



# Financing Residential Solar in Connecticut:

## Insights into Loan Programs

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June 5, 2023



# **Welcome & Agenda**

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## **Introduction**

## **Overview of the Greenhouse Gas Reduction Fund**

## **Energy Burden and Barriers to Residential Solar**

## **Electricity Rates and Levelized Cost of Energy**

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- Smart-E Loan

## **Comparison of Loan Products by Income and Race**

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# *Introduction*





Connecticut Green Bank is the nation's first state green bank. Established in 2011 as a quasi-public agency, the Green Bank uses limited public dollars to attract private capital investment and offers green solutions that help people, businesses and all of Connecticut thrive.

**Our mission is to confront climate change by increasing and accelerating investment into Connecticut's green economy to create more resilient, healthier, and equitable communities**

**Guiding this mission is our vision for  
“...a planet protected by the love of humanity.”**

## *Overview of the Greenhouse Gas Reduction Fund*



## Greenhouse Gas Reduction Fund

- **Inflation Reduction Act** – provides \$27 billion to the U.S. Environmental Protection Agency (EPA) to administer the Greenhouse Gas Reduction Fund (GGRF)
- **Implementation Framework** – EPA recently released a three-part implementation framework for the GGRF, including:
  - ❖ **National Clean Investment Fund** - \$14 billion competition that will fund 2-3 national nonprofits that will partner with private capital providers to deliver financing at scale to businesses, communities, community lenders, and others
  - ❖ **Clean Communities Investment Accelerator** - \$6 billion competition that will fund 2-7 hub nonprofits with the plans and capabilities to rapidly build the clean financing capacity of specific networks of public, quasi-public, and nonprofit community lenders to ensure that households, small businesses, schools, and community institutions in low-income and disadvantaged communities have access to financing
  - ❖ **Solar for All** - \$7 billion competition that will provide up to 60 grants to states, tribes, municipalities and nonprofits to expand the number of low-income and disadvantaged communities for investment in residential and community solar

## Solar for All Competition

- **Funding and Awards** – \$7 billion from Section 134(a)(1) of the Clean Air Act for up to 60 awards (i.e., states (including territories), Tribal governments, municipalities, and eligible entities) which must be invested in low-income and disadvantaged communities to deploy or benefit from zero-emission technologies
- **Activities** – expand existing low-income solar programs or design and deploy new Solar for All programs, including the following types of projects:
  - ❖ **Residential Rooftop** – rooftop and ground-mounted that support individual households, master-metered facilities, and/or common areas in multifamily buildings
  - ❖ **Community Solar** – solar PV producing facility or power purchasing program in which benefits flow to multiple residential customers
  - ❖ **Associated Storage** – store solar for various purposes (e.g., resilience, demand response)
  - ❖ **Enabling Upgrades** – building infrastructure to support solar deployment (e.g., roof repairs)





# Greenhouse Gas Reduction Fund



## EPA Marks Earth Week with Release of Implementation Framework

The Greenhouse Gas Reduction Fund will be implemented via three complementary grant competitions to fund projects that will combat the climate crisis and create good-paying jobs.

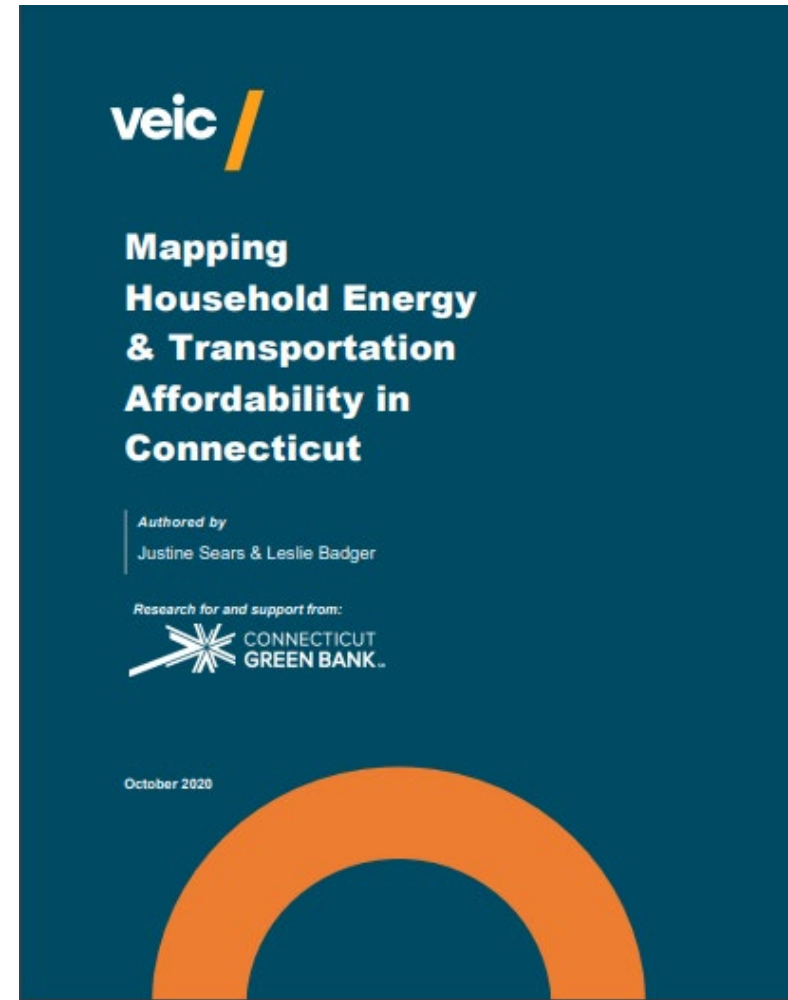


## *Energy Burden and Barriers to Residential Solar*



# Energy Burden

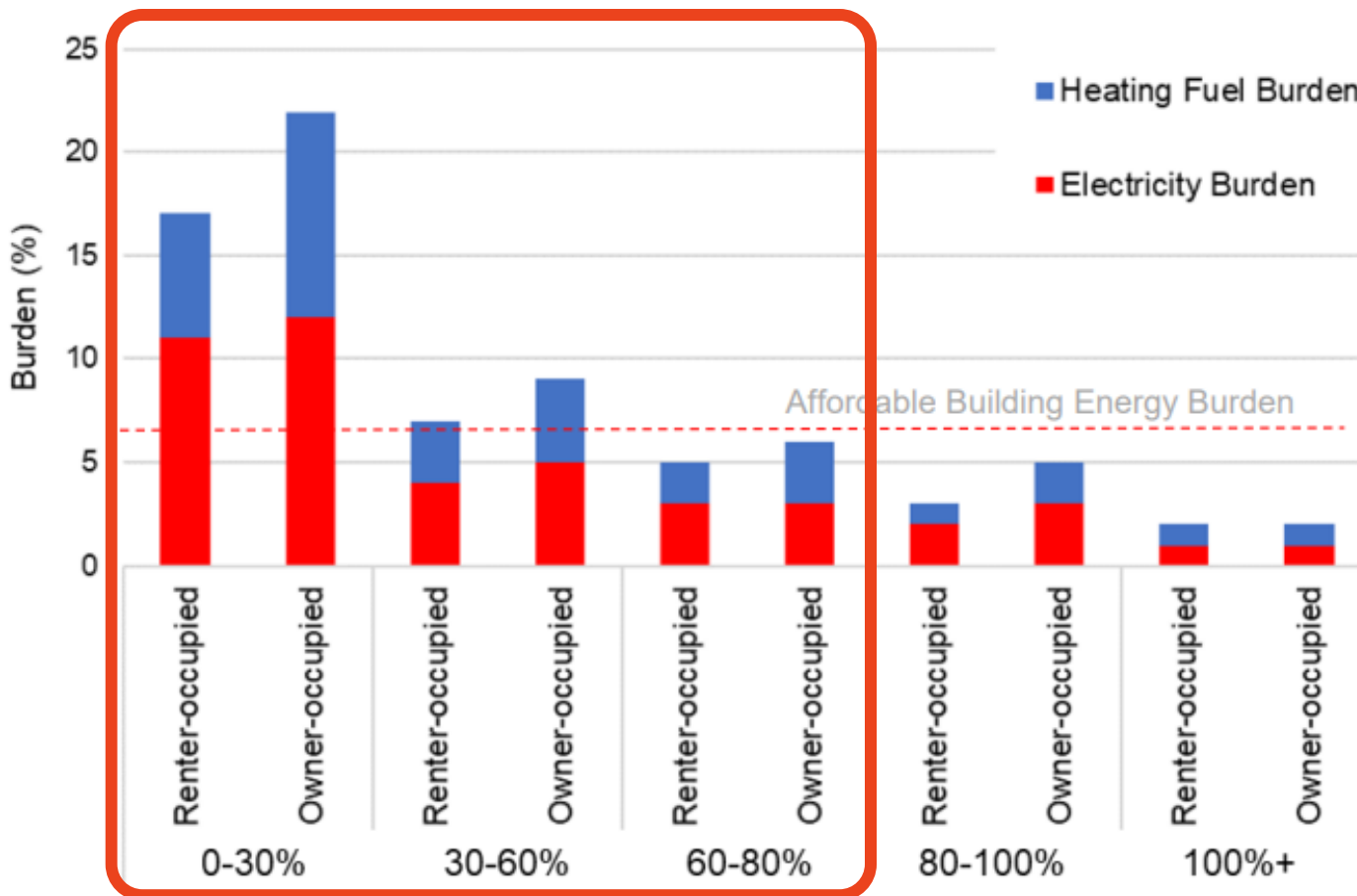
- **Energy Burden** – energy spending expressed as a percentage of household income
- **Energy Affordability Threshold** – energy burden above which is considered unaffordable
- **Energy Affordability Gap** – difference between actual home energy bills and affordable home energy bills for a specific geographic area



## REFERENCES

[Mapping Household Energy & Transportation Affordability in Connecticut by VEIC for Connecticut Green Bank \(October 2020\)](#)

# Energy Burden Income and Ownership

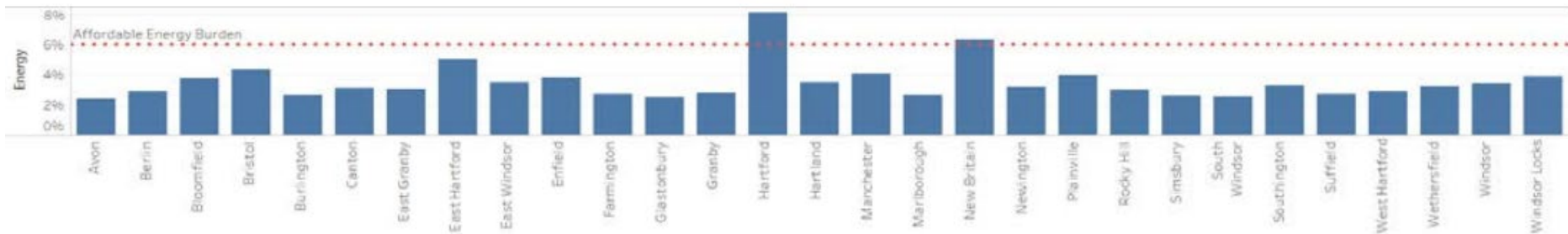
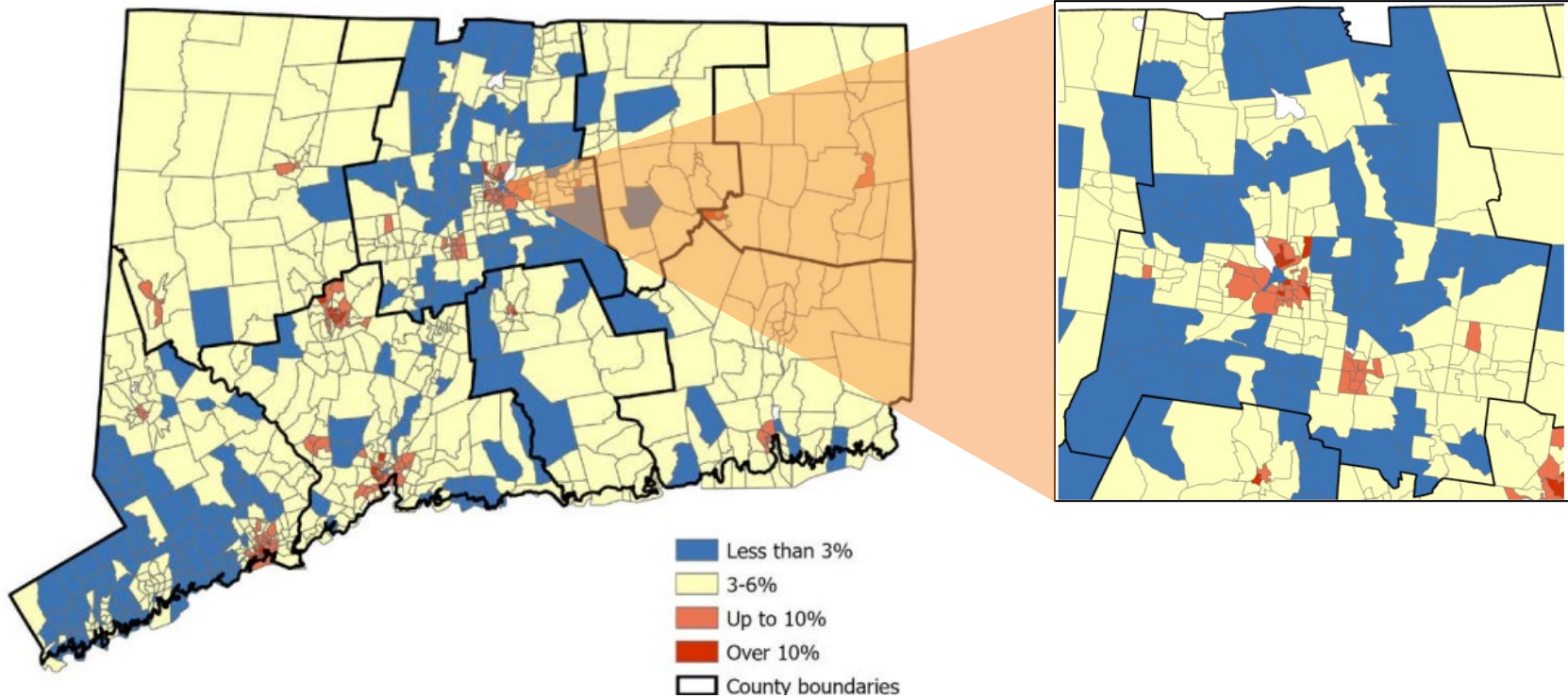


Low-income (<80% AMI), owner occupied and rental housing, experience the highest energy burden

## REFERENCES

[Mapping Household Energy & Transportation Affordability in Connecticut by VEIC for Connecticut Green Bank \(October 2020\)](#)

# Energy Burden Hartford County



## REFERENCES

[Mapping Household Energy & Transportation Affordability in Connecticut by VEIC for Connecticut Green Bank \(October 2020\)](#)

# Barriers to Residential Solar Low Income Adoption



## Affordable and Accessible Solar for All: Barriers, Solutions, and On-Site Adoption Potential

Jenny Heeter, Ashok Sekar, Emily Fekete, Monisha Shah, and Jeffrey J. Cook

*National Renewable Energy Laboratory*

NREL is a national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy  
Operated by the Alliance for Sustainable Energy, LLC

This report is available at no cost from the National Renewable Energy  
Laboratory (NREL) at [www.nrel.gov/publications](http://www.nrel.gov/publications).

Contract No. DE-AC36-08GO28308

Technical Report  
NREL/TP-6A20-80532  
September 2021

## 1. Finance and Funding

- ❖ Inability to afford an upfront payment
- ❖ Difficulty accessing low-cost financing options for low or no credit score
- ❖ Limited LMI specific incentives, credits, or financing mechanisms to bring down cost of solar and enable bill savings from day one
- ❖ LMI households without tax appetite to benefit directly from the federal investment tax credit
- ❖ And more...

## 2. Community Engagement

## 3. Policy and Regulatory

## 4. Site Suitability

## 5. Resilience and Recovery

### REFERENCES

[Affordable and Accessible Solar for All: Barriers, Solutions, and On-Site Adoption Potential \(nrel.gov\)](https://www.nrel.gov/publications/affordable-and-accessible-solar-for-all-barriers-solutions-and-on-site-adoption-potential)



## *Electricity Rates and Levelized Cost of Energy*



## Residential Electricity Rates

- **Electricity Rates** – Connecticut has among the highest electricity rates in the continental United States
  - ❖ **Deregulation** – in the late 1990's separated generation from transmission and distribution
  - ❖ **Natural Gas Power Plants** – overreliance on natural gas
  - ❖ **War in the Ukraine** – exacerbated the problem
- **Impacting Most Vulnerable** – Standard Offer generation rates increased by an additional \$0.12/kWh bringing “all-in” electricity rates from January through June of 2023 to about \$0.37/kWh

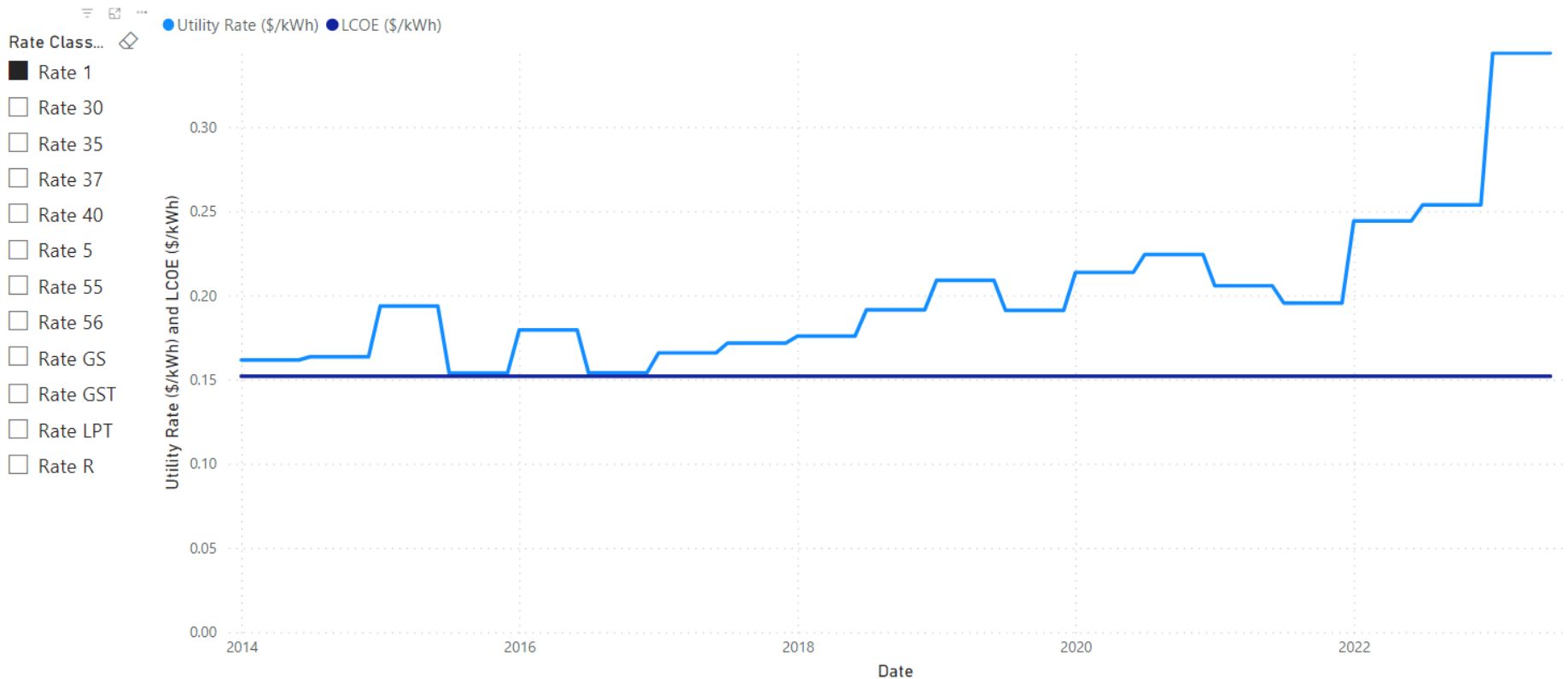
## Levelized Cost of Energy

- **LCOE**– is a measure of the cost of electricity generated from a particular source (e.g., residential solar), taking into account the initial investment costs, operating and maintenance costs, and fuel costs.
- **Formula** – Total Life Cycle Costs (\$/W) divided by Total Lifetime Energy Production (kWh/kW) – to get \$/kWh...with following influential factors:
  - ❖ **Location** – sunny areas vs. lots of trees and shading
  - ❖ **System Size** – LCOE decreases as the system size gets bigger (i.e., economies of scale)
  - ❖ **Type of Panel** – more efficient panels vs. hardware costs of panels
  - ❖ **Financing Terms** – systems financed with loans will have higher LCOE than those financed by cash
- **Available Resources** – NREL’s “Comparative Photovoltaic Levelized Cost of Energy Calculator,” as well as Google’s artificial intelligence partner Bard

### REFERENCES

NREL – <https://www.nrel.gov/solar/market-research-analysis/solar-levelized-cost.html> and [www.nrel.gov/pv/lcoe-calculator/](http://www.nrel.gov/pv/lcoe-calculator/)  
Google Bard – [www.bard.google.com](http://www.bard.google.com)

# Electricity Rates vs. LCOE



In Connecticut, **residential solar is cheaper than standard offer electricity rates**, including transmission, distribution, and other charges

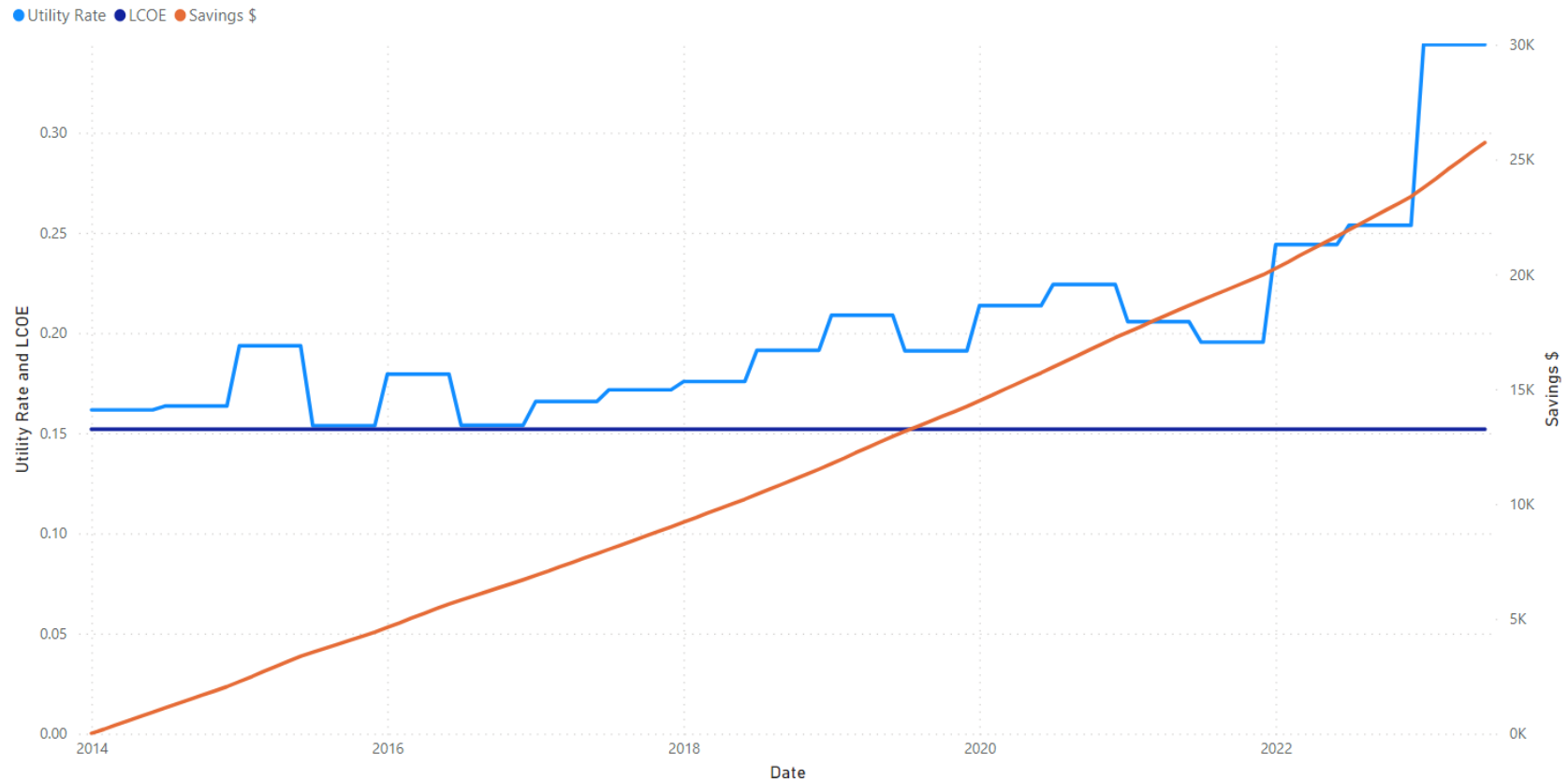
## REFERENCES

Project Assumptions – 7-kW residential solar system, \$3.91/W installed cost, \$0.68/W upfront incentive, 13% capacity factor, annual degradation rate of 0.5%, 25-year system life, \$336 annual O&M costs, 10% discount rate yield \$0.152/kWh LCOE for residential solar

# Electricity Rates vs. LCOE Cumulative Savings



Utility Rate, LCOE and Savings \$ by Date



With production data, contract data, and electricity rates cumulative savings can be determined from residential solar



## *Finance Tools – Loans and Credit Enhancements*



## Finance Tools

### Loans and Credit Enhancements

- **Loans** – financing tool that provides access to capital to finance residential solar. Some fundamental elements of loans are:
  - ❖ **Interest Rate** – percentage of interest being paid overtime to borrow the capital upfront
  - ❖ **Maturity Terms** – how long the load is being repaid over time (e.g., months, years)
  - ❖ **Other Terms** – Security, "O&M", Insurance, etc.
  
- **Credit Enhancements** – can improve access to loans, while also improving the interest rates (e.g., keeping them affordable) and maturity terms (e.g., extending loan to the useful life of the measure)
  - ❖ **Loan Loss Reserve** – financing tool that protects lenders from significant losses (e.g., second loan loss reserve in the Smart-E Loan)
  - ❖ **Interest Rate Buydown** – financing tool that reduces the interest rate to borrowers to increase energy savings while preserving the lender's yield

## Comparisons

### Payments vs. Interest Paid

- **Example** – assume a \$25,000 loan at varying maturity terms (i.e., 5 years vs. 25 years) and interest rates (i.e., 5% vs. 1%), what are the monthly payments, including interest paid:
  - ❖ **5 Years vs. 25 Years @ 5% Interest Rate** – monthly payment of \$472 for 60 months with interest paid of \$3,307 for 5-year loan vs. monthly payment of \$146 for 300 months with interest paid of \$18,844 for 25-year loan
  - ❖ **25 Years @ 1% vs. 5% Interest Rate** – monthly payment of \$94 for 300 months with interest paid of \$3,265 @ 1% interest rate vs. monthly payment of \$146 for 300 months with interest paid of \$18,844
- **Take-Aways** – the lower the interest rate and the longer the term, the more likely a loan is going to be affordable for more households and cash flow positive (i.e., electricity savings from residential solar are greater than loan payments). Just like any loan – the faster you pay it off, the less interest you'll pay. However, valuing these tradeoffs (affordability vs. Interest paid) differs for everyone and can be influenced by contractors paying fees to buydown interest rates or lenders offering their own promotions.

## *Connecticut Solar Loan*



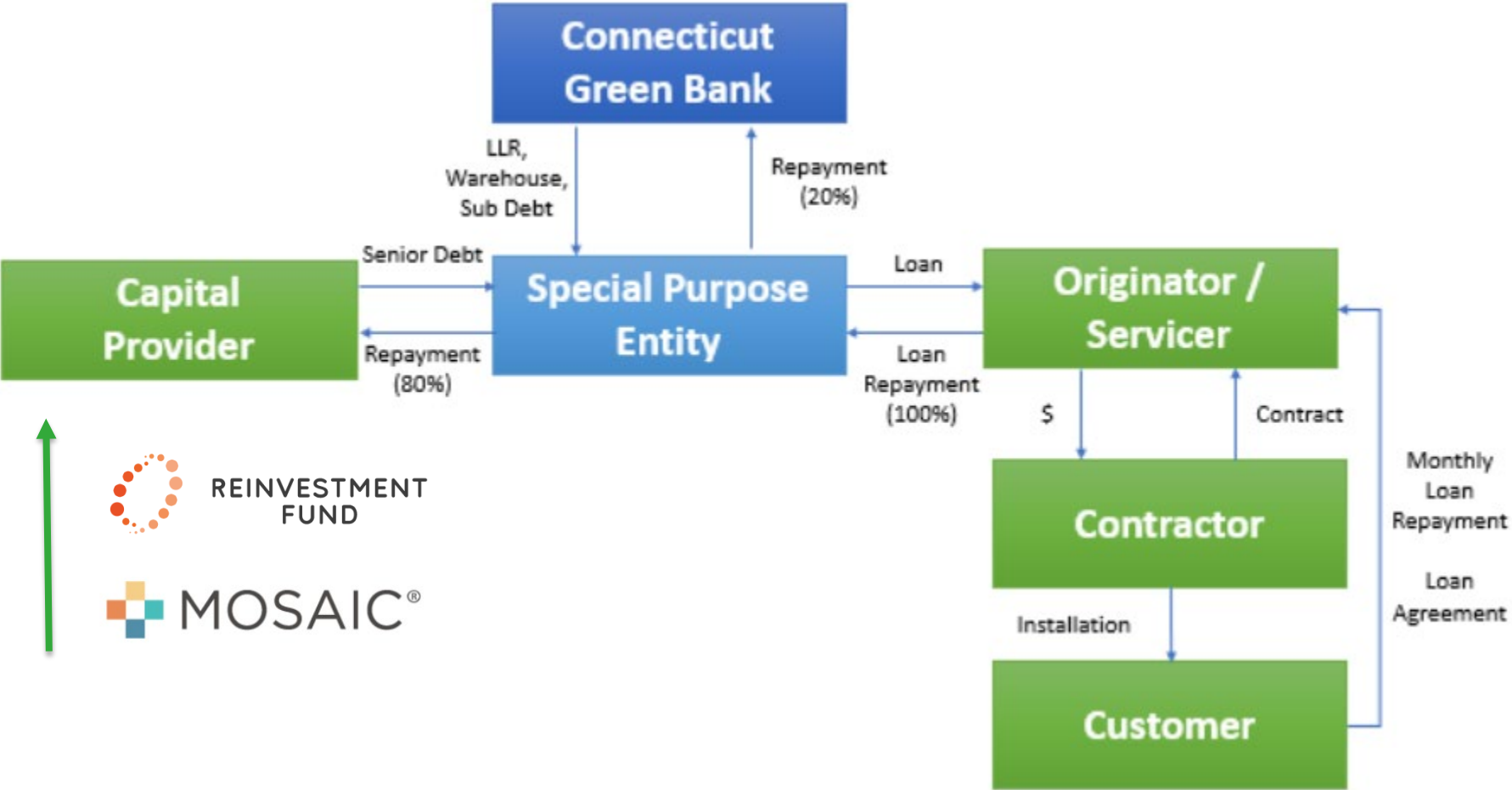
## Connecticut Solar Loan

|                        |   |
|------------------------|---|
| <b>Market Segment</b>  | <b>Residential Single Family</b>  |
| <b>Product Summary</b> | Provide local contractors and households with access to a custom solar loan product   |
| <b>Support Needed</b>  | <ul style="list-style-type: none"> <li>▪ Local Contractors</li> <li>▪ Strategic Partner – Sungage Financial</li> <li>▪ Subordinated Debt and Loan Loss Reserve</li> <li>▪ RSIP Incentive</li> </ul> |
| <b>CT Results</b>      | 279 loans totaling \$9.1 million of investment and 2.2 MW of solar PV. Sungage Financial built national business from the product   |

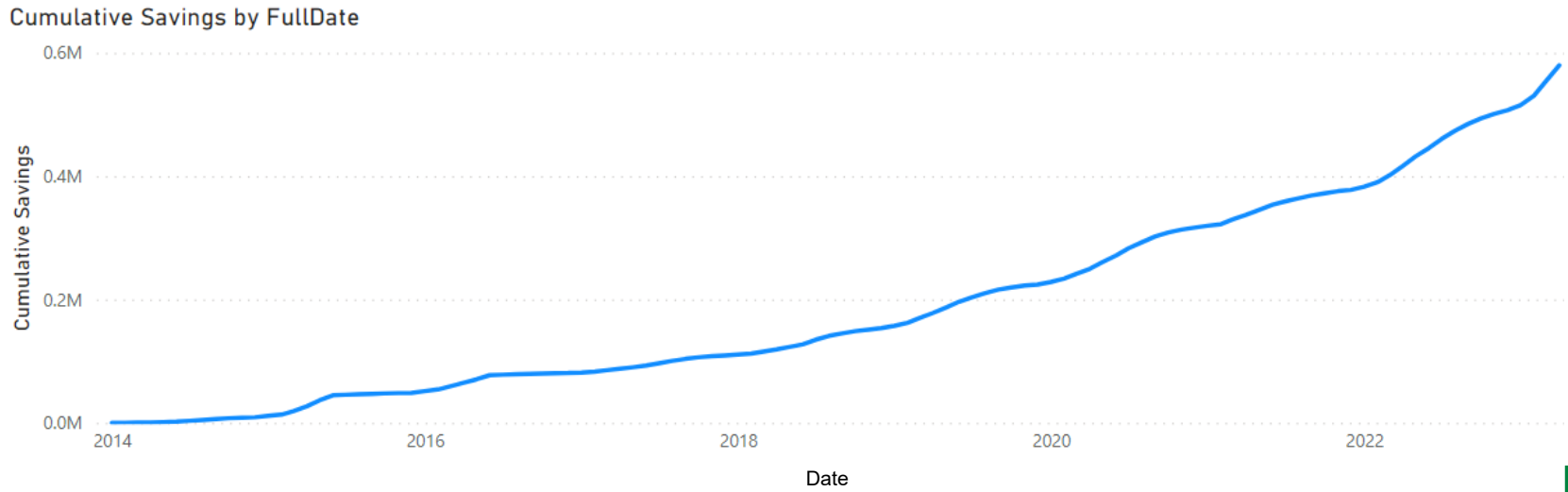
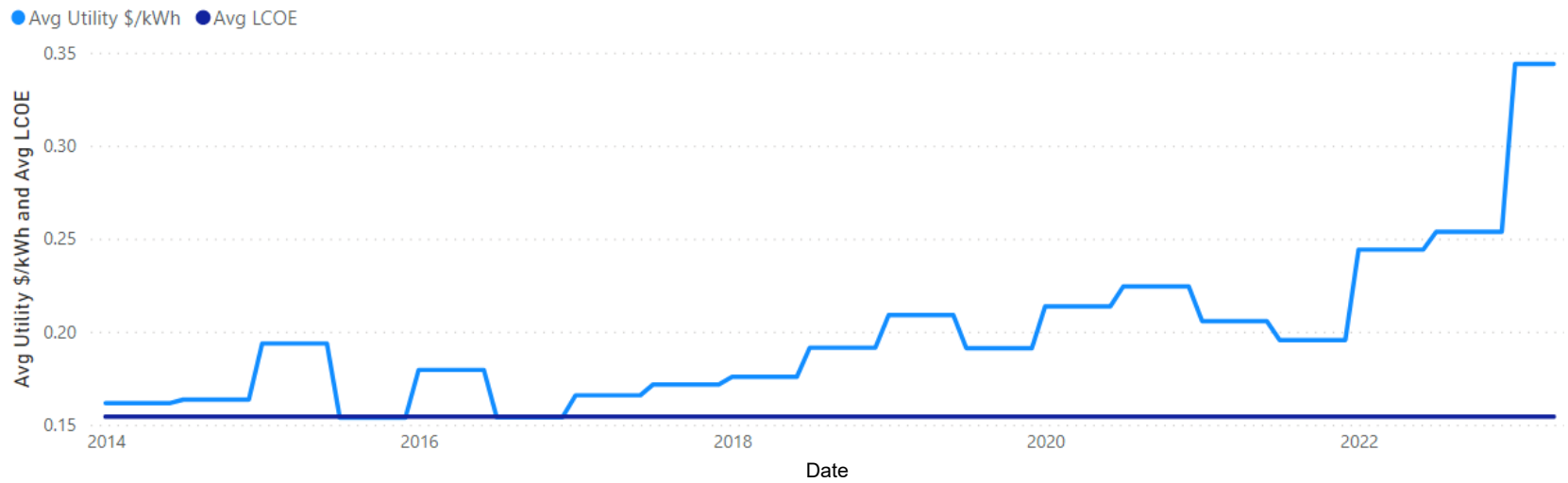




# Connecticut Solar Loan Legal Structure and Flows of Capital



# Connecticut Solar Loan LCOE vs. Electricity Rates – Cumulative Savings



## *Smart-E Loan*

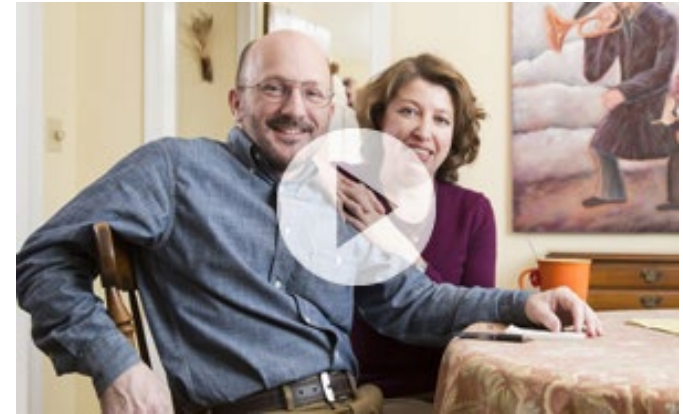


## Smart-E Loan

|                        |  |
|------------------------|--|
| <b>Market Segment</b>  | <b>Residential Single Family</b><br>(Credit Enhancement – IRB, LLR)  |
| <b>Product Summary</b> | Partnership with thirteen (13) local community banks and credit union to provide easy access to affordable financing for comprehensive clean energy measures, including H&S. 5-20-year terms at rates ranging from 4.49-6.99% for \$500-\$50,000 of borrowing. |
| <b>Support Needed</b>  | <ul style="list-style-type: none"> <li>Provide 2<sup>nd</sup> Loan Loss Reserve (LLR) up to 7.5% of losses Class A and 15.0% of losses Class B</li> </ul>  |
| <b>CT Results</b>      | 6,316 projects for \$116.3 MM investment, 10.0 MW solar PV (1,036 solar projects), over 85% projects have EE   |

**smart-e loan**

**energize CT**<sup>SM</sup>  
CONNECTICUT

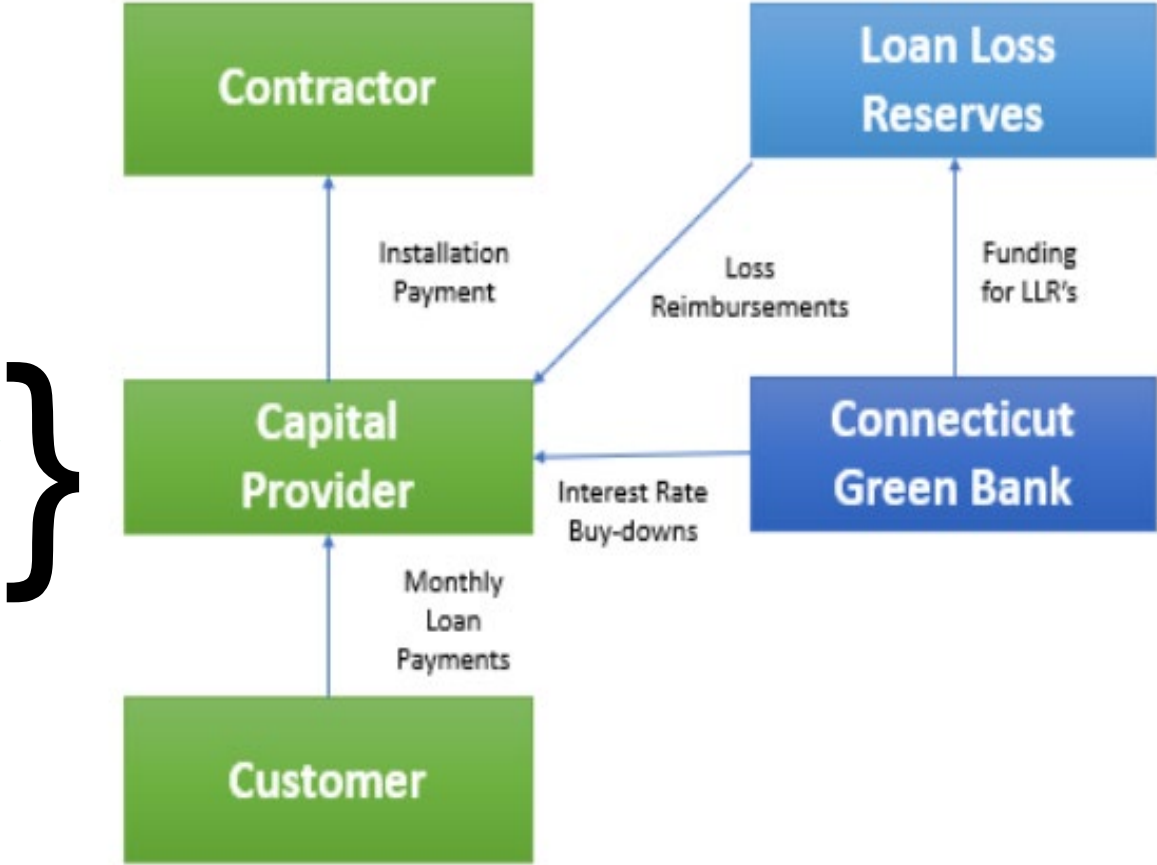


# Smart-E Loan Financial Structure

Credit  
Unions

Community  
Banks

CDFIs

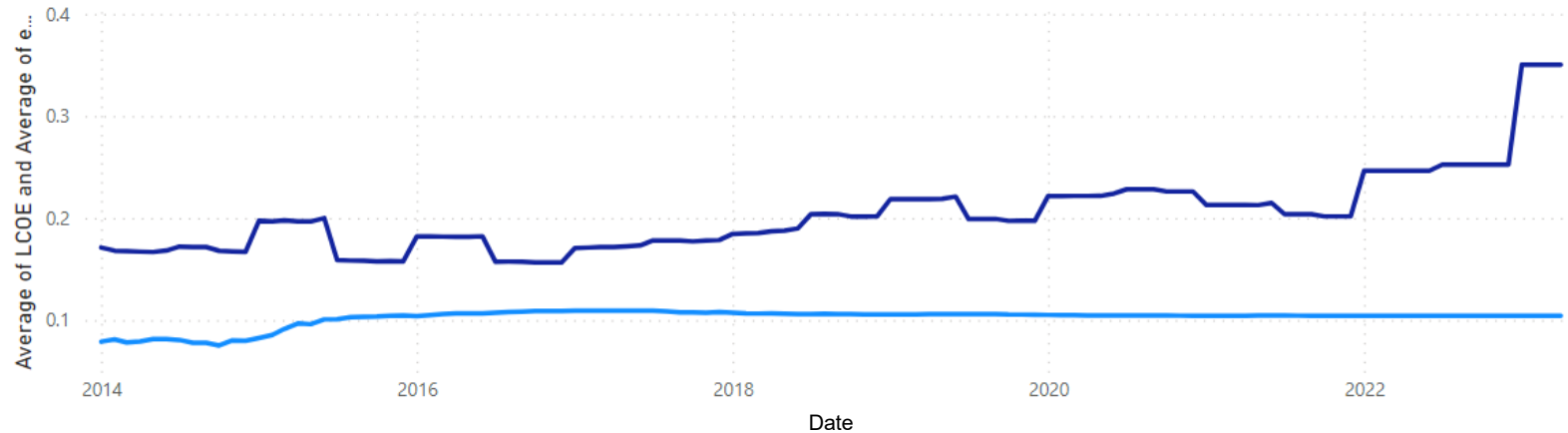


# Smart-E Loan

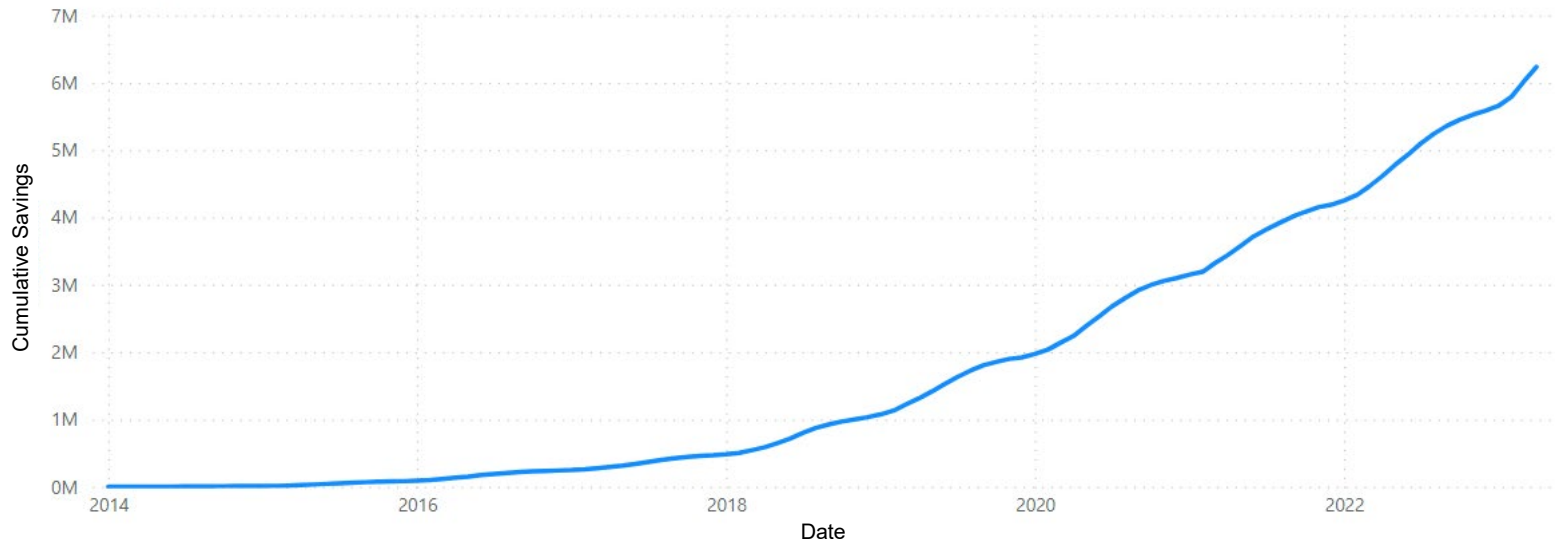
## LCOE vs. Electricity Rates – Cumulative Savings

Average of LCOE and Average of electric\_rate by ts

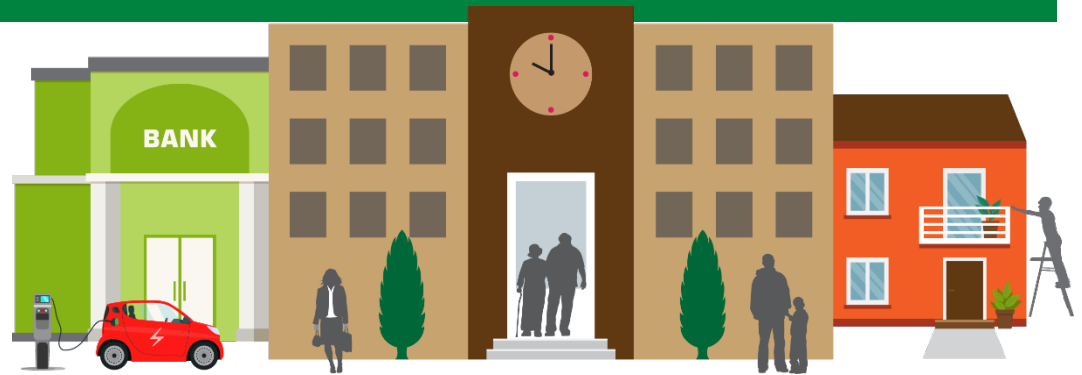
● Average of LCOE ● Average of electric\_rate



Cumulative Savings over time



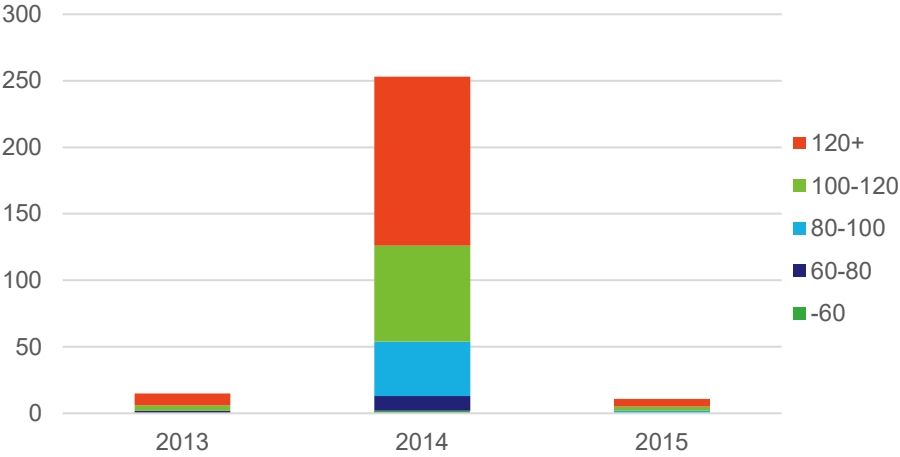
## *Comparison of Loan Products by Income and Race*



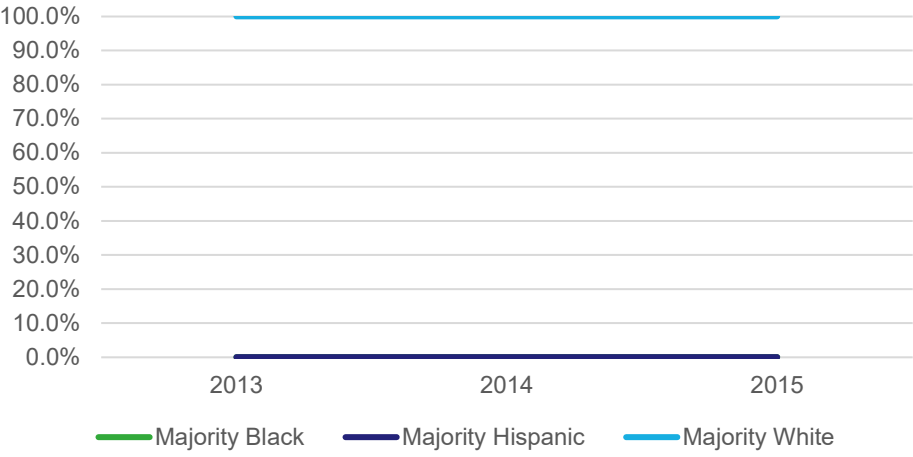


# Comparison of Loan Products Income and Race

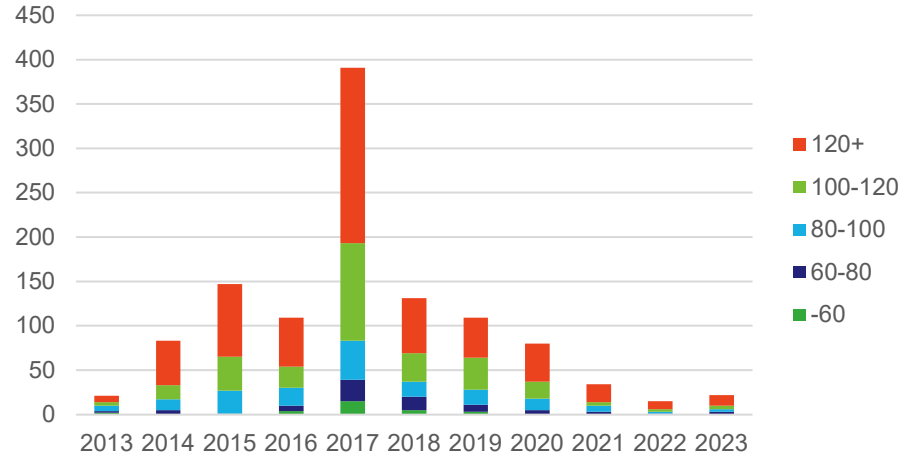
**CT Solar Loan Participation by AMI Bands**



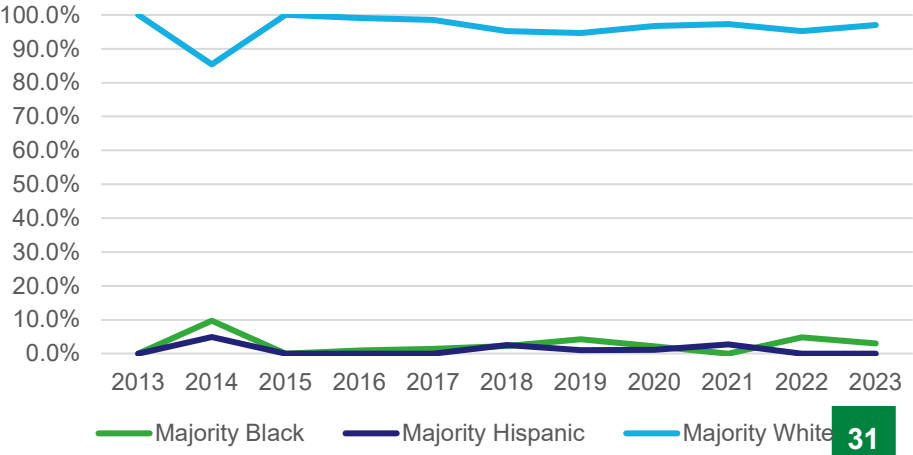
**CT Solar Loan Participation by Majority Race**



**Smart-E Loan Participation by AMI Band**



**Smart-E Loan Participation by Majority Race**



## *Closing Thoughts*



## Additional Information and Engagement



### Financing Residential Solar in Connecticut #1

Insights into Loan Programs

Connecticut Green Bank - June 5th, 2023

- **Story Map** – further details, graphs, and data sets  
“Financing Residential Solar in Connecticut – Insights into Loan Programs”
- **Public Comments** – invite you to visit our Greenhouse Gas Reduction Fund website [www.ctgreenbank.com/ggrf](http://www.ctgreenbank.com/ggrf) and provide public comments on “Solar for All” competition

<https://storymaps.arcgis.com/stories/84ce04cdd6a44403855943539a7dae09>

# Follow-On Webinars to Support Greenhouse Gas Reduction Fund Solar for All Competition

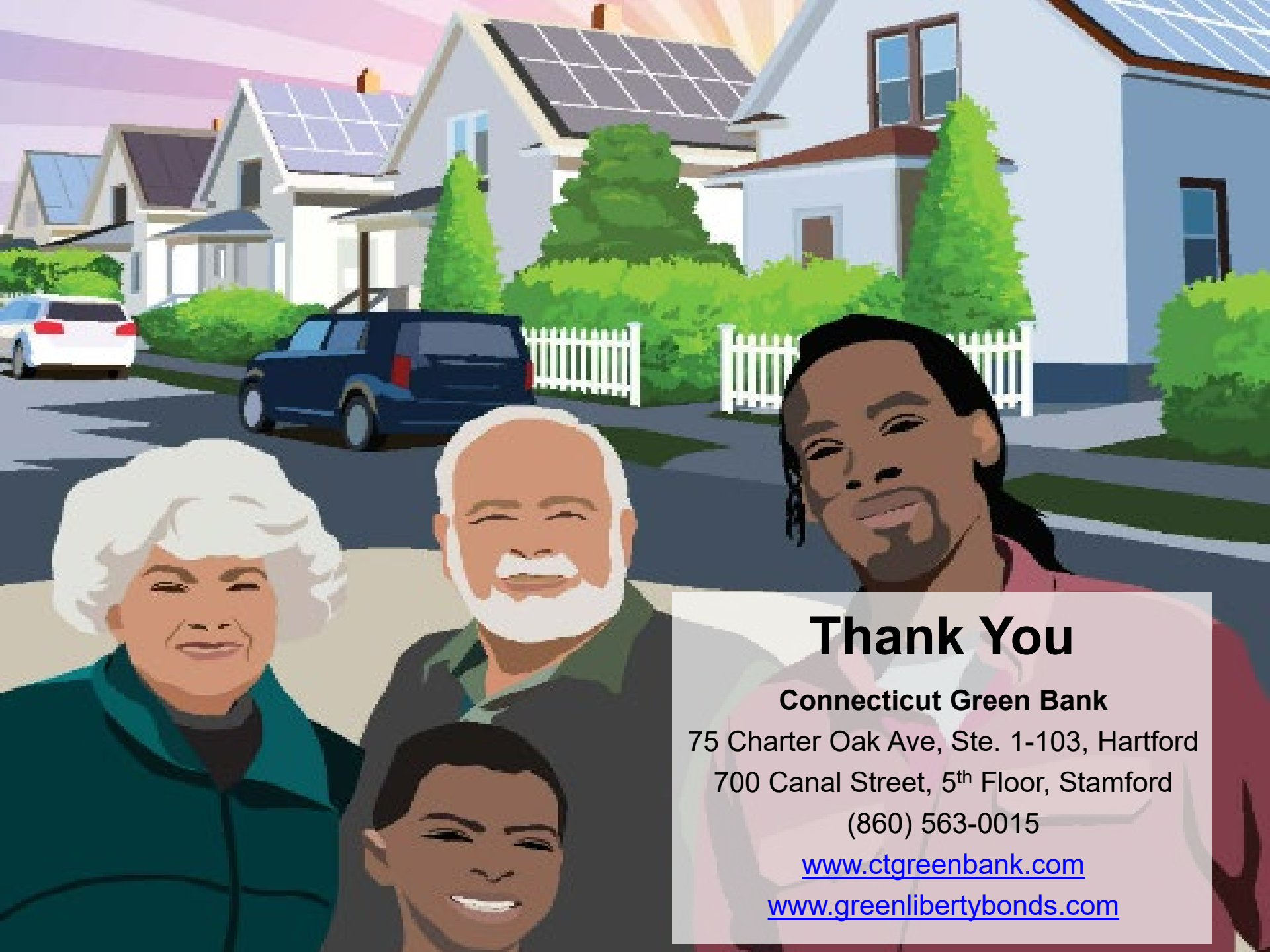


- **Webinar #3** – Financing Residential Solar in Connecticut #2: Insights into Lease Programs (Thursday, August 3, 2023 from 12:00-1:00 EDT)
- **Webinar #4** – Managing a Market Transition – Residential Renewable Energy Solutions and Energy Storage Solutions for Low-Income and Distressed Communities, including Single Family and Affordable Housing



## *Questions & Answers*





## Thank You

**Connecticut Green Bank**

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[www.ctgreenbank.com](http://www.ctgreenbank.com)

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