Puerto Rico LMI PV Rooftop Technical Potential and Solar Savings Potential Dataset

Data Documentation

August 2020

Data Overview

The Puerto Rico Low and Moderate Income (LMI) Photovoltaic (PV) Rooftop Technical Potential and Solar Savings Potential Dataset is a tract-level data set that provides estimates of LMI rooftop solar technical potential at the tract level and LMI solar savings potential at the County level. This dataset was produced by the National Renewable Energy Laboratory, in collaboration with Arizona State University and the University of Puerto Rico-Mayaguez, as part of a larger U.S. Department of Energy’s Solar Energy Technologies Office funded project to enhance the social value of energy for low-income communities in Puerto Rico. The core datasets consist of two wide format comma-separated values (csv)\* files **("pr\_lmi\_pvr\_potential.csv"** and **"pr\_lmi\_solar\_savings.csv")** that can be tagged to tract or county geometry files using the GEOID. This dataset is intended to give researchers, planners, advocates, and policy-makers access to credible data to analyze low-income solar opportunities in Puerto Rico.

Acronyms

ACS American Community Survey

ASU Arizona State University

AMI Area Median Income

DOE U.S. Department of Energy

EIA Energy Information Administration

HUD U.S. Department of Housing and Urban Development

FMR Fair market rent

kWh kilowatt-hour

kW kilowatt

LiDAR Light Detection and Ranging

LEAD Low-Income Energy Affordability tool

LMI Low and Moderate-Income

MWh megawatt-hour

MW megawatt

PREPA Puerto Rico Electric Power Authority

USGS 3DEP United States Geological Survey 3D Elevation Program

NASA G-LiHT National Aeronautics and Space Administration Goddard’s LiDAR, Hyperspectral and Thermal Imager

PR Puerto Rico

PV Photovoltaic

SAM System Advisory Model

NREL National Renewable Energy Laboratory

Data Table Structure

The Puerto Rico LMI PV Rooftop Technical Potential and Solar Savings Potential Dataset is comprised of two different LMI datasets: i) the **PR LMI PV Rooftop Technical Potential Dataset** provided at the Census Tract level, and ii) the **PR LMI Solar Savings Potential Dataset** available at the County level. Both datasets are broken out by Area Median Income (AMI), tenure, and building type and they are both delivered in a wide-table format with each row representing a single tract or county. Table 1 provides a general overview of both datasets.

Table 1: Datasets included as part of the Puerto Rico Solar For All dataset

|  |  |  |
| --- | --- | --- |
| Column | Source | Field Types |
| PR LMI PV Rooftop Technical Potential | Developed by NREL; derived from high resolution 2015-2017 LiDAR data from NASA G-LiHT and USGS 3DEP, building footprints from HOTOSM, demographic variables from the American Community Survey (2011-2015), solar resource from the National Solar Radiation Database (NSRDB; 2017), and system generation estimates from the System Advisory Model (SAM). | (1) Number of households  (2) Number of solar-suitable buildings  (3) Number of developable roof planes  (4) Total area of developable planes (m2)  (4) Total solar capacity (MW), and  (6) Total annual solar generation (MWh) -- for each AMI income group (0-30% AMI, 30-50% AMI, 50-80% AMI, 80-120% AMI, >120% AMI), building type (multi-family or single-family), and tenure (renter or owner) |
| PR LMI Solar Savings Potential | Developed by NREL; derived from the PR LMI PV Rooftop Technical Potential dataset, PREPA 2018 residential energy consumption and billing, and the LEAD estimates of electricity expenditures by tenure and building type. | (1) Number of clients  (2) PV rooftop annual generation potential (MWh)  (3) Total electric consumption (MWh)  (4) Average cost of electricity ($/kWh)  (5) Total annual electric bill ($/year)  (6) Total bill savings potential ($/year)  (7) Percent electric consumption offsetable by rooftop PV generation -- for each AMI income group (0-30% AMI, 30-50% AMI, 50-80% AMI, 80-120% AMI, >120% AMI), building type (multi-family or single-family), and tenure (renter or owner) |

**An important note on uncertainty ...**

These data are estimates derived from statistical modeling and data munging of datasets sourced from varied geographic units and with varied levels of uncertainty. Care should be taken when interpreting these results particularly for policy-planning or regulatory considerations, particularly tract-level estimates. For a detailed discussion on uncertainty in the data, refer to [Sigrin and Mooney (2018)](https://www.nrel.gov/docs/fy18osti/70901.pdf).

i. LMI Rooftop PV Technical Potential

The Puerto Rico LMI PV Rooftop Technical Potential dataset provides estimates of technical potential for Puerto Rico's LMI communities at the Census Tract level, broken out by AMI income bin, building type, and tenure. These data are derived from rooftop suitability modeling using 2015-2017 high-resolution LiDAR data from NASA G-LiHT and USGS 3DEP. Demographic data was pulled from the 2011-2015 American Community Survey (ACS) 5-Year Estimates and overlaid with LiDAR data to estimate technical potential per U.S. Census tract by income, building type, and tenure. Fields available include estimates of number of households, number of suitable buildings, number of developable planes, area of developable planes (m2), total capacity potential (MW), and total annual generation potential (MWh) for each of the 20 demographic combinations of AMI income group (0-30% AMI, 30-50% AMI, 50-80% AMI, 80-120% AMI, >120% AMI), housing type (multi-family or single-family), and tenure (renter or owner). The result is an array of 120 fields related to LMI solar potential for each Census Tract.

ii. LMI Solar Savings Potential

The Puerto Rico LMI PV Rooftop Solar Savings Potential dataset provides estimates of rooftop solar bill savings potential for Puerto Rico's LMI communities at the County level, broken out by AMI income bin, building type, and tenure. These data were calculated from the overlay of PREPA-provided 2018 residential bill and consumption data at the County level and the Puerto Rico LMI Rooftop PV Technical Potential dataset. Fields available include total number of clients, rooftop PV annual generation potential (MWh), total electric consumption (MWh), average cost of electricity ($/kWh), total annual electric bill ($/year), total bill savings potential ($/year) capped at the total bill, and the percent electric consumption offsetable by rooftop PV generation, for each of the 20 demographic combinations of AMI income group (0-30% AMI, 30-50% AMI, 50-80% AMI, 80-120% AMI, >120% AMI), housing type (multi-family or single-family), and tenure (renter or owner). The result is an array of 140 fields related to LMI solar potential for each Census Tract.

Data Dictionary

Table 2: PR LMI PV Rooftop Technical Potential ("pr\_lmi\_pvr\_potential.csv") Data Dictionary

|  |  |
| --- | --- |
| Column | Description |
| geoid | GEOID |
| very\_low\_mf\_own\_hh | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Household Count |
| very\_low\_mf\_rent\_hh | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Household Count |
| very\_low\_sf\_own\_hh | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Household Count |
| very\_low\_sf\_rent\_hh | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Household Count |
| low\_mf\_own\_hh | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Household Count |
| low\_mf\_rent\_hh | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Household Count |
| low\_sf\_own\_hh | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Household Count |
| low\_sf\_rent\_hh | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Household Count |
| mod\_mf\_own\_hh | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Household Count |
| mod\_mf\_rent\_hh | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Household Count |
| mod\_sf\_own\_hh | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Household Count |
| mod\_sf\_rent\_hh | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Household Count |
| mid\_mf\_own\_hh | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Household Count |
| mid\_mf\_rent\_hh | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Household Count |
| mid\_sf\_own\_hh | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Household Count |
| mid\_sf\_rent\_hh | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Household Count |
| high\_mf\_own\_hh | High Income (>120% AMI), Multi-Family, Owner-Occupied - Household Count |
| high\_mf\_rent\_hh | High Income (>120% AMI), Multi-Family, Renter-Occupied - Household Count |
| high\_sf\_own\_hh | High Income (>120% AMI), Single-Family, Owner-Occupied - Household Count |
| high\_sf\_rent\_hh | High Income (>120% AMI), Single-Family, Renter-Occupied - Household Count |
| very\_low\_mf\_own\_bldg\_cnt | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Suitable Building Count |
| very\_low\_mf\_rent\_bldg\_cnt | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Suitable Building Count |
| very\_low\_sf\_own\_bldg\_cnt | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Suitable Building Count |
| very\_low\_sf\_rent\_bldg\_cnt | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Suitable Building Count |
| low\_mf\_own\_bldg\_cnt | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Suitable Building Count |
| low\_mf\_rent\_bldg\_cnt | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Suitable Building Count |
| low\_sf\_own\_bldg\_cnt | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Suitable Building Count |
| low\_sf\_rent\_bldg\_cnt | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Suitable Building Count |
| mod\_mf\_own\_bldg\_cnt | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Suitable Building Count |
| mod\_mf\_rent\_bldg\_cnt | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Suitable Building Count |
| mod\_sf\_own\_bldg\_cnt | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Suitable Building Count |
| mod\_sf\_rent\_bldg\_cnt | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Suitable Building Count |
| mid\_mf\_own\_bldg\_cnt | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Suitable Building Count |
| mid\_mf\_rent\_bldg\_cnt | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Suitable Building Count |
| mid\_sf\_own\_bldg\_cnt | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Suitable Building Count |
| mid\_sf\_rent\_bldg\_cnt | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Suitable Building Count |
| high\_mf\_own\_bldg\_cnt | High Income (>120% AMI), Multi-Family, Owner-Occupied - Suitable Building Count |
| high\_mf\_rent\_bldg\_cnt | High Income (>120% AMI), Multi-Family, Renter-Occupied - Suitable Building Count |
| high\_sf\_own\_bldg\_cnt | High Income (>120% AMI), Single-Family, Owner-Occupied - Suitable Building Count |
| high\_sf\_rent\_bldg\_cnt | High Income (>120% AMI), Single-Family, Renter-Occupied - Suitable Building Count |
| very\_low\_mf\_own\_devp\_cnt | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Developable Plane Count |
| very\_low\_mf\_rent\_devp\_cnt | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Developable Plane Count |
| very\_low\_sf\_own\_devp\_cnt | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Developable Plane Count |
| very\_low\_sf\_rent\_devp\_cnt | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Developable Plane Count |
| low\_mf\_own\_devp\_cnt | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Developable Plane Count |
| low\_mf\_rent\_devp\_cnt | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Developable Plane Count |
| low\_sf\_own\_devp\_cnt | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Developable Plane Count |
| low\_sf\_rent\_devp\_cnt | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Developable Plane Count |
| mod\_mf\_own\_devp\_cnt | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Developable Plane Count |
| mod\_mf\_rent\_devp\_cnt | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Developable Plane Count |
| mod\_sf\_own\_devp\_cnt | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Developable Plane Count |
| mod\_sf\_rent\_devp\_cnt | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Developable Plane Count |
| mid\_mf\_own\_devp\_cnt | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Developable Plane Count |
| mid\_mf\_rent\_devp\_cnt | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Developable Plane Count |
| mid\_sf\_own\_devp\_cnt | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Developable Plane Count |
| mid\_sf\_rent\_devp\_cnt | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Developable Plane Count |
| high\_mf\_own\_devp\_cnt | High Income (>120% AMI), Multi-Family, Owner-Occupied - Developable Plane Count |
| high\_mf\_rent\_devp\_cnt | High Income (>120% AMI), Multi-Family, Renter-Occupied - Developable Plane Count |
| high\_sf\_own\_devp\_cnt | High Income (>120% AMI), Single-Family, Owner-Occupied - Developable Plane Count |
| high\_sf\_rent\_devp\_cnt | High Income (>120% AMI), Single-Family, Renter-Occupied - Developable Plane Count |
| very\_low\_mf\_own\_devp\_m2 | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| very\_low\_mf\_rent\_devp\_m2 | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| very\_low\_sf\_own\_devp\_m2 | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| very\_low\_sf\_rent\_devp\_m2 | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| low\_mf\_own\_devp\_m2 | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| low\_mf\_rent\_devp\_m2 | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| low\_sf\_own\_devp\_m2 | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| low\_sf\_rent\_devp\_m2 | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| mod\_mf\_own\_devp\_m2 | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| mod\_mf\_rent\_devp\_m2 | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| mod\_sf\_own\_devp\_m2 | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| mod\_sf\_rent\_devp\_m2 | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| mid\_mf\_own\_devp\_m2 | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| mid\_mf\_rent\_devp\_m2 | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| mid\_sf\_own\_devp\_m2 | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| mid\_sf\_rent\_devp\_m2 | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| high\_mf\_own\_devp\_m2 | High Income (>120% AMI), Multi-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| high\_mf\_rent\_devp\_m2 | High Income (>120% AMI), Multi-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| high\_sf\_own\_devp\_m2 | High Income (>120% AMI), Single-Family, Owner-Occupied - Developable Surface Area (sq.m) |
| high\_sf\_rent\_devp\_m2 | High Income (>120% AMI), Single-Family, Renter-Occupied - Developable Surface Area (sq.m) |
| very\_low\_mf\_own\_mw | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Total Capacity (MW) |
| very\_low\_mf\_rent\_mw | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Total Capacity (MW) |
| very\_low\_sf\_own\_mw | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Total Capacity (MW) |
| very\_low\_sf\_rent\_mw | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Total Capacity (MW) |
| low\_mf\_own\_mw | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Total Capacity (MW) |
| low\_mf\_rent\_mw | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Total Capacity (MW) |
| low\_sf\_own\_mw | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Total Capacity (MW) |
| low\_sf\_rent\_mw | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Total Capacity (MW) |
| mod\_mf\_own\_mw | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Total Capacity (MW) |
| mod\_mf\_rent\_mw | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Total Capacity (MW) |
| mod\_sf\_own\_mw | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Total Capacity (MW) |
| mod\_sf\_rent\_mw | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Total Capacity (MW) |
| mid\_mf\_own\_mw | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Total Capacity (MW) |
| mid\_mf\_rent\_mw | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Total Capacity (MW) |
| mid\_sf\_own\_mw | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Total Capacity (MW) |
| mid\_sf\_rent\_mw | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Total Capacity (MW) |
| high\_mf\_own\_mw | High Income (>120% AMI), Multi-Family, Owner-Occupied - Total Capacity (MW) |
| high\_mf\_rent\_mw | High Income (>120% AMI), Multi-Family, Renter-Occupied - Total Capacity (MW) |
| high\_sf\_own\_mw | High Income (>120% AMI), Single-Family, Owner-Occupied - Total Capacity (MW) |
| high\_sf\_rent\_mw | High Income (>120% AMI), Single-Family, Renter-Occupied - Total Capacity (MW) |
| very\_low\_mf\_own\_mwh | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| very\_low\_mf\_rent\_mwh | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| very\_low\_sf\_own\_mwh | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| very\_low\_sf\_rent\_mwh | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| low\_mf\_own\_mwh | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| low\_mf\_rent\_mwh | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| low\_sf\_own\_mwh | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| low\_sf\_rent\_mwh | Low Income (30-50% AMI), Single-Family, Renter--Occupied - Total Annual Generation Potential (MWh) |
| mod\_mf\_own\_mwh | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| mod\_mf\_rent\_mwh | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| mod\_sf\_own\_mwh | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| mod\_sf\_rent\_mwh | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| mid\_mf\_own\_mwh | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| mid\_mf\_rent\_mwh | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| mid\_sf\_own\_mwh | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| mid\_sf\_rent\_mwh | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| high\_mf\_own\_mwh | High Income (>120% AMI), Multi-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| high\_mf\_rent\_mwh | High Income (>120% AMI), Multi-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |
| high\_sf\_own\_mwh | High Income (>120% AMI), Single-Family, Owner-Occupied - Total Annual Generation Potential (MWh) |
| high\_sf\_rent\_mwh | High Income (>120% AMI), Single-Family, Renter-Occupied - Total Annual Generation Potential (MWh) |

Table 3: PR LMI Solar Savings Potential ("pr\_lmi\_solar\_savings.csv") Data Dictionary

|  |  |
| --- | --- |
| Column Name | Description |
| cnty\_geoid | County GEOID |
| cnty\_name | County Name |
| very\_low\_mf\_own\_clients | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| very\_low\_mf\_rent\_clients | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| very\_low\_sf\_own\_clients | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Number of Clients |
| very\_low\_sf\_rent\_clients | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Number of Clients |
| low\_mf\_own\_clients | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| low\_mf\_rent\_clients | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| low\_sf\_own\_clients | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Number of Clients |
| low\_sf\_rent\_clients | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mod\_mf\_own\_clients | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mod\_mf\_rent\_clients | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mod\_sf\_own\_clients | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mod\_sf\_rent\_clients | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mid\_mf\_own\_clients | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mid\_mf\_rent\_clients | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mid\_sf\_own\_clients | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mid\_sf\_rent\_clients | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| high\_mf\_own\_clients | High Income (>120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| high\_mf\_rent\_clients | High Income (>120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| high\_sf\_own\_clients | High Income (>120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| high\_sf\_rent\_clients | High Income (>120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| very\_low\_mf\_own\_pvr\_mwh | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| very\_low\_mf\_rent\_pvr\_mwh | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| very\_low\_sf\_own\_pvr\_mwh | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Number of Clients |
| very\_low\_sf\_rent\_pvr\_mwh | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Number of Clients |
| low\_mf\_own\_pvr\_mwh | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| low\_mf\_rent\_pvr\_mwh | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| low\_sf\_own\_pvr\_mwh | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Number of Clients |
| low\_sf\_rent\_pvr\_mwh | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mod\_mf\_own\_pvr\_mwh | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mod\_mf\_rent\_pvr\_mwh | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mod\_sf\_own\_pvr\_mwh | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mod\_sf\_rent\_pvr\_mwh | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mid\_mf\_own\_pvr\_mwh | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mid\_mf\_rent\_pvr\_mwh | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mid\_sf\_own\_pvr\_mwh | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mid\_sf\_rent\_pvr\_mwh | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| high\_mf\_own\_pvr\_mwh | High Income (>120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| high\_mf\_rent\_pvr\_mwh | High Income (>120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| high\_sf\_own\_pvr\_mwh | High Income (>120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| high\_sf\_rent\_pvr\_mwh | High Income (>120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| very\_low\_mf\_own\_elec\_mwh | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| very\_low\_mf\_rent\_elec\_mwh | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| very\_low\_sf\_own\_elec\_mwh | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Number of Clients |
| very\_low\_sf\_rent\_elec\_mwh | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Number of Clients |
| low\_mf\_own\_elec\_mwh | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| low\_mf\_rent\_elec\_mwh | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| low\_sf\_own\_elec\_mwh | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Number of Clients |
| low\_sf\_rent\_elec\_mwh | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mod\_mf\_own\_elec\_mwh | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mod\_mf\_rent\_elec\_mwh | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mod\_sf\_own\_elec\_mwh | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mod\_sf\_rent\_elec\_mwh | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mid\_mf\_own\_elec\_mwh | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mid\_mf\_rent\_elec\_mwh | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mid\_sf\_own\_elec\_mwh | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mid\_sf\_rent\_elec\_mwh | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| high\_mf\_own\_elec\_mwh | High Income (>120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| high\_mf\_rent\_elec\_mwh | High Income (>120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| high\_sf\_own\_elec\_mwh | High Income (>120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| high\_sf\_rent\_elec\_mwh | High Income (>120% AMI), Single-Family, Renter -Occupied - Number of Clients |
| very\_low\_mf\_own\_dlrs\_per\_mwh | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| very\_low\_mf\_rent\_dlrs\_per\_mwh | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| very\_low\_sf\_own\_dlrs\_per\_mwh | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Number of Clients |
| very\_low\_sf\_rent\_dlrs\_per\_mwh | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Number of Clients |
| low\_mf\_own\_dlrs\_per\_mwh | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| low\_mf\_rent\_dlrs\_per\_mwh | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| low\_sf\_own\_dlrs\_per\_mwh | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Number of Clients |
| low\_sf\_rent\_dlrs\_per\_mwh | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mod\_mf\_own\_dlrs\_per\_mwh | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mod\_mf\_rent\_dlrs\_per\_mwh | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mod\_sf\_own\_dlrs\_per\_mwh | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mod\_sf\_rent\_dlrs\_per\_mwh | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Number of Clients |
| mid\_mf\_own\_dlrs\_per\_mwh | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| mid\_mf\_rent\_dlrs\_per\_mwh | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| mid\_sf\_own\_dlrs\_per\_mwh | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| mid\_sf\_rent\_dlrs\_per\_mwh | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| high\_mf\_own\_dlrs\_per\_mwh | High Income (>120% AMI), Multi-Family, Owner-Occupied - Number of Clients |
| high\_mf\_rent\_dlrs\_per\_mwh | High Income (>120% AMI), Multi-Family, Renter-Occupied - Number of Clients |
| high\_sf\_own\_dlrs\_per\_mwh | High Income (>120% AMI), Single-Family, Owner-Occupied - Number of Clients |
| high\_sf\_rent\_dlrs\_per\_mwh | High Income (>120% AMI), Single-Family, Renter-Occupied - Number of Clients |
| very\_low\_mf\_own\_elec\_bill\_dlrs | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| very\_low\_mf\_rent\_elec\_bill\_dlrs | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| very\_low\_sf\_own\_elec\_bill\_dlrs | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| very\_low\_sf\_rent\_elec\_bill\_dlrs | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| low\_mf\_own\_elec\_bill\_dlrs | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - $/year) |
| low\_mf\_rent\_elec\_bill\_dlrs | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Electric Bill ($/year) |
| low\_sf\_own\_elec\_bill\_dlrs | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| low\_sf\_rent\_elec\_bill\_dlrs | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| mod\_mf\_own\_elec\_bill\_dlrs | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| mod\_mf\_rent\_elec\_bill\_dlrs | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| mod\_sf\_own\_elec\_bill\_dlrs | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| mod\_sf\_rent\_elec\_bill\_dlrs | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| mid\_mf\_own\_elec\_bill\_dlrs | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| mid\_mf\_rent\_elec\_bill\_dlrs | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| mid\_sf\_own\_elec\_bill\_dlrs | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| mid\_sf\_rent\_elec\_bill\_dlrs | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| high\_mf\_own\_elec\_bill\_dlrs | High Income (>120% AMI), Multi-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| high\_mf\_rent\_elec\_bill\_dlrs | High Income (>120% AMI), Multi-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| high\_sf\_own\_elec\_bill\_dlrs | High Income (>120% AMI), Single-Family, Owner-Occupied - Total Annual Electric Bill ($/year) |
| high\_sf\_rent\_elec\_bill\_dlrs | High Income (>120% AMI), Single-Family, Renter-Occupied - Total Annual Electric Bill ($/year) |
| very\_low\_mf\_own\_billsave\_dlrs | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| very\_low\_mf\_rent\_billsave\_dlrs | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| very\_low\_sf\_own\_billsave\_dlrs | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| very\_low\_sf\_rent\_billsave\_dlrs | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| low\_mf\_own\_billsave\_dlrs | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| low\_mf\_rent\_billsave\_dlrs | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| low\_sf\_own\_billsave\_dlrs | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| low\_sf\_rent\_billsave\_dlrs | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| mod\_mf\_own\_billsave\_dlrs | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| mod\_mf\_rent\_billsave\_dlrs | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| mod\_sf\_own\_billsave\_dlrs | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| mod\_sf\_rent\_billsave\_dlrs | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| mid\_mf\_own\_billsave\_dlrs | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| mid\_mf\_rent\_billsave\_dlrs | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| mid\_sf\_own\_billsave\_dlrs | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| mid\_sf\_rent\_billsave\_dlrs | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| high\_mf\_own\_billsave\_dlrs | High Income (>120% AMI), Multi-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| high\_mf\_rent\_billsave\_dlrs | High Income (>120% AMI), Multi-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| high\_sf\_own\_billsave\_dlrs | High Income (>120% AMI), Single-Family, Owner-Occupied - Total Bill Savings Potential ($/year) |
| high\_sf\_rent\_billsave\_dlrs | High Income (>120% AMI), Single-Family, Renter-Occupied - Total Bill Savings Potential ($/year) |
| very\_low\_mf\_own\_pct\_kwh\_offset | Very Low Income (0-30% AMI), Multi-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| very\_low\_mf\_rent\_pct\_kwh\_offset | Very Low Income (0-30% AMI), Multi-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| very\_low\_sf\_own\_pct\_kwh\_offset | Very Low Income (0-30% AMI), Single-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| very\_low\_sf\_rent\_pct\_kwh\_offset | Very Low Income (0-30% AMI), Single-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| low\_mf\_own\_pct\_kwh\_offset | Low Income (30-50% AMI), Multi-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| low\_mf\_rent\_pct\_kwh\_offset | Low Income (30-50% AMI), Multi-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| low\_sf\_own\_pct\_kwh\_offset | Low Income (30-50% AMI), Single-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| low\_sf\_rent\_pct\_kwh\_offset | Low Income (30-50% AMI), Single-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mod\_mf\_own\_pct\_kwh\_offset | Moderate Income (50-80% AMI), Multi-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mod\_mf\_rent\_pct\_kwh\_offset | Moderate Income (50-80% AMI), Multi-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mod\_sf\_own\_pct\_kwh\_offset | Moderate Income (50-80% AMI), Single-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mod\_sf\_rent\_pct\_kwh\_offset | Moderate Income (50-80% AMI), Single-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mid\_mf\_own\_pct\_kwh\_offset | Middle Income (80-120% AMI), Multi-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mid\_mf\_rent\_pct\_kwh\_offset | Middle Income (80-120% AMI), Multi-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mid\_sf\_own\_pct\_kwh\_offset | Middle Income (80-120% AMI), Single-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| mid\_sf\_rent\_pct\_kwh\_offset | Middle Income (80-120% AMI), Single-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| high\_mf\_own\_pct\_kwh\_offset | High Income (>120% AMI), Multi-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| high\_mf\_rent\_pct\_kwh\_offset | High Income (>120% AMI), Multi-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| high\_sf\_own\_pct\_kwh\_offset | High Income (>120% AMI), Single-Family, Owner-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |
| high\_sf\_rent\_pct\_kwh\_offset | High Income (>120% AMI), Single-Family, Renter-Occupied - Percent Electric Consumption Offsetable by Rooftop PV Generation |

Methods and Assumptions

LMI Rooftop PV Technical Potential

The PR LMI PV Rooftop Technical Potential Dataset was derived from rooftop suitability modeling using high resolution LiDAR data overlaid with demographic variables to classify potential by income group, building type, and tenure. This analysis is a Puerto Rico extension of the work described in [Sigrin and Mooney (2018)](https://www.nrel.gov/docs/fy18osti/70901.pdf) and with updated assumptions on PV Rooftop suitability and performance. Documented in this section are the methods for i) the rooftop suitability modeling, and ii) the LMI demographic estimation of potential.

1. Rooftop Suitability Modeling Methods

The rooftop suitability modeling uses NREL’s PV Rooftop Suitability Model v2.0, which uses LiDAR data[[1]](#footnote-1) and geospatial computation to estimate the suitability of a roof plane based on its orientation (azimuth and tilt), shading, and size. For details on the PV Rooftop Suitability Model v1.0, see [Gagnon et al. (2016)](https://www.nrel.gov/docs/fy16osti/65298.pdf). As noted, the assumptions used in the PR technical potential analysis relies on updated assumptions on what makes a plane suitable for PV. As a result, the PR technical potential estimates are not directly comparable to the 2018 SEEDSII REPLICA data layers for the 50-states. Differences in assumptions include new panel power densities (182 W/m2), inclusion of north facing planes, relaxation of minimum size requirements to be >= 1.62 m2 (i.e., the size of single 60-cell 250 watt solar panel), and adjustments to how shading is calculated for each developable surface. Table 4 details the specific assumptions used to determine a plane’s suitability. Once suitable planes have been generated, we run the NREL System Advisory Model (SAM) to calculate the performance of PV at each plane. Table 5 details the assumptions applied for PV performance simulations that were fed into SAM and ran for each developable plane.

Table 4: Assumptions for Suitability

|  |  |
| --- | --- |
| Requirement | Description |
| Shading | Measured shading for four seasons and required an average of 80% unshaded surface |
| Azimuth | All possible azimuths |
| Tilt | Average surface tilt <= 60 degrees |
| Minimum Area | >= 1.62 m2 (area required for a single 60-cell solar panel) |

Table 5: Assumptions for PV Performance Simulations

|  |  |  |
| --- | --- | --- |
| PV System Characteristics | Value for Flat Roofs | Value for Tilted Roofs |
| Tilt | 15 degrees | Tilt of plane |
| Ratio of module area to suitable roof area | 0.70 | 0.98 |
| Azimuth | 180 degrees (south facing) | Midpoint of azimuth class |
| Module Power Density | 182 W/m2 | |
| Total system losses | Varies (SAM defaults + individual surface % shading) | |
| Inverter efficiency | 96% | |
| DC-to-AC ratio | 1.2 | |

1. LMI Demographic Estimation of Technical Potential

From the LiDAR PV rooftop data set described above, we extend the data set to estimate tract-level solar technical potential by building income, tenure, and building size. This consists of two broad steps: (1) Intersecting individual building technical potential estimates with demographic factors from the Census Bureau 2011–2015 American Community Survey; (2) Aggregating the building-level estimates to the tract, county, and state level and conducting Monte Carlo runs to determine the median estimate. This work relies on demographic data from the ACS’s 2011–2015 5-year estimates; see Table 6 for a detailed account on tables used in this analysis. The ACS publishes these data as smaller crosstabs, with much of the detail available only at the larger (i.e., county) geographic levels. To account for this, we use random weighted sampling and proportional allocation methods to disaggregate demographic data into a tract-level cross-tabulation of household counts by AMI income group, per building type and tenure. Using this demographic crosstab, we rely on a series of methods tailored toward translating the counts of households per building type (e.g., single-family detached, 2–4 units, 5+ units) into estimates of building counts by building size class (i.e., small as 5,000 ft2 or less, medium as 5,000-25,000 ft2, large as 25,000 ft2 or more) and use this information to bootstrap residential buildings. The final tract-level estimates are determined based on the median of a 100-sample Monte Carlo simulation. The methods used for the PR LMI estimation are based on the methodology used in the U.S. national analysis. For a detailed discussion of the LMI estimation from LiDAR data, see [Sigrin and Mooney (2018)](https://www.nrel.gov/docs/fy18osti/70901.pdf).

Table 6: 2015 Five-Year American Community Survey Published Tables Used

|  |  |
| --- | --- |
| Table | Source Code |
| Household Income in the Past 12 Months (in 2015 Inflation-Adjusted Dollars) | B19001 |
| Tenure by Household Income in the Past 12 Months (in 2015 Inflation-Adjusted Dollars) | B25118 |
| Tenure by Units in Structure | B25032 |
| Tenure by Household Size by Units in Structure | B25124 |

ii.i Definition of LMI

This work uses the AMI definition to define LMI households. The AMI definition uses the Department of Housing and Urban Development’s (HUD) AMI income limits[[2]](#footnote-2) which is based on local geography and the relative cost of living in a particular location. HUD’s AMI income limits are used to determine the eligibility of applicants for federal assistance programs. They are based off the median income for Fair Market Rent (FMR) areas (i.e., metropolitan areas, parts of some metropolitan areas, and non-metropolitan counties) and are adjusted based on the family size[[3]](#footnote-3). Using these AMI income thresholds, we categorize households into the following low- to moderate-income groups, as defined by the Community Development Block Grant (CBDG)[[4]](#footnote-4), based on household income and the number of people in the household:

* Very Low Income: 0% to 30% of AMI
* Low Income: 30% to 50% of AMI
* Moderate Income: 50% to 80% of AMI
* Middle Income: 80% to 120% of AMI
* High Income: >120% of AMI

1. LMI Solar Savings Potential

The LMI Solar Savings Potential analysis builds off of the technical potential work by comparing the total generation potential to electric consumption and billing data to estimate how much rooftop solar could help the Puerto Rican LMI communities save on electric bills. Municipality level residential electric consumption and total bill accountings were provided by PREPA for the 2018 calendar year. Using the PREPA data and LEAD energy expenditure by income, tenure, and building type, we estimated the total consumption and annual bill at the County level and compared these estimates with our rooftop generation potentials.

1. The PR work uses LiDAR data from NASA G-LiHT (3 cm resolution collected in spring 2017; limited spatial coverage of PR) and USGS 3DEP (0.03-m resolution collected in 2015; near-complete spatial coverage of PR). [↑](#footnote-ref-1)
2. <https://www.huduser.gov/portal/datasets/il.html#2018> [↑](#footnote-ref-2)
3. The HUD baseline numbers for each income limit are based off the 4-person family size. For households with larger or smaller sizes, percentage adjustments are made to the income break limits based off the number of people in the household. Source: <https://www.huduser.gov/portal/datasets/il/il16/IncomeLimitsBriefingMaterial-FY16.pdf> [↑](#footnote-ref-3)
4. The CBGD income class delineation was chosen here because it includes a class for moderate income, whereas the standard Section-8 definition does not. [↑](#footnote-ref-4)