Rhode Island Solar Siting Needs Assessment Report

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Rhode Island Solar Siting Conflicts on Farm and Forested Open Space - Objective 1

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NEEDS ASSESSMENT OVERVIEW

The University of Rhode Island was awarded funding from USDA-NIFA to improve solar siting decisions through quantitative economic research and Extension efforts. This report details findings from a needs assessment exercise conducted through the project, and provides information on research methods, interpretation of results, and outreach activities.

Our overall project seeks to inform two main groups -- primary stakeholders (e.g. state and local decision-makers) and secondary stakeholders (e.g. residents and landowners). For the purposes of this needs assessment, we include two other groups in our secondary stakeholder category -- solar developers and non-governmental advocates. These collective voices represent varying opinions and motivations and illustrate the complexity of meeting renewable energy targets while also preserving environmental function, rural character, and economic vitality in Rhode Island.

It is important to consider that undeveloped land in Rhode Island often has non-monetary value to residents. This project involves two original research studies that will generate market and non-market data -- the first, a housing market study, and the second, a choice experiment -- that will be useful to policymakers charged with making solar siting decisions for the communities. We know that 13-30 times the current installed solar energy is needed to meet Rhode Island’s technical potential, and that raises many questions. Where will this solar be installed? Where should it be installed? Do policies in place to date reflect resident values, in addition to environmental and economic considerations?

This needs assessment exercise was useful in building relationships with our primary stakeholders, and forming our own baseline understanding of knowledge gaps associated with solar siting concerns at the individual and community level. In this report, we discuss the data collection methods, policy context, and findings resulting from the needs assessment exercise we conducted. Ideally, our findings will inform how the research results of this project can inform policy amendments at the state and local level in Rhode Island, so that decision makers are armed with tools that allow them to make decisions reflective of resident and community preference.

THE SITUATION

Due to the abundance of greenhouse gasses emitted from burning fossil fuels, Earth currently stands at the brink of a climate crisis.¹ In response to this concerning state of affairs, Governor Gina Raimondo set an aggressive goal for Rhode Island -- to procure 100% of our state’s electricity from renewable energy sources by the year 2030.² The state will rely on several types of renewable energy to meet this goal, solar being a priority.

Implementing solar energy in the smallest state comes with a unique set of challenges. With only 1,034 square miles of total land area, Rhode Island is severely land constrained. Solar energy is land intensive, requiring approximately five acres of land to

generate 1 MW of solar energy. Comparatively, wind energy requires one acre of land or less to generate 1 MW.³

In addition, while onshore wind energy production is typically suitable for dual use, solar energy production rarely is.³ Ground-mounted solar arrays are typically densely-packed, making the space occupied by the array generally unusable. In Rhode Island, ground-mounted solar installations are almost always surrounded by fencing, rendering the array itself inaccessible to anything but birds and insects. Wind turbines, on the other hand, cannot be densely packed. Their blade range and the need for unimpeded air space require them to be sited far from one another, leaving space around them for early successional habitats, agricultural production, grazing, and more.

Currently, fifty-nine percent of RI's land area is forested, equivalent to 393,000 acres. Much of that forest land is privately owned.⁴ Another 69,000 acres in Rhode Island is agricultural land.⁵ Development of undisturbed, uncompromised tracts of land is almost always less expensive than development of urbanized areas. For example, it is much less expensive to harvest trees and grade land to prepare a site for a solar array than it is to remediate a landfill. Due to this and other contributing cost factors, undeveloped areas are seeing a high volume of solar development applications.

A significant increase in renewable energy generation and procurement is necessary for Rhode Island to achieve the 100% renewable electricity goal stated in Executive Order 20-01 (Figure 1). In Figure 1, the yellow line in the graph at left represents the increase in GWh renewable generation required to meet the 100% renewables goal. The red line represents renewable generation with the current Renewable Energy Standards in place. The difference between the two lines is 4,400 GWh. The bar graph at right in

³ Lang, Corey, PhD, “Land Use and Renewables,” Environmental Economics 350G: Sustainable Energy (class lecture, University of Rhode Island, Kingston, RI, November 4th, 2020)
Figure 1 depicts the single-technology capacities needed to fill the 4,400 GWh gap. From this graph, it is clear that utility-scale solar will play a significant role in filling the gap to reach 7,700 gigawatt-hours of electricity use in 2030, representing between 2,600 to 3,500 MW of this increase. With respect to the increase, each MW increase of ground-mounted solar generation requires additional land.

![Figure 1: Single-Technology Capacities Needed](image1)

Over the past decade, an increasing amount of Rhode Island’s solar growth has been the result of non-residential and utility-scale installations (Figure 2). Projections indicate that 17.8% of Rhode Island renewable energy in the year 2050 will be sourced from commercial-scale solar projects.\(^6\) Commercial-scale (non-residential) projects occur where land is either currently used for business activities, including buildings and parking lots, or undeveloped land that is zoned for commercial purposes. Residential projects are those installed on residential property, either on rooftops or ground-mounted in yards. Utility-scale projects, on the other hand, typically produce at least 10 megawatts of energy. Although the generated power is usually purchased by utility companies, other consumers of this energy may include local government agencies and developers.

![Figure 2: Annual Solar Installations in Rhode Island](image2)

Source: Solar Energy Industries Association, 2020

Our needs assessment focuses on solar siting on two main land uses -- commercial and brownfield, or “compromised land”, and agricultural and forested open space, or uncompromised land. In order for Rhode Island to procure 100% of its electricity from renewable energy sources, approximately 5.2% of RI’s total land area will need to be devoted to renewable energy siting.\(^6\) Based on this, and in light of Rhode Island’s limited land availability, there is the potential for conflict to arise related to solar development. As this issue becomes more

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Quick RI Solar Facts:

- Technical potential = 3,390 - 7,340 MW
- Would require ~5.2% of RI's total land area.
- Represents 13 - 30 times the amount of solar currently installed.
- Could displace 70% of RI's current greenhouse gas emissions (7.65 million metric tons of carbon dioxide).\(^9\)

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prevailing, there is a greater need for informed policymaking related to the complex issue of solar siting in Rhode Island. We believe that these complex siting challenges can be overcome by a comprehensive policy that addresses conflicts with natural resources and resident preferences.

**DATA COLLECTION METHODS**

**Background Research:** To understand and analyze the current state of the solar siting policy in Rhode Island, we considered the many different policies and programs that impact solar siting statewide. This examination allowed us to gauge how the state and municipalities are managing solar energy siting, what goals exist at the state and local levels, and how those goals may differ.

We reviewed relevant state-level solar-related policy and incentives that enable and/or encourage solar development in Rhode Island, including net metering and virtual net metering (2011), the Renewable Energy Growth Program (2014), and the states’ Renewable Energy Portfolio Standards (2016). We examined the State of Rhode Island’s solar siting guidance developed in 2018 by the Office of Energy Resources and Division of Statewide Planning in cooperation with a Solar Siting Advisory Working Group composed of non-governmental organization representatives, municipal planners, developers, residents, state policymakers, and landowners. We reviewed bills introduced in the RI legislature in 2019 and 2020 related to solar siting, and also reviewed a compiled list of municipal comprehensive plans and ordinances amended and/or developed in response to the guidance by the RI Office of Energy Resources since 2018.

We took the opportunity to connect with researchers and Extension specialists at the University of Massachusetts Clean Energy Center in Amherst to discuss their 15-month project funded by the US Department of Energy National Renewable Energy Laboratory Solar Energy Innovation Network. Their project seeks to develop a set of planning tools that can be implemented across the Northeast to ensure that solar projects are well-sited. Projects considered “well-sited” are in line with the preferences of local communities and provide economic returns to those communities through a bottom-up, collaborative process.

Finally, we reviewed Governor Gina Raimondo’s 100% Renewable Energy by 2030 Executive Order and participated in “The Road to 100% Renewable Electricity 2030” public meetings to hear the results of the Brattle Group’s economic and energy market analysis on meeting the goal set by Raimondo’s Executive order.

**Public Meetings:** In order to gain an understanding of resident preferences related to solar siting, and observe local-level governance, we attended a number of public meetings. Doing so also helped us understand the detailed process involved in choosing a solar site, construction, and the following operations and maintenance. We gathered data from zoning and planning board meetings and Town Council meetings in West Greenwich, Hopkinton, Middletown, North Smithfield, and Woonsocket. A map

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summarizing these meeting locations, and the locations of our stakeholder interviews can be found in Figure 3.

**Stakeholder Interviews:** Based on our background research, we were able to identify several key players in Rhode Island policy development related to solar siting. These individuals, including municipal planners and state policymakers, represent our primary stakeholders for this project. We were able to conduct personal interviews with a number of these state and local leaders which helped us understand their needs and concerns. In addition to these target stakeholders, we also interviewed solar energy developers and representatives of non-governmental advocacy organizations during our needs assessment. Data about those interviews, including the list of interviewees, is included in Table 2 below.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Interviewee, Job Title</th>
<th>Interview Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acadia Center</td>
<td>Hank Webster - Staff Attorney and RI Director</td>
<td>Apr 23, 2020</td>
</tr>
<tr>
<td>American Farmland Trust</td>
<td>Emily Cole - New England Climate and Agriculture Program Manager</td>
<td>Oct 22, 2019</td>
</tr>
<tr>
<td>Audubon Society of RI</td>
<td>Meg Kerr - Senior Director of Policy</td>
<td>Mar 26, 2020</td>
</tr>
<tr>
<td>Green Development, LLC</td>
<td>Hannah Morini - Director of Business Development</td>
<td>Oct 25, 2019</td>
</tr>
<tr>
<td>GrowSmart RI</td>
<td>Scott Millar - Senior Policy Analyst</td>
<td>Jul 9, 2020</td>
</tr>
<tr>
<td>Kearsarge Energy</td>
<td>Paul Raducha - Senior Developer</td>
<td>Mar 24, 2020</td>
</tr>
<tr>
<td>The Nature Conservancy</td>
<td>Sue Anderbois - Climate and Energy Program Manager</td>
<td>Apr 23, 2020</td>
</tr>
<tr>
<td>RI Division of Statewide Planning</td>
<td>Paul Gonsalves - Principal Planner</td>
<td>Mar 24, 2020</td>
</tr>
<tr>
<td>RI Office of Energy Resources</td>
<td>Chris Kearns - Interdepartmental Manager and Legislative Liaison</td>
<td>Oct 28, 2019</td>
</tr>
<tr>
<td>Town of Burrillville, RI</td>
<td>Raymond Goff - Director of Planning and Economic Development</td>
<td>Oct 25, 2019</td>
</tr>
<tr>
<td>Town of Exeter, RI</td>
<td>Ashley Sweet - Town Planner</td>
<td>Nov 18, 2019</td>
</tr>
<tr>
<td>Town of West Greenwich, RI</td>
<td>David Provonsil, PE - Town Planner</td>
<td>Nov 15, 2019</td>
</tr>
</tbody>
</table>

9 For more information regarding interviews, please refer to Table 2.
Interviews with state policymakers helped us grasp a deeper understanding of the solar siting guidance development process undertaken in 2018, and the factors contributing to its implementation by cities and towns. Interviews with municipal planners allowed us to understand the strengths and weaknesses of the existing solar siting policy, the level of development pressure in the city or town, and the relationship between the two. Municipal planners in rural towns and high solar development pressure were prioritized for interviews.

Interviews with solar energy developers were intended to help us gain an understanding of development priorities, and how those priorities relate to cost and location with regard to the existing policy tools in place by the community. Interviews with individuals at non-government organizations were intended to reveal strengths and weaknesses with existing and proposed solar siting-related policy at the state and local level, both in terms of energy economics and the environment.

<table>
<thead>
<tr>
<th>Table 3: Sample Stakeholder Interview Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To State Policymakers:</strong></td>
</tr>
<tr>
<td>What was the state’s process to assemble the solar siting advisory group? What intended results were reached through the working group? What areas are still lacking?</td>
</tr>
<tr>
<td><strong>To Municipal Planners:</strong></td>
</tr>
<tr>
<td>Did your municipality adopt the state model ordinance? If so, did you make any changes to the model ordinance, and why? If you have received an abundance of proposals, what do you think is driving development in your town?</td>
</tr>
<tr>
<td><strong>To Developers:</strong></td>
</tr>
<tr>
<td>What considerations go into choosing a solar energy development site over another? What are the cost considerations in rural and suburban areas versus urban areas?</td>
</tr>
<tr>
<td><strong>To Non-Governmental Organization Professionals:</strong></td>
</tr>
<tr>
<td>What policies do you believe need to be put in place to incentivize solar development to help RI meet its aggressive renewable energy targets, but also protect our open space? Are we on track to do that?</td>
</tr>
</tbody>
</table>

**POLICY CONTEXT**

There are a number of state-level policies and programs relevant to the solar siting issue in Rhode Island, which we detail in this section. These programs have created pathways towards solar energy development in Rhode Island.

**Long-Term Contracting Standards:** In 2009, Rhode Island enacted the Long-Term Contracting Standard for Renewable Energy (LTCS). The LTCS requires electric distribution companies to annually request proposals from renewable energy developers. This creates an incentive for the distribution companies to enter into long-term contracts (up to 15 years) with developers that promote the use of renewable energy. As shown in Figure 4, LTCS has contributed to 650 GWh of Rhode Island’s 2019 production.

**Net Metering and Virtual Net Metering:** Net metering allows eligible customers to receive energy bill credits for up to 125% of the on-site consumption during a billing
To be eligible for net metering, renewable energy generation must occur on-site and be sized to meet on-site load demands, based on a three-year average of electricity consumption for the property. The distinction between net metering and virtual net metering is location -- virtual net metering allows the customer to be eligible for energy bill credits even if the renewable energy generation does not occur on their property. In Rhode Island, groups that are eligible for virtual net metering include state agencies, quasi-state agencies, municipalities, public housing authorities, public schools, private schools, non-profits, and federal government and hospitals. Virtual net metering projects in Rhode Island are eligible for up to 10 MW per project site.\footnote{10} The net and virtual net metering laws were enacted in 2011.\footnote{11} Net metering and virtual net metering projects were responsible for approximately 20\% of Rhode Island's total renewable energy production in 2019, at 190 GWh, as seen in Figure 4.

Both the net metering and virtual net metering programs are integral to Rhode Island meeting its renewable energy targets. Onsite renewable energy systems, including solar and wind generators, require adequate sunlight and wind conditions before customers can generate excess power; this is not always possible. Virtual net metering automatically sends excess power to the grid and imports power from the grid when needed. It allows the customer to balance the amount they are importing and the amount they are exporting so that they are only billed (or credited) for the net difference. In this case, the consumer is not suffering the consequences if the liability of weather conditions affects their renewable energy output. The appeal of both net metering and virtual net metering

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|}
\hline
\textbf{Renewable Energy Program} & \textbf{2019 Capacity} & \textbf{2019 Production} \\
\hline
Renewable Energy Growth & 70 MW of solar & 90 GWh \\
Long-Term Contracting Standard & 180 MW of various technologies (including wind, solar, small hydro, and LFG) & 650 GWh \\
Net Metering/Virtual Net Metering & 160 MW of solar & 190 GWh \\
\hline
\textbf{Total} & \textbf{410 MW} & \textbf{930 GWh (13\% of 7.250 GWh 2019 load)} \\
\hline
\end{tabular}
\caption{Existing RI Renewable Energy Programs}
\label{table:existing_renewable}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure4.png}
\caption{Existing RI Renewable Energy Programs}
\label{fig:existing_renewable}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Example of REGP at URI}
\label{fig:example_regp}
\end{figure}


lies in the reliability and efficiency it brings to solar power for customers. Figure 4 represents the capacity and the production of each Rhode Island renewable energy program, with the totals represented at the bottom. In 2019, 13% of Rhode Island’s electricity use was supported by renewable energy production, which was supplemented by these programs.12

Renewable Energy Growth Program: One of Rhode Island's primary state incentives for solar is the Renewable Energy Growth Program (REGP). The REGP allows for distributed generation projects, or those projects that use renewable energy technologies to generate electricity close to, but not necessarily where it will be used. Distributed generation systems can be a single structure or part of a microgrid and serve both residential and commercial sectors; they provide the opportunity for land-restricted entities to generate clean energy. Small-scale customers (projects under 25kW) and large-scale customers (projects over 25kW) are eligible under different applications. For example, a small-scale project receives between 28.55¢ and 32.25¢ per kilowatt hour, an amount derived from a performance-based incentive set by the RI Distributed Generation Board.

Large-scale solar projects require bids that must be below the “ceiling price” and be set for a 20-year tariff, rather than a contract.13 This policy is dictated by the fulfillment of chapter 26.6 of Title 39 of the Rhode Island General Law.14 For example, the University of Rhode Island purchases energy produced in West Greenwich from a utility-scale solar development on a gravel pit, located about 13 miles away from campus. The energy output is then sold under long-term tariffs at fixed prices. In total, the projects resulting from the REGP accounted for 90 GWh of solar production in 2019. The arrows in Figure 5 point from commercial-scale solar arrays located on a gravel pit in West Greenwich, RI and a capped landfill in South Kingstown, RI to the University of Rhode Island Kingston campus, which uses the energy generated at both array locations.

State-Level Solar Siting Guidance for Municipalities: The Rhode Island Office of Energy Resources and Division of Statewide Planning developed two Solar Siting Guidance Reports related to municipal comprehensive plans and model ordinance for zoning and taxation.15

Figure 6: Proposed solar development far surpasses current solar capacity. Source: The Providence Journal, March 16, 2018

The reports were developed as a result of a collaborative process that included a broad set of stakeholders through public outreach meetings and solar siting working group meetings conducted between June and October 2018. This group, called the RI Solar Energy Systems Working Advisory Group, is herein referred to as the “Advisory Group.”

The Advisory Group developed a set of thirteen renewable energy siting principles, which are intended to be considered together in the development of tailored siting ordinances. These siting principles appear in Table 4.

**Table 4: Rhode Island Principles for Renewable Energy Siting**

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Accelerate the pace toward achieving Rhode Island’s renewable energy and greenhouse gas reduction goals through thoughtful and strategic development of renewable energy projects of all sizes.</td>
<td></td>
</tr>
<tr>
<td>2. Build support for achieving Rhode Island’s renewable energy and greenhouse gas reduction goals by increasing public understanding of the multiple benefits of renewable energy including to the economy, the environment, to promote equity and to cultivate climate resiliency.</td>
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</tr>
<tr>
<td>3. Provide predictability, consistency and fairness in state and local rules, regulations, zoning and ordinances to support development of renewable energy projects.</td>
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<tr>
<td>4. Promote proactive, comprehensive utility distribution system planning.</td>
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<tr>
<td>5. Ensure that regulations governing renewables are applied in a fair and balanced manner with those governing other land uses, while recognizing that local zoning is the authority of communities to establish public health and safety standards.</td>
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<tr>
<td>6. Honor commitments to keep permanently protected land free from development.</td>
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</tr>
<tr>
<td>7. Encourage renewable energy development on commercial and industrial zoned land, on already developed land, and in other locations with environmental alterations such as closed landfills, brownfields, parking lots, commercial and residential rooftops, sand and gravel pits.</td>
<td></td>
</tr>
<tr>
<td>8. Support the economic viability of farms through appropriate renewable energy development as a complementary use in a manner which keeps farms in agricultural production while preserving agricultural soils.</td>
<td></td>
</tr>
<tr>
<td>9. Promote policies that recognize ecological services and sensitivity as well as habitat connectivity in the siting of renewable energy projects.</td>
<td></td>
</tr>
<tr>
<td>10. Respect landowner rights to realize value from their property within the context of established planning and zoning principles.</td>
<td></td>
</tr>
<tr>
<td>11. Ensure equitable access to renewable energy installations for all consumers, and recognize that delaying the transition to renewable energy disproportionately burdens environmental justice communities.</td>
<td></td>
</tr>
<tr>
<td>12. Provide local governments with guidance on smart renewable energy siting and to ensure consistency between the state guide plan and local ordinances and policies. Establish a timeline for all municipalities to adopt renewable energy siting ordinances and associated processes.</td>
<td></td>
</tr>
<tr>
<td>13. Provide opportunities for state and municipal governments to lead by example and use renewables to exercise more control over their energy use and production in meeting their energy needs.</td>
<td></td>
</tr>
</tbody>
</table>

**Source: RI Office of Energy Resources, March 1, 2018**
More specifically, the Advisory Group specifically directed changes to comprehensive plans to include where the various types of solar systems would be appropriate in the community, and also to promote the use of previously disturbed lands or existing impervious surfaces as priority sites for solar energy development.

**Model Ordinances:** The model ordinance template included voluntary guidance for both zoning and taxation. RI General Law §45-24 authorizes communities to adopt zoning ordinances that control the use of land and how it is developed to implement the vision of their comprehensive plans and protect the public health, safety and welfare.17 The Advisory Group articulates that communities should include solar energy systems as a land use in their zoning code, minding the fact that solar energy systems vary in size and shape, and those characteristics may cause barriers to development and impacts.

The model zoning ordinance follows the template below:

- Title
- 1.0 Purpose and Consistency with Comprehensive Plan
- 2.0 Definitions
- 3.0 Permits Required
- 4.0 District Use Regulations
- 5.0 Site Requirements Generally
- 6.0 Review Requirements
- 6.1 Additional Development Plan Review requirements for Primary Use Solar Energy Systems
- 6.2 Reviews for Accessory Solar Energy Systems
- 7.0 Abandonment and Removal
- 8.0 Violations
- 9.0 Severability

The categories listed above are merely the minimum requirements for a town’s solar siting zoning ordinance, and may not be comprehensive for every municipality. For that reason, it is recommended that towns tailor the ordinance to meet their specific needs. The Advisory Group also articulates that the ordinance of a specific town considers all the various types of solar energy systems that may be developed within their jurisdiction, from rooftop solar to large commercial scale arrays, and adequately considers where these systems may be developed. The guidance provided in conjunction with the model zoning ordinance suggests that sites for solar development must be chosen in a manner that is consistent with a municipality’s comprehensive plan.

The model taxation ordinance provides an example tax structure in which the city or town in question “authorizes its assessor to levy a tax on renewable energy tangible property as defined in 39-26-5 in accordance with the rules and regulations executed by the Rhode Island Office of Energy Resources.”18 As of September 2018, ~46% of RI municipalities (18 of 39 total) adopted the model.

taxation ordinance. Of these, eight adopted it without changes, while the other ten altered some criteria to fit their existing tax code. In total, 56% of Rhode Island municipalities (23 of 39) currently have solar energy systems included in their current municipal comprehensive plans and ordinances.

**Past Introduced Solar Siting Bills:** In 2019, three bills related to solar siting were introduced to RI legislature: the Rhode Island Energy Resource Act (H5789), Zoning Ordinances, (H5646), and Net Metering, (H5775) but none passed. The Energy Resource Act aimed to direct solar projects to be developed on compromised land including landfills, carports and rooftops. Section 39-26.3-1 of the bill reads:

“The General Assembly further finds that it is in the interest of the state to incentivize and promote development on brownfields, landfills, superfund sites, gravel pits, parking lots, and developed and previously disturbed lots and minimize impacts to environmental conservation and housing development. For this reason, certain standards and other provisions for the processing of applications and allocation of interconnection costs are hereby set forth to assure that the application process assists in the development of renewable generation resources in a timely manner.”

The bill went on to outline a policy structure that would provide reimbursements varying in value for the interconnection costs associated with renewable energy sited on preferred locations.

House Bill 5646 redirected residential development by requiring the replacement of residential lots lost to alternative uses, including solar development, in other areas of cities or towns. House Bill 5775, promoted expansion of virtual net metering to industrial and commercial entities. In 2020, bills in regards to the Renewable Energy Standard (S2404), State Purchases (S2638), and School Funds and Property (H7459) were introduced. S2404 aimed to increase renewable energy standards to meet the state's goal of 100% electricity from renewable sources by 2030. The Senate Environment and Agricultural Committee had recommended this bill for further study, but it died in committee. S2638 required that the state and all of its departments purchase one hundred percent renewable energy by January 1st, 2031. The bill had been recommended by the Senate Environment and Agricultural Committee to be studied further, but it also died in committee. H7459 created a program for rooftop solar installations on schools for their electricity use and was referred to the House Finance Committee, where it also failed to move past the committee stage.

**Executive Order 20-01:** The signing of a 100% Renewables by 2030 Executive Order by Governor Gina Raimondo in January of 2020 was the impetus for the RI Office of Energy Resources to invest in a study conducted by Synapse Energy Economics, Inc.

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26 School Funds and Property. Bill (2020).
The study, which measures the solar siting opportunities for Rhode Island, is essential for determining which policies and programs need to be implemented for the state to reach its 2030 goal. Energy and economic analyses must be completed to make efficient programs and policies. As a result of the executive order, Synapse Energy Economics Inc. and the Brattle Group were commissioned by the state to collect data on solar potential and its economic impacts.

As stated above, Synapse Energy Economics Inc. was contracted through the Rhode Island Office of Energy Resources. Synapse found the total, technical, and economic potential for rooftop solar, ground-mounted solar, and parking lot/carport solar, and compared the costs for those potential sites. This information can help the state make more informed decisions about how to move the solar industry forward in a way that is economically feasible.

The other group commissioned by the state, the Brattle Group, conducted research on ways that Rhode Island can purchase wind and solar energy, both in-state and across New England, to reach its goal of complete reliance on renewables by 2030. The Brattle Group report includes model portfolios, policy suggestions, and an extensive cost-benefit analysis; their recommendations will provide a framework for Rhode Island’s policy, planning, and equity goals as the state pursues its renewable energy target. Solar energy is expected to play a large role in meeting that target; however, plans to develop new solar sites have led to a series of conflicts in Rhode Island.

**Act on Climate Bill**: Introduced in 2014, the Resilient Rhode Island Act\(^\text{27}\) created the state’s first holistic climate legislation and created specific emission targets for the future. Passed on March 23, 2020. The Act on Climate 2020 bill\(^\text{28}\) (H7399 and S2165) aims to overhaul the existing standards to align with the most current scientific data. The new bill adds accountability measures and updates emissions targets. The 2021 bill creates a goal for net-zero carbon emissions by 2050, a change from the 80% emission reduction called for in the Resilient Rhode Island Act.

Replacing traditional energy generation methods with renewables is one of the most significant and impactful ways to reduce carbon emissions. Like the Executive Order 20-01, this Act will likely bring attention to Rhode Island’s potential for implementing renewable energy systems, solar being of primary interest. The Act on Climate bill also specifically mentions augmenting jobs in the renewable energy sector as one of its primary goals. To meet this target, Rhode Island will need to implement more renewable energy systems. It is reasonable to assume that these goals will result in greater incentives for solar energy developments throughout the state.

**FINDINGS**

We undertook a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to examine the existing solar siting policy and related conflicts in Rhode Island identified through our needs assessment (Figure 8).\(^\text{29}\) The SWOT analysis will help us pinpoint inhibiting and enhancing factors surrounding our first objective: to identify stakeholder knowledge gaps related to solar siting in Rhode Island. Evaluating these factors will


\(^{28}\) Act on Climate Bill (2020).

help us properly fill those gaps with the results of economic research; we believe that this will ultimately result in a well-rounded solar siting policy that represents the stakeholder preferences identified through this work. In light of the current climate crisis, a transition from fossil fuels to clean energy is crucial to halting the rapid progression of climate change. Governor Gina Raimondo recognized this urgent need when she set a goal for Rhode Island to obtain 100% of its energy from renewable sources by the end of 2030. Solar energy is expected to be an integral part of accomplishing this goal, but in a land-poor state, choosing solar sites comes with a unique set of challenges. There has been much work done already to identify priorities for consideration by those involved in setting policy for commercial-scale solar development in Rhode Island, but competing priorities have caused a rift among stakeholders involved in the issue. We believe that it is possible to create a solar siting policy that could solve land use conflicts and preserve environmental integrity with proper consideration of non-market values associated with development. Here, non-market values are defined as attributes which are valued outside of an economic context (e.g. the rural character of a town). This analysis outlines strengths, weaknesses, opportunities and threats related to the current state of solar energy development in Rhode Island.

**Figure 8: SWOT Analysis Template**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Helpful to achieving the objective</td>
<td>Harmful to achieving the objective</td>
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**STRENGTHS:**

- SESAWG’s development of a model ordinance for municipalities
- Market valuation study commissioned by the RI Office of Energy Resources, conducted by Synapse Energy Economics, Inc.

The formation of the Solar Energy Systems Advisory Working Group (Advisory Group) in 2018, led by the Office of Energy Resources and Rhode Island Division of State Planning, represents the first coordinated effort to curate solar siting policy for Rhode Island. The working group consisted of stakeholders including developers, policymakers, landowners, municipal leaders, state agency staff, and non-governmental organization representatives whose work is relevant to and/or impacted by the solar siting situation in Rhode Island. These stakeholders were engaged to provide broad...
representation and diverse perspectives on the different aspects of solar siting and numbered 46 entities in total, ranging from municipal planning offices to non-governmental organizations to developers. Together, the group cooperatively discussed issues and priorities that the guidance must address.

The Advisory Group drafted a model solar siting ordinance that municipalities could either adopt or use as a guideline for a town-specific ordinance in their municipality. With the guidance of the working group, the model ordinance provided context for municipalities on how they should reference commercial solar development in their municipal comprehensive plan in regards to General Law §45-22.2. It set a level playing field and outlined the most important considerations related to solar siting, including existing zoning and taxation regulation, for local decision makers to consider in reviewing development proposals. As of September 2018, 18 of 39 municipalities, or~46% of municipalities had adopted the model ordinance, with ~25% of those adopting the ordinance as written by the Advisory Group. Although the work of this group is generally seen as a strength here, we have observed that more often than not, the municipalities that adopted the model ordinance without tailoring it to their communities’ needs are more ill-equipped to handle development pressure.

The work of Synapce Energy Economics, Inc., a firm contracted by the RI Office of Energy Resources in 2019 to analyze the potential and costs of solar energy development on compromised sites (e.g. rooftops, ground-mounted solar, parking lots/carports), is considered a significant strength in the solar siting arena in Rhode Island. Based on input from state policymakers at the RI Office of Energy Resources, Synapce examined and quantified solar potential on all rooftops, landfills, gravel pits, brownfields, commercial and industrial lots, and parking lots and solar carports. These categories were identified as location types that might aid in policymakers’ decisions vis a vis balancing solar development with other land uses including agriculture, open space, and housing. Synapce’s study found that in addition to the 250+ megawatts of interconnected solar in Rhode Island to date, an additional 3,390-7,340 megawatts of solar has the technical potential for interconnection, or 5,560-12,600 gigawatt-hours of electricity. That potential equates to a 7.65 million metric ton reduction of carbon dioxide, or 70% of RI’s total, current greenhouse gas emissions. These results are staggering, and prove that there are alternatives for siting solar in Rhode Island.

WEAKNESSES:
- State-level policy is increasingly outdated, limited, and lacks momentum
- Non-tailored model ordinances fail to address place-based concerns
  - Existing guidance does not reflect resident preference
  - Current state incentives are flawed

In an interview with Scott Millar of GrowSmart RI, the issue of policy relevance was raised, specifically the fact that guidance reports are not updated regularly, and lack up-to-date knowledge of new siting issues and details associated with them. A member of the Advisory Group himself, Millar felt it crucial to continually update and change the

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guidance at the state level to ensure that municipalities without the resources to tailor ordinances were well supported in their decision-making efforts.

The lack of impetus to propel formal statewide policy tools forward is another significant weakness. The project team noticed a trend when studying past introduced bills: policies related to developing renewable energy, including residential preferences for solar siting, have little legislative momentum. In 2019 and 2020, proposed legislation related to solar siting died in the committee stage. The relevant legislation includes three bills from 2019 and three from 2020. Most barely made it a quarter of the way through the process and were never released by their assigned committees. It is evident that the will to develop solar exceeds the will of policymakers and advocates to speak on behalf of municipal officials tasked with deciding where solar should and should not be sited.

In the absence of comprehensive solar siting policy at the state level, municipalities, especially those in rural areas, often lack the resources to create and enforce strong ordinances by themselves. Coupled with the fact that solar development in rural areas is less cost prohibitive than that in more urban areas for developers, and you have the level of development pressure we are seeing in rural communities in Rhode Island. These are also frequently the areas where the most farmland and forested open space exists, and for which residents place a high value.

The solar siting debate in the towns of Portsmouth and Hopkinton, RI is a prime example of this phenomenon. In May 2020, Portsmouth passed a solar-siting ordinance with the intention of modifying it at a later date. In its current state, the ordinance allows commercial-scale projects to be built in residential neighborhoods (Figure 9). The public opposed this idea and demanded that a re-vote take place in December 2020, claiming that there was a lack of public awareness and an improper notification of meetings to the public. While many Portsmouth residents voiced concern about solar development
in the town, the issue was not resolved, with review by the Zoning Board of Review and the Town Council still underway.

As of December 2019, the Town of Hopkinton had approved 19 ground-mounted solar projects (Figure 7). Of those 19 projects, six (32%) were approved for residential to commercial zoning changes, an additional six (32%) were installed on farmland, and the remaining seven (36%) were installed on commercial and industrial lands. As of December 2020, the Hopkinton Town Council was working to amend the town zoning ordinances as it pertains to applications for solar projects. Potential changes include labeling commercial solar projects as “industrial use” and restricting them to manufacturing areas, categorizing commercial-scale solar development as land development projects so that the Town Council cannot override the Planning Board, and addressing setback distances and placing a limit on tree-clearing.

Conversely, one of the most densely populated towns in Rhode Island, West Warwick, faces an entirely different set of challenges in response to solar developments. The town is enthusiastic about growing their clean energy sector, stating it as one of their top five priorities in their comprehensive plan. Despite this, West Warwick receives far fewer solar development applications than locations like Hopkinton, because developers associate rural locations with lower costs.

In both Portsmouth and Hopkinton, the policy changes taking place have been demanded by the public. As demonstrated by the residents’ concern in these towns, the ordinances in their current state are not reflective of public preference. At the town meetings we attended, we witnessed that there is an overwhelming consensus among residents from rural areas that the solar siting policy in their municipality is failing to protect the rural character of the town.

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Figure 7: Solar Projects in Hopkinton, Rhode Island. Source: ArcGIS, June 2020

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Stakeholders have highlighted the issue with valuation of forests for greenhouse gas reduction versus installation of commercial scale solar energy. Forests remove carbon dioxide from the air and have other non-monetary ecosystem health values. Solar energy is land-intensive, but is an effective source of renewable energy and provides an alternative to the massive greenhouse gases emitted from traditional energy sources. Ashley Sweet, the current town planner in Exeter, stated, “it defies logic to cut down trees in the name of reducing our carbon.” Scott Millar, the manager of community technical assistance at GrowSmart RI and a forest landowner himself, has a similar stance. Millar believes that renewable energy statutes need to be revised to encourage renewable energy development on developed and disturbed parcels; he also advocates that losing forest is counterproductive to climate change mitigation.

Other stakeholders have a slightly different perspective, including Hank Webster at the Acadia Center, who believes that reducing fossil fuel emissions should be our main priority. He references the fact that an acre of solar offsets carbon at a greater degree than an acre of trees. However, trees have non-monetary values that solar does not, including aesthetic and recreational uses.

The policy-driven renewable energy development incentives in Rhode Island have created a disconnect between developer and resident. The incentives mentioned in the background research section of this report include the Rhode Island Renewable Energy Growth Program, Net Metering, and Virtual Net Metering. These programs promote the growth of solar energy generation in Rhode Island, and play a role in encouraging businesses and residents to purchase renewable energy generated either on their own land (net metering), or on land elsewhere (virtual net metering). While these programs were not intended to drive solar development on forested or farmland, they also do not consider or address siting conflicts.

In interviews with two of our non-governmental organization stakeholders, Meg Kerr of the Audubon Society of RI, and Sue AnderBois of The Nature Conservancy of RI, both mentioned a loophole within the virtual net metering program. Under 2011 state law, projects up to 10 MW are eligible for virtual net metering. This MW restriction was made with a conservationist goal: to ensure that projects don’t occupy large tracts of open space, including forests and farmland. However, developers found that they could circumvent this restriction by putting two ‘separate’ projects next to each other. The size of these “larger-than-the-policy-intended” projects frequently causes land-use conflicts in land-scarce Rhode Island. Interviewees identified this loophole as a major problem that revised state and/or local level solar siting policy in Rhode Island should address.

For towns without strong or unified ordinances, these flaws make it easy for developers to target their undisturbed land, which tends to be least expensive for a commercial-scale solar development project. According to Paul Raducha, formerly a senior developer at Kearsarge Energy, the process that a developer uses to choose a site varies by company. For Kearsarge, developing previously compromised land is their preference; however, for many companies, the least expensive land is the most

desirable land. The cost of the land itself does not only refer to the market value of the land, but also its location and what is on it. In discussing what guides development at Kearsage, Raducha refers to three considerations, or “buckets”: financing, development, and construction. The development phase is highly location-focused and must consider the interconnection process, existing site characteristics, and the zoning ordinances of the area. According to Raducha, interconnection is one of the most significant variables that dictates how a developer values one site over another. He notes that it is important to analyze the cost at different geographical locations and compare how much it will cost to connect to the grid. Exeter, West Greenwich, and Hopkinton are the three towns in Rhode Island with the most installed or pending capacity, with Exeter at 87 MW, West Greenwich at 76 MW, and Hopkinton at 67 MW.

All three towns are primarily rural, representing a conflict between the desire of developers to inexpensively connect to the grid and residential desire to protect the character of their town.

The project team attended meetings in a number of RI municipalities in an effort to take the “pulse” of resident perceptions of solar development on farms and forested open space. In 2019 and 2020, we attended town meetings held in Hopkinton, West Greenwich, Woonsocket, North Smithfield and Middletown. In the rural communities, the public’s attitude towards solar development was much more negative than the attitude in more developed communities. It was inferred from this observation that preservation of rural character is very important to the residents of rural communities, and that current policies incentivizing development are leading developers to uncompromised land where the cost of construction (e.g. tree clearing) pales in comparison to the costs associated with developing a commercial-scale array on top of a building, for example.

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**OPPORTUNITIES:**

• Conduct non-market valuation study to quantify solar siting preferences of residents; utilize results to inform local policy revisions that reflect resident preference.

• Operationalize stakeholder suggestions to increase knowledge of solar siting tradeoffs and evolving technology through consumer and developer education efforts.

• Employ the information collected by the Synapse study to educate stakeholders on Rhode Island’s technical solar potential.

• Maximize on technological advancements and on the recent passage of the Act on Climate Bill to build momentum for solar development on compromised land.

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Through the non-market valuation study planned as part of this project, we have the opportunity to form a better understanding of the public’s willingness to pay for various siting outcomes. Based on the research findings, the state and local municipalities will have data to inform potential changes to existing policy that reflect resident preference.

Stakeholders have identified additional opportunities to transform the renewable market through technological advancements. As stated by Hank Webster of Acadia Center, improvements made on solar tiles from Tesla will change the cost structure for rooftop

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installations, increasing the feasibility of solar development on rooftops and other structures.\textsuperscript{39} This development will drive down the cost of rooftop solar, likely increasing the likelihood of developing solar sites in urban locations. Although rare, dual-use solar sites also provide an opportunity to creatively implement solar energy while preserving land function. A local example of an experimental dual-use solar project at Our Kids Farm in Exeter is shown in Figure 10. Stakeholders identified transforming technologies, consumer education, and state support as crucial components of a thriving solar field.

An example of opportunity in action can be seen by the town of Burrillville, which conducted a survey in the summer of 2019 to gauge how its residents stand on the issue of solar development. This survey, managed by Burrillville town planner Raymond Goff, asked residents how they felt about installing solar arrays on forested space, where they would prefer to see solar, and whether they minded being within visual range of the arrays. The results of this survey found that 62.5\% of residents strongly support small-scale solar arrays, but 89.8\% are concerned about losing functional farm and forested land as a result. These findings were shared at the town council meeting in October, and recommendations were made to amend the towns’ solar policy based on these findings.\textsuperscript{40}

There have been many identified opportunities for Rhode Island to address the solar siting issue. A considerable amount addresses the current lack of consistent policy across Rhode Island municipalities, while others identify a disconnect between applying the non-tailored model ordinance and addressing place-based concerns. Here, we recognize an opportunity for the state of Rhode Island to invest in a model ordinance review to tailor the guidelines to the needs of individual municipalities. Additionally, we see an opportunity for solar siting policies to be town-specific, based on the town’s characteristics including residential preferences, existing and future land use, zoning, and more. Like Burrillville, other municipalities across Rhode Island have the opportunity to survey their residents and amend their ordinances according to the data gathered.

One of the most significant opportunities to date was uncovered by the Synapse Energy Economics research commissioned by the RI Office of Energy Resources. Their research data revealed Rhode Island’s total solar potential for landfills, rooftops, brownfields, gravel pits, parking lot solar, and commercial lots. Local policymakers have the ability to use this data to better understand the capacity for solar on compromised land within their municipalities, and tailor their local ordinances to reflect that potential. However, just knowing about these sites will not necessarily lead developers to pursue projects there if the financial costs are still higher in these locations than in farm and

\textsuperscript{39} Webster, Hank. Solar Siting- Acadia Center and URI. Personal interview, April 23rd, 2020.

\textsuperscript{40} Goff, Ray. Solar Siting- Burrillville and URI. Personal interview, October 25th, 2019.
forest sites. To that end, the state also has the opportunity to provide incentives for
developers that reflect the preferences identified through the non-market valuation
study, and take advantage of the potential identified by Synapse.

Another opportunity comes in the form of the Act on Climate Bill, which was passed on
March 23, 2021. This bill, which legally requires Rhode Island to achieve net-zero
carbon emission by the year 2050, has the potential to highlight the current state of
solar energy in Rhode Island. Like Governor Raimondo’s 100% renewable energy by
2030 goal, this bill would likely require additional solar energy development to meet its
target. As addressed in the weaknesses section of the SWOT analysis, a lack of
momentum has been a significant challenge in revising solar siting policy. The passing
of a bill specifically related to environmental issues in Rhode Island may be early
evidence of the tides shifting, providing an opportunity for new solar legislation. By
putting a spotlight on Rhode Island’s renewable energy systems, specifically solar, the
Act on Climate bill may provide policymakers with the opportunity and initiative to
reexamine the state’s solar policy and tailor it to fit the needs of municipalities.

THREATS:
• Policy development is lagging behind developmental pressure.
• Developer preferences do not match resident preferences, flawed incentives.

As previously mentioned, the failure of policy to keep pace with pressure from
developers is a significant threat to equitable solar siting in Rhode Island. As
demonstrated by our research on past and pending legislation, a trend currently exists
regarding solar policy: most legislation lacks the necessary momentum and fails to
make it out of the committee stage. Additionally, the siting preferences of developers
and residents do not consistently align; there is a need for incentives that consider
those varying preferences, but there has been little state legislation that has tackled the
solar siting issue.

Another threat is caused by the existing tax structure, which provides an incentive for
creating commercial-scale projects and primarily considers economic benefits rather
than land use or public preference. Although commercial-scale solar projects may not
align with the values of rural municipalities, they are often accepted due to the tax
payments the municipality receives or chosen as the more favorable option between
two projects (e.g. choosing between housing development or a solar site).

Furthermore, while the Act on Climate Bill presents new opportunities to amend state
solar policy, it also poses a potential threat. If passed, the bill may place undue pressure
on municipalities to allow solar developments in order to meet the goal of net-zero
emission. This may result in municipalities feeling pressure to sacrifice their valued rural
character in order to comply with the legislation.

CONCLUSION

This needs assessment has informed the planned economic research for this project
and our approach to extending information about the research results as tools for
decision makers engaged in solar siting policy in Rhode Island and beyond. By
identifying the strengths, weaknesses, opportunities, and threats surrounding the solar siting issue in its current state, the project team was able to develop an in-depth understanding of the challenges faced by decision makers, developers, residents and advocates, and identify how best to inform and support our primary stakeholders. It is our belief that these efforts will help Rhode Island attain equitable solar policy that reflects residential needs while upholding state goals regarding renewable energy and carbon emissions.

![Table showing SWOT Analysis Findings](image)

*Figure 11: SWOT Analysis Findings*
REFERENCES


Rhode Island Solar Siting Conflicts on Farm and Forested Open Space - Objective 1


Sweet, Ashley. Solar Siting- Exeter Town Planning and URI. Personal interview, November 18th, 2019.

