has led to the development of new opportunities for exploration and collaboration, and the results of this process in terms of project decision making is reviewed below, as are reflections on some of the barriers and challenges associated with the process.

4.1. Survey results and reflections

The survey of residential utility ratepayers on Long Island reveals overwhelming support for solar energy technology development. 92% of Long Island survey respondents reported support of solar energy development in their communities. The most supported development types are rooftop solar (with 75% reporting support whether or not the system is visible), carport solar (with 74% reporting support whether or not the system is visible), and ground-mounted systems on landfills (74% reporting support whether or not the system is visible). The most highly supported financial models are projects privately funded by local companies (82% support), private funding for community solar (79% support), public funding for community solar (74% support), and privately funded projects on private property (73% support), while the least preferred financial models are public financing (69% support) and privately funded project developed by non-local companies (69% support).

The majority of respondents are in favor of solar development regardless of the financial model, as variation in response is quite low and all options receive majority support. Responses regarding preferences in response to various decisions and tradeoffs involved in solar energy development projects suggest that the majority of respondents support solar energy development across all provided decision categories. The results also suggest that respondents care whether solar energy development projects provide jobs to their communities, are supportive of solar energy development projects that reduce electricity costs for schools and are developed with mixed-use or the ability to provide supplemental income to farmers, and support the environmental motivations and benefits associated with reducing fossil fuel usage and GHG emissions.

Some of the survey results surprised or contradicted assumptions previously held by some members of the project's Leadership Team and Consortium, while others provided direct insight into opportunities for promoting solar energy development. Survey respondents expressed relatively low levels of concern about the aesthetics or visibility of solar systems, and respondents seemed to correctly identify the potential for local and more broad scale environmental benefits without misidentifying any possible environmental concerns. Respondents were asked one item specifically about solar energy development project co-located within agricultural lands (the item was asked with specific language about providing supplemental income to farmers), and this form of development received very high levels of support (72% of respondents supporting).

The process of collaboratively developing and implementing a survey also posed challenges. There were many items of interest that did not ultimately end up on the survey, such as specific items about existing experience with PV technology and items about specific knowledge regarding solar energy technology and policy. The leadership team and the local utility worked together to implement the survey, and the utility was understandably more attentive to survey length and to survey items being easily accessible for mobile responses, given their experience with their customers and with regularly sending them surveys. Some demographic data were collected from respondents, but responses to these survey items was not required; because of this, there are many non-responses for area of residence and the data cannot effectively be used for a fine-grained spatial analysis, as was one original ambition of the leadership team. The process suggests the importance of considering the multiple aims and positions of the diverse group of actors involved and the importance of transparent prioritization to ensure data collection aligns with project aims.

4.2. Project process results and reflections

The overall project process, allowing significant levels of stakeholder engagement and involvement, has shaped the overall approach to farmland within the project. Initially, agricultural lands were going to be left out of consideration entirely, in recognition of the complexities and challenges involved in using farmland for energy development. The issues are perceptual cultural but are also financial and political, and given the project's emphasis on low conflict development, agricultural lands were initially deemed off the table. However, the stakeholder driven process of engagement with the project suggested more interest in tackling the complexities of mixed-use solar energy development on agricultural lands. The survey results also suggest public support. As a result, a working group was created to specifically consider how to integrate agricultural lands within the project. This working group includes agricultural land owners as well as municipal leaders and solar development professionals, and the collaborative discussions and the work being done by this group emerged as a direct consequence of stakeholder engagement within the project.

For the process stakeholder driven process itself, there are also opportunities for reflection and learning. Some of the challenges of the project involved connecting with the right people, capturing all viewpoints and constituencies, and maintaining engagement throughout the process (keeping folks in it for the long haul). Data acquisition has also been a challenge for the project, as the involvement of individual stakeholders representing specific institutions does not necessarily translate to institutional support for sharing data that may be considered proprietary, privileged, or secure. Some of these challenges suggest the importance of obtaining support from institutions, even when those institutions are being represented by particular individuals willing to engage as stakeholders.

5. Discussion and conclusion

The findings from the social science research associated with the Long Island Solar Roadmap project suggest that ratepayers on Long Island are supportive of mid- to large-scale solar development across a range of development types and financial models. The most highly supported development types (putting solar on rooftops, carports, and landfills) and the most highly supported financial models (privately funded community solar and projects by local companies) suggest prioritizing these forms in policy and regulatory environments (permitting and incentivizing) as well as in research and development (as more research may be needed to safely and effectively locate solar on landfills). The concerns expressed by survey respondents also suggest a need for educational outreach that increases transparency regarding the financing, funding, and utility motivations for supporting mid- to large-scale solar. While education alone may not shift attitudes or behaviors (Heberlein, 2012), targeted information that increases trust may help address concerns regarding solar development, as perceived reputation of utility actors and solar developers is an important consideration for these respondents and trust is a key element in shaping public perceptions.

The Long Island Solar Roadmap Project process clearly illustrates

the value of stakeholder driven processes. In this case, involving stakeholders early in project allowed participants from both the Steering Committee and the larger Consortium to contribute directly to shaping the project's aims and scope. For example, consideration of agricultural lands was initially considered to be off the table for the project, as it was perceived to be too high conflict. However, stakeholders engaged in the process suggested the Leadership Team work to explore the contexts in which solar development on agricultural lands may be supported by farmers and the public alike, and a Working Group formed to consider how to best integrate what kinds of agricultural lands into the project. The survey also included an item regarding support for mixed use solar development on agricultural lands that could provide additional income for farmers, which received a high level (72%) of support. The project's engagement with stakeholders allowed for consideration of a development type that would likely have not been considered at all without stakeholder input.

Stakeholder engaged processes are not synonymous with community engaged research; however, both arguably benefit from integration of collaborative governance principles into the research process (Prehoda et al., 2019). One key element of collaborative governance is establishment of the process and responsibilities for decision making early on in any collaboration, and the Long Island Solar Roadmap project intentionally involved deliberation over decision making early on in the process of engaging with stakeholders. This involved ensuring agreement about the form of decision making (in this case, that a goal is agreement but not full consensus) and about the role of participants in decision making (in this case, that decisions are ultimately made by the project Leadership Team). This deliberation arguably helps to mitigate confusion and tension later on in the process.

Others have argued that one of the key outcomes of stakeholder engaged research processes is the creation and enhancement of professional networks among participating stakeholders (Yusuf et al., 2018). This project will aim to assess this at the end of the process, but also aims to contribute substantive recommendations for improving the policy process for permitting, regulating, funding, and incentivizing mid- to large- scale solar development on Long Island. Thus far, the project's results suggest that solar energy development is not necessarily contested because of visibility, but because of concerns about transparency and trust and a general lack of knowledge regarding the funding and financing of solar PV development. The project also suggests that mixed use solar development is worth further exploration and incentivization, which may require an even broader group of stakeholders (including builders and zoning planners) engaged in processes that offer opportunities for improving local policy processes to promote solar development in space constrained environments.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.tej.2019.106678.

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Chelsea Schelly is an associate professor of sociology in the Department of Social Sciences at Michigan Technological University. She researches the social and policy dimensions of energy transitions. Her research explores how technological systems interact with social structures through both policy and practice.

Jessica Price is a Landscape Conservation Ecologist at The Nature Conservancy on Long Island and is the project lead on the Long Island Solar Roadmap Project.