

Overview

The State of Connecticut Department of Energy and Environmental Protection, Connecticut Energy Efficiency Board, Connecticut Green Bank, Eversource Energy, and The United Illuminating Company (UI) were joint partners in the U.S. Department of Energy Clean Energy for Low-Income Communities Accelerator (CELICA), which focused on advancing energy affordability for low-income households and communities across the country.

Based on information provided by CELICA partners in Connecticut, this case study examines how the state scaled up energy efficiency and renewable energy programs for low-income households. The state's goal is to weatherize 80% of homes at all income levels by 2030 and ensure equitable access to energy efficiency and solar energy for all households. Through a combination of energy efficiency and renewable energy programs, the state aims to bring low-income household energy burden — the percent of income spent on energy bills — on average down to 6%, which is more in line with higher income households¹ and closer to affordable according to the Home Energy Affordability Gap model² used by the state³.

A preliminary program analysis done by Connecticut partners in 2012 revealed that low-income homeowners were not equitably participating in energy efficiency and renewable energy programs. This gap and subsequent 2014 analysis and memo⁴ became the impetus for the state's Solar for All program, which provides low-income single-family owner-occupied households with guaranteed energy bill savings and financing on a package of energy efficiency and rooftop solar improvements. This program offers the option of an energy savings agreement for deeper savings opportunities on top of the utility-funded energy efficiency program, combined with a rooftop solar photovoltaics (PV) lease provided by PosiGen, a private company that leverages private financing. The utility ratepayer-funded energy efficiency program serves 20,000 low-income households each year, helping the state toward its goal of weatherizing 80% of homes at all income levels, including low income, by 2030. As of 2017, households of all incomes have nearly equivalent rates of rooftop solar. The state is working to maintain parity in rooftop solar as installations increase.⁵

The state developed financing products and new funding initiatives to ensure equitable access for households at all income levels needing home repairs or mitigation of health and safety issues prior to receiving energy services. These initiatives removed barriers to low-income single-family homeowners accessing energy efficiency and renewable energy. This case study provides more details on how these

¹ Colton, R. Home Energy Affordability in Connecticut: The Affordability Gap (2016). Prepared for: Operation Fuel: Retrieved from <http://www.operationfuel.org/wp-content/uploads/2016/12/2016-ConnecticutHEAG-Final.pdf>

² Home Energy Affordability Gap Methodology, Retrieved from http://www.homeenergyaffordabilitygap.com/01_whatIsHEAG2.html

³ 2018 Connecticut Comprehensive Energy Strategy, http://www.ct.gov/deep/lib/deep/energy/ces/buildings_sector.pdf

⁴ CT Green Bank Memo on "Market Analysis of Residential Solar Deployment and Housing Characteristics of CT's Low Income Sector," Retrieved from https://www.ctgreenbank.com/wp-content/uploads/2015/12/CGB-BOD-Memo_Low-Income-Solar-and-Housing-Market-Analysis_v20141212.pdf

⁵ Barbose, GL, Darghouth, NR, Hoen, B., & Wiser, RH. (2018). Income Trends of Residential PV Adopters: An analysis of household-level income estimates. *Lawrence Berkeley National Laboratory*. LBNL Report #: LBNL-2001146. Retrieved from <https://escholarship.org/uc/item/7p21s3nz>

programs are combined to achieve the state’s goals for scaling up their efforts and bringing the benefits of energy efficiency and renewable energy to low-income households.

Key Partnerships

The Connecticut Department of Energy and Environmental Protection (DEEP) and the Connecticut Green Bank share a commitment to the equitable distribution of energy improvement resources by income, geography, and other factors including access by racial and ethnic minorities⁶. State law directs DEEP to ensure low-income households have equitable access to clean and efficient energy programs,⁷ specifically by assessing the equitable distribution of public energy efficiency funds and public renewable energy funds across all populations. DEEP’s strategy for low-income energy efficiency is outlined in its Comprehensive Energy Strategy.⁸ To achieve its goals, DEEP works closely with the Connecticut Green Bank and utilities in the state to design and implement programs for low-income households. DEEP manages the state’s DOE Weatherization Assistance Program (WAP) grant and participates in Connecticut’s Low-Income Energy Advisory Board (LIEAB),⁹ which promotes cross-sector partnerships between utilities, social service agencies, municipalities, and other stakeholders.

After early successes with residential solar financing products for market-rate customers, the Green Bank shifted its focus in 2014 to understanding the needs of low-income customers, including energy efficiency and health and safety challenges. This ultimately led to developing programs that focus on reducing low-income energy burden.

The other key partners include the two major utilities in Connecticut (Eversource and UI) that provide funding for low-income energy programs. DEEP has regulatory oversight of these utilities, allowing for relatively clear communication and collaboration.

Spotlight: Using data to drive planning

High energy burden in Connecticut is a particularly pervasive problem at the intersection of high energy costs and low incomes. As of November 2018, Connecticut ranks as the fifth highest and tenth highest among all U.S. states in terms of residential electricity and gas prices, respectively.¹⁰ Around 322,000 households, or 25% of the state’s 1.3 million households, are considered low-income, meaning that they earn 60% or less than the state median income. The table below shows three energy programs with different eligibility thresholds and the number of households that qualify for each. The “Energy Affordability Gap,” the dollar amount by which households’ energy bills exceed affordability (defined by Connecticut as more than 6% of annual income), ranges from \$1,250 to \$2,500 a year per low-income household.¹¹

⁶ CT Green Bank. Sharing Solar Benefits: Reaching Households in Underserved Communities of Color in Connecticut (2019). <https://www.ctgreenbank.com/sharing-solar-benefits-in-communities-of-color/>

⁷ CT Gen Stat § 16-245ee (2012)

⁸ Comprehensive Energy Strategy: CT General Statutes Section 16a-3d. Connecticut Department of Energy and Environmental Protection. February 8, 2018. Retrieved from http://www.ct.gov/deep/lib/deep/energy/ces/2018_comprehensive_energy_strategy.pdf

⁹ Low-Income Energy Advisory Board. Connecticut Department of Energy and Environmental Protection. Retrieved from <http://www.ct.gov/deep/cwp/view.asp?a=4120&Q=506660>

¹⁰ U.S. Energy Information Administration. Rankings: Average Retail Price of Electricity to Residential Sector, November 2018; Rankings: Natural Gas Residential Prices, November 2018. Retrieved from <https://www.eia.gov/state/rankings/?sid=CT#/series/31>

¹¹ Colton, R. Home Energy Affordability in Connecticut: The Affordability Gap (2016). Prepared for: Operation Fuel: Retrieved from <http://www.operationfuel.org/wp-content/uploads/2016/12/2016-ConnecticutHEAG-Final.pdf>

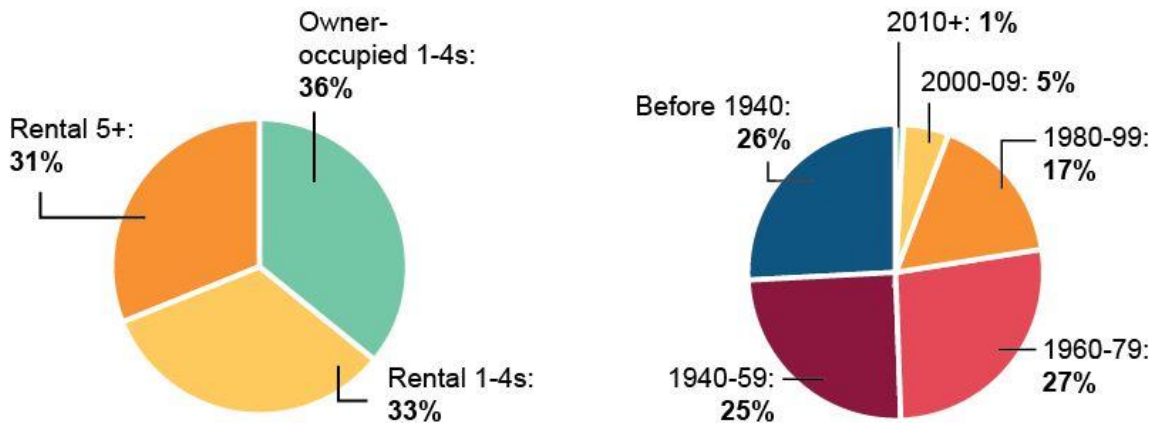
Table 1. Connecticut Low-Income Energy Efficiency and Renewable Energy Programs

Program Name	Income Eligibility	Qualified Households (%)
Home Energy Solutions-Income Eligible program (utility-administered program) Connecticut Weatherization Assistance Program	<60% State Median Income	322,000 (24%)
Solar for All program (branding term for use of Residential Solar Investment Program, low- and moderate-income performance-based incentive)	<100% Area Median Income	681,000 (50%)

To assess data on housing types, fuel sources, and housing vintage for low-income households, partners in Connecticut used the U.S. Department of Energy (DOE) Low-Income Energy Affordability Data (LEAD) Tool. The LEAD Tool contains data on energy burden and housing for low-income households and can be used for stakeholder engagement and energy program planning. As shown in Figure 1, single-family owner-occupied homes and multifamily buildings represent nearly two-thirds of the low-income housing in Connecticut. Therefore, the Green Bank decided to partner with PosiGen on programs like Solar for All for low-income single-family homeowners, and with the Connecticut Housing Finance Authority, Connecticut Department of Housing, DEEP, the MacArthur Foundation, and local Community Development Financial Institutions on financing for affordable multifamily building energy retrofits.

FIGURE 1

Low-Income Housing Units by Housing Type (left) and Vintage (right)



SOURCE: Low-income Energy Affordability Data (LEAD) tool, U.S. Department of Energy

Connecticut also used available data from the DOE’s LEAD Tool to determine that age of low-income housing was another issue to be considered in their programming and that could impede progress toward achieving their goals. As represented in Figure 1, the LEAD Tool included data on the vintage of the

housing stock in Connecticut. 78% of homes with low-income occupants were built in 1979 or earlier, whereas 67% of higher income households lived in such housing. Low-income households living in older housing units experience a combination of higher fuel costs, general home inefficiencies (low level of insulation, air leakage, etc.), and deferred maintenance and related potential health and safety issues that must be addressed before energy efficiency improvements can be made. The state's utility ratepayer-funded Home Energy Solutions-Income Eligible (HES-IE) program estimates that between 15% and 35% of the housing units included its program are unable to receive energy efficiency upgrades due to a health or safety issue. Given these trends, partners in Connecticut believe health and safety is an emerging area for which additional data and pilot initiatives may help inform the state's strategy and leverage additional funding.

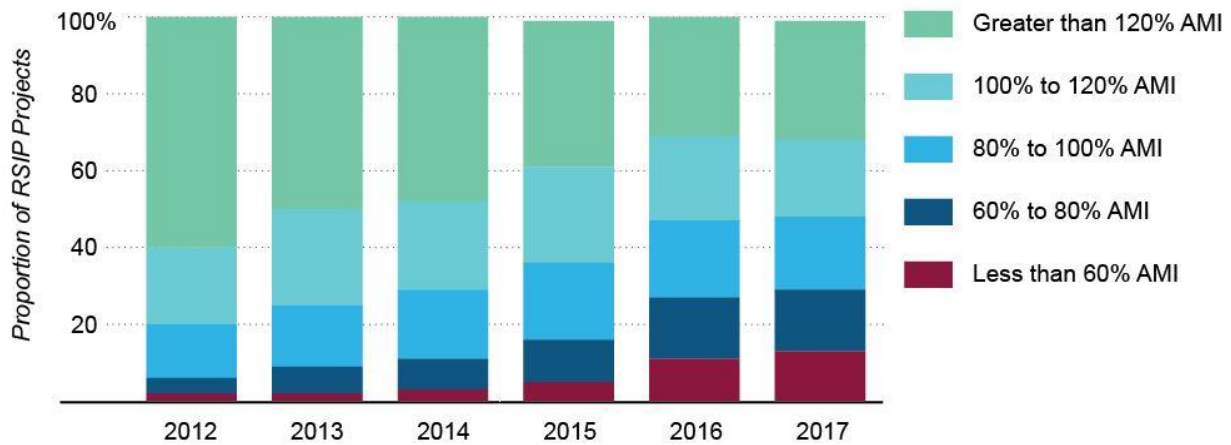
Outcomes Achieved: Low-Income Energy Efficiency and Renewable Energy Programs in Connecticut

DEEP and the Connecticut Green Bank cite the following progress they and their partners have made in addressing each of the state's specific low-income energy objectives.

Reduced the energy affordability gap

- The HES-IE program serves, on average, 20,000 low-income homes each year, resulting in expected (deemed) energy savings of \$5.72 million in 2018. This helps households reduce their energy costs by an average of 24%.
- The Solar for All program and campaign, which integrates the HES-IE services and promotes an additional energy efficiency and solar lease "bundle" offered by the Green Bank and partners such as PosiGen, has deployed energy efficiency in over 2,300 homes served with solar PV installations for a total of 15 Megawatts (MW) of rooftop solar since 2015. About 60% of projects are in low-income census tracts, defined as more than half of households earning less than 80% Area Median Income (AMI). Of these low-income solar PV projects, 97% received energy efficiency improvements at no cost with support from utility administered energy efficiency programs. Around 63% of participating household projects receive the low- and moderate-income performance-based incentive through the Residential Solar Investment Program (RSIP) from the Green Bank, which is noted in Table 1. The program and its primary partner, PosiGen, guarantee first-year savings based on the system size and other characteristics and no escalation of power purchase agreement costs in subsequent years.
- Connecticut is one of only four states where the median income of households with rooftop solar was lower than the overall state median income.¹² Rooftop solar PV penetration has achieved 4% overall penetration, or 32,000 homes. As shown in Figure 2, the RSIP has helped reduce upfront costs of solar energy to make it more accessible for low- and moderate-income households, with 48% of RSIP projects in 2017 occurring in census tracts with incomes less than 100% of AMI (up from 17% in 2012).

¹² Barbose, GL, Darghouth, NR, Hoen, B., & Wiser, RH. (2018). Income Trends of Residential PV Adopters: An analysis of household-level income estimates. *Lawrence Berkeley National Laboratory*. LBNL Report #: LBNL-2001146. Retrieved from <https://escholarship.org/uc/item/7p21s3nz>

FIGURE 2**Distribution of RSIP Approved Solar PV Projects by Census Tract Median Income, 2012-2018**

SOURCE: Connecticut Green Bank

Expanded financing for energy efficiency and solar for low-income and low-credit customers

- The Solar for All program has demonstrated a 5:1 leverage ratio of Green Bank to private investor funds.
- Due to the strong portfolio performance, the Green Bank broadened the criteria for Smart-E Loans to offer the product to “credit-challenged” customers and extended the loan terms to 15 to 20 years. Since launching in January 2017 through the end of 2018, 1,374 credit-challenged customer projects were approved, 224 of which (or 16%) were in low-income census tracts. According to data provided by the Green Bank, and analysis provided by Elevate Energy, the default and delinquency rates for low-income customers have been statistically equivalent to the rates for non-low-income customers.

Addressed health and safety barriers to energy improvements

- Up to 25% of a Smart-E Loan can be used for health and safety improvements. For 2017 to 2018, 24 credit-challenged customer loans addressed a health or safety issue.
- There is a \$1.5 million revolving health and safety loan fund for multifamily projects in the state.

Lessons Learned from Efforts to Scale Up Low-Income Energy Programs in Connecticut

Examine data early and on an ongoing basis.

Data and metrics were used early in Connecticut to establish a roadmap that is grounded in the landscape in which programs operate. Data analysis has continually influenced low-income program design and implementation. The Green Bank’s decision to launch the Solar for All program was based on finding that a large portion of the low-income population lived in single-family homes and that income and credit score were not necessarily correlated for low-income households. This program has partnered with PosiGen, a private provider, to offer leased (third party-owned) rooftop solar PV systems combined with efficiency-focused Energy Savings Agreements (ESAs) that guarantee first-year energy savings with no upfront costs and a fixed (non-escalating) lease to participating low-income households. Alternative underwriting (i.e., bill

payment history) is also used to remove access barriers for some households. The data showing inequitable access to technologies inspired the State of Connecticut to encourage its partners to identify ways to expand the number of low-income households participating in their energy efficiency and renewable energy programs. Along the process, partners recognized that good outreach and community engagement can be a challenge to even the best-designed product or program.

Address health and safety barriers.

Addressing health and safety barriers was a high priority for Connecticut. States or municipalities often need to collaborate with many different parties to bring together solutions for low-income communities. For example, the Clean Energy Healthy Homes Initiative was a \$1.5M program that ran from 2016-2018 and identified the prevalence and mix of different kinds of health and safety barriers that existed in participating HES-IE homes. With a limited amount of funding available to address health and safety issues related to energy efficiency installations, and in response to the need and desire to grow the available resources for health and safety related home improvements, Connecticut Green Bank is working with the state Department of Public Health and other agencies and housing and social services partners to launch the [Connecticut Green and Healthy Homes Project](#), a statewide initiative to target and reduce medical and energy costs of Medicaid recipients. Additional information on their early stage efforts on this project are featured in a separate [CELICA Issue Brief: Promising Examples of Integrated Energy Efficiency and Health Services for Low-income Households](#).

Take the long view.

Connecticut partners expressed that a low-income strategy can take a long time to bear fruit. When the Green Bank examined solar penetration rates by income range in 2014, the penetration rate for lower income households was 10 times lower than for more affluent households. They examined their program data every month, talked with their contractors and partners about meeting their goals, and engaged their board to help strategize. While they had their doubts about the ability to make substantial progress, by 2018, a national study found that Connecticut had reached income parity in rooftop solar adoption.¹³

Resources

- [Connecticut Energy Efficiency Dashboard](#)
- [Low-Income Affordability Data \(LEAD\) Tool](#), U.S. Department of Energy.
- [A Level Playing Field: New Tools and Programs for Energy Affordability](#), Better Buildings Summit, August 2018.
- [Solar for All: How Connecticut Green Bank Drives Solar and Energy Efficiency for Low-to-Moderate-Income Households](#), July 2018. Green Bank Network, Natural Resources Defense Council.
- [Scaling for Success: Clean and Efficient Energy for Low to Moderate Income Homes in Connecticut](#), Connecticut Department of Energy & Environmental Protection and Connecticut Green Bank. May 2017.
- [Market Analysis of Residential Solar Deployment and Housing Characteristics of CT's Low-income Sector](#), December 2014.
- [Role of a Green Bank – Low-Income Solar Deployment](#), December 2014.

¹³ Barbose, GL, Darghouth, NR, Hoen, B., & Wiser, RH. (2018). Income Trends of Residential PV Adopters: An analysis of household-level income estimates. *Lawrence Berkeley National Laboratory*. LBNL Report #: LBNL-2001146. Retrieved from <https://escholarship.org/uc/item/7p21s3nz>

Referenced Programs

Program or Initiative	Key Characteristics and Funding Sources
<u>Home Energy Solutions-Income Eligible (HES-IE) Program</u>	<p>What: Provides on-the-spot energy efficiency upgrades for free to income-eligible participants (with household income less than 60% of state median income) to approximately 20,000 households on average annually in recent years; the program provides the same services as Home Energy Solutions (HES), the market-rate program</p> <p>Who: Administered by utilities</p> <p>Funding: Ratepayer-funded</p> <p>Why: Low-income customers lack upfront capital to pay for audits and energy efficiency measures</p>
<u>Connecticut Weatherization Assistance Program (CTWAP)</u>	<p>What: Comprehensive weatherization for 75 to 100 low-income homes annually (household income less than 60% of state median income)</p> <p>Who: U.S. DOE grant administered by DEEP and the Community Action Agency Network</p> <p>Funding: Federal WAP grant funding plus additional Low Income Home Energy Assistance Program funds to address health and safety barriers</p> <p>Why: Federal formula and block grant funding for weatherizing low-income homes helps save energy and money</p>
<u>Residential Solar Investment Program (RSIP) Low- and Moderate-Income Performance Based Incentive</u>	<p>What: Elevated incentive (three times standard incentive offered) for third party-owned systems leased to low- and moderate-income customers</p> <p>Who: Administered by the Connecticut Green Bank</p> <p>Funding: Combination of rate-payer funding and monetization of Solar Home Renewable Energy Credits (SHRECs) to recover program administration costs</p> <p>Why: Encourage private investment in the low-income solar market through higher, stable cash flows</p>
<u>Solar for All Program</u>	<p>What: “Bundle” of rooftop solar PV lease plus optional energy efficiency savings agreement (ESA), where basic efficiency (HES or HES-IE) is conducted on all projects and 66% opt for deeper measures through the ESA, like insulation and smart thermostats; no income or credit limits and projects serving low- and moderate-income households receive a higher incentive under RSIP, with first-year savings guarantee that varies based on the size of the PV system</p> <p>Who: PosiGen and other partners act as developer and third-party owner</p> <p>Funding: Green Bank capital leveraged private dollars (5:1 ratio) to create a \$40 million fund; solar incentives provided through the RSIP</p> <p>Why: Provide the full value of federal and state incentives and reduce energy burden without the responsibility of ownership</p>

Program or Initiative	Key Characteristics and Funding Sources
<u>Smart-E Loan</u>	<p>What: Low interest unsecured loan for one- to four-unit owner-occupied homes, which can cover more than 40 energy efficiency and renewable energy measures; up to 25% of the loan can be used for health and safety upgrades; the credit-challenged version of the loan allows a minimum FICO® of 580 with a 50% DTI maximum and waives the DTI screen for FICO® scores above 680, whereas market-rate Smart-E product requires a minimum FICO® credit score of 640 and has a 45% debt-to-income (DTI) ratio maximum</p> <p>Who: Partnership between Green Bank and 12 local lenders (credit unions, community banks, and one CDFI)</p> <p>Funding: A CDFI and three credit unions offer the credit-challenged Smart-E loan; an additional six lenders offer the regular Smart-E product only</p> <p>Why: Provide a comprehensive energy loan option to households that can finance multiple measures, including health and safety</p>