Sharing Solar Benefits

Reaching Households in Underserved Communities of Color in Connecticut

Executive Summary

The Connecticut Green Bank's (Green Bank's) low-to-moderate income (LMI) focused solar PV programs have had a significant impact on solar penetration in Connecticut's historically underserved and under-resourced communities. Solar PV adoption in LMI census tracts is now higher than solar penetration in upper income census tracts relative to the distribution of owner-occupied homes. However, recent national studies have shown that there is widespread inequity in the deployment of residential rooftop solar in the U.S. when considering race and ethnicity, and not income alone.[1] In February 2019, the Green Bank conducted an analysis of the distribution of the Residential Solar Investment Program (RSIP) fleet to determine whether or not the program has been successful in reaching racial and ethnic minorities in addition to low-income households.

The analysis shows that the RSIP program has been effective at reaching communities of color, and in some instances penetration in communities of color outperforms penetration in White neighborhoods.

Background

The Connecticut Green Bank was established through Public Act 11-80 in 2011. In 2012, the Green Bank launched the Residential Solar Investment Program (RSIP) which provides up-front rebates and performance-based incentives to owner-occupied residential solar PV installations through a declining incentive block model. Two years after launching the RSIP, Connecticut experienced huge growth in its residential solar market, expanding from 16 megawatts (MW) approved in 2012-2013, to 33 MW in 2014 alone. Despite this success, only 11% of projects approved in 2014 were located in census tracts with a median income <80% of the area median income (AMI). To rectify this disparity, the Green Bank designed two opportunities to support contractors focused on low-to-moderate income solar deployment and achieve socioeconomic parity within the RSIP.

> **Key Facts:**
>
> Two significant barriers to solar adoption in Connecticut are income and homeownership.
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> LMI households and communities of color that were previously underrepresented in solar PV adoption responded favorably to measured incentives and market focus, suggesting that with the right program design, it is possible to achieve a racially and economically inclusive solar market.

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1   Sunter, D. A., Castellanos, S., & Kammen, D. M. (2019). Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity. Nature Sustainability,2(1), 71-76. doi:10.1038/s41893-018-0204-z https://www.nature.com/articles/s41893-018-0204-z

In 2015, the Green Bank established a unique low-to-moderate income performance-based incentive (LMI PBI) within the RSIP. The LMI PBI incentive is greater than the market rate PBI and is only available to third-party owned solar PV installations serving LMI households. In 2015, the Green Bank also opened an RFP inviting solar financing proposals that would drive deployment in low-to-moderate income communities. As a result of this RFP, the Green Bank also established the Solar for All partnership with PosiGen – a solar provider focused on the LMI market, to help expand solar and energy efficiency deployment in underserved communities. Since launching these programs in 2015, solar adoption in low-to-moderate income communities increased by 187% (see Tables 1 and 2).[2]
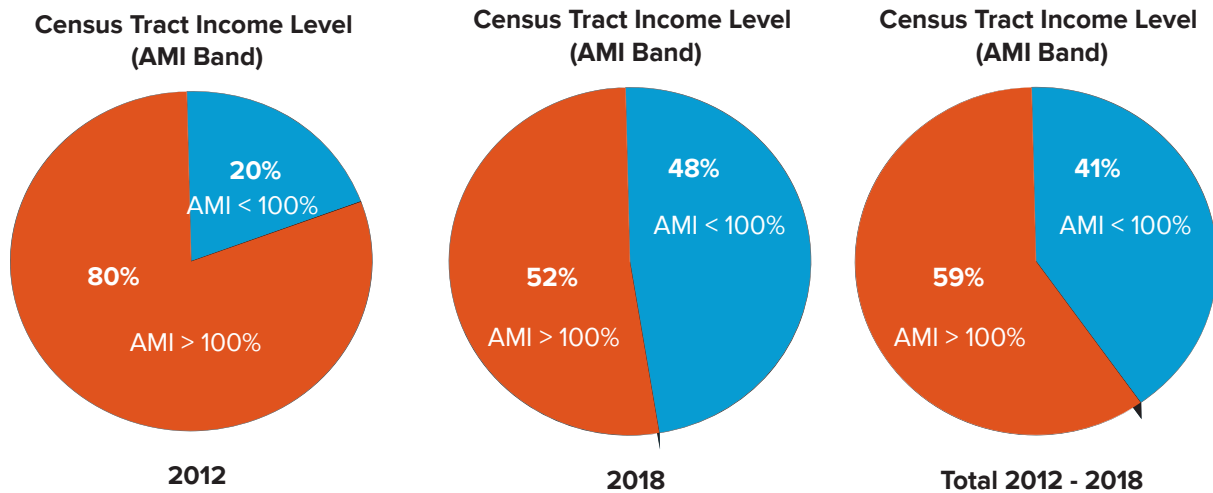

Census Tract Income Level (AMI Band)

20% AMI < 100%
80% AMI > 100%

2012

48% AMI < 100%
52% AMI > 100%

2018

41% AMI < 100%
59% AMI > 100%

Total 2012 - 2018

Table 1 RSIP Projects by AMI Band and Calendar Year Approved (2012-2018)[3]

Census Tract Income Level (AMI Band)	2012	2013	2014	2015	2016	2017	2018	Grand Total
<60%	17	36	135	353	649	604	839	2,633
60%-80%	30	100	339	780	886	707	1,116	3,958
80%-100%	107	232	810	1,422	1,128	877	1,361	5,937
100%-120%	155	370	1,028	1,763	1,223	904	1,476	6,919
>120%	462	726	2,152	2,674	1,772	1,421	2,129	11,336
Grand Total	771	1,464	4,464	6,992	5,658	4,513	6,921	30,783

2   Total RSIP deployment in census tracts <100% AMI was 4,361 at the end of calendar year 2015, and rose to 12,527 at the end of calendar year 2018 representing 187% growth. Total RSIP deployment in census tracts <80% AMI was 1,790 at the end of calendar year 2015 and rose to 6,548 by the end of calendar year 2018 representing 266% growth.
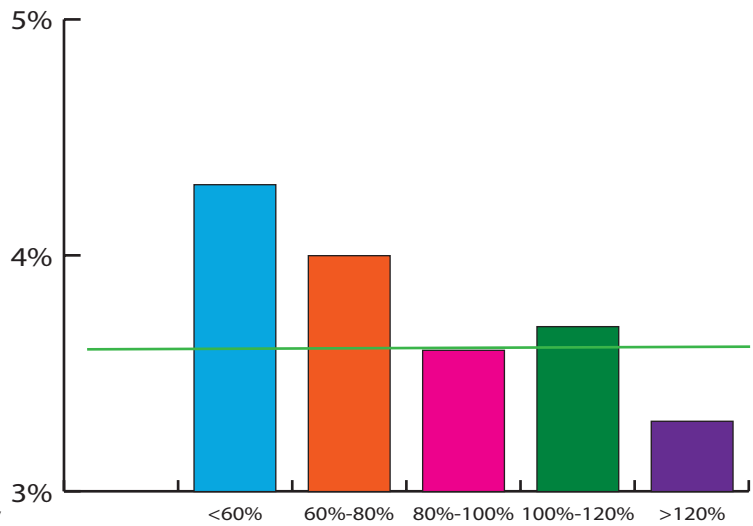3   RSIP data through 12/31/2018

Table 2 RSIP Distribution as a Percent of Owner-Occupied Homes by Income Band (2012-2018)[4]

Census Tract Income Level (AMI Band)	# Projects	Total Owner-Occupied 1-4 Unit Homes	Percent of Homes with Solar
<60%	2,633	60,769	4.3%
60%-80%	3,958	99,220	4.0%
80%-100%	5,937	165,331	3.6%
100%-120%	6,919	187,463	3.7%
>120%	11,336	345,311	3.3%
Grand Total	**30,783**	**858,094**	**3.6%**

Analysis One – RSIP Penetration in Communities of Color

To analyze RSIP penetration in communities of color, data from the 2016 U.S. Census was used to categorize each census tract in Connecticut as "Majority Hispanic," "Majority Black," "Majority White," or "No Majority Race" based on how the population identified in that year. Census tracts were categorized as having a majority race if more than 50% of the population in that census tract identified as Hispanic, Black or White. A no majority census tract indicates that there was no single dominant race or ethnic group in that census tract. 74.4% of Connecticut's population lives in a predominantly White census tract, 7.8% live in a majority Hispanic census tract and 3.1% live in a majority Black census tract. 14.7% of the population lives in a census tract with no dominant race (see Table 3).

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4   RSIP data through 12/31/2018

Table 3 Connecticut Census Tracts and Population by Race/Ethnicity

	Number of Census Tracts	Total Population	Percent of Population
Majority Hispanic	51	280,795	7.8%
Majority Black	24	111,390	3.1%
Majority White	558	2,669,635	74.4%
No Majority Race	200	526,750	14.7%
Grand Total	**833**	**3,588,570**	**100%**

Because the RSIP program is limited to owner-occupied households the analysis also looked at the distribution of owner-occupied households in each census tract category. 85% of owner-occupied households in Connecticut are located in majority White census tracts, while less than 6% of owner-occupied households are located in majority Hispanic or Black census tracts (see Table 4).

Table 4 Owner-Occupied 1-4 Unit Homes by Race/Ethnicity of Census Tract

	Number of Owner-Occupied 1-4 Unit Homes	Percent of all Owner-Occupied 1-4 Unit Homes
Majority Hispanic	31,152	3.6%
Majority Black	18,163	2.1%
Majority White	731,901	85.3%
No Majority Race	76,878	9.0%
Grand Total	**858,094**	**100%**

Comparing the distribution in the RSIP to the distribution of owner-occupied homes by race/ethnicity reveals that the RSIP is slightly overrepresented in these tracts. 4.1% of RSIP projects compared to 3.6% owner-occupied households are located in majority Hispanic census tracts and 3.8% of RSIP projects are in census tracts that identified as majority Black compared to just 2.1% of owner-occupied households. The RSIP is roughly on par with the distribution of owner-occupied housing in no majority tracts, which contain 10.3% of projects vs 9% of owner-occupied homes respectively (see Table 5).

Table 5 Distribution of RSIP Projects Compared to Owner-Occupied Households by Race/Ethnicity

	Percent of 1-4 Unit Owner-Occupied Homes	Percent of RSIP Projects
Majority Hispanic	3.6%	4.1%
Majority Black	2.1%	3.8%
Majority White	85.3%	81.8%
No Majority Race	9.0%	10.3%
Grand Total	**100.0%**	**100%**

In addition to owner-occupancy, the analysis also considered income. The majority of owner-occupied homes in predominantly majority Black and Hispanic census tracts in the state are located in census tracts with a median income <80% of the area median. The majority of owner-occupied homes in upper income census tracts are majority White census tracts, although a small portion (3.9%) of upper income homes are in No Majority Race census tracts (see Table 6).
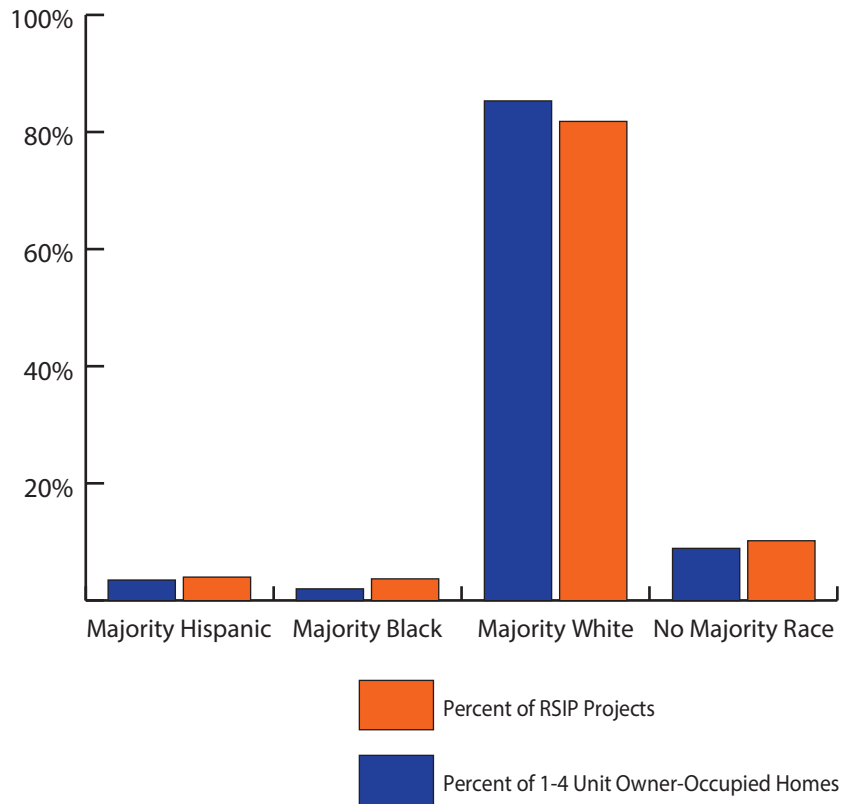
Table 6 Distribution of Owner-Occupied Homes by Race/Ethnicity and Income

Census Tract Income Level (AMI Band)	Majority Hispanic		Majority Black		Majority White		No Majority Race	
	Number of OO Homes	Percent of OO Homes	Number of OO Homes	Percent of OO Homes	Number of OO Homes	Percent of OO Homes	Number of OO Homes	Percent of OO Homes
<60%	18,423	30.3%	7,800	12.8%	11,454	18.8%	23,092	38.0%
60%-80%	10,757	10.8%	5,647	5.7%	62,233	62.7%	20,583	20.7%
80%-100%	1,972	1.2%	4,716	2.9%	148,294	89.7%	10,349	6.3%
100%-120%	-	--	-	--	178,030	95.0%	9,433	5.0%
>120%	-	--	-	--	331,890	96.1%	13,421	3.9%
Grand Total	**31,152**	**3.6%**	**18,163**	**2.1%**	**731,901**	**85.3%**	**76,878**	**9.0%**

When comparing the distribution of the RSIP portfolio to the distribution of owner-occupied homes in communities of color by income band, we see that the RSIP again mirrors or is overrepresented when compared to majority White tracts. In the <60% AMI band the percent of RSIP projects in this income band is slightly below par compared to the number of owner-occupied homes in majority Hispanic neighborhoods (30.2% of homes vs 24.9% of projects), on par with the number of homes in no majority census tracts (38% of homes and projects) and beyond parity with respect to the number of owner-occupied homes in majority Black census tracts (12.8% of homes vs 22.4% of projects). In addition, in the <60% AMI band, the percent of RSIP projects is slightly below par compared to the number of owner-occupied homes in majority White neighborhoods (18.8% of homes vs 14.58% of RSIP projects), while there is parity in the No Majority Race census tracts. The RSIP is overrepresented in both the Black and Hispanic categories in the 60-80% and 80-100% AMI bands, while it is underrepresented in majority White census tracts for the 60-80% AMI band and roughly on par for the 80-100% band. In income bands of 100% and higher, RSIP is roughly on par with the number of owner-occupied homes in majority White census tracts. RSIP deployment versus % of owner-occupied homes is roughly at or above parity in all AMI bands for no majority race census tracts (see Table 7).

Table 7 Owner-Occupied Housing and RSIP Distribution by Race/Ethnicity and Income

Census Tract Income Level (AMI Band)	Majority Hispanic		Majority Black		Majority White		No Majority Race	
	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP
<60%	30.3%	24.91%	12.8%	22.41%	18.8%	14.58%	38.0%	38.09%
60%-80%	10.8%	13.04%	5.7%	7.68%	62.7%	56.04%	20.7%	23.24%
80%-100%	1.2%	1.57%	2.9%	4.48%	89.7%	87.94%	6.3%	6.01%
100%-120%	--	--	--	--	95.0%	95.04%	5.0%	4.96%
>120%	--	--	--	--	96.1%	95.14%	3.9%	4.86%
Grand Total	3.6%	4.11%	2.1%	3.77%	85.3%	81.81%	9.0%	10.31%

Lastly, when comparing installation rates per owner-occupied home by race/ethnicity we see that the RSIP has been successful in reaching communities of color. On an installation per owner-occupied home basis, there are 86% more installations in majority Black census tracts than majority White census tracts, 18% more installations in majority Hispanic census tracts and 20% more installations in No Majority Race census tracts than majority White census tracts (see Table 8).

Table 8 RSIP Installations Per Capita Comparison

	Number of Owner-Occupied 1-4 Unit Homes	Number of RSIP Installations	Number of Installations per Owner-Occupied Home (OOH)	Percent More/Less than the Number of RSIP Installations per OOH in majority-White tracts
Majority Hispanic	31,152	1,265	0.0406	18%
Majority Black	18,163	1,160	0.0639	86%
Majority White	731,901	25,184	0.0344	0%
No Majority Race	76,878	3,174	0.0413	20%
Grand Total	858,094	30,783	0.0359	4%

Analysis Two – Solar for All Penetration in Communities of Color

In addition to looking at the entire RSIP, the analysis was repeated using only data from the Solar for All program's (PosiGen's) solar installations. As the primary Green Bank-supported driver of solar adoption in LMI communities, the goal of this analysis was to determine whether the Solar for All program and its implementer, PosiGen, had been more successful at reaching communities of color than the RSIP overall. The results show that PosiGen has been more successful in reaching communities of color than the RSIP portfolio – 10-16% of PosiGen's projects are in majority Hispanic or Black census tracts and over 25% of their projects are in No Majority census tracts. On a per owner-occupied home basis, PosiGen has 1,275% more projects per home in majority Black census tracts than majority White census tracts, 427% more projects in No Majority tracts than majority White census tracts and 408% more projects in majority Hispanic tracts (see Tables 9-11).

Table 9 Owner-Occupied Housing and Solar for All Project Distribution by Race/Ethnicity and Income

Income Band (% of AMI)	Majority Hispanic		Majority Black		Majority White		No Majority Race	
	% of OO Homes	% of Projects	% of OO Homes	% of Projects	% of OO Homes	% of Projects	% of OO Homes	% of Projects
<60%	30.3%	16.98%	12.8%	31.96%	18.8%	7.56%	38.0%	43.50%
60%-80%	10.8%	16.56%	5.7%	14.13%	62.7%	44.15%	20.7%	25.17%
80%-100%	1.2%	1.14%	2.9%	6.27%	89.7%	84.62%	6.3%	7.98%
100%-120%	--	--	--	--	95.0%	89.71%	5.0%	10.29%
>120%	--	--	--	--	96.1%	85.00%	3.9%	15.00%
Grand Total	3.6%	10.24%	2.1%	16.17%	85.3%	47.38%	9.0%	26.21%

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Table 10 Solar for All Installations Per Capita Comparison

	Number of Owner-Occupied 1-4 Unit Homes	Number of Solar for All Installations	Number of Installations per Owner-Occupied Home (OOH)	Percent More/Less than the Number of Solar for All Installations per OOH in White-majority tracts
Majority Hispanic	31,152	207	0.0066	408%
Majority Black	18,163	327	0.0180	1275%
Majority White	731,901	958	0.0013	0%
No Majority Race	76,878	530	0.0069	427%
Grand Total	858,094	2,022	0.0024	80%

Table 11 Distribution of RSIP Portfolio Compared to Solar for All Portfolio by Race/Ethnicity

	Number of RSIP Installations	Percent of RSIP Installations	Number of Solar for All Installations	Percent of Solar for All Installations
Majority Hispanic	1,265	4.1%	207	10.2%
Majority Black	1,160	3.8%	327	16.2%
Majority White	25,184	81.8%	958	47.4%
No Majority Race	3,174	10.3%	530	26.2%
Grand Total	30,783	100%	2,022	100%

Conclusion

This analysis shows that the RSIP has been effective at reaching homeowners in communities of color despite a clear correlation between income, race and ethnicity and homeownership in Connecticut. 85% of 1-4 unit owner-occupied homes in Connecticut are located in majority White census tracts, and nearly 70% of these homes are located in census tracts with median income greater than 100% of the area median income. Despite these institutional barriers to homeownership, and as a by-product, solar PV adoption, data from the Connecticut Green Bank's Residential Solar Investment Program (RSIP) demonstrates that states can achieve "solar parity" by equitably distributing resources and access across all racial, ethnic, and socioeconomic groups.

LMI communities and communities of color that were previously underserved in solar PV adoption responded favorably to measured incentives and market focus. The experience in Connecticut bucks the trend of recent national studies that have shown a widespread inequality in the deployment of rooftop solar in the U.S. when considering race and ethnicity. Despite this success, there is still much work to be done to ensure equitable access to clean energy in the state. Less than 5% of owner-occupied households across all racial, ethnic and income groups have been able to participate in the state's primary residential solar program thus far, and many more renters could be reached through shared clean energy programs. Continued and improved opportunities for participation across all racial, ethnic and income groups could play a major role in widespread support for a transition to more renewable energy to not only improve our environment but ensure inclusive prosperity in the growing green economy. As the RSIP approaches its statutory target of 300 MW, the Connecticut Green Bank would like to underscore that future programs and policies must address LMI communities of color and strongly recommends that these programs and policies include mechanisms that facilitate the continued participation of historically underserved households.

Acknowledgements