Equity in Solar:
Using Geospatial and Survey Data to Assess Performance and Identify Opportunities

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ACEEE 2022 Summer Study On Energy Efficiency in Buildings

OUTLINE

BACKGROUND

- Historically, most residential solar programs have not prioritized targeting low- and moderate-income (LMI) households.

- As solar markets have grown and programs have expanded, opportunities for households to benefit from solar have increased.

- However, substantial barriers and challenges remain for LMI households to participate in solar compared to non-LMI households.
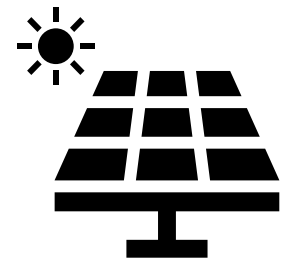
BACKGROUND

- To ensure that programs are equitably distributing benefits and effectively targeting limited resources, policymakers and program managers need research to understand:
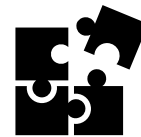
    ✓ The population eligible for the program

    ✓ The population actually participating in the programs

    ✓ The disparity between them

    ✓ Tools and resources available to help find and target underserved groups and non-participating households

BACKGROUND

- <u>NYSERDA's NY-Sun Program</u> provides financial incentives, solar programs, and other support for the deployment of solar in New York State.

- **NYSERDA's Residential Rooftop** solar program has existed since the early 2000s and provides incentives for the installation of solar systems on homes. Since 2015, LMI projects can receive an added incentive.

- In 2020, the **Solar Energy Equity Framework** was enacted:

    - A goal of 40% of solar benefits be provided to targeted to disadvantaged communities (DACs) to meet Climate Act requirement.

    - NYSERDA developed initial interim DAC definitions (updated draft criteria for DACs is undergoing development and finalization now).
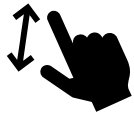
RESEARCH GOALS

- APPRISE conducted research for NYSERDA to:

  Assess the extent to which recent participants reside in the Interim Disadvantaged Communities

  Project the income distribution and LMI status of recent participants based on geographic location and publicly available data

  Estimate the LMI status of participants based on income data from a commercial database
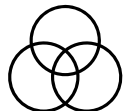
  Compare the results to self-reported data collected from a participant survey to assess projection accuracy and commercial database income accuracy.

Data Sources

DATA SOURCES
#1 – Program Data

1. **NYSERDA Program Participant Data File**

   - Included address information for each participant

   - Includes participation information

   - All participants through 2020

   - Did NOT include income (not collected for most program participants)

2. **NYSERDA Interim DAC Data File**

   - Indicators to identify DAC Census block groups in NY

DATA SOURCES
#2 – Public Data

1. **HUD Low- and Moderate-Income (LMI) Special Tabulations**
   - Provides estimates of the population in each Census Block Group at or below different Area Median Income thresholds corresponding to HUD income definitions.
   - Estimates derived from Census' American Community Survey (ACS) data.

2. **DOE Low-Income Energy Affordability Data (LEAD) Tool**
   - Provides key metrics on households in each Census Tract, including counts by AMI level, poverty level, and SMI level.
   - Allows for estimates for key demographic subgroups (such as Single-Family Homes).
   - Estimates derived from Census' American Community Survey (ACS) data.

DATA SOURCES
#3 – Commercial Data

1. **Data Axle Database**

    - Commercial dataset with demographic, financial, and household information for specified geographic area.

    - Data is obtained or modeled/imputed from various sources.

    - Limited public information to assess quality and accuracy of income and other data (proprietary).

DATA SOURCES
#4 – Collected Survey Data

- APPRISE conducted a representative participant survey to collect demographic and satisfaction data.

Survey Invitation	• Sent Letters and Email (if email available)

Survey Mode	• Self-Administered Web Survey • Fielded in Jan. / Feb. 2021

Sample Size	• 3,420 Participants from 2015-2020 Selected • Stratified by Region and Type

Survey Results	• 942 Completed Surveys • 29% final Response Rate

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DATA SOURCES
#4 – Collected Survey Data

Region	Regular Incentive Survey Respondents	Affordable Incentive Survey Respondents	Total Survey Respondents
Western	239	40	279
Central	217	39	256
Eastern	130	66	196
NYC	200	11	211
TOTAL	**786**	**156**	**942**

Source: NYSERDA Oct. 2020, NYSERDA 2021

Analysis and Results

Analysis of Participation by Geographic Location
Portion Located in Disadvantaged Communities

Analysis Approach:

1. Geocode participant locations using addresses

2. Identify which geocoded participants are located in DACs based on their Census block group.

Analysis of Participation by Geographic Location
Portion Located in Disadvantaged Communities

Participant Status	NY Population	Residential Rooftop Solar Participants
Not in Disadvantaged Community	72%	92%
Located in Disadvantaged Community	28%	8%

Source: NYSERDA 2020, NYSERDA October 2020, NYSERDA 2021

Analysis of Participation by Geographic Location
AMI Concentration Comparison

Analysis Approach:

1. Geocode participant locations using addresses

2. Identify block groups with high concentration of population (66% or more) at or below defined AMI thresholds.

3. Identify which geocoded participants are located in high concentration area based on their Census block group.
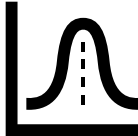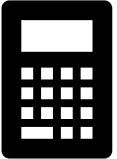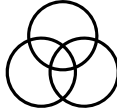
Analysis of Participation by Geographic Location
AMI Concentration Comparison

Participant Status	NY Population	Residential Rooftop Solar Participants
Share in Block Groups with >66% population at or below 50% AMI	9%	1%
Share in Block Groups with >66% population at or below 80% AMI	25%	6%
Share in Block Groups with >66% population at or below 120% AMI	51%	30%

Source: HUD 2022, NYSERDA 2020, NYSERDA October 2020, NYSERDA 2021

Projection & Survey Comparison Results

Analysis Approach:

1. Estimate the distribution of income for NYS.

2. Project the income distribution for the survey respondents based on the income distribution for their Census areas.

3. Compare projection results to the income distribution estimated based on the respondent's self-reported income and household size.

Projection & Survey Comparison Results
HUD LMI Special Tabulations

AMI Category	NY Population (HUD LMI)	Rooftop Solar Survey Respondents	
		Projections based on Census Block Group distribution (HUD LMI)	Estimates based on self-reported income (Participant survey)
0-50% AMI	32%	20%	5%
>50-80% AMI	16%	15%	10%
>80-120% AMI	18%	20%	20%
>120% AMI	34%	46%	65%
Total LMI (<=80% AMI)	**48%**	**35%**	**15%**

Source: HUD 2022, NYSERDA October 2020, NYSERDA 2021.

Projection & Survey Comparison Results
DOE LEAD Tool
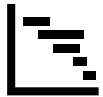
AMI Category	NY Population (DOE LEAD)	Rooftop Solar Survey Respondents	
		Projections based on Census Tract income distribution SF Homes (DOE LEAD)	Estimates based on self-reported income (Participant survey)
0-60% AMI	36%	21%	8%
>60-80% AMI	10%	10%	7%
>80-100% AMI	9%	10%	10%
>100% AMI	44%	59%	75%
Total LMI (<=80% AMI)	**46%**	**31%**	**15%**

Source: HUD 2022, NYSERDA October 2020, NYSERDA 2021.

Commercial Database & Survey Comparison
Data Axle Commercial Database

Analysis Approach:

1. Standardize and clean address and contact information

2. Use addresses and household information to match participant data to Data Axle data.

3. For those matched, compare results to the income distribution estimated based on the respondent's self-reported income and household size.

4. Compare accuracy of results at the participant level.

Commercial Database & Survey Comparison
Data Axle Commercial Database

AMI Level	Estimates based on Commercial Database Income (Data Axle)	Estimates based on self-reported income (Participant survey)
0-50% AMI	5%	2%
>50-80% AMI	10%	9%
>80-120% AMI	19%	20%
>120% AMI	67%	70%
Total LMI (<=80% AMI)	**15%**	**11%**

Source: Data Axle 2022, NYSERDA October 2020, NYSERDA 2021

Summary & Take-Aways

Summary & Take-Aways
NY Residential Rooftop Solar Participants

Disadvantaged Communities (DACs)

- Compared to the general population, participants are *less likely* to live in interim DAC areas or areas with high LMI concentration (28% NYS vs. 8% participants)

Locations

- On average, participants reside in higher income Census Block groups or tracts (about 48% of NYS residents estimated LMI based on location versus about 31%/35% estimated for participants).

Income

- Household incomes are higher for participants than others in their same Census block groups or tracts (31%/35% projected as LMI vs. 15% LMI based on survey reporting).

Summary & Take-Aways
Projecting Income based on Geography

Sources
- One project source was focused on the general population (HUD LMI) and one allowed for targeting to subgroups (DOE LEAD).

Projection Results
- Both public data sources used were found to *overestimate* the share of participants that would be expected to be LMI based on their geographic location.

More Research Needed
- This was a starting point – further research should explore the accuracy of projecting income based on more granular information to target estimates.

Summary & Take-Aways
Assessing Income from Commercial Dataset

LMI Distribution
- This analysis found that, on average, there was *moderate agreement* between the LMI distribution from the Data Axle database and the participant survey.

Individual Results
- Review of results on an individual participant basis found *low agreement* between the database income and self-reported income.

More Research Needed
- Further research is needed to assess the accuracy, currency, and limitations of income data from proprietary sources.

Program Equity and Targeting

Value of Public Data

- Public data like HUD LMI and DOE LEAD can be valuable for program managers to identify specific census blocks or tracts with high LMI concentrations.
- This can be used to check against participant data or inform marketing and outreach.

LMI Eligibility

- While this analysis found limitations in projecting or imputing income for households, the survey results suggest that households are willing to self-report income and household size.
- Programs could consider self-reporting of income (with verification for a random sample) as an option to reduce application barriers.

Next Steps

- Similar research is needed for community solar programs to understand the extent to which LMI households are participating in these programs.

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Thank you!

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