DNV

WHEN TRUST MATTERS

2013-2020 MASSACHUSETTS RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

BERKSHIRE GAS

Cape Light Compact

EVERSOURCE

Liberty

nationalgrid

Unitil

RESULTS BRIEF

MA22X05-B-RCPSERB

Equity in energy efficiency

"The PAs recognize that this is an ambitious vision. Providing comprehensive programs that benefit all customers is not just the PAs' obligation, it is also fundamental to their mission and purpose"

-2022-2024 Plan, p. 48

A data-driven focus on energy equity

The Massachusetts Program Administrators (PAs) define energy equity as "the process of establishing more equal access to and participation in energy efficiency, particularly among those groups who have historically participated at lower rates, including renters/landlords, moderate-income customers, English-isolated families, and microbusinesses."[1]

The PAs and Energy Efficiency Advisory Council (EEAC) Consultants collaborated on this results brief to help stakeholders better understand historically underserved populations and their program participation. This brief provides a snapshot of demographics and historic program engagement in selected sub-populations targeted for additional equity investment.

This brief uses data the PAs make publicly available via the Customer Profile Dashboard. At the time of this brief's publication, the dashboard provides users with key summary statistics on 2013–2021 program performance and PA populations. Although the PAs have supported all customers since the start of the statewide programs, the enhanced equity investments are included in the 2022-2024 plan, which is currently underway, and are thus not reflected in this brief. Please refer to the PAs' quarterly updates for up-to-date tracking of key equity performance metrics.

Responding to sweeping changes in 2020

Massachusetts is carrying out an ambitious agenda to address climate change. At the end of 2020, its Executive Office of Energy and Environmental Affairs (EEA) published a roadmap detailing the technical and policy pathways to reach net zero greenhouse gas (GHG) emissions by 2050. In March 2021, Governor Baker signed into law the Act Creating a Next Generation Roadmap for Massachusetts Climate Policy outlining the plan to achieve the net zero goal. The PAs responded with the Massachusetts Joint State Wide Electric and Gas Three-Year Energy Efficiency Plan 2022-2024 ("2022-2024 Plan"), which includes aggressive energy efficiency savings and GHG reductions goals along with significant longer-term investments such as workforce development and a focus on historically underserved communities.

RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

"The accumulation of decades of efforts to address these customers' energy burdens and to make their homes safer and more comfortable requires that the PAs focus attention during the 2022-2024 term on new energy-efficient measures and building types that have been less comprehensively served."

-2022-2024 Plan, p. 47

In 2020, the nation also turned its attention to equity and the systemic challenges that vulnerable communities face. As national leaders in energy efficiency, the MA PAs proactively embraced this opportunity to strengthen their engagement and increase participation in vulnerable communities. Equity, electrification, and workforce development became the three pillars of the 2022-2024 Plan.

Empowerment and support for vulnerable communities have long been integral to the PAs' programs, which have featured partnerships with community action agencies and income-eligible multifamily contractors as well as no-cost energy efficiency measures for qualifying customers. Well before the 2022-2024 Plan, the PAs also sponsored efforts to improve communication and data transparency, including:

- **Partnering with municipal groups** and providing them with PA data and geographic support tools
- **Supporting communities' unique needs and questions** by creating a self-service online data platform to share PA data in a way that protects customer privacy
- **Sponsoring two nationally cited equity studies** to identify program non-participants and understand barriers to participation from the perspective of people living in vulnerable communities[2, 3]
- **Active partnership in an equity working group** with stakeholders from a wide range of interest groups

Going forward, the PAs' simultaneous commitments to energy efficiency and GHG targets, energy equity, and ratepayers will require new approaches, regulatory support, and collaboration with community stakeholders. This brief offers data and insights that can help the PAs, regulators, and stakeholders engage in the collaborative process.

---

1 Massachusetts Joint State Wide Electric and Gas Three-Year Energy Efficiency Plan 2022-2024, November 1, 2021.

2 The Residential Nonparticipant Customer Profile Study examined participation rates in block groups with high proportions of renters, moderate-income households, and English-isolated households.

3 The Nonparticipant Market Barriers Study connected with residents in low-participation areas identified in the Residential Nonparticipant Customer Profile Study to better understand their awareness of the program(s) and other barriers to participation.

Contents

Defining communities to target

Hard-to-Reach and Environmental Justice Communities - program activity

Income Eligible Program - participation over time

2013-2020 Income Eligible Program measures

Customer segments of interest

Income-qualified households

Renter-occupied households

Beyond Program Year 2020: Addressing the needs of income-qualified households

The MA Customer Profile Dashboard

Definitions

RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

Defining communities to target

The PAs' programs are designed to serve all customers across Massachusetts. Understanding geography, demographics, and past program participation helps the PAs meet the needs of the Commonwealth's diverse customer population. These pages explore two geographic designations used to define vulnerable communities.

EEA Environmental Justice Communities

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) assigns Environmental Justice (EJ) status to a Census block group if a certain percentage of its population meets the state's criteria for income level, minority status, and/or English isolation (households lacking English language proficiency).[4]

DPU Hard-to-Reach Communities

The MA Department of Public Utilities (DPU) established a set of criteria for defining Targeted Hard-to-Reach Communities; see p. 97-98 in the DPU Order on the PAs' 2022-2024 Three-Year Plans (D.P.U. 21-120 through D.P.U. 21-129). Beginning in 2022, the DPU ordered the PAs to use these criteria to determine which municipalities are eligible for targeted equity investment and outreach. DPU Hard-to-Reach Communities are towns that contain at least one EEA EJ block group and also have historically low participation, defined in the DPU Order as 27% or lower.

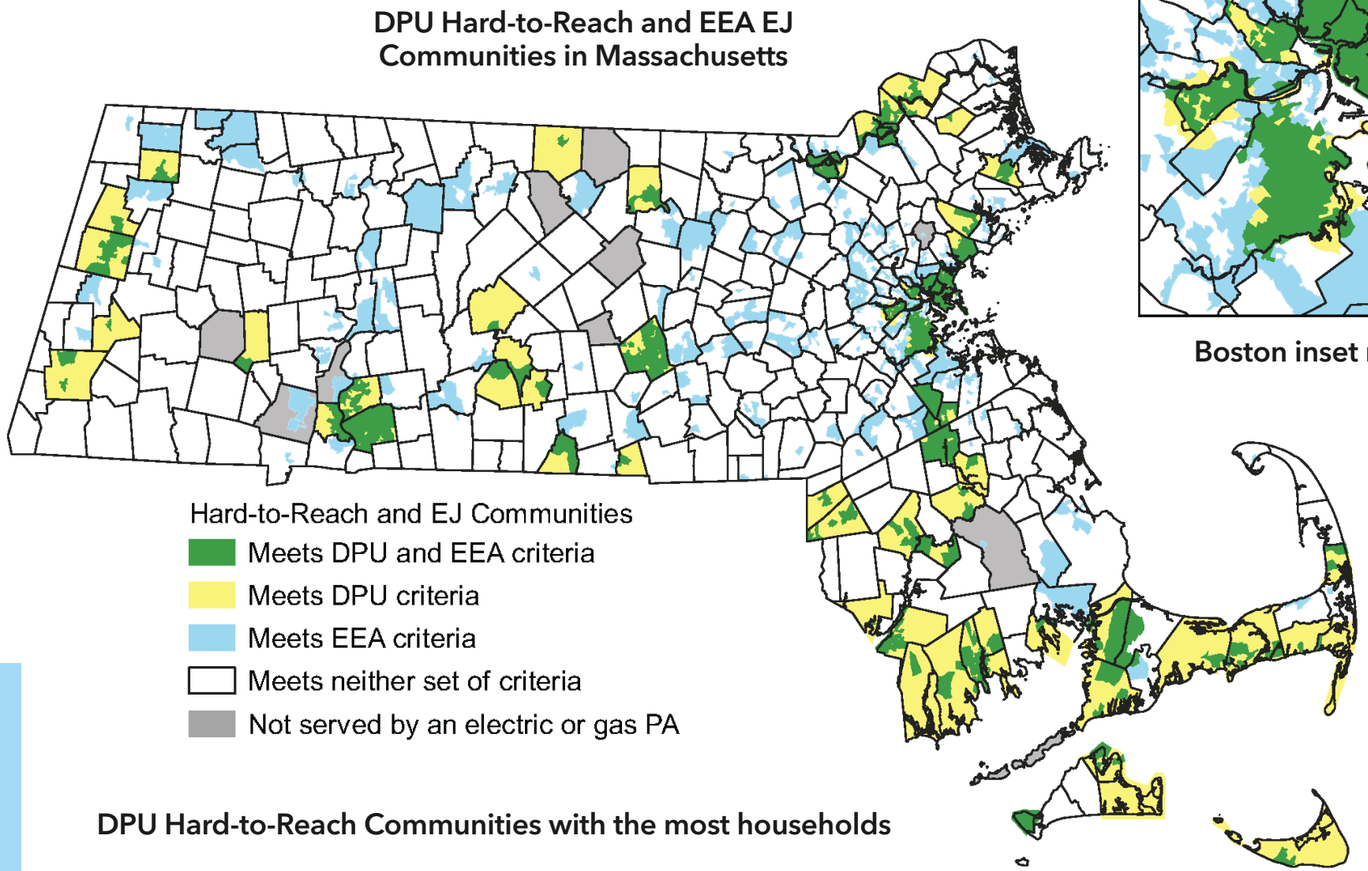
The map

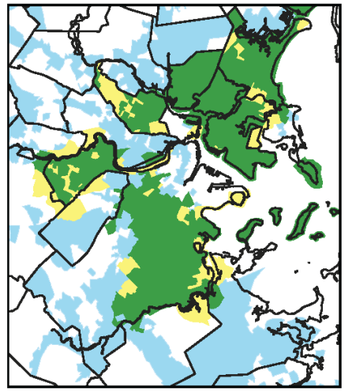
The map on this page shows which block groups meet the state's criteria for EJ Communities, which towns meet the DPU's criteria for Hard-to-Reach Communities, and the overlap between the two.

> *"To reach all of their customers, the PAs must provide services that meet customers' unique needs, based on the kind of building they live in, whether they own or rent, their income, what languages they speak, where they are located in the state, and other key demographic characteristics."* -2022-2024 Plan, p. 46

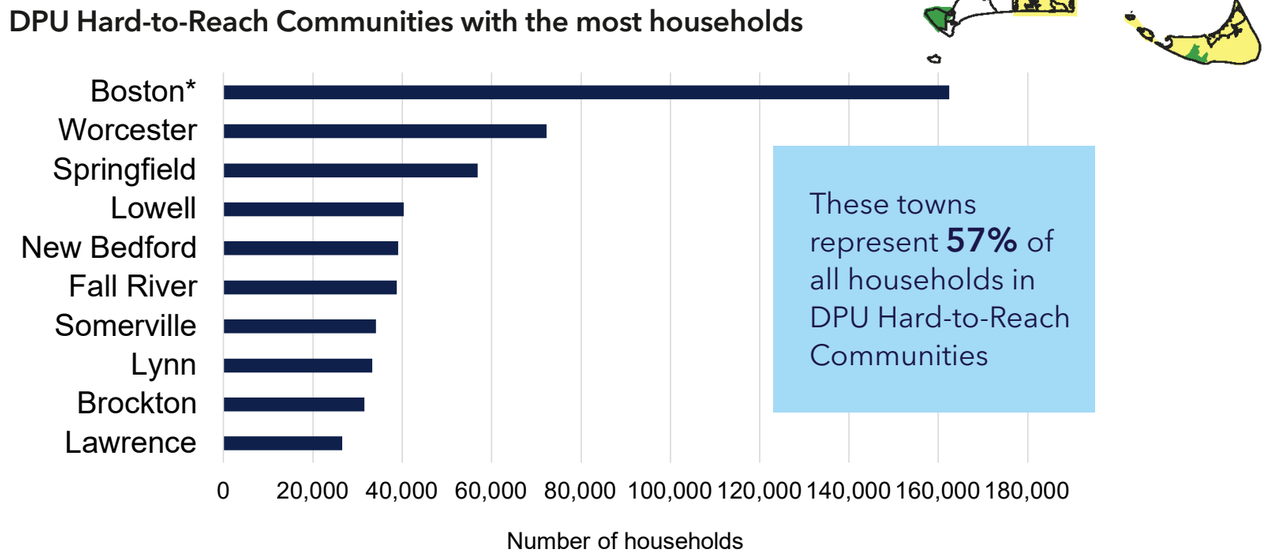
[4] The full criteria for qualifying as a DPU Hard-to-Reach and/or EEA EJ Community are listed on the Definitions page at the end of this brief.

RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY





Boston inset map



These towns represent **57%** of all households in DPU Hard-to-Reach Communities

[*] As a whole municipality, the City of Boston would not meet the criteria for a DPU Hard-to-Reach Community. However, because it contains nearly a tenth of Massachusetts's population, the DPU Order states that Hard-to-Reach Communities will include the Boston neighborhoods of Allston, Brighton, Dorchester, East Boston, Fenway, Mattapan, Mission Hill, and Roxbury."

Hard-to-Reach and Environmental Justice Communities - program activity

These graphs compare electric and gas location participation rates and population savings achieved for customers in DPU Hard-to-Reach Communities, EEA EJ Communities,[5] and outside these areas from 2013-2020.[6] This data includes participants from the residential and income eligible programs.

In the top graphs, it is notable that although location participation rates for DPU Hard-to-Reach and EEA EJ Communities are lower than in outside areas, the three lines trend towards convergence in recent years. Note that the criteria for DPU Hard-to-Reach areas include historically low participation, which means that participation was lower by definition between 2013 and 2017.

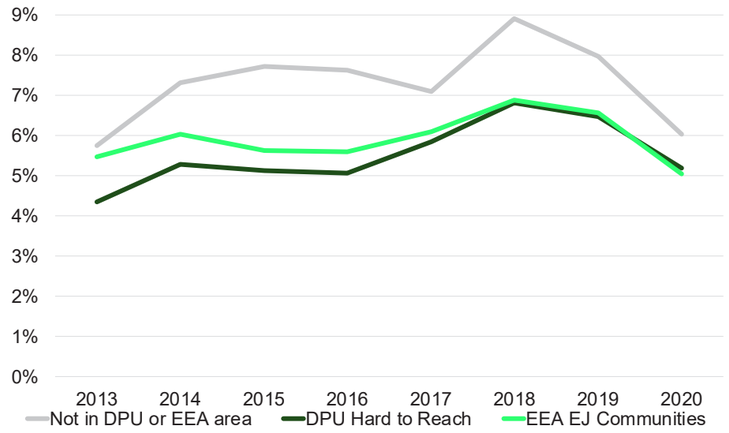
The bottom graphs show that while DPU Hard-to-Reach areas have lower population savings achieved than other areas, population savings achieved in the EEA EJ areas is about the same as or sometimes greater than in the outside areas. A pattern of lower participation rates but equivalent savings achieved indicates deeper savings and/or larger projects. Past PA equity studies have established that the PAs' Low Income Multifamily program is one of the key delivery channels in EEA EJ areas, which is consistent with a smaller number of projects that each get larger/deeper savings.

Notably, participation and savings rates dipped in 2020 for all groups, associated with complications of the COVID-19 pandemic.

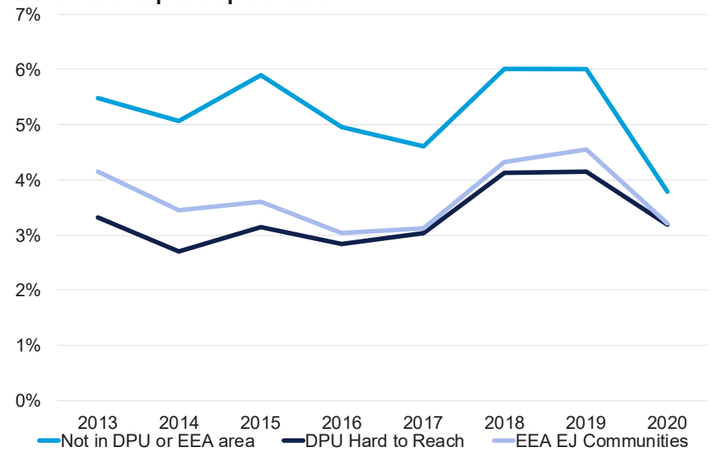
[5] The DPU and EEA lines both include the overlapping geographic areas, as shown in green on the map on pages 6-7.

[6] The data for these graphs comes from the MA Customer Profile Dashboard's socioeconomic page.

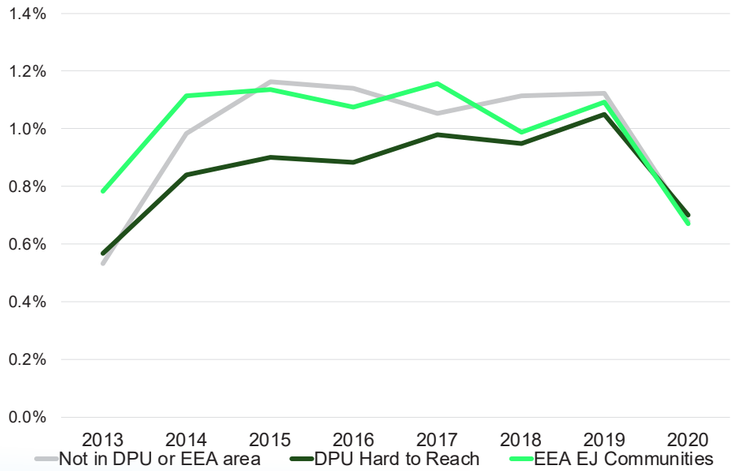
Electric location participation rate



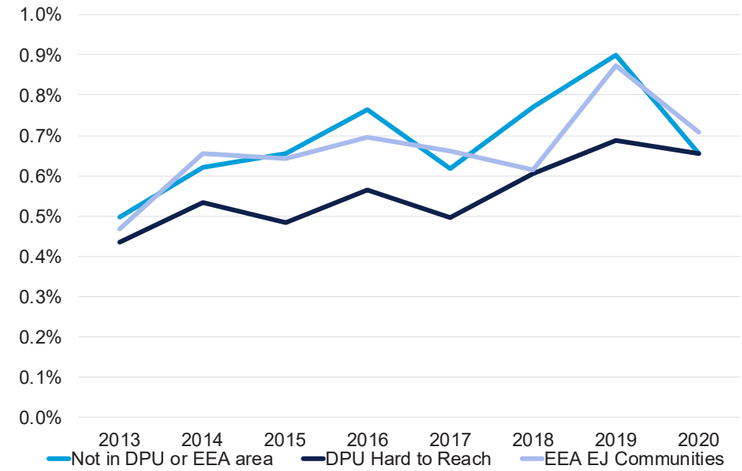
Gas location participation rate



Electric population savings achieved



Gas population savings achieved



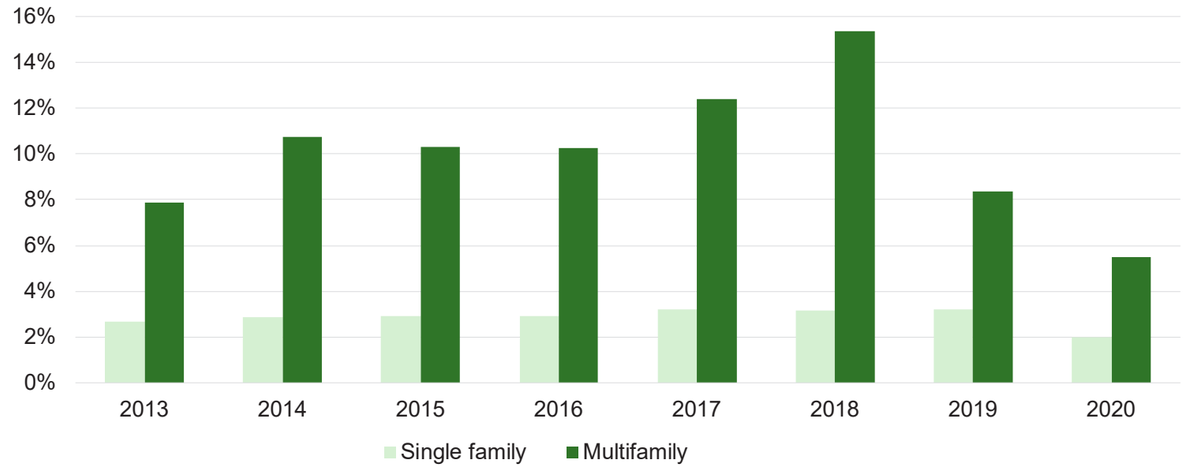
RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

Income Eligible Program - participation over time

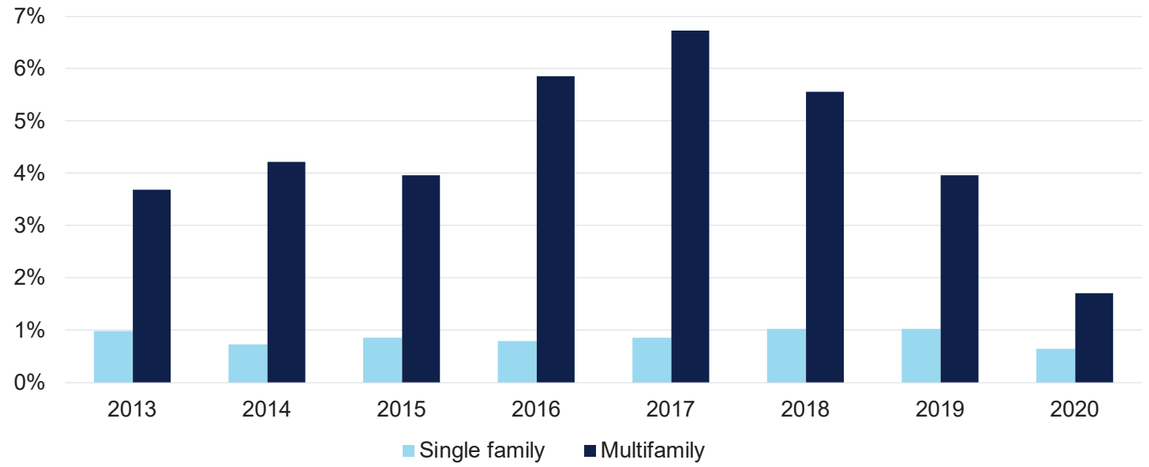
These pages present the time-series household-level participation rates for the Income Eligible Program.

The graphs show that participation rates among single family households remained steady or even slightly increased until 2020, when participation dropped during the COVID-19 pandemic. Multifamily participation rates peaked in 2017 and 2018, which is consistent with the PAs' concentrated efforts to increase participation and outreach for multifamily properties in accordance with the 2016-2018 Plan. Multifamily participation rates then decreased substantially in 2020. This decrease was influenced by conditions associated with the COVID-19 pandemic, as implementers were confronted with unprecedented barriers such as stay-at-home orders and restricted access to homes and buildings. This was particularly true for medically at-risk communities and Housing Authorities—two sub-populations that are core contributors to multifamily participation in the Income Eligible programs.

Electric household participation rate - Income Eligible program



Gas household participation rate - Income Eligible program



Analytic approach

There are inherent challenges involved in quantifying the participation rates of eligible low-income populations due to the sensitivity and unavailability of household income information. To overcome these challenges, DNV used the following steps to estimate the eligible low-income population.

Participating households (numerator)

- *Identify all locations (based on primary address) that participated in the Income Eligible program, regardless of fuel or sector.*
- *Determine the number of households at these locations as the higher of the following two values: 1) the number of electric accounts at the location, or 2) the number of units reported in the MA e911 system. Utilizing the MA e911 system helps provide a more accurate picture of household quantities in cases where buildings might be served by master-metered gas or electric accounts.*
- *Calculate the number of participating households at the location. For buildings participating through the single family initiative (1-4 units), if at least 50% of the units were on a low-income rate, it was assumed that all households were served; otherwise, participation was based on the proportion of units on a low-income rate. For buildings participating through the multifamily initiative, it was assumed that 100% of units were served. (This is based on information from program implementers that the entire building is served when participating in the Income Eligible multifamily initiative.)*

Eligible households (denominator)

- *Use U.S. Census Public Use Microdata Sample (PUMS) data.*
- *Identify single family (1-4 unit) eligible households using a combination of household income and number of occupants, with the same thresholds as the program eligibility criteria.*
- *Identify multifamily (5+ unit) eligible households as those in 5+ unit buildings with a household income at or below 60% of the state median income. Program eligibility states that a development qualifies if at least 50% of its households have an income at or below 60% of the area median income. This estimate undercounts market rate households in eligible buildings.*
- *PUMS data is available at the statewide level, so the total number of households was scaled by the percentage of Massachusetts residents that are served by the PAs.*

RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

2013-2020 Income Eligible Program measures

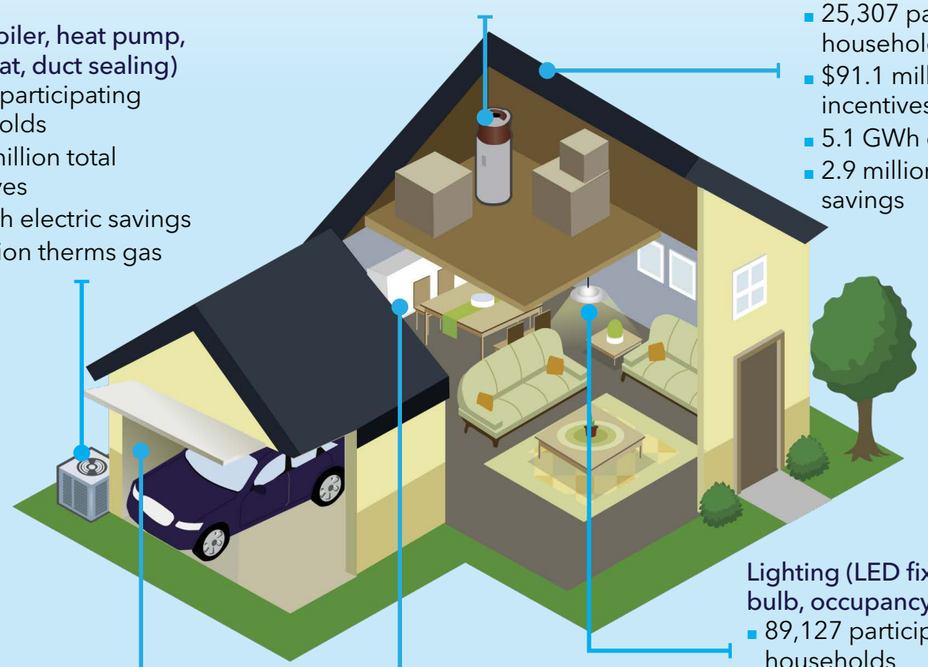
These pages show which measures were installed in households that participated in the income eligible programs from 2013 through 2020. Each measure type shows representative technologies (not an exhaustive list), the number of participating households (electric and gas), total incentives (electric and gas), electric energy savings, and gas energy savings. The number of participating households was calculated as described on page 11.

Single family

Hot water (tankless water heater, heat pump water heater, faucet aerator, showerhead)
- 15,641 participating households
- $9.6 million total incentives
- 1.6 GWh electric savings
- 0.3 million therms gas savings

HVAC (boiler, heat pump, thermostat, duct sealing)
- 36,384 participating households
- $81.1 million total incentives
- 4.0 GWh electric savings
- 1.4 million therms gas savings

Envelope (air sealing, insulation, weatherization)
- 25,307 participating households
- $91.1 million total incentives
- 5.1 GWh electric savings
- 2.9 million therms gas savings



Lighting (LED fixture, LED bulb, occupancy sensor)
- 89,127 participating households
- $12.2 million total incentives
- 48.3 GWh electric savings

Plug load (power strip)/ TLC kits*
- 86,960 participating households
- $11.9 million total incentives
- 19.2 GWh electric savings

Appliances (refrigerator, clothes washer, dehumidifier)
- 40,282 participating households
- $25.7 million total incentives
- 20.7 GWh electric savings

Other
- 32,097 participating households
- $8.9 million total incentives
- 1.1 GWh electric savings
- 0.3 million therms gas savings

* TLC kits include basic measures such as LED night lights, refrigerator and hot water thermostats, refrigerator coil brushes, and wall plate stoppers. For more information on all measures, see the PAs' comprehensive eTRM tool at https://etrm.anbetrack.com/#/workarea/home.

Multifamily

Envelope (air sealing, insulation, weatherization)
- 35,314 participating households
- $47.4 million total incentives
- 6.8 GWh electric savings
- 3.5 million therms gas savings

HVAC (boiler, heat pump, thermostat, duct sealing)
- 53,141 participating households
- $113.2 million total incentives
- 18.4 GWh electric savings
- 5.2 million therms gas savings

Plug load (power strip)/TLC kits*
- 95,544 participating households
- $4.2 million total incentives
- 12.4 GWh electric savings

Other
- 58,261 participating households
- $15.3 million total incentives
- 8.5 GWh electric savings
- 0.3 million therms gas savings

Lighting (LED fixture, LED bulb, occupancy sensor)
- 156,199 participating households
- $125.9 million total incentives
- 152.5 GWh electric savings

Appliances (refrigerator, clothes washer, demumidifier)
- 37,593 participating households
- $10.0 million total incentives
- 7.6 GWh electric savings

Hot water (tankless water heater, heat pump water heater, faucet aerator, showerhead)
- 51,027 participating households
- $47.2 million total incentives
- 2.8 GWh electric savings
- 4.1 million therms gas savings

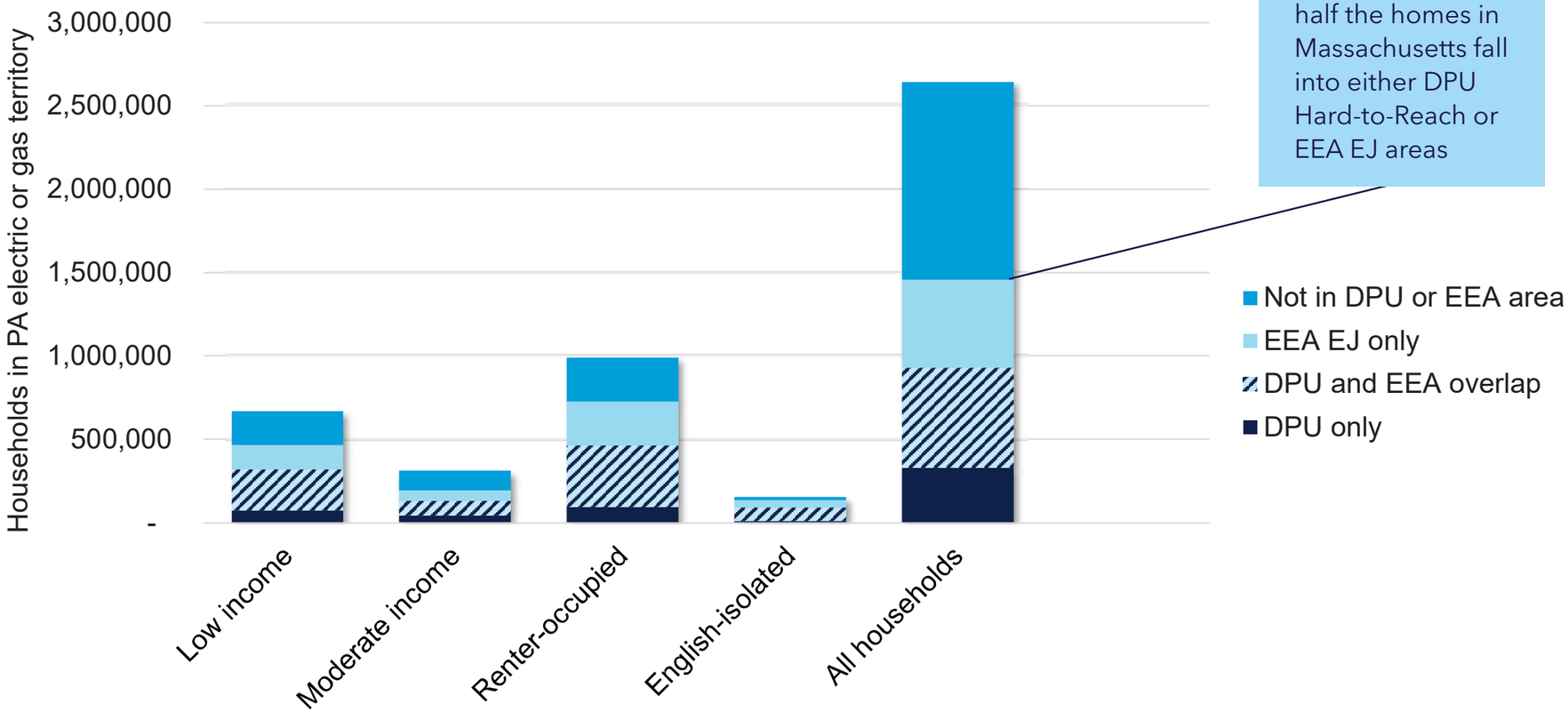
Customer segments of interest

The graph to the right shows the number of Massachusetts households that are low-income, moderate-income, renter-occupied, and English-isolated (customer segments of interest). For each customer segment, the graph also shows the proportion of households that are located in a DPU Hard-to-Reach Community (dark blue), an EEA EJ Community (sky blue), in both (cross-hatched), or outside of these areas (cyan).

It should be noted that these customer segments overlap substantially (e.g., most low-income households are also renter-occupied). Additionally, "all households" includes every household in Massachusetts and not just the customer segments of interest.

The PAs are committed to helping all customers in these segments, regardless of whether they're located in an EJ or Hard-to-Reach area, and conduct their programs in all parts of their service territories. As the chart shows, there are many customers in segments of interest that are not located in DPU Hard-to-Reach areas. For example, there are more renters located outside of DPU Hard-to-Reach areas than inside them.

Demographics in DPU Hard-to-Reach and EEA EJ Communities[7]



Approximately half the homes in Massachusetts fall into either DPU Hard-to-Reach or EEA EJ areas

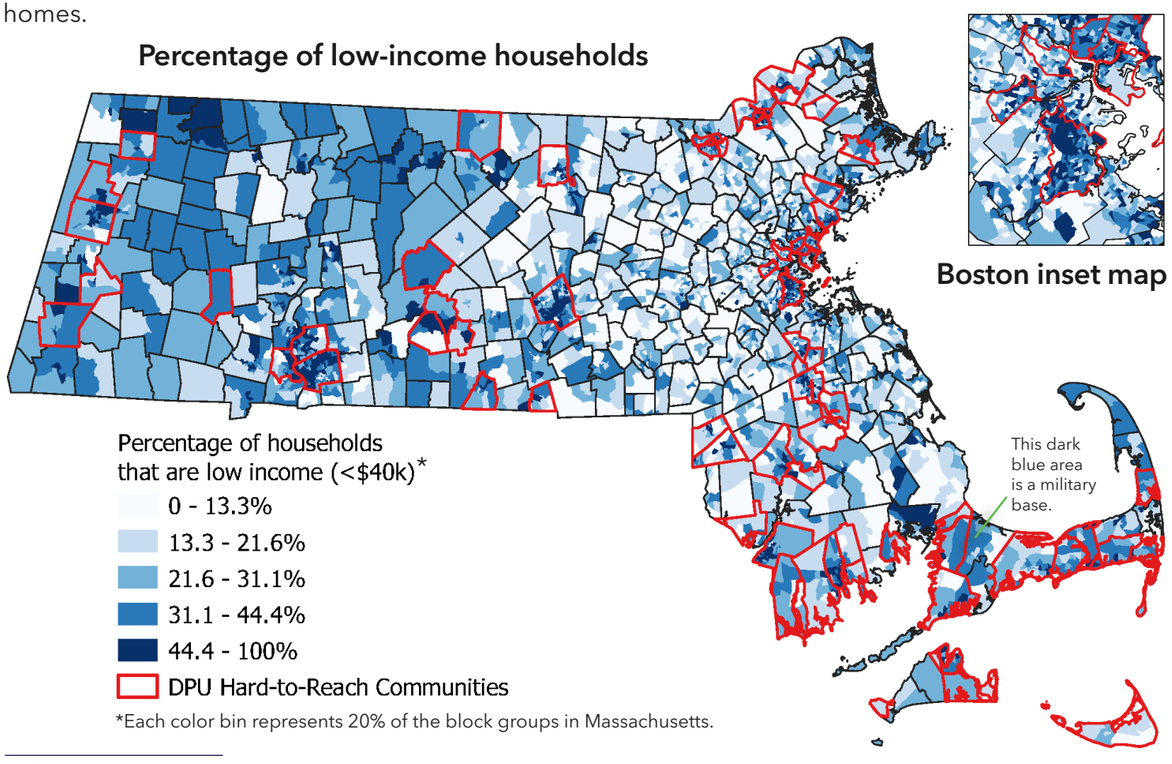
[7] Low income includes households with income <$40k and moderate income includes households with income between $40k and $60k, as reported in the 2021 one-year American Community Survey from the US Census. Customer profile studies in Massachusetts have used these thresholds for several years because they are the closest approximations using readily available data. They do not completely align with the precise eligibility requirements for the Income Eligible and Enhanced Incentives program as the program eligibility is based on household income and number of household members, and ACS only reports these two variables together at the statewide level.

Income-qualified households

These maps show the density of low- and moderate-income households by Census block group. The towns outlined in red are DPU Hard-to-Reach Communities.[8] Low-income households tend to be concentrated in urban areas, and as the bar graph shows, the majority of these households are in Boston. However, the maps also show that much of the western part of the state has a high proportion of low- and moderate-income households. Most of these households are outside of DPU Hard-to-Reach Communities.

The western part of the state tends to be rural. A common characteristic of rural homes is the use of delivered fuels (especially oil and propane) for heat. Electrifying these homes by installing electric heat pumps, a focus of the 2022-2024 Plan, has numerous benefits including lower per-unit heating costs and reduced variability in heating costs. Regulated fuels also offer greater security to the most vulnerable households because their heat cannot be shut off for non-payment during the winter months.

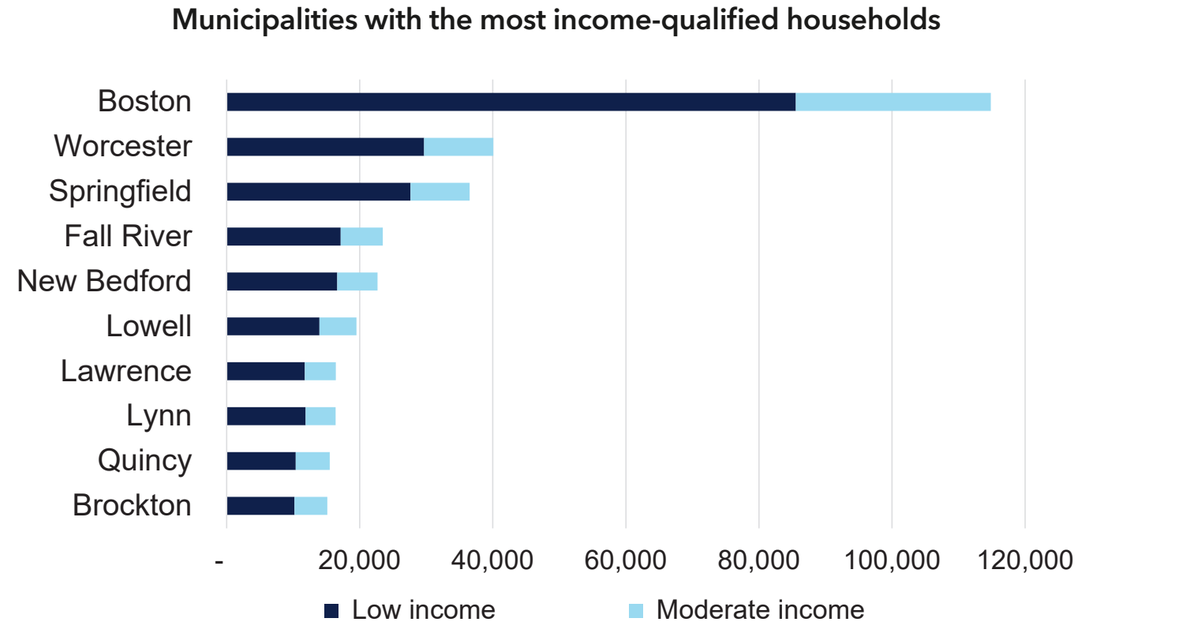
While the 2022-2024 Plan focuses on electrification, it's not always practical for some homes to electrify heating. The PAs are still offering incentives for high-efficiency fossil fuel systems. These systems reduce carbon emissions and can lower energy costs. In the case of natural gas conversion, they can also provide steadier prices and regulate against shut-offs for vulnerable homes.

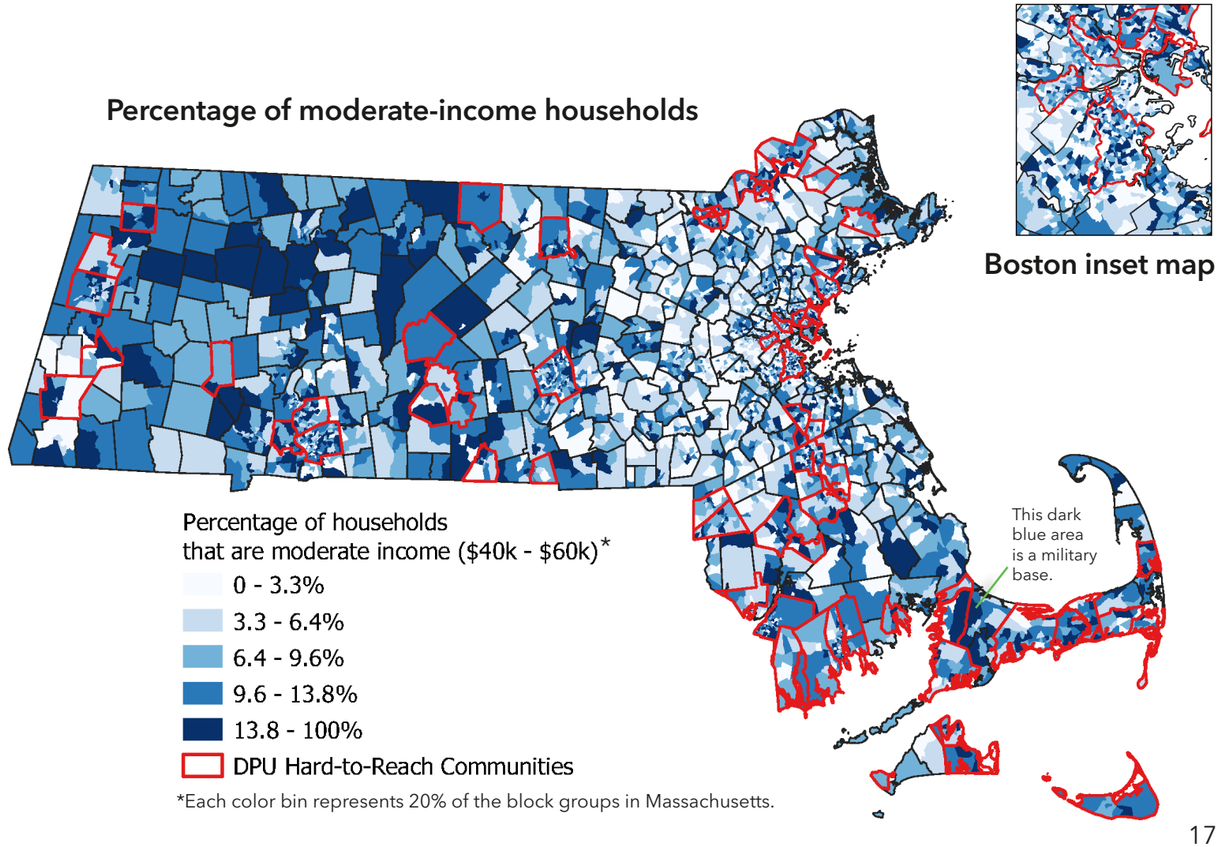


*Each color bin represents 20% of the block groups in Massachusetts.

[8] Note that the DPU Hard-to-Reach Communities shown here are defined based on historically low program performance from 2013-2017 rather than the full lifetime of services. For more information, see p. 97-98 in the DPU Order on the PAs' 2022-2024 Three-Year Plans

RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY



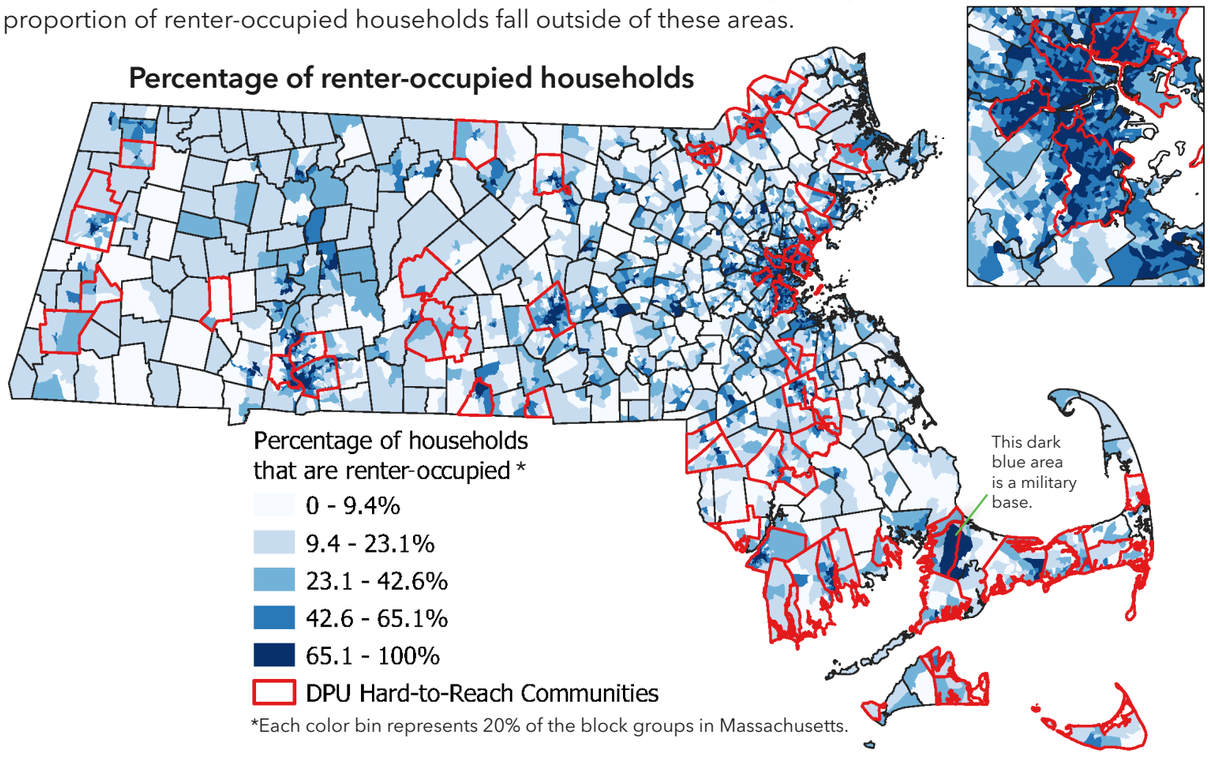


*Each color bin represents 20% of the block groups in Massachusetts.

Renter-occupied households

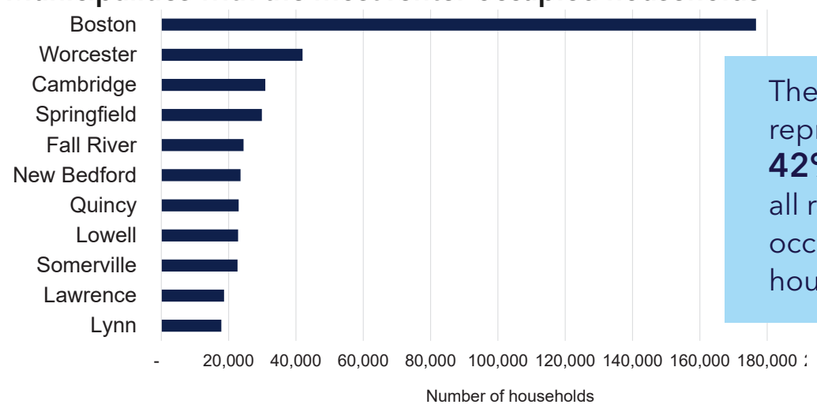
This section presents information about renter-occupied households, one of the key demographics in the 2022-2024 Plan. Of the 2.76 million households in Massachusetts, 976,841 (35%) are renter-occupied. Renter-occupied households tend to concentrate in urban areas; 42% of renter-occupied households are in 10 urban and suburban municipalities.

The map below shows the concentration of renter-occupied households across the state. The towns outlined in red are DPU Hard-to-Reach Communities. Notably, a large proportion of renter-occupied households fall outside of these areas.



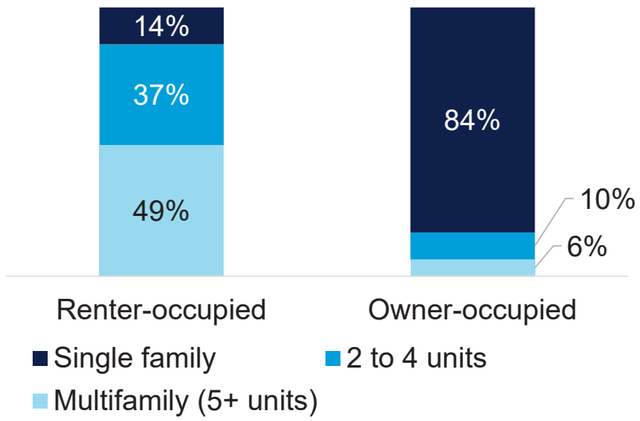
*Each color bin represents 20% of the block groups in Massachusetts.

Municipalities with the most renter-occupied households



These towns represent **42%** of all renter-occupied households

Percentage of renter-occupied housing by building type



Renter/multifamily overlap

The graph to the left shows that almost all renter-occupied households are in buildings with more than one unit. Thus, programs targeting these building types will tend to also target renters.

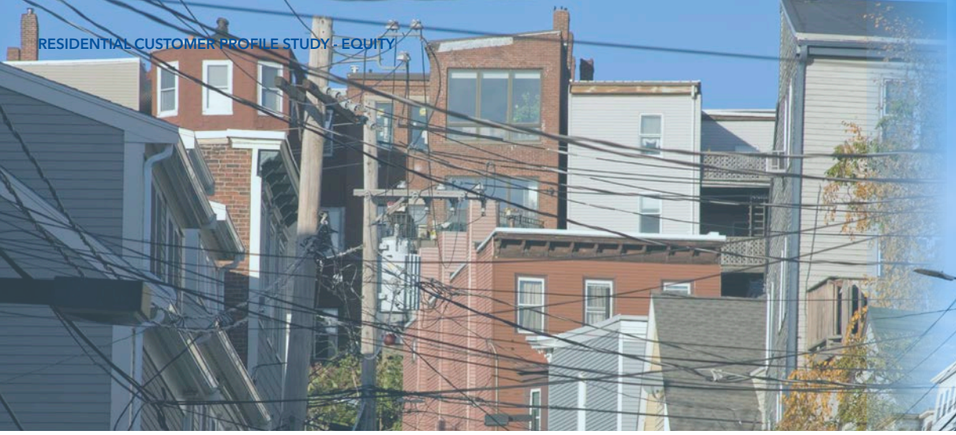
Split incentives

An important non-financial barrier for renters is the "split-incentive" problem. Because the landlord owns the building and most of the energy-using appliances in the home, implementing most non-behavioral energy efficiency measures is the landlord's responsibility. However, because tenants usually pay their own utility bills, they are the ones who stand to benefit most from energy efficiency improvements. This can reduce the landlord's motivation to make these improvements.

To help encourage participation among the renter/landlord population, in the 2022-2024 Plan the PAs are:

- Increasing investments to serve renters and landlords
- Offering a weatherization incentive up to 100% for individually-metered rental units
- Reporting renter-specific KPIs including metrics around low-rise buildings

> *"Smaller landlords… are more likely to self-manage their properties, and therefore have fewer management resources to dedicate to energy efficiency program participation. This means a targeted effort to better reach small landlords and educate them about the program and its benefits and value proposition, but also potentially offering simplified participation options and processes for small landlords and greater access to technical support."* 2022-2024 Plan, –p.114



RESIDENTIAL CUSTOMER PROFILE STUDY - EQUITY

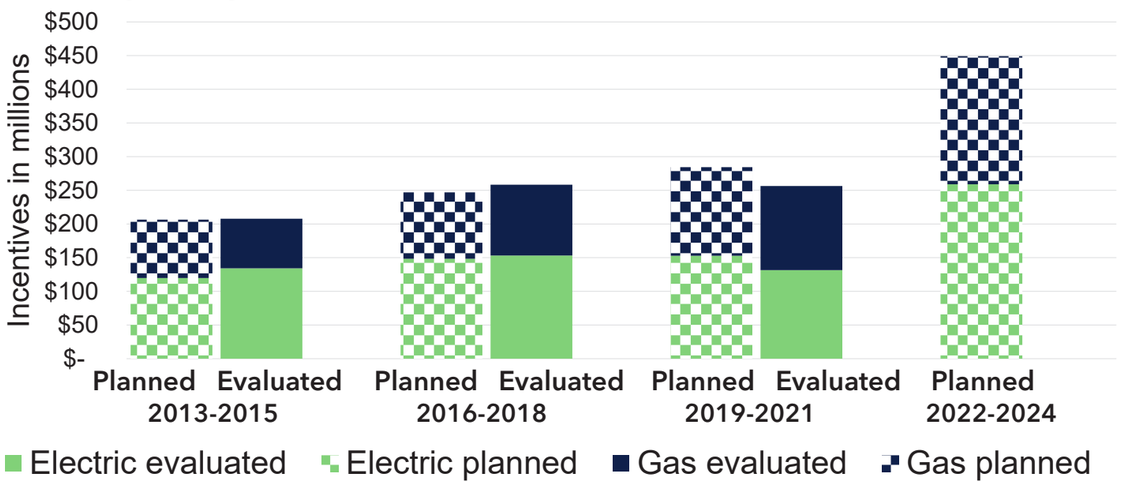
Beyond Program Year 2020: Addressing the needs of income-qualified households

While this brief focuses on results from the 2013-2020 program years, it's helpful to consider these results in the context of the ambitious agenda that the PAs, EEAC, and other stakeholders have set in motion for the 2022-2024 term. The 2022-2024 Plan calls for workforce development, community-focused initiatives, and increased investments for moderate-income customers, including:

- A planned $136 million investment to serve moderate-income customers (61%-80% of the state median income)
- No-cost weatherization
- Enhanced incentives for heating systems, with higher incentives for efficient electric heating

The plan also calls for substantially increasing incentives provided through the Income Eligible Program, with a planned investment of $589 million to serve income-eligible customers. The figure below shows incentives for the Income Eligible Program by triennium and fuel type from the electric and gas term reports, with the textured bars for each 3-year term showing planned incentives and the solid bars showing evaluated incentives. Ongoing monitoring of the data as it becomes available will be critical to assessing the PAs' progress toward and the attainability of these goals.

Income Eligible Program incentives



Non-financial barriers

The planned increased investment in incentives for income-qualified customers aims to reduce financial constraints as a barrier to participation. The 2022-2024 Plan calls for lowering non-financial barriers to participation as well. PA equity studies have shown that low- and moderate-income households in Massachusetts may:

- Need more awareness and understanding of energy efficiency programs
- Fear scams and lack trust in the government and their landlords
- Prioritize other household needs over energy efficiency

> *"The PAs' primary strategy for building trust is to identify the entities that customers already trust, and to work with them to promote the benefits of energy efficiency."*
> -2022-2024 Plan, p. 47

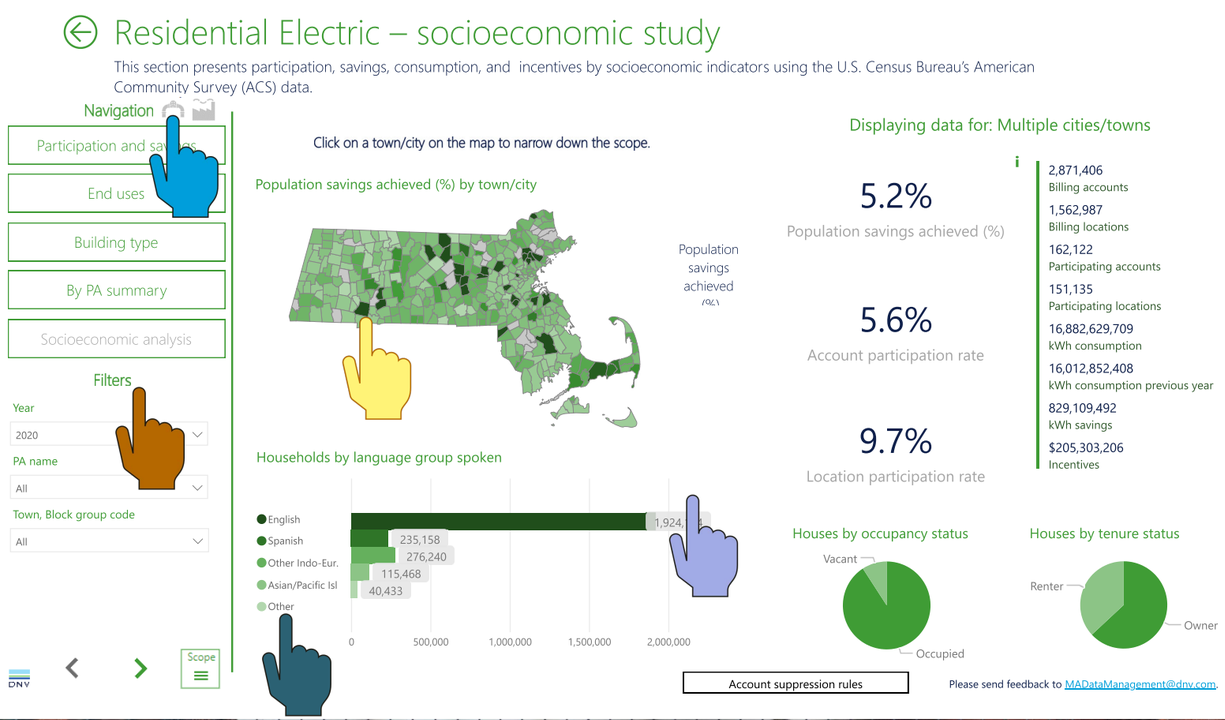
The PAs and stakeholders collaborated to design the Community First Partnership program to help overcome these non-financial barriers by leveraging the nuanced local knowledge and community trust of local organizations. This program builds on the 2019-2021 term's Municipal Partnership Strategy, to increase focus on environmental justice communities. This focus includes improvements to expand the involvement of community-based organizations, increase the flexibility of design to encourage innovative proposals, and align goals, data, and outcomes shared between the PAs and their partners.

English isolation is another non-financial barrier that can affect customer awareness and understanding of energy efficiency programs. It affects approximately 6% of households statewide, 70% of which are renter-occupied. To better reach English-isolated households, the PAs are identifying local "hot spots" with high concentrations of specific spoken languages.

Visit the MA Customer Profile Dashboard to interact

Users can visit the dashboard online to interact with these results and go deeper into the data.

- Hover over any town to see data at town and block group levels.
- Filter the data by year, PA, demographic variables, etc.
- View languages spoken in the selected geographic areas.
- Toggle between electric and gas.
- Export the underlying data to an Excel file.



Creating the RCPS

DNV follows an ISO 27001-certified process to obtain data extracted from the PAs, clean and transform it into a standard format, and load it into the relational data warehouse, where it is combined with third-party data. Once data is loaded to the data warehouse, it is reflected in the privacy-controlled Veracity dashboard immediately, and can be queried and used for PA reporting, ad hoc analysis, and evaluation contractor sharing.

Third-party data

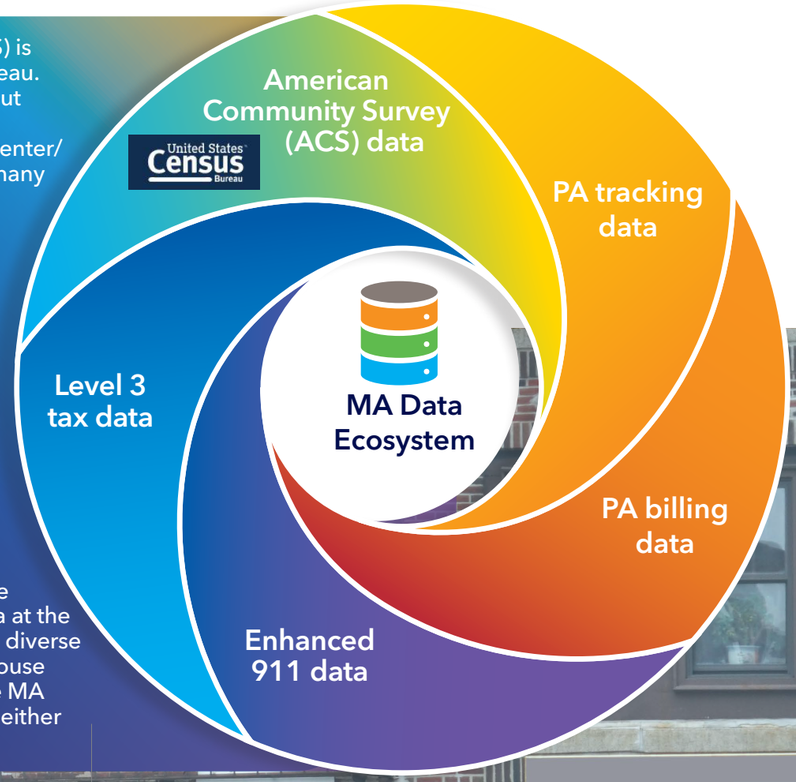
The maps in this brief use the 2019 ACS 5-year Estimates provided in geodatabase format. The statewide demographic metrics use Public Use Microdata Sample (PUMS) with data from the ACS 1-year survey.

The American Community Survey (ACS) is conducted through the US Census Bureau. It provides a wealth of information about people's work status and occupations, educational attainment, income level, renter/owner status, languages spoken, and many more topics.

The Level 3 tax assessor data provide parcel-level information about building and property attributes, including square footage and building class.

The Enhanced 911 data, or E911 data, provide precise point-level address information, including addresses in multi-building complexes.

The ACS data are collected at the level of the Census block group, a small geographical unit with a population of ~600 to 3,000 people. The Level 3 tax data and Emergency 911 data are at the building level. The PAs collect their data at the individual account level. Merging these diverse data sources within the MA data warehouse allows us to learn much more about the MA energy landscape and population than either source could tell us in isolation.



Definitions

DPU Hard-to-Reach Community - According to the DPU Order on the PAs' 2022-2024 Three-Year Plans (D.P.U. 21-120 through D.P.U. 21-129), to be designed as a Targeted Hard-to-Reach Community, municipalities must 1) be served by an electric and/or gas Program Administrator; 2) contain at least one environmental justice population as defined by the EEA Environmental Justice Policy (see below for EEA EJ definition), and 3) have historically low participation rates (defined as a combined consumption-weighted participation rate of 27% or less from 2013-2017).

Notably, as a whole municipality, the City of Boston would not meet the criteria for a DPU Hard-to-Reach Community. However, because it contains nearly a tenth of Massachusetts's population, the D.P.U. Order states that Hard-to-Reach Communities will include the Boston neighborhoods of Allston, Brighton, Dorchester, East Boston, Fenway, Mattapan, Mission Hill, and Roxbury.

EEA EJ Community - In Massachusetts, the Executive Office of Energy and Environmental Affairs (EEA) assigns Environmental Justice (EJ) status to a Census block group when one or more of the following criteria are true: 1) the annual median household income is 65% or less of the statewide annual median household income; 2) minorities make up 40% or more of the population; 3) 25% or more of households identify as speaking English less than "very well"; and/or 4) minorities make up 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.

English-isolated - Defined as households in which no one 14 and over speaks English only or speaks a language other than English at home and speaks English very well.

Equity - Defined by the PAs as "the process of establishing more equal access to and participation in energy efficiency, particularly among those groups who have historically participated at lower rates, including renters/landlords, moderate-income customers, English-isolated families, and microbusinesses"

Incentives - Money paid to participants by PAs to encourage participation in energy efficiency programs

Location participation - The ratio of participating locations to total locations in the population

Population savings achieved - The ratio of savings to consumption, calculated as (the current year savings) over (the current year consumption plus savings)

Savings - Reflects gross energy savings achieved by accounts participating in energy efficiency programs

About DNV

We are the independent expert in risk management and quality assurance. Driven by our purpose, to safeguard life, property, and the environment, we empower our customers and their stakeholders with facts and reliable insights so that they can make critical decisions with confidence. As a trusted voice for many of the world's most successful organizations, we use our knowledge to advance safety and performance, set industry benchmarks, and inspire and invent solutions to tackle global transformations. DNV is committed to a just and equitable clean energy transition.

DNV
101 Station Landing
Suite 520
Medford, MA 02155