ASSESSING STATE POLICIES FOR UTILITY-SCALE SOLAR SITING IN MARYLAND, TEXAS AND FLORIDA THROUGH AN ENERGY JUSTICE LENS: A COMPARATIVE CASE STUDY

by
Olivia Newport

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Abstract

With the current increased focus on greenhouse gas emissions reductions and recognizing and responding to past inequities, understanding ways to improve existing regulatory frameworks and guidance to be more inclusive becomes increasingly important. This capstone project aims to understand the state of existing utility-scale solar deployment in the U.S., considerations when choosing a specific site for a utility-scale solar installation, and factors that drive public opposition and acceptance of renewable energy installations in their communities through an intensive literature review. Then, a qualitative, case study comparison was conducted of the statutes, regulations and guidance related to utility-scale solar siting in Maryland, Florida, and Texas at the state level. The comparison characterizes the procedural energy justice aspects of each state's processes and differences, through criteria related to public and local government opportunities for participation and transparent guidance. Potential strategies to provide opportunities for more meaningful public and local government input, with the aim to increase community acceptance, were then identified. Each state has different regulatory characteristics and level of state involvement in the utility-scale solar siting process that impacted the ability of the public and local governments to be involved in the decision-making process. The study concludes with potential technical solutions to increase public acceptance of planned utility-scale solar, including integrated vegetation management and agrivoltaics.

Reader and Advisor: Tom Peterson

Secondary Reader: Dr. Michael Schwebel

Table of Contents

List of Figures

List of Tables

Executive Summary

Transitioning away from fossil fuels toward renewable energy is a key action needed to limit global warming and future carbon dioxide emissions in the U.S. and globally. With this transition comes the opportunity to revisit existing policies and processes and amend them to better represent and suit the needs of all involved. While it is important to focus on the technical viability aspects of introducing increased renewable energy generation capacity in the U.S., achieving community buy-in on these projects is also needed to move forward.

Utility-scale solar has increasingly become more cost-effective and its development is growing in the United States to help achieve federal and state renewable energy and greenhouse gas emission reduction goals and targets. Renewable energy siting, especially for technology types such as utility-scale photovoltaics that have vast land requirements, can face opposition from local communities for a multitude of reasons, which are summarized in this study. Factors contributing to local acceptance or opposition to utility-scale solar in communities may not align with the criteria prioritized by developers.

To better understand the role of states in renewable energy siting accepted by communities, this study employed a qualitative, comparative case study approach and applied a procedural energy justice lens to determine the differences between three states' review and approval processes for siting of utility-scale solar installations. Numerous criteria measuring procedural energy justice through governance and democratic decision-making were identified to compare the states' processes, based on an Initiative for Energy Justice scorecard framework. The study then identified opportunities for these states to improve aspects of procedural energy justice in those processes and proposed potential technical alternatives that states could prioritize, including integrated vegetation management and agrivoltaics, to improve utility-scale solar suitability in communities.

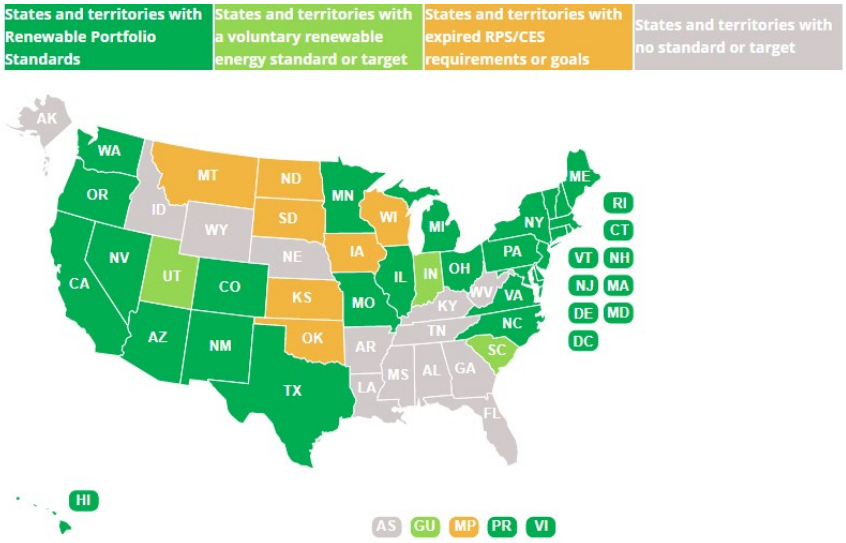
Introduction

The Biden administration has an ambitious clean energy and greenhouse gas emissions (GHG) reduction agenda that has a focus on environmental justice, energy and environmental resilience, and economic recovery. A major part of the agenda includes increasing the installation of renewable energy technologies, such as solar, to power the electric grid. However, utility-scale solar siting has become a hot-button, energy justice issue in local communities that poses a potential threat to the Biden agenda and state renewable portfolio and clean energy standard goals if not recognized and addressed.

There are a few important drivers of renewable energy development in the United States at both the federal and state levels. In April 2021, President Biden announced a new target to reduce the U.S. economy's greenhouse gas emissions by 50 to 52 percent in 2030 from a 2005 baseline and set a goal to reach 100 percent carbon pollution-free electricity by 2035 in the country, in addition to having the U.S. rejoin the Paris Agreement (The White House, 2021).

At the state level, 30 states, Washington D.C., and two U.S. territories have active renewable or clean energy requirements, typically in the form of a renewable portfolio standard (RPS), while three additional states have voluntary renewable energy goals, as shown in Figure 1 (National Conference of State Legislatures, 2021). Some RPSs or clean energy standards have specific percentage carve-outs for future generation from solar or wind. Government policies, such as the investment tax credit project completion deadline on December 31, 2023, and RPSs that encourage the development of large-scale renewable energy technologies have driven recent growth in utility-scale solar.

Figure 1. Renewable Portfolio Standards or Voluntary Targets by State



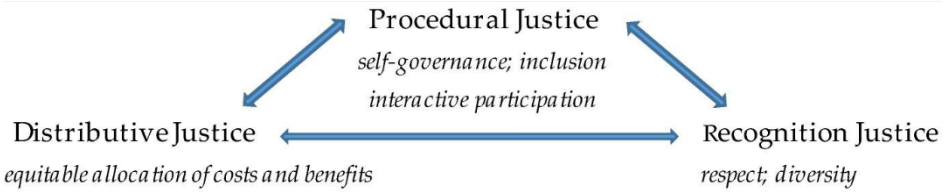
Map identifying which U.S. states have renewable portfolio or clean energy standards, voluntary targets, or no standards or targets. (NCSL, 2021)

Utility-scale solar, which according to the U.S. Energy Information Administration (EIA) is a project with a total electric generating capacity greater than one megawatt (MW), will be critical to scale up and increase renewable electricity generation to meet the Biden administration's goals and some state RPSs but may also contribute to increased land use conflicts and opposition. While electricity generation from utility-scale solar is currently a small percentage of the U.S.'s overall electricity generation from utility-scale power plants, it is expected to grow in the coming years. Large-scale photovoltaic (PV) systems typically require between 4.2 and 6.1 acres per MW of alternating current, technology-type dependent, and therefore with expected large-scale solar growth to 144 GW by 2030, land requirements to site this solar range from 604,800 to 878,400 acres (Electric Power Research Institute, 2020, p. 1).

Energy Justice Defined

Energy justice brings together many interrelated issues, including access to energy, affordability, sustainability, systems that allow for public participation, and intergenerational justice and accountability. Most energy justice definitions feature three tenets: distributional, procedural, and restorative, also referred to as the "triumvirate of tenets" (McCauley and Heffron, 2018, p. 1). Each of the three tenets feeds into the others, as shown in Figure 2. Restorative justice is also sometimes referred to as recognition justice (Finley-Brook and Holloman, 2016). Another definition comes from the Initiative for Energy Justice, which defines energy justice as "the goal of achieving equity in both the social and economic participation in the energy system, while also remediating social, economic and health burdens on those historically harmed by the energy system" (n.d.).

Figure 2. Energy Justice Definition Flow Chart



Flowchart displaying the relationship between the three tenets of energy justice. (Finley-Brook and Holloman, 2016)

Manifestations of energy justice are related to but differ from environmental and climate justice. In the transition away from fossil fuels, communities will feel new senses of injustice related to community engagement and involvement in decision-making and implementation processes, especially related to siting new energy infrastructure (McCauley and Heffron, 2018, p. 4). Procedural energy justice research has found that protest by those impacted by energy infrastructure siting decisions is not just a critical component of engagement in the siting processes, but that it is instead a "mechanism for ensuring the long-term acceptability of renewables in communities" (McCauley and Heffron, 2018, p. 4).

This paper will focus mainly on the procedural tenet of energy justice, which includes the issues of governance and use of democracy in decision-making.

Solar siting is an energy justice issue because benefits from its installation have not historically been well distributed, and those involved in the siting process has not always been transparent with or conducted adequate dialogue with the impacted community. For example, African Americans hold fewer solar jobs than other racial groups and ethnicities, and rooftop solar panels and energy efficiency upgrades that reduce electricity bills have been found to reinforce existing social inequities and are less likely to benefit lower income renters than wealthier homeowners (Finley-Brook and Holloman, 2016, p. 3). Several studies have shown that Americans generally support increasing the amount of renewable energy capacity, but local residents often oppose development of larger-scale renewable projects in their communities. Involvement in decision-making procedures by communities that host the new energy infrastructure can impact how citizens view the siting decision.

Recently some states have experienced issues with backlash from local communities related to solar siting and energy justice issues. Given its large land requirements, utility-scale solar is especially susceptible to this backlash. In Florida, a 50-MW solar and 12-MW battery storage project that would span about 600 acres, proposed by Origis Energy and Gainesville Regional Utilities, received pushback from the community, who viewed it as “a blemish on a community whose roots date back to before the Civil War” (Swartz, 2021). Also, in Montgomery County, Maryland, the community is divided over a proposal that would change zoning restrictions to allow solar development in the county’s Agricultural Reserve (Fenston, 2021). These are just a few examples of current renewable energy siting conflicts happening across the U.S. Opportunities exist to improve energy justice in solar siting by expanding access to low-cost clean energy, designing siting and permitting processes for large-scale projects that include consulting impacted communities, and taking advantage of government’s procurement and

infrastructure to create economic opportunity for low-income communities (Solar Energy Industries Association [SEIA], 2021).

Research Objectives

The purpose of this research is to analyze the statutes, regulations and guidance in Maryland, Florida, and Texas at the state level on utility-scale solar siting to characterize the policies' procedural aspect of energy justice and to identify potential ways to better incorporate local input and increase community acceptance. The below research questions will be used to examine the research statement.

RQ1: What differences exist between Maryland, Texas and Florida's review and approval processes for siting of utility-scale solar installations?

RQ2: What opportunities exist for states to improve aspects of procedural energy justice in their utility-scale solar siting processes?

These states were chosen for their different regulatory characteristics and level of state involvement in the utility-scale solar siting process: Maryland has an RPS with a solar carve-out of about 14.5 percent, making it more likely that utility-scale solar installations will be needed for the state to meet its goal; Florida does not have a mandatory or voluntary RPS; and Texas has already surpassed its RPS goal. Maryland, Florida and Texas are also all states identified by EIA that are expected to increase their installed utility-scale solar capacity in the near term (2020). This review is not meant to be a comprehensive evaluation of state-level regulations and guidance related to utility-scale solar siting, but rather a sampling of case studies that represents the diverse regulatory landscape across the U.S.

Research Significance

This research is important because utility-scale solar development is picking up the pace in the U.S., states are revisiting or setting new RPS targets, and transitioning to renewable energy is an important part of the global mitigation strategy against climate change impacts. As the number of

utility-scale solar installations grows, so does the potential for conflicts with communities where solar will be installed. Increasing opportunities for impacted communities to meaningfully participate in the siting process can potentially contribute to conflict resolution, or avoidance altogether. Public participation in decision-making related to the environment may lead to "less litigation, fewer delays and generally better implementation of the decisions" as well as to increase accountability and acceptability of those decisions (Richardson and Razzaque, 2006). Other research has shown that public participation's ability to increase a project's acceptability hinges on whether the public can influence major aspects of the project, and if they perceive that the decision made is fair, which matters because strong public resistance can bring renewable energy projects to a standstill or force their cancellation (Liu et al., 2020). Much of the literature related to utility-scale solar siting focuses on technical or physical issues, without delving into the social aspect of the siting. There are a few studies that try to understand the perceptions of residents impacted by solar development, the various factors that influence their perceptions, and the role that government plays in achieving community acceptance.

Methods

A qualitative, comparative case study approach was used to conduct the research in this study. Comparative case studies have been used in other research studies to understand development of, response to, and impacts of renewable energy policies. Koster and Anderies used a comparative case study analysis of countries including Spain, China, Brazil, and the United States to study recurring patterns in obstacles to energy transitions and how governments use institutional factors to overcome them (2013). Mormann, Reicher and Hanna compared the experiences of California, Texas and Germany in ramping up their renewable energy development by analyzing their subsequent "electricity costs, policy design, output intermittency, grid stability, and soft costs" to identify best practices for policymakers and regulators moving forward (2016). Researchers have also taken the case study

approach to study low-carbon energy transitions generally understood to be successful in Samsø, Denmark, and Feldheim, Germany, through an energy justice lens, that reviewed "consultation processes, information flow/sharing, decision-making and outcomes" (Mundaca, Busch and Schwer, 2018).

In this study, first a background review was conducted of federal resources from EIA, the Lawrence Berkley National Laboratory (LBNL) and the National Renewable Energy Laboratory (NREL) to understand the landscape of utility-scale solar installations to-date and future projections in the U.S. and for each of the identified three states. A literature review was also carried out to summarize factors influencing public response to and acceptance of large-scale solar development, in addition to the factors that developers consider when choosing to pursue a specific site. Then, an online review of the Maryland, Texas, and Florida state legislation and other guidance documents related to renewable energy generation requirements and utility-scale solar siting was performed to identify and characterize the siting requirements. This study did not cover the federal or local approval processes for utility-scale solar siting.

To analyze the data, criteria were established that captured the process and decision-making aspects of state policies building off of criteria in the Initiative for Energy Justice's scorecard framework (Baker et al., 2019). The process portion of the scorecard focuses on whether marginalized communities can participate meaningfully in the policy process, with sufficient support, and the decision-making portion focuses on whether the policy places decision-making of marginalized communities at the forefront. These criteria were used to focus on the procedural aspect of energy justice and the ability of the community to participate in the siting process.

Results

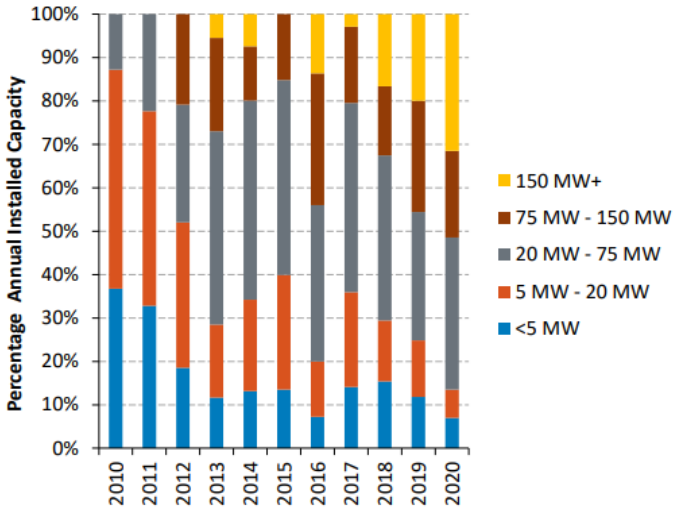
The results from the literature and online review of the study are described below. The study will first detail the state of current and projected utility-scale deployment in the U.S., and then will name considerations of developers when choosing sites for renewable energy development compared to factors that influence public response to these systems. The study will then summarize current or lack of renewable energy requirements in Maryland, Texas and Florida and analyze regulations and guidance related to utility-scale solar siting in those states, with a particular focus on the status and role of public participation in the siting process.

Current State and Projected Growth of Utility-Scale Solar Installations in the U.S.

To understand the current and projected utility-scale solar growth trajectory in the U.S., the study reviewed existing federal data. Development of utility-scale solar projects in the U.S. has been increasing over time and is expected to continue to do so in the future. In 2020, about 2.2 percent of the U.S.'s utility-scale electricity was generated by solar PV, which is equal to 88 billion kilowatt-hours of electricity, according to EIA (National Conference of State Legislatures, 2021). The August 2021 EIA Short-term Energy Outlook notes that utility-scale solar capacity rose by about 10.6 gigawatts (GW) in 2020; EIA forecasts 16.2 and 16.6 GW of additional capacity to come online in 2021 and 2022, respectively. LBNL's Utility-Scale Solar report, 2021 edition, reported that 73 percent of all solar added in the U.S. in 2020 was utility-scale (though its definition of utility-scale solar is a ground-mounted project greater than 5 MW). Solar of all sizes made up 27 percent of the U.S. capacity additions to the grid in 2020 (Bolinger et al., 2021). Cumulatively, utility-scale solar accounts for 61 percent of the solar capacity installed in the U.S. (Bolinger et al., 2021). As shown in Figure 3, over the past few years, there

has been an emergence in solar PV systems that are 150 MW or greater being installed, and fewer projects under 20 MW.

Figure 3. U.S. PV System Size Distribution by Year Above 1 MW



Stacked bar chart displaying the percentage of annual installed PV system capacity by year. (Finley-Brook and Holloman, 2016)

According to EIA, most utility-scale solar in the country is being built in the South Atlantic, from Florida up the East Coast to Maryland and West Virginia (2020). In 2019, 2.2 GW of solar was installed in this region, which is more than double the amount installed in California (1.0 GW), the area/state with the second-most growth over the same time. Texas is also expected to dramatically increase its utility-scale solar capacity through 2022, projected by EIA to add 10 GW of utility-scale solar capacity by the end of 2022 (2021).

Developer Considerations for Utility-Scale Solar Siting

Projections show that utility-scale solar in the U.S. is expected to grow in the near-term, meaning that projects have already been approved or are undergoing the necessary application processes, so next the study summarizes factors that developers consider when choosing to pursue project development at a specific location. States must weigh a multitude of factors when considering whether to accept an application for a new utility-scale solar project, which do not necessarily align with

the key factors that developers consider. These considerations for siting a solar project from a developer's perspective include (American Clean Power, n.d.):

- Physical characteristics, which include the amount of solar radiation an area receives, its topography, exposure to water and/or flooding, geologic features, wildlife and habitat, and cultural resources.
- Land prices and the existence of transmission capacity and reasonable interconnection costs also play a role in determining where a developer chooses to site a project.
- Opportunities for other benefits that a community values, such as combining agricultural practices like grazing, and long-term habitat for plants and animals.

Developers of utility-scale solar projects must work within regulatory processes at the federal, state and local levels to identify optimal sites for utility-scale solar arrays using a variety of criteria, and then must comply with regulations that govern construction activities, protect the environment and ensure safe operations (American Clean Power, n.d.). This process begins with the solar developer determining who has jurisdiction over the siting land use decision and whether any environmental laws apply to the chosen site; conducting site diligence, field work and technical studies to determine land suitability and necessary permits, and addressing feedback from public comment periods (American Clean Power, n.d.).

Factors Contributing to Public Acceptance of Renewable Energy Developments

Installing renewable energy generators, including utility-scale solar, can provide benefits to communities but can also face opposition. Utility-scale solar can reduce GHGs and air emissions, create an alternative revenue stream for farmers, and provide an opportunity to redevelop previously unusable land, such as brownfields, while negative impacts include farmland and/or forest loss, historic property loss, impact on community aesthetics and glare (Maryland Department of Planning, n.d.). Researchers at

Columbia Law School found 152 instances of contested renewable energy facilities across the U.S., with the opposition coming in the form of either local legislation or "comments at public hearings, letter-writing campaigns, petitions, participation in administrative proceedings, or lawsuits" brought by individual residents, community-based organizations or non-profits (Marsh, McKee and Welch, 2021).

However, research has been conducted in the U.S. and abroad to identify the universe of factors that influence the local community's perception and acceptance of large-scale renewable energy. Roddis et al. found 28 determinants that shape community acceptance of large-scale solar farms in the United Kingdom, which they grouped into eight categories: "aesthetic, environmental, project details, temporal, social, construction and process" (2020, p. 239). They also found that the broader underlying issues that influence community acceptance of solar infrastructure include "'green on green' tension, issues of scale and place attachment, and policy, process and justice." Research has also been conducted in Great Lakes states to identify positive and negative community perceptions surrounding the economic, environmental, local and global impacts of solar projects in the region (Uebelhor et al., 2021).

Fear of or opposition to changing the existing landscape or land use and uneven distribution of potential benefits and burdens are also factors that contribute to community pushback to utility-scale solar projects. Unequal distribution of potential positive and negative consequences include employment opportunities, access to decision-making processes, and access to more advanced, low-carbon technologies (Carley and Konisky, 2020). Results from a survey of residential utility ratepayers in Long Island, New York, showed that respondents were largely supportive of solar development of more than 250 kW in their communities, particularly if they were located on rooftops or at other mixed-use sites, and that one of respondents' main concerns were if the economic benefits associated with the solar development were fairly distributed (Schelly et al., 2020). However, due to their size, most if not all utility-scale solar projects are ground-mounted, which means the projects typically depend on

converting farmland or other natural areas into a power production land use (Electric Power Research Institute, 2020).

Other studies have shown that local governments play an important role in advocating for the needs of their communities and achieving a compromise in renewable energy siting issues. A case study in Japan found that conflicts over renewable energy development can be avoided if local governments act as intermediaries between local communities and project developers by pursuing policies to reduce concerns and encourage social acceptance of the developments (Akita et al., 2020). Fraser conducted a study of the democratic, early adopters of renewable power compared to countries that implemented feed-in tariffs and found that for South Africa, better opportunities for the public to participate in the site selection could improve the country's chance of transitioning to renewable energy in a just way, and that bridging social capital was an issue that influenced solar siting in several countries (2021). Additionally, plans, zoning codes and inspection processes may not exist for this specific type of development and therefore may need to be revised (Electric Power Research Institute, 2020, p. 1).

Evidence shows that the "not in my backyard" phenomenon simplifies existing opposition to solar development. People may like wind and solar in the abstract but when it comes to siting a particular project, some object to having large projects near their homes, especially if they do not receive a financial benefit from the project, and this issue can often arise since solar can require at least 10 times the land per unit of power generated than fossil fuel-fired plants (Gross, 2020, p. 1). According to Gross, opposition from the community takes the form of worrying about property values; losing forests, farmland, and other ecosystems; concern about the water needs of solar installations and being impacted by the new development without compensation. A phone survey conducted with residents in six Southern California counties found that the visual impact of large-scale solar facilities does influence support for these types of projects, and that the respondents' preference for the amount of buffer distance from the solar facility changed with the type of land in question (Carlisle et al., 2016). Other

studies have found that while a person's general attitudes toward renewable energy can be positive, they show increased disdain for utility-scale solar or wind farms as they are proposed to be built closer to their residence (Larson and Krannich, 2014).

State Case Studies

The following case studies were conducted in the study to understand the current and projected renewable energy installed capacity and generation from solar in Maryland, Florida and Texas. The case studies also aim to identify the extent to which those state governments are involved in the utility-scale solar siting process, with a focus on portions of the regulations and guidance that relate to procedural energy justice through identifying the level of stakeholder and public involvement.

Maryland

State Renewable Goals

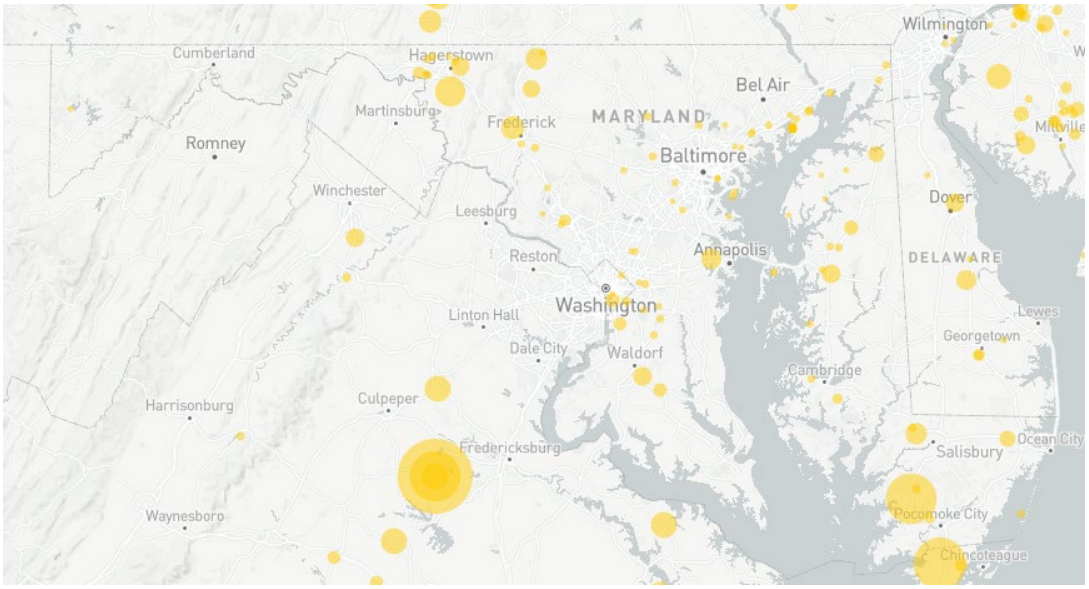
The state of Maryland's annotated code, Public Services and Utilities chapter, Title 7: Gas, Electric and Water Companies, Subtitle 7: Renewable Energy Portfolio Standard, requires that all retail electricity sales, with a few specific exceptions, in the state are subject to a renewable portfolio standard that incrementally increases each year and culminates in a 2030 target of 50 percent from Tier 1 renewables, with at least 14.5 percent derived from solar energy.

Current and Projected Solar Generation

Per EIA Form 860, in 2020, there were 95 solar electric power plants operating in Maryland with a nameplate capacity of 1 MW or greater. Of those, only nine have a nameplate capacity of greater than 9 MW, and only one installation has a nameplate capacity greater than 30 MW (Great Bay Solar 1 in Somerset County, which has a generating capacity of 75 MW). Per the Maryland state profile on EIA, in 2020, about 4 percent of the state's total electricity generation came from solar energy, although 35 percent of the solar generation came from utility-scale PV (2021). SEIA projects that Maryland will just

about double its solar generation (of all types) by 2025, adding 1,373 MW compared to its currently installed 1,377 MW (2021).

Figure 4. Map of Operating Utility-Scale Solar Projects in Maryland, 2020



Map displaying installed utility-scale solar projects in Maryland through 2020. (Schroeder, 2021)

Key State Solar Siting Laws, Regulations and Guidance

The state's Public Service Commission (PSC) gives out a Certificate of Public Convenience and Necessity (CPCN) to any energy-generation facilities, including utility-scale solar facilities, per the state's Department of Planning (n.d.). The PSC is made up of five commissioners, who are appointed for five-year staggered terms by the governor and must be approved by the state Senate (PSC, n.d.). The PSC considers the following criteria when determining whether or not to award a CPCN: the recommendation of the governing body of each county or municipality where the project is proposed to be located; the project's impact on the stability and reliability of the electric system, economics, aesthetics, historic sites, aviation safety, air and water pollution, and availability and means to dispose of wastes in a timely manner; minimize forest loss and provisions for afforestation and reforestation (Department of Planning, n.d.).

The PSC uses a formal adjudication process to make its decision (Department of Planning, n.d.). The process entails the assignment of a public utility law judge, data requests, testimony, hearings and legal briefs at the duration of which the PSC makes its decision through a formal order. Certain organizations are automatically parties to the proceeding, including the Maryland Department of Natural Resources Power Plant Research Program; however, a local government must petition the PSC to become an intervening party. Local governments also do not have the authority to approve generation facilities. The PSC may also consider written comments submitted as well as comments received at public hearings in its decision-making process.

In addition to the regulatory processes in place for solar siting, in 2019 Governor Hogan established a Task Force on Renewable Energy Development and Siting that published its final report in August 2020. The task force estimated that between 7,766 (low estimate) and 33,033 (high estimate) acres of ground-mounted panels on agricultural land will be needed to meet the solar carve-out requirement in the state's RPS (2019). The task force's membership contains representatives from the state's departments of agriculture, commerce, environment, natural resources, planning and transportation; the state Energy Administration, state Environmental Service, two Farm Bureau representatives, the Maryland Association of Counties, Maryland Municipal League, and representatives from the solar and wind energy industries (Governor's Task Force, 2019). Historically task force meetings have included time on the agenda to hear public comments.

The state Department of Planning also created a Solar Facility Siting Guidance website that provides local governments with strategies that can minimize impacts from utility-scale solar on agricultural lands and forests and to focus siting on developed lands or brownfields instead. The guidance features local government case studies with best practices for solar siting, case studies of solar siting on brownfields, and online mapping with electricity transmission lines and zoning layers (n.d.).

Florida

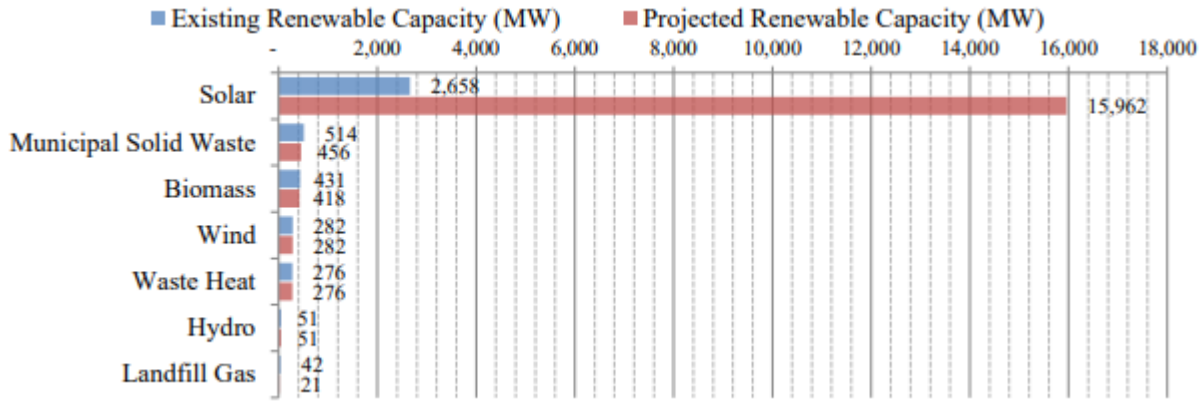
State Renewable Goals

Florida does not have a mandatory state RPS. Democratic lawmakers have proposed numerous bills, none of which have succeeded, over the past few years, most recently HB 81 and SB 366, which will be under consideration during the 2022 legislative session beginning in January 2022. These bills would require the state to reach 50 percent renewable energy by 2030 and 100 percent by 2040 (News Service of Florida, 2021).

Current and Projected Solar Generation

Per EIA Form 860, in 2020, there were 87 solar electric power plants operating in Florida with a nameplate capacity of 1 MW or greater. Of those, 52 have a nameplate capacity greater than 30 MW, and 42 have a nameplate capacity of 70 to 74.9 MW. In 2020, 3.7 percent of the state's electricity came from solar, including all technology types (SEIA, 2021). SEIA projects that through 2025, Florida will add 12,046 MW of solar capacity to its existing 7,681 MW (2021). Figure 5, from the Florida PSC's review of 10-year site plans for the state's utilities, extends the projection through 2030, and shows that solar exponentially outpaces all other expected additional renewable capacity (2020).

Figure 5. Florida's Current and Projected Renewable Resources Through 2030



Bar graph displaying the existing and projected renewable capacities in MW in Florida from 2020-2030. (Florida PSC, 2020, p. 31)

Key State Solar Siting Laws, Regulations and Guidance

Utility-scale solar installation in Florida is booming, as it is the most affordable type of new electricity infrastructure in the state because utilities can recover the costs of their solar investment after the fact. The PSC in the state has encouraged utility-owned project structures through three of its orders from 2016-2017 that approved multiple rate case settlement agreements between the state's Office of Public Counsel and three of the state's largest investor-owned utilities, which allow the utility to recover revenue from the projects through a solar base rate adjustment (SoBRA) once the projects are in service (May, 2021). Each utility has a specific cost-cap per kilowatt alternating current to qualify for cost-recovery.

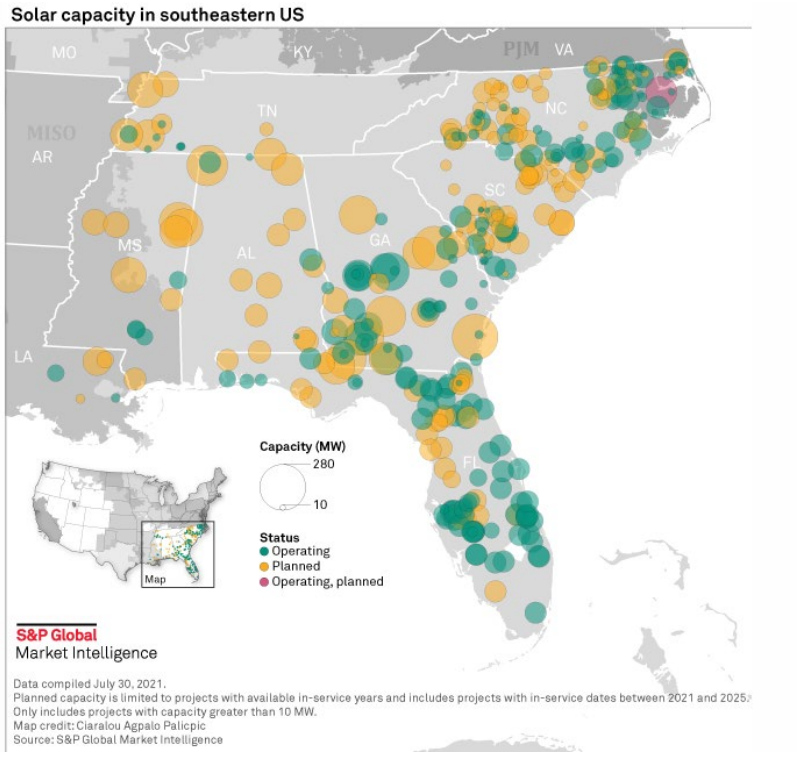
SoBRA has been the subject of recent court cases in the state. In 2019, the Florida Supreme Court unanimously ruled that Florida Power and Light (FP&L) could rate base more than $860 million for eight solar projects that were approved in 2016 and were already constructed (Bennett, 2021). Then in October 2021, the Florida PSC unanimously approved FP&L's four-year rate settlement agreement that was developed with the state's Office of Public Counsel, the Florida Retail Federation, the Florida Industrial Power Users Group, and the Southern Alliance for Clean Energy (Misbrener, 2021). The agreement phases in new rates beginning in 2022, that will support long-term investment in solar infrastructure, what FP&L calls the largest solar buildout in the U.S., which is a plan to install 30 million solar panels in Florida by 2030.

In addition to the encouragement from the PSC, the predominance of utility-owned solar projects in Florida comes from three other factors (May, 2021). The first is that under Florida law, third-party solar developers are not permitted to sell retail electricity to others, meaning that these developers must instead make wholesale sales of electricity to electric utilities via power purchase agreements. Second, Florida's current regulatory policy does not allow investor-owned utilities to earn

returns on payments made to third-party solar developers as part of a PPA, disincentivizing IOUs from entering PPAs. Third, there is no mandatory RPS law in place for Florida's electric utilities.

Given the PSC decisions, Florida's regulated utilities are driving the state's future capacity additions but are usually choosing to develop and build the projects themselves as opposed to utilizing third-party solar developers (Foehringer Merchant, 2019). As shown in Figure 6, all utility-owned solar plants in Florida have been sized just below 75 MW, largely because any solar plants with a capacity of 75 MW or more "are subject to rigorous Florida Public Service Commission need determination review and permitting under the Florida Power Plant Siting Act" (May, 2021). For projects with a capacity of less than 75 MW, there does not appear to be a central coordinated review by the state that considers potential land use and zoning impacts conflicts before issuing a certification that grants approval of the proposed location.

Figure 6. Map of Solar Capacity in the Southeastern U.S. by Operating Status and Capacity



Map of the southeastern states in the U.S. with dots showing the locations of operating and planned utility-scale solar installations; the size of the dot represents the project capacity. (S&P Global, 2021)

For those large (capacity of 75 MW or more) steam or solar electrical generating facilities, the state Power Plant Siting Act is the centralized process for licensing; it also replaces all local and state permits (2021). As part of the certification process for a proposed project, there are a few instances where those affected by a proposed project, including residents and the local government(s), can be involved in the process, per the Florida Department of Environmental Protection's (DEP's) listed opportunities for public involvement (2021). The local government whose jurisdiction will be impacted by the project can choose to host a public meeting to receive input.

Per the Power Plant Siting Act, local governments, unless exempted by statute, make a finding on whether the application aligns with current land use and zoning ordinances; any citizen can attend the land use hearing, which is only held if a petition is filed to dispute the local government's land use determination. A summary of public comments received is then included in the agency reports submitted to the DEP's Siting Coordination Office, although the Siting Board can conclude that it is "in the overall best public interest to certify the project, regardless of a negative recommendation," per the Power Plant Siting Act. Then A certification hearing is then scheduled, which must be published in newspapers and in the state's Administrative Register with at least 45 days prior to the hearing so that the public can review associated reports and analysis. Impacted parties in the public can attend the certification hearing if held. The Siting Board hearing, where the decision is made whether an application will be approved or denied per the Power Plant Siting Act, is a subset of a standard meeting of the governor and their cabinet.

Texas

State Renewable Goals

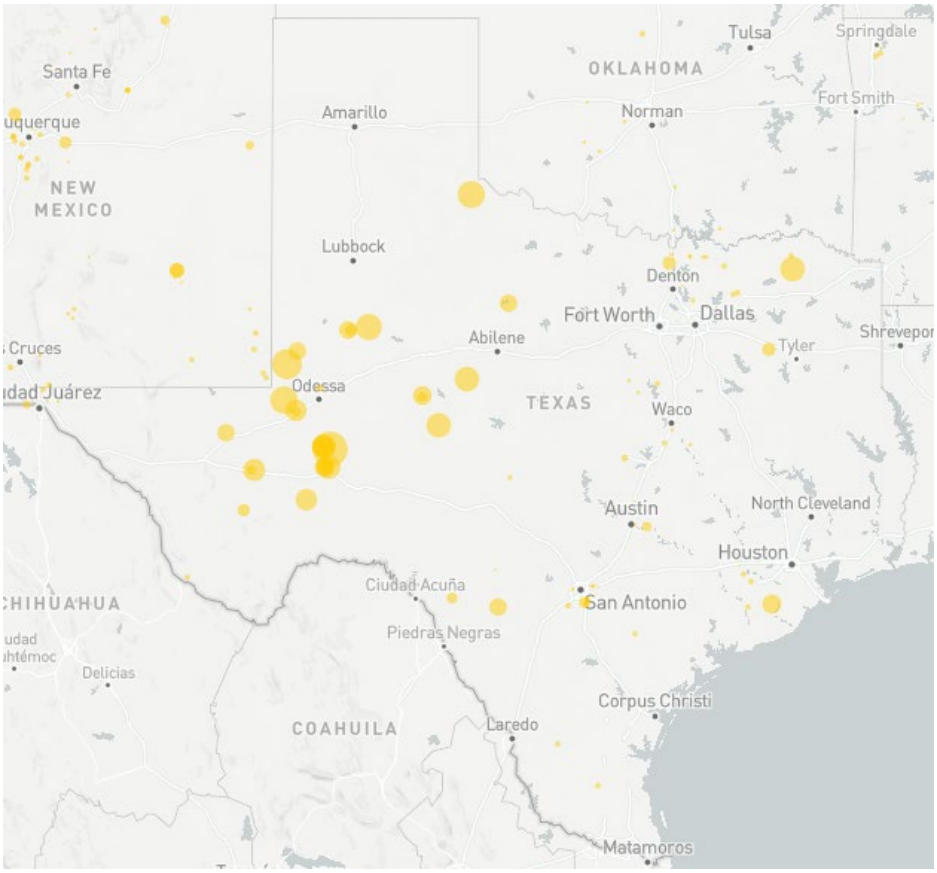
In 2005, the Texas Utilities Code, Section 39.904 established a renewable generation requirement for IOUs and retail suppliers of 5,880 MW of renewable energy generation by 2015 and a

10,000 MW goal by 2025, which was already achieved in 2010 (Texas Office of the Governor, Economic Development and Tourism, 2014, p. 5). Within the goal, there was a target that 500 MW come from non-wind sources.

Current and Projected Solar Generation

Per EIA Form 860, in 2020, there were 81 solar electric power plants operating in Texas with a nameplate capacity of 1 MW or greater. Of those, 17 have a nameplate capacity greater between 100 and 199 MW, and 8 have a nameplate capacity of 200 to 300 MW. In 2020, 2.6 percent of the state's electricity came from all solar technology types (SEIA, 2021). SEIA also projects that Texas will add 26,995 MW of solar generation capacity through 2025, the most of any state, in addition to its 11,063 MW of already installed capacity (2021).

Figure 7. Map of Operating Utility-Scale Solar Projects in Texas, 2020



Map displaying installed utility-scale solar projects in Texas through 2020. (Schroeder, 2021)

Key State Solar Siting Laws, Regulations and Guidance

Utility-scale solar siting in Texas falls in the hands of the local government. There is currently no established state authority for involvement in the process; however, the North Central Texas Council of Governments and State Energy Conservation Office created an Ordinance Framework for Solar Photovoltaic Installations in Texas as a solar siting resource for municipalities (Essa, Curtiss and Dodinval, 2021, p. 24). As of July 2016, less than 20 Texas cities have passed a solar-specific ordinance, meaning most have chosen to approve of solar installations projects through local permits alone (GoSolar, 2016).

Discussion

Developers of utility-scale solar projects and the public impacted by these projects weigh a variety of factors in their potential response actions, some of which overlap and others that do not. Notably, developers are influenced by costs, whether it be land prices, access to transmission capacity or the cost of interconnection. Public acceptance is centered around a wide range of concerns that include changing land use and aesthetics, impact on the environment, influence on livelihoods, construction noise and timeline, impact on property values, and ability to participate and contribute in the siting process. Potential methods to align these factors and resolve conflict include alternative siting approaches and technical solutions, further discussed in the Next Steps section of the study.

Table 1. Factors Influencing Developer Preference and Public Acceptance in Siting Decisions

Factors Influencing Developer Interest	Factors Influencing Public Acceptance
Physical characteristics (solar radiation, topography, exposure to flooding)	Environmental and aesthetic concerns
Land prices	Fear of changing land use and impact on livelihood
Existence of transmission capacity and cost of interconnection	Local government involvement in siting
Incorporating community values (such as cultural resources)	Construction timeline
Wildlife and habitat	Process of siting
	Impact on property values and compensation

Each state reviewed has taken a different approach to its level of involvement in utility-scale solar siting, as well as the level of input it receives from the public and from local governments in the process. The study identified criteria related to procedural energy justice based off the framework from the process and decision-making elements of the Initiative for Energy Justice's policy scorecard. Then, characteristics of the state regulations and guidance from the three state case studies related to procedural energy justice are summarized below.

Table 2. Procedural Energy Justice Criteria for Utility-Scale Solar Siting in State-Level Policies

Criteria Related to Procedural Energy Justice	Maryland	Florida	Texas
Local government involvement in the state licensing process?	Local government can become an intervening party; but no authority to approve generation facilities	Local government makes finding on land use/zoning consistency; may host public informational meetings	Only local government approval needed in solar siting
Requirement to have public hearings	Yes	Multiple instances where public hearings *may* occur	N/A
Methods of public participation	-Attend public hearings -Provide written comments	-Provide input on and challenge land use determination -Request local government hold public informational meeting -Attend land use hearing (if held) -Attend certification hearing (if held)	N/A
Are parties involved in decision-making elected or appointed officials?	PSC has five members; appointed by the Governor; approved by the state Senate	Siting board is the governor and their cabinet	N/A
Opportunity for public to participate more broadly in the process instead of commenting on specific projects	Governor's Task Force on Renewable Energy Development and Siting	None found	N/A

Criteria Related to Procedural Energy Justice	Maryland	Florida	Texas
Existence of solar facility siting guidance provided by state	Yes (Department of Planning)	None found	Yes (State Energy Conservation Office)

Texas is unique when compared with the other states in this study given the lack of state-level involvement in utility-scale solar siting processes. Given that Texas is poised to add more solar generation capacity than any other U.S. state through 2025, it appears that many utility-scale solar projects are moving ahead without or in spite of any public pushback. Since there are other factors that influence utility-scale solar siting, like irradiance and overall state acreage, this study cannot say with certainty that the lack of state involvement in the utility-scale solar siting process is contributing to this boom in solar development.

Florida's cut-off for when utility-scale solar siting must undergo the more stringent process under the Power Plant Siting Act, only for projects 75 MW or greater, limits the amount of public involvement in the siting process. A utility-scale solar project rated at 75 MW can be up to 450 acres, using the higher range estimate of acres required per MW of solar from the Electric Power Research Institute (2020). This indicates that those impacted by utility-scale solar projects smaller than 75 MW may not have sufficient opportunities to meaningfully participate in the decision-making process. For installations 75 MW or larger, there are many potential opportunities for the impacted public and local governments to participate along the process, with the caveat that some opportunities may not be available if certain hearings are not held. To ensure that projects in different localities are following best practices and that those impacted have similar recourse throughout the siting process, Florida's DEP could consider issuing solar siting guidance for transparency and equity across different locales.

From the online guidance and regulation review conducted in the study, Maryland appears to provide the public with the opportunity to respond more broadly to solar siting concerns in the state

through the Governor's task force, in addition to attending public hearings or providing written comments on specific utility-scale solar developments. Maryland also provides guidance on utility-scale solar siting best practices to municipalities, although the state retains the final say in approving power generating facilities, which is a limiting factor on the local government's control. The state's specific guidance to focus utility-scale solar siting efforts on brownfields instead of agricultural land may be an alternative siting approach that prevents future land use conflicts.

With projected growth in solar in these three states, there is the potential that land use conflict and opposition from local communities will occur, but this study's analysis against the identified procedural energy justice criteria identifies opportunities for more public and local government input to potentially increase community acceptance. To ensure more transparent proceedings, state governments can look to require at least one public hearing to give the communities impacted a chance to provide their input and to ensure that local government input is included in the siting process at the state level. If not already, states may also consider whether there is the opportunity to make decision-makers in these settings elected officials. Lastly, state governments can create specific solar siting documents for their state as a resource for local governments to learn best practices, share strategies and move forward in choosing more suitable sites from the start.

Next Steps

There are a few process-related and technical response actions that state governments can employ to improve the procedural energy justice characteristics of their utility-scale solar siting processes. Liu et al. found that for sustainable energy projects to achieve desired public support, the development of these projects should focus on "active guidance and transparent public participation" (2018). If increased transparency and public participation in the process is not possible or does not achieve public acceptance, there are potential technical solutions that states could implement.

Since much of the opposition to utility-scale solar arises to changes in land use, one potential way to reduce community opposition is for government planning and zoning bodies to enact legislation or special use permits that require integrated vegetation management (IVM) at solar sites. Numerous potential economic and environmental benefits arise from IVM. These include selecting and planting native wildflower seed mixes that provide habitat for pollinators and insects, encourage ecosystems services like pollination, and improve a site's aesthetics (Electric Power Research Institute, 2020, p. 11). Utilizing IVM can also improve plant performance and reduce the need for stormwater management and mowing, which can lead to reduced electricity generation costs (Electric Power Research Institute, 2020, p. 11).

In a similar vein, agrivoltaics, which is the colocation of solar energy and agriculture in the forms of beekeeping, livestock grazing or crops, is also a relatively new concept that removes land use competition between farmers and energy production (Electric Power Research Institute, 2020, p. 10). As found earlier in the study, one main factor driving public protest against utility-scale solar development is fear of land use change, and this is an alternative technology approach that may reduce conflicts between these land use types. Agrivoltaics may also support other conservation goals, such as improved biodiversity and water quality and a reduced soil erosion. Comprehensive plans at the state or local level to align and integrate objectives across clean electricity percentage and open space preservation goals can provide the necessary framework and guidance on how to achieve all goals.

States can also consider investing in the use of geographic information systems as part of a broader multi-criteria decision analysis (GIS-MCDA) to assist with solar siting, that can take into account physical, economic and social data to improve decision-making. One particular study within this area is a cross-disciplinary review of solar siting analyses that uses a GIS-MCDA approach and social science research on public responses to solar PV development (Sward et al., 2021). This methodology recognizes that incorporating social considerations into criteria of solar siting is "important for public acceptability

and fairness" and can improve the process for solar developers while minimizing social and environmental impacts and trying to "mitigate the inequalities from historical siting of energy facilities." In addition to the social considerations, other factors incorporated via GIS are the solar resource, distance to electric infrastructure, slope of land, elevation, land cover, nearby transportation networks, visual impacts, water availability, estimated levelized cost of electricity, and air temperature.

Future research efforts could build upon the findings of this study and expand the use of an energy justice framework to evaluate statutes and guidance. Additional research could study how state processes with increased procedural energy justice impact siting approval rates and added capacity of renewable energy. Another potential research path could be to assess impacts of these statutes, regulations and guidance at the state level related to utility-scale solar siting on the other tenets of energy justice, restorative and distributive. Other research could be conducted at the federal and/or local levels to analyze statutes and guidance related to renewable energy siting through the procedural energy justice framework.

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