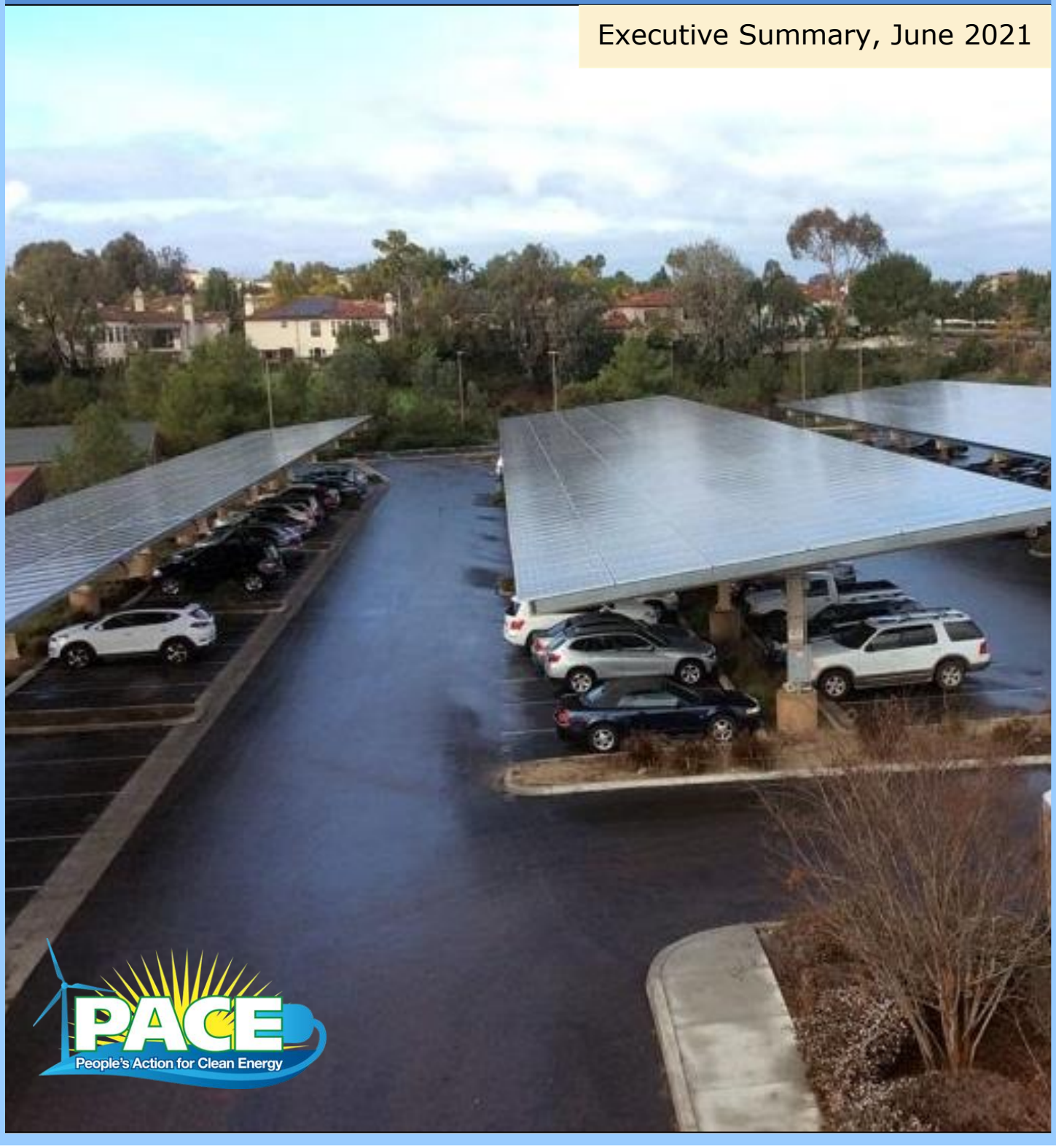
Solar Canopies in Connecticut:

Siting Potential, Implementation Guidance, and Policy Considerations

Executive Summary, June 2021



Acknowledgments

This report was produced by People's Action for Clean Energy (PACE) in consultation with multiple stakeholders in Connecticut. The principal authors of this project are PACE Operations Manager Kieren Rudge and PACE President Mark Scully. Additional team members PACE Vice President Bernard Pelletier and Operations Manager Humna Sharif contributed to the success of this project.

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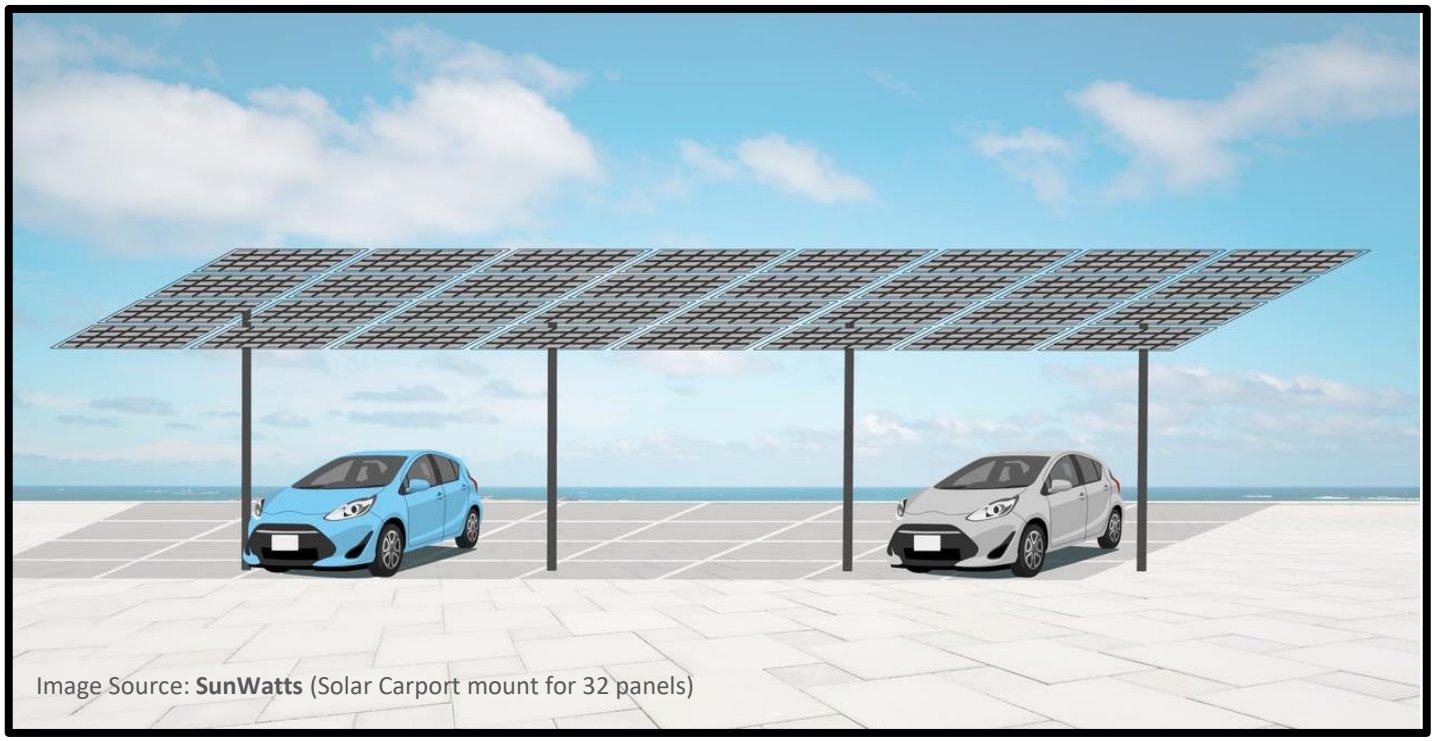

Image Source: **SunWatts** (Solar Carport mount for 32 panels)

Executive Summary

Connecticut aims to have a zero-carbon electric sector by 2040 and has developed plans and recommendations to facilitate this energy transition.[1] Meeting this target will require a range of renewable sources, with solar playing a significant role. As the cost of solar panels continues to fall, arrays are being built at an increasing pace across the state. To meet the state's goals, we will need solar arrays on residential and commercial rooftops, parking lots, as well as larger, utility-scale projects on brownfields, gravel pits and other land parcels.

As expected, the search for sites for larger solar projects has led to conflicts between the interests of clean energy and the preservation of prime agricultural land and forests. One way to avoid or minimize these inevitable conflicts is to site solar arrays on land that has already been "degraded," notably parking lots.

While the state's plans reference the production of solar energy in multiple different ways, there is no mention of solar canopies as a part of the 100% renewable energy sector.[2] This is a significant oversight as solar canopies have many unique benefits and can produce a significant amount of energy in Connecticut. While the positive impacts of solar canopies are well understood, there has not been research quantifying the potential of this type of solar energy in Connecticut.

People's Action for Clean Energy conducted this study to fill this crucial gap in knowledge by analyzing the amount of energy that solar canopies could potentially produce throughout the state. This study was completed to demonstrate that solar canopies can be a major component of the future electric sector in Connecticut and that implementation of this technology needs to be supported by public policy. The study used geospatial analysis tools to examine large parking lots in every town in Connecticut and estimate the number of solar canopy arrays that could be sited in each lot.

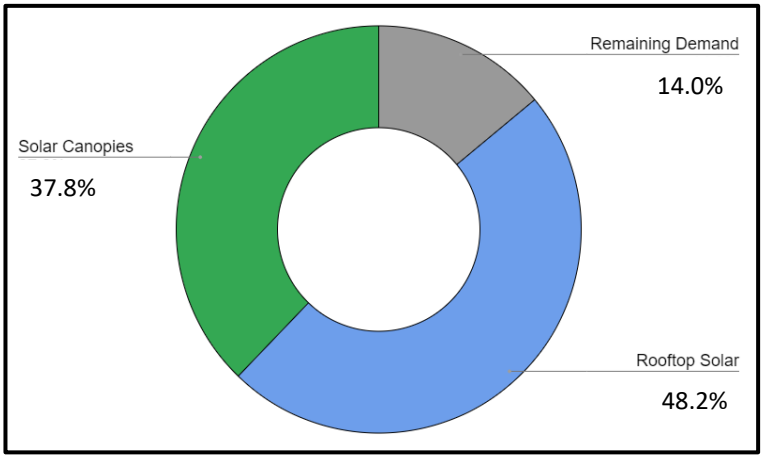

Fig. 1 Future Potential Energy Portfolio of Solar Canopies and Rooftop Solar in Connecticut

The results of this study demonstrate that there are 8,416 potentially viable sites across Connecticut. The combined capacity of all sites is 7,021 MW. The total estimated annual production is 9,226 GWh. These figures represent a substantial amount of the state's potential energy portfolio. The estimated annual production from solar canopies is equivalent to 37.8% of current statewide energy consumption. This amount of energy would be able to power roughly 870,000 homes.[3] When combined with estimates of rooftop solar installation potential, 86% of current statewide energy consumption can be produced.[4]

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[1] *Executive Order No. 3.* Governor Ned Lamont, State of Connecticut. 2019.
[2] *Draft Integrated Resource Plan.* Report. Department of Energy and Environmental Protection, State of Connecticut. 2020.
[3] U.S. Energy Information Administration (EIA). "Frequently Asked Questions (FAQs)." Accessed January 2021. https://www.eia.gov/tools/faqs
[4] "Project Sunroof." Accessed January 2021. https://www.google.com/get/sunroof/.

The annual production estimates vary between the 169 towns in Connecticut. However, each town can produce some energy from solar canopies. Town-level annual production as a percentage of energy consumption ranges from 5.8% to 180%, with an average percentage of 40.1%. The production of solar canopies by town can be seen in Figures 1 and 2, with a detailed table for each town available in the appendix.

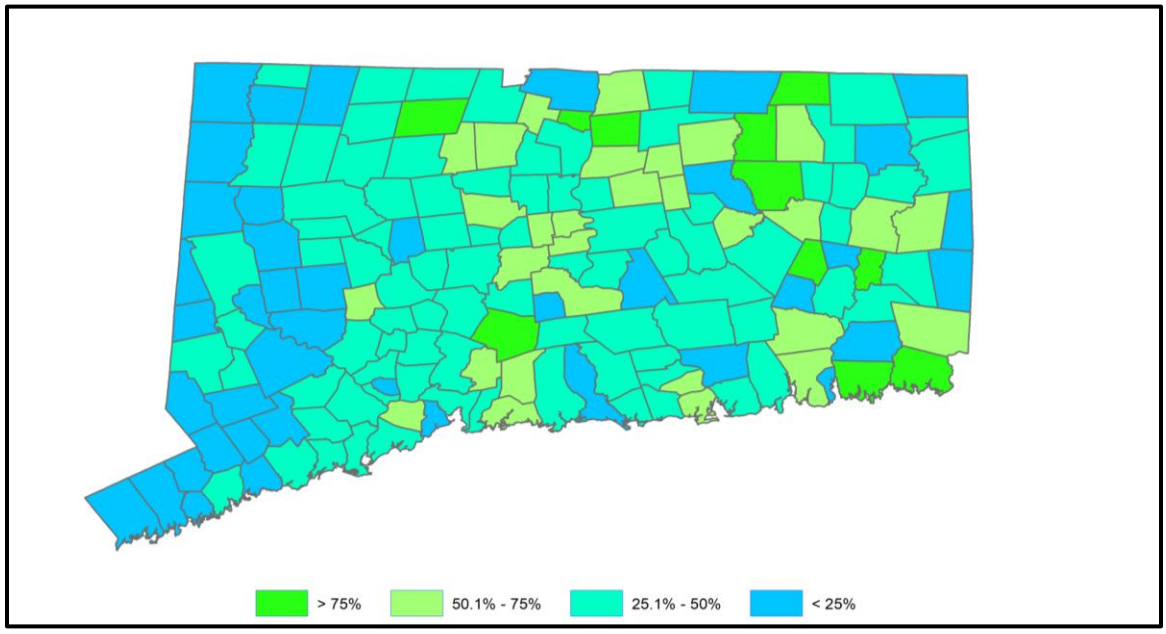

Fig. 2. Statewide Map of the Percentage of Current Energy Consumption that can be produced by Solar Canopies in Each Town in Connecticut.

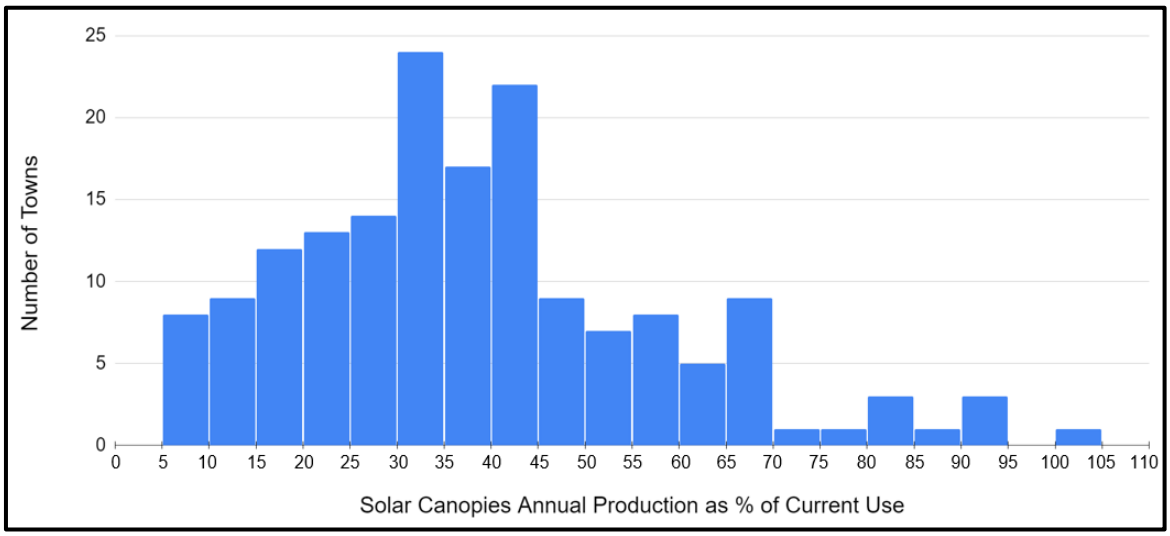

Fig. 3. Histogram of the Percentage of Current Energy Consumption That can be Produced by Solar Canopies in Each Town in Connecticut

*2 Outliers are omitted with values of 160% and 179% respectively

This study demonstrates that solar canopies have significant potential as a component of Connecticut's energy portfolio. In addition to production levels, there are multiple benefits associated with solar canopies. These benefits are strong on their own but can be significantly more effective with policy that supports the implementation of solar canopies.

Benefits of Solar Canopies

1. **Preservation of Agricultural Land and Forests**
   Unlike large solar farms, solar canopies can be sited on existing impervious surfaces. This removes the need to infringe upon valuable natural resources.

2. **Local, Distributed Energy Generation**
   Parking lots and other sites where solar canopies can be installed are generally close to an energy sink. This reduces losses from long-term transmission and fosters grid resilience.

3. **Pairing with Electric Vehicles and Battery Storage**
   Solar canopies can be made with electric vehicle (EV) compatibility, enabling a transition to a clean transportation sector. Battery storage can also be integrated to support EVs and energy use at any time of day.

4. **Reducing Urban Heat Island Effect**
   Solar canopies can reduce urban heat and therefore help to reduce dangerous heat waves. This is especially the case when canopies are sited over impervious surfaces that retain large amounts of heat.

5. **Environmental Justice Implications**
   When sited thoughtfully, solar canopies can ameliorate current inequitable conditions by converting impervious surfaces into more beneficial uses for local communities. Solar canopies that follow shared ownership models can be more accessible than installations that benefit property owners only.

6. **Reduced Energy Costs**
   With current economic market projections solar power, and canopies specifically will save consumers money on their electricity use. This can be supplemented with government-backed incentive programs.

7. **Protection from Elements**
   Solar carports can protect cars and paved surfaces from weather that may damage them, saving money for lot owners and patrons.

Multiple policy mechanisms can be implemented to support solar canopies in Connecticut. Policies have been passed in the neighboring states of Rhode Island, Massachusetts, and New York. If passed in Connecticut these policies would enable expanded solar canopy adoption by public and private entities and support a transition away from centralized energy production via fossil fuels.

Policy Recommendations

1. **Create Adder Incentives for Solar Canopies and Related Infrastructure**
   Adder incentives can support specific types of renewable energy production such as solar canopies. This added incentive would offset costs and could encourage solar canopies, battery storage, or other types of systems. Rhode Island and Massachusetts both have solar canopy adders of $0.06 per kWh produced.

2. **Expand Virtual Net Metering Eligibility**
   Virtual net metering is currently limited to a $10 million cap on the total amount of electricity produced statewide that is eligible for the program. States such as Massachusetts have greatly expanded their cap in recent years, and Connecticut should follow suit. Additionally, virtual net metering should be expanded to include individual systems with larger capacities.

3. **Support Equitable and Modern Grid**
   PURA is assessing proposals to update policies related to Connecticut's electric grid. Policies that support distributed energy systems (DERs), including solar canopies should be prioritized. These include decreasing the cost of interconnecting with the grid, facilitating connection of DERs, and incorporating solar canopies into regional plans.

4. **Zoning and Local Ordinances**
   Explicitly defining and mentioning solar canopies in local ordinances and zoning codes increases the likelihood that they will be installed. Additionally, measures can be incorporated to enable solar canopies. Examples that have been implemented include allowing solar canopies to exceed height restrictions and making clear standards that differentiate requirements for rooftop solar versus solar canopies.

This study concludes that locally sited solar canopies can generate a significant amount of energy in the state of Connecticut and that state-level policies would enable a more effective renewable energy transition. Incorporating solar canopies into key statewide plans such as the Integrated Resources Plan would allow Connecticut to avoid overreliance on large-scale production facilities that compete for space with vital natural resources. The community economic benefits of solar canopies are also abundant and need to be taken into consideration when deciding how to support this type of renewable energy.

For further information on solar canopies and an extended report please visit https://pacecleanenergy.org/solar-canopies.