



# MASSACHUSETTS GREEN COMMUNITIES PROGRAM

## 2017 PROGRESS REPORT



**Prepared for**

**Massachusetts Department of Energy Resources**

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**Cover Page Photo Captions:**

Top: The Town of Pepperell celebrates receipt of its second Green Communities Grant.

Bottom Left: Great Barrington, a town with a population of 7,000 in western Massachusetts, received its Green Community designation in 2012. Towns receive a Green Communities plaque to commemorate their designation.

Bottom Right: The Town of Hatfield's energy reduction strategy targets schools as well as homes.

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# Executive Summary

Over the last few years, Massachusetts has taken bold steps to expand clean energy opportunities and promote sustainable practices across the Commonwealth. The Department of Energy Resources' (DOER) mission is to create a clean, affordable and resilient energy future for the Commonwealth. This includes providing the tools and resources necessary for cities and towns to reduce costs and carbon emissions through the Green Communities Designation and Grant Program. This program provides a roadmap, along with financial and technical support, to municipalities that commit to meeting certain criteria. Key among these criteria is reducing municipal energy use by an ambitious and achievable goal of 20 percent over five years.

The program's impact is both broad and deep: The program has engaged most of the state's 351 communities and supports continuous improvement with a goal of achieving significant and lasting energy and greenhouse gas emissions reductions. This program continues to be a model for how state and local governments can work together to achieve shared goals of lowering carbon emissions and reducing energy costs – ultimately producing financial savings for municipalities that can be directed to other needs.

The Green Communities Program success is driven by community participation, energy reductions and associated cost savings, greenhouse gas emissions reductions, and goal achievement. This report discusses these and other program benefits.

## 1. Participation

The program continues to experience diverse and increased participation throughout the Commonwealth. As of the end of 2017, nearly two-thirds of Massachusetts communities—210 of 351 municipalities—were designated Green Communities. These municipalities represent more than 70 percent of the total Massachusetts population. Twenty-five municipalities became Green Communities in 2017. Participants include large and small communities in all regions, urban and rural.

## 2. Energy Reductions and Cost Savings

As of the end of 2017, Green Communities had reduced energy use by 1.1 million MMBtus, an 11 percent decline since their baseline years, which is enough to power and heat approximately 8,400 Massachusetts homes. These energy reductions equate to annual energy cost savings of \$13.7 million.

## 3. Emissions Reductions

These energy reductions represent emissions reductions of approximately 87,500 metric tons of carbon dioxide (CO<sub>2</sub>) equivalent or taking roughly 18,000 cars off the road.

## 4. Goal Achievement

Twenty-seven Green Communities reduced their energy use by 20 percent or more.

## 5. Additional Benefits

In addition to energy and greenhouse gas emissions reductions, Green Communities have reaped benefits such as: (1) improved health, safety, and air quality from building and vehicle upgrades; (2) better utilized buildings; and, (3) greater comfort for staff, students, and visitors.

# MASSACHUSETTS GREEN COMMUNITIES PROGRAM

# 2017 SNAPSHOT



## ENERGY REDUCTIONS



**11%**

energy reduction achieved  
across all municipalities  
in the program

.....  
enough to power and heat  
**8,400 homes**

## GOAL ACHIEVEMENT

27 municipalities  
reduced their energy  
use by **20% or more**



## EMISSIONS REDUCTIONS

GHG emissions reductions of **87,500**  
metric tons of CO<sub>2</sub>-equivalent

EQUAL TO TAKING

**18,000**

CARS OFF THE ROAD



[ANNUAL COST SAVINGS OF \$13.7 MILLION]

## ADDITIONAL BENEFITS

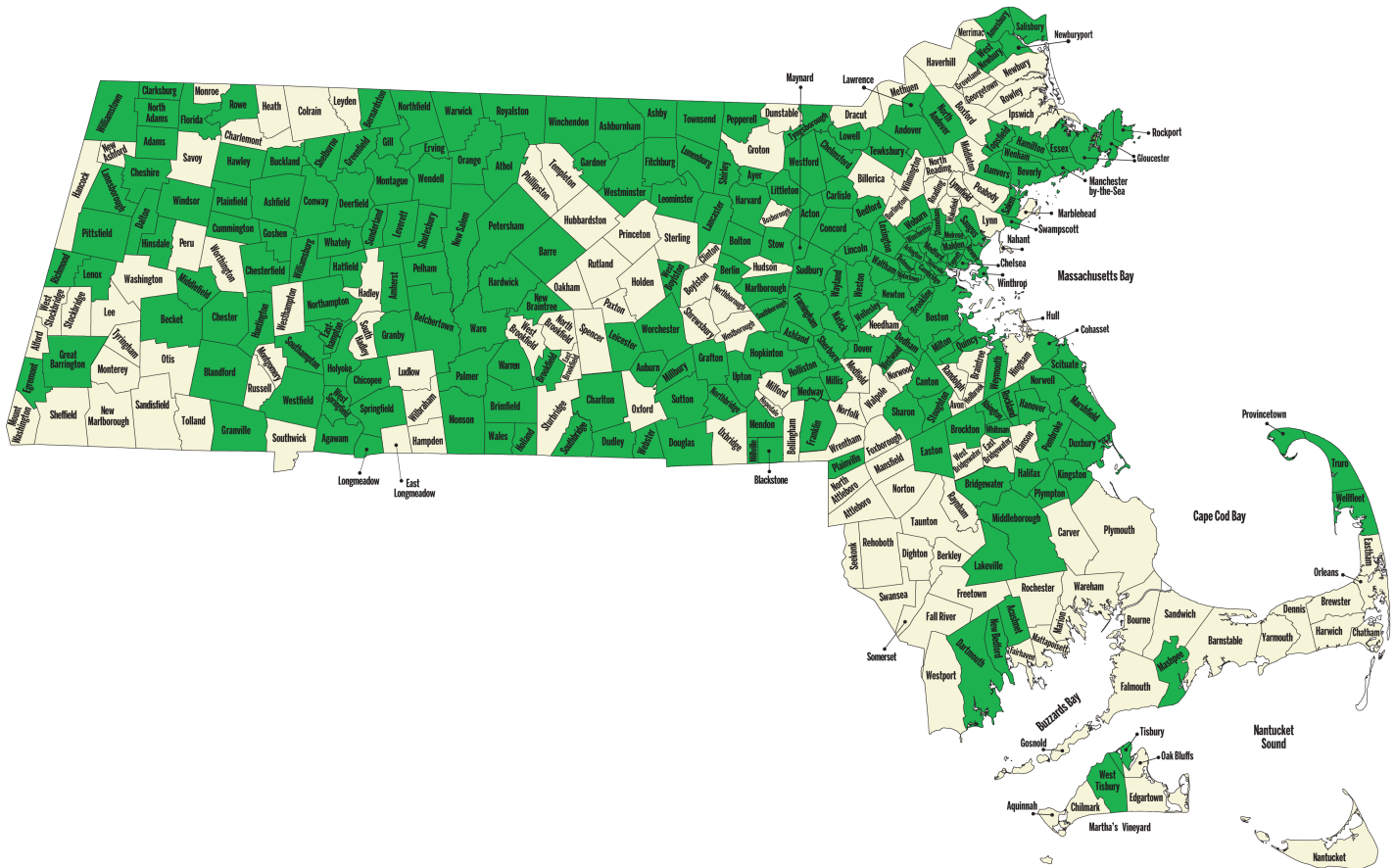
Safer, healthier, more comfortable buildings and improved air quality

# Introduction and Purpose

The Green Communities Designation and Grant Program provides a roadmap, along with financial and technical support, to Massachusetts municipalities that (1) pledge to cut municipal energy use by an ambitious and achievable goal of 20 percent over five years and (2) meet specific additional eligibility criteria. The additional eligibility criteria include enabling zoning and permitting for renewable energy, purchasing higher efficiency vehicles to replace existing vehicles, and adopting more stringent building codes.

The 210 municipalities that were designated Green Communities as of 2017 are highlighted in green in the figure below.

Figure 1. Map of Designated Green Communities



Designated Green Communities are required to provide annual reports starting the first year after designation. These reports demonstrate the municipalities' continued program eligibility and their progress towards meeting the 20 percent energy reduction goal. This 2017 Progress Report:

- provides a summary of the achievements, challenges, and future opportunities of the program;
- contextualizes these achievements against advances in state energy policy; and
- highlights municipalities that have achieved energy reductions of 20 percent or more.

The energy-reducing measures selected by each municipality can vary. The purpose of this report is to provide an update on the lessons learned and useful take-aways that collectively will inform and refine program efforts going forward.

### **Each community has distinct characteristics that drive its choice of strategies and solutions, including:**

- **the functions performed by the municipality;**
- **the amount of energy used for each function; and,**
- **the municipalities demographics, priorities, challenges, and opportunities.**

The goals of the Green Communities Program are multi-faceted.

First, the program aims to achieve breadth, engaging with many diverse communities across the state. As of the end of 2017, nearly two-thirds of Massachusetts communities were designated Green Communities. Of these, 25 became Green Communities in 2017.

Second, the program aims to achieve depth, promoting continuous improvement that results in significant energy and cost reductions.

As of December 2017, Green Communities reduced their energy use by 1.1 million MMBtus versus their baseline years. This 11 percent energy reduction is enough to power and heat more than 8,400 Massachusetts homes and equates to emissions reductions of approximately 87,500 metric tons of CO<sub>2</sub> equivalent. The energy reductions also provide an annual energy cost savings of \$13.7 million. Twenty-seven municipalities reduced their energy consumption by at least 20 percent.



# Green Community Program Elements

To be designated as a Green Community, Massachusetts municipalities must meet five criteria as established in the Green Communities Act. This section describes each criterion. Collectively, these criteria put communities on a path to plan for and implement various forms of clean energy and energy saving measures to achieve an energy reduction goal, lower energy costs, and strengthen the local economy. Once designated, communities apply for grants to support specific projects that drive further cost savings and provide economic development benefits to both municipalities and the state.

The following figure identifies the five criteria and provides a brief description of each one. This report

focuses primarily on energy reductions from activities related to criteria 3, 4, and 5 and these results are provided within the Program Results section. Zoning and permitting (criteria 1 and 2) is an important component of the program as well. However, there has been little change to results related to zoning and permitting in 2017 and so we have not included a discussion of results related to zoning and permitting this year.

For more information on the Green Communities Program, please see the program website at: <https://www.mass.gov/orgs/green-communities-division-massdoer>. Program guidance documents are also available at this website.

## 1 & 2: RENEWABLE ZONING AND PERMITTING

1. Allow zoning in designated locations for the as-of-right siting of renewable or alternative energy generating facilities, research and development facilities, or manufacturing facilities.
2. Develop, or have in place, an expedited application and permitting process of one year at most, for applicable facilities in the designated renewable zone from Criterion 1, above.

## 4: VEHICLE FLEET

Municipal governments and school districts must:

1. Adopt a Fuel-Efficient Vehicle Policy requiring all municipal departments and divisions to purchase fuel-efficient vehicles,
2. Develop and maintain a vehicle inventory for all four-wheeled passenger vehicles, and
3. Provide a plan for replacing non-exempt vehicles with vehicles that meet specified fuel efficiency ratings.

## 3: MUNICIPAL ENERGY CONSUMPTION

1. Establish an energy use baseline inventory for municipal buildings (including schools, drinking water, wastewater treatment plants and pumping stations and open spaces), street and traffic lighting, and vehicles; and
2. Adopt an Energy Reduction Plan (ERP) demonstrating a reduction of 20 percent of baseline energy use after five years of implementation.

## 5: NEW CONSTRUCTION

1. Municipalities must minimize the life cycle cost of all newly constructed homes and buildings and those undergoing major renovation.
2. Municipalities have satisfied this criterion by following DOER's recommendation of adopting the Massachusetts' Board of Building Regulations and Standards (BBRS) Stretch Code (780 CMR 115.AA).



# Relevant State Initiatives and Practices

The Green Communities program was established by state energy statute. The support the Green Communities program receives from a suite of state energy initiatives and practices is essential to its success.

The table on the following page shows that the number of supportive energy initiatives and practices are expanding. Important developments in the past year include:





























1. Increased deployment of battery storage systems to meet peak demand, allow for a ramp up in renewable energy, and increase resiliency;
2. Community adoption of policies and resolutions in support of net zero building and 100 percent renewable energy;
3. New community engagements in climate change and greenhouse gas reduction planning activities, including activities around vulnerability assessment and resiliency;
4. Sustained momentum of Solarize campaigns and an extension of these campaigns to support renewable heating and cooling systems such as air- and ground-source heat pumps;
5. Further adoption of Property Assessed Clean Energy (PACE); and,
6. Continued uptick in electric vehicle purchases and charging station installations.

**“The support the Green Communities program receives from a suite of state energy initiatives and practices is essential to its success.”**
















Caption: A resident in Brookline promotes the Town's Solarize campaign, a program that aligns with and supports the community's Green Community efforts.

Table 1. Massachusetts Initiatives and Practices Supporting the Green Community Program

Initiative	Description	Criteria			
		Renewable Zoning and Permitting (1&2)	Municipal Energy Consumption (3)	Vehicle Fleet (4)	New Construction (5)
STATUTORY/REGULATORY					
Green Communities Act	Comprehensive energy reform legislation promoting development of renewable energy, energy efficiency, green communities, and implementation of the Regional Greenhouse Gas Initiative. This policy created the Green Communities program.				
Global Warming Solutions Act	Requires reductions in greenhouse gas emissions from each sector of the Massachusetts economy, summing to a total reduction of 25% below the 1990 baseline emission level in 2020 and at least an 80% reduction in 2050.				
Renewable Portfolio Standard (RPS)	Requires suppliers (including regulated distribution utilities and competitive supplies) to obtain a certain percentage of electricity from renewable energy.				
Alternative Portfolio Standard (APS)	Requires suppliers to procure a certain percentage of electricity from Combined Heat and Power (CHP), flywheel storage, efficient steam technologies, renewable thermal and any other approved alternative energy technology.				
Energy Storage Target and Incentives	Requires electric distribution companies to procure 200 MWh of viable and cost-effective energy storage by January 1, 2020 and provides grants to support community implementation.				
MUNICIPAL PRACTICES THAT SUPPORT CLEAN ENERGY					
Climate Goals/Action Plans	Carbon emission reduction targets and roadmaps for achieving the targets.				
Municipal Vulnerability Preparedness (MVP) Program	Support for cities and towns in Massachusetts to plan for climate change resiliency and implement projects.				
100 Percent Clean Energy/Renewable Commitments	Community-wide commitments to transition to 100 percent clean or renewable energy by a specified date.				
Zero Net Energy Strategies	A commitment to advance strategies and practices that support the goal of building zero net energy buildings.				
Property Assessed Clean Energy (PACE)	Provides energy efficiency and renewable energy improvement financing s for private properties.				

Initiative	Description	Criteria			
		Renewable Zoning and Permitting (1&2)	Municipal Energy Consumption (3)	Vehicle Fleet (4)	New Construction (5)

### MUNICIPAL PRACTICES THAT SUPPORT CLEAN ENERGY (CONT'D)

<b>Massachusetts CEC's HeatSmart Program</b>	Seeks to increase the adoption of small-scale clean heating and cooling technologies through a competitive solicitation process that aggregates homeowner buying power to lower installation prices for participants.				
<b>DOE's SolSmart Program</b>	Provides no-cost technical assistance to help local governments become "open for solar businesses". In recognition of their achievements, communities receive designations of SolSmart Gold, Silver, and Bronze.				
<b>Massachusetts CEC's Solarize Program</b>	Increases the adoption of small-scale solar electricity through a competitive solicitation process that aggregates homeowner buying power to lower installation prices for participants.				
<b>Purchase Power Agreements</b>	Enables municipalities to host an on-site solar PV system and agree to buy energy, without owning the equipment.				
<b>Community Choice Aggregation</b>	Municipalities aggregate the electrical load of customers within their borders to competitively procure electricity supply. Through this approach, a community can increase the renewable energy content of its electricity supply.				
<b>Net Metering</b>	Customers generate their own electricity and offset their electricity usage. Any excess generation is exported to the electric grid. Public net metering facilities are entitled to special benefits, including larger maximum capacity and higher credit value for projects of a certain size.				
<b>Renewable Heating and Cooling Incentives</b>	Rebates to support the installation of renewable heating, hot water, and cooling technologies at facilities across the Commonwealth.				
<b>Energy Efficiency Incentives for Municipalities</b>	Through ratepayer funded energy efficiency programs implemented by utilities, incentives are available for various projects.				
<b>Streamlined ECM Procurement for Municipalities</b>	A provision of the Green Communities Act (Ch. 25A Sec. 14) allows public entities to procure energy efficiency projects up to \$100,000 through Investor Owned Utilities.				
<b>Municipal-Owned Street Lighting</b>	Massachusetts passed legislation requiring utilities to sell street lights to municipalities interested in purchasing and maintaining them.				
<b>LED Street Lighting Tariffs</b>	Massachusetts utilities updated street lighting tariffs to include LEDs, allowing municipalities to convert their street lights to LEDs.				
<b>Electric Vehicle Fleets</b>	Incentives to public entities for the acquisition of electric vehicles and the installation of charging stations.				

# Program Results

## Participation

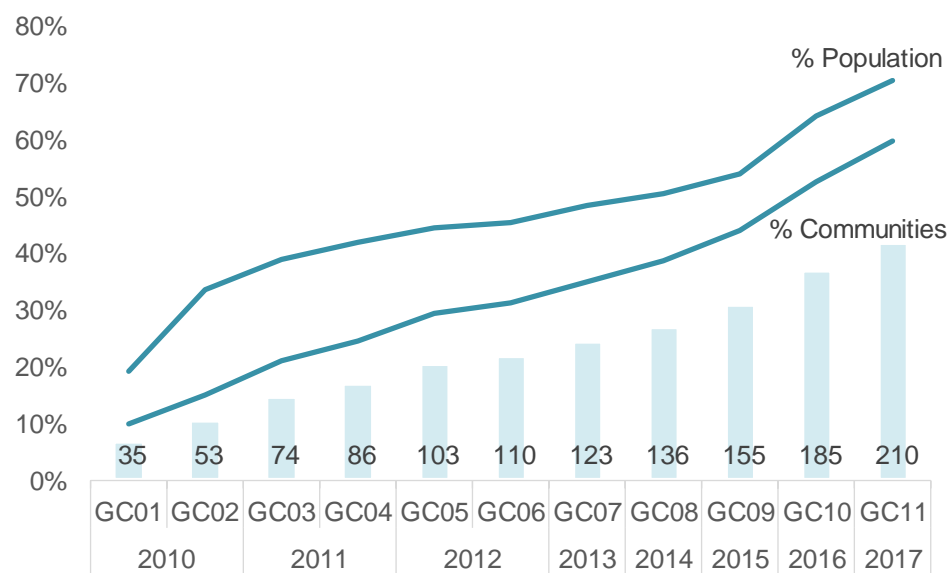
Participating communities are geographically, demographically, and socioeconomically diverse. Green Communities are located in the north, south, central, and western regions of the state and span urban, suburban, and rural parts of the state.

Twenty-five municipalities have become Green Communities since last year's Progress Report. The number of participating communities continues to grow at a steady rate, demonstrating sustained interest in the program over the past eight years. The figure below illustrates that nearly two-thirds of Massachusetts communities are now designated Green Communities, representing more than 70 percent of the state population.



Caption: Grant recipients celebrate a recent award at the State House with the Secretary of Energy and Environmental Affairs Matthew Beaton and Department of Energy Resources Commissioner Judith Judson.

Figure 2. Growth of Green Communities Program participation

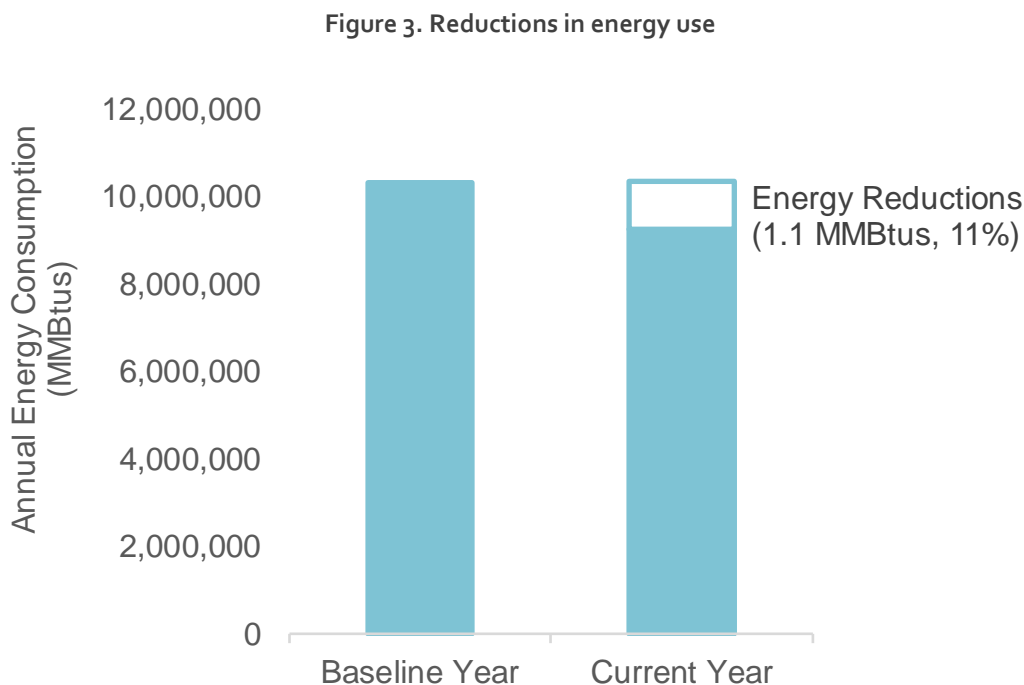


# Energy Reductions

The Green Communities Program has reduced energy use across participating communities. As of the end of 2017, Green Communities reduced their energy use by 11 percent or 1.1 million MMBtus versus their baseline years.<sup>1</sup> This reduction in energy use represents enough energy to power and heat more than 8,400 Massachusetts homes.

The figure below compares energy use in the baseline year across municipalities with current year energy use. Energy use declines from the baseline to the current year demonstrate a reduction in energy use.

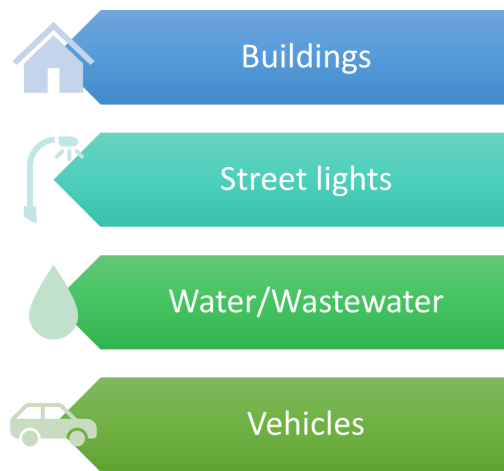
The energy consumption and reduction data are based on actual energy use that is tracked and reported by municipalities. The baseline year is established when the municipality is designated a Green Community. The current year represents the most recent fiscal or calendar year of program participation. Energy reductions are calculated as the difference in consumption from the baseline year to the current year and are not weather-normalized.



<sup>1</sup>Several communities were not included as they did not provide baseline or current year data.

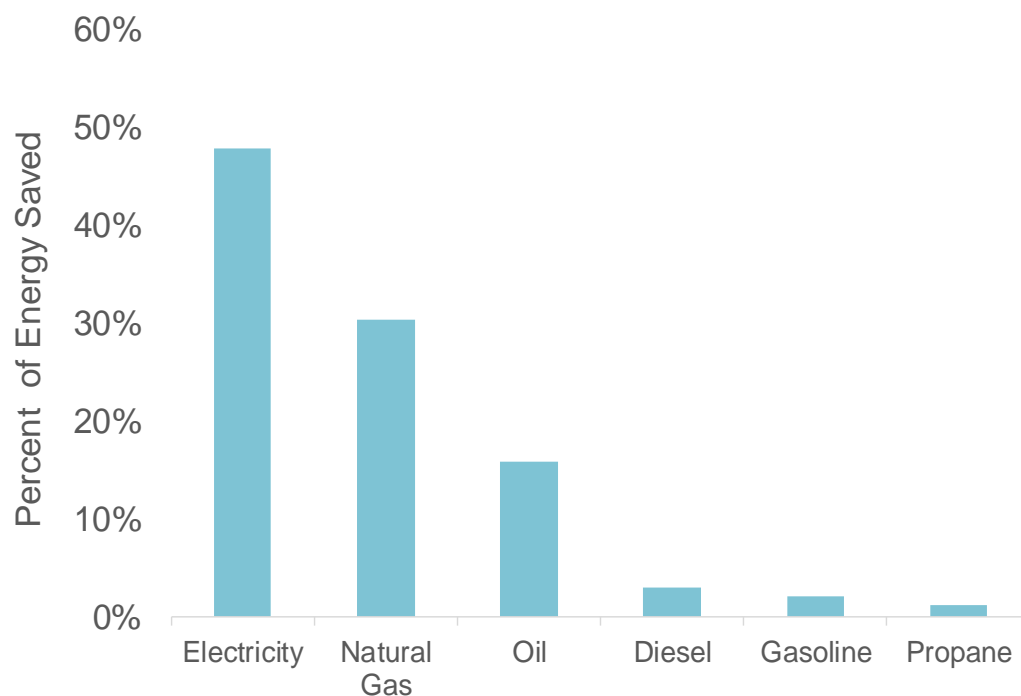
## Energy Reductions (cont'd)

The Green Communities Program is designed to enable energy reductions in four categories of energy use: buildings, street and traffic lights, water and wastewater infrastructure, and vehicles.



Energy reductions are due primarily to electricity, natural gas, and oil savings. Approximately half of the energy reductions are electric, due to lighting upgrades. Another 30 percent are natural gas reductions, due to more efficient heating systems, building controls, and weatherization efforts. Sixteen percent relate to oil, due to the shift away from oil-based heating and to weatherization efforts. The figure below shows the percent energy reduction by fuel type.

Figure 4. Percent energy reductions, by fuel type





Communities of differing sizes use energy differently. The figure below shows the proportion of current year energy consumption by category for communities of differing sizes.

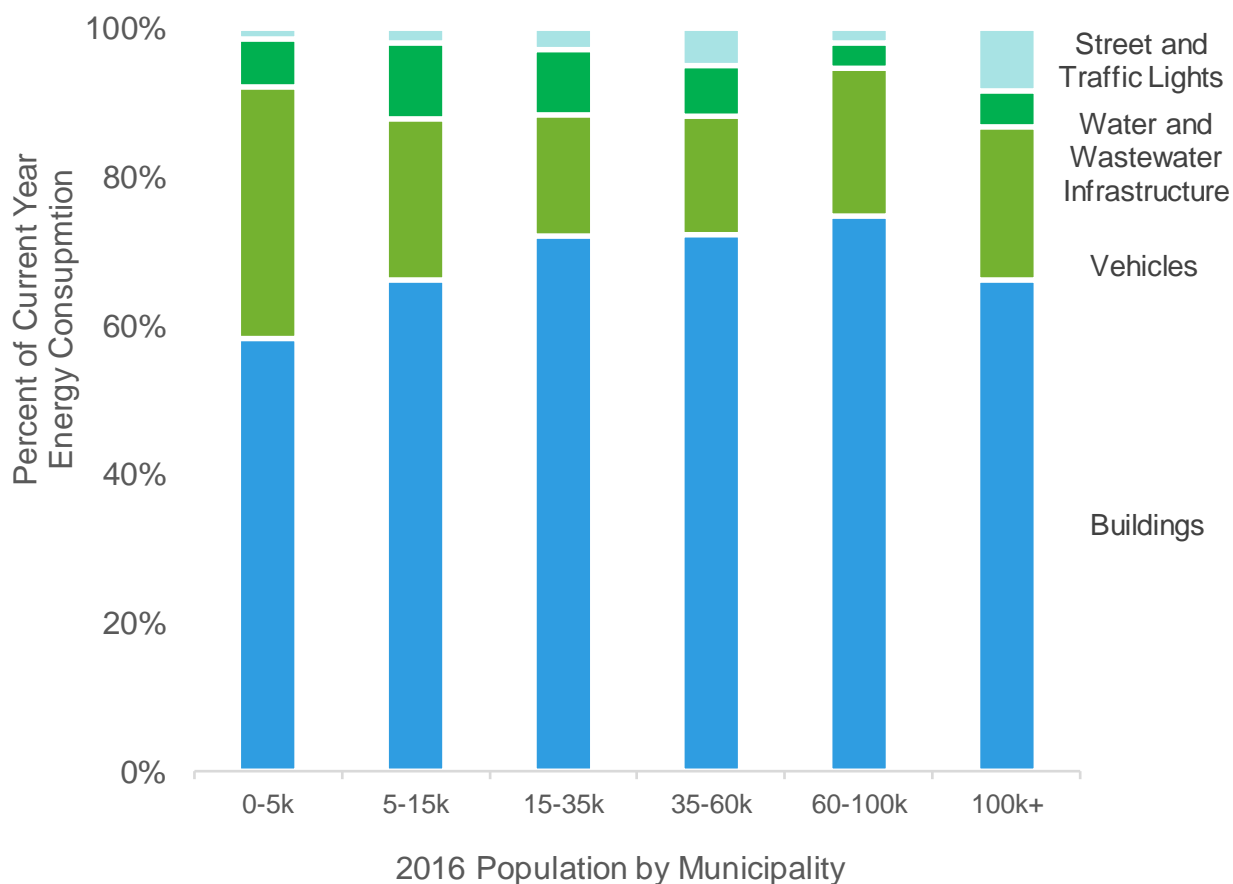
Building energy use represents 60 to 70 percent of energy use by communities and is by far the largest share of energy consumption. Other than building energy use, the ways in which energy is used vary considerably by community, resulting in differences in opportunities and strategies to reduce energy use by community.

Very small communities tend to use a greater proportion of energy for vehicles as there are fewer buildings to manage. Very large communities also tend to use a greater proportion of energy for vehicles as they use in-house resources to provide more transportation-related services (such as snow removal and school busing) to residents, rather than outsourcing these services.

While reducing street and traffic light energy use is an opportunity for all communities, it represents a bigger opportunity for larger communities with more street and traffic lights.

Energy needs for water and wastewater infrastructure represent a greater proportion of total energy use for small- to mid-sized communities.

Figure 5. Percent of current year energy consumption, by category





# Energy Reductions (cont'd)

The figure below shows the percent change in energy use as a proportion of the baseline year energy use for buildings, street lighting, water and wastewater infrastructure, and vehicles.

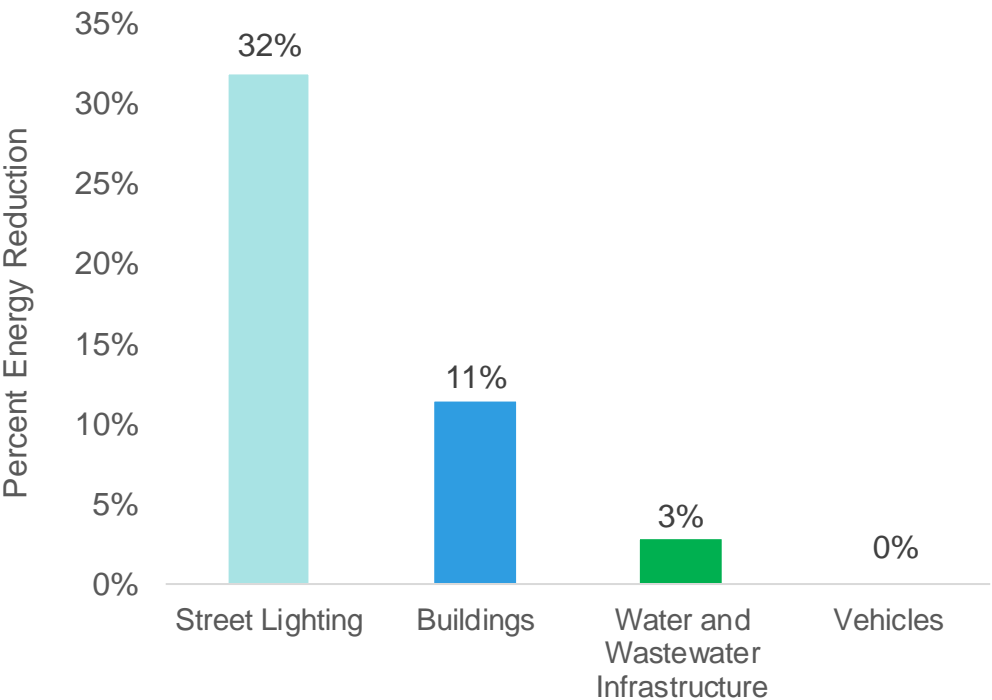
**Street lighting** is providing the largest percent reductions in energy use since the start of the program, but generally represents a relatively small proportion of energy use.

**Buildings** represent the greatest proportion of energy consumption and communities have reduced building energy use by 11 percent on average.

Energy use by **water and wastewater infrastructure** is relatively small and energy reductions are minimal.

Communities are finding energy use by **vehicles** to be the most challenging to reduce. Increases in the number of vehicles municipalities own and operate, as well as delivery of additional types of transportation services by municipalities, are offsetting energy use reductions in this category.

Figure 6. Percent change in energy use, by category



Some municipalities are achieving modest levels of vehicle energy reductions through a combination of vehicle replacement and policies and practices. Forty-three Green Communities have implemented 126 vehicle-related projects, mostly involving existing vehicle replacements with more fuel-efficient gas/diesel, hybrid, or electric vehicles.



Caption: Lieutenant Governor Karyn Polito and Department of Energy Resources Commissioner Judith Judson check out the electric vehicle charging station at the Senior Center parking lot in the Town of Dalton.



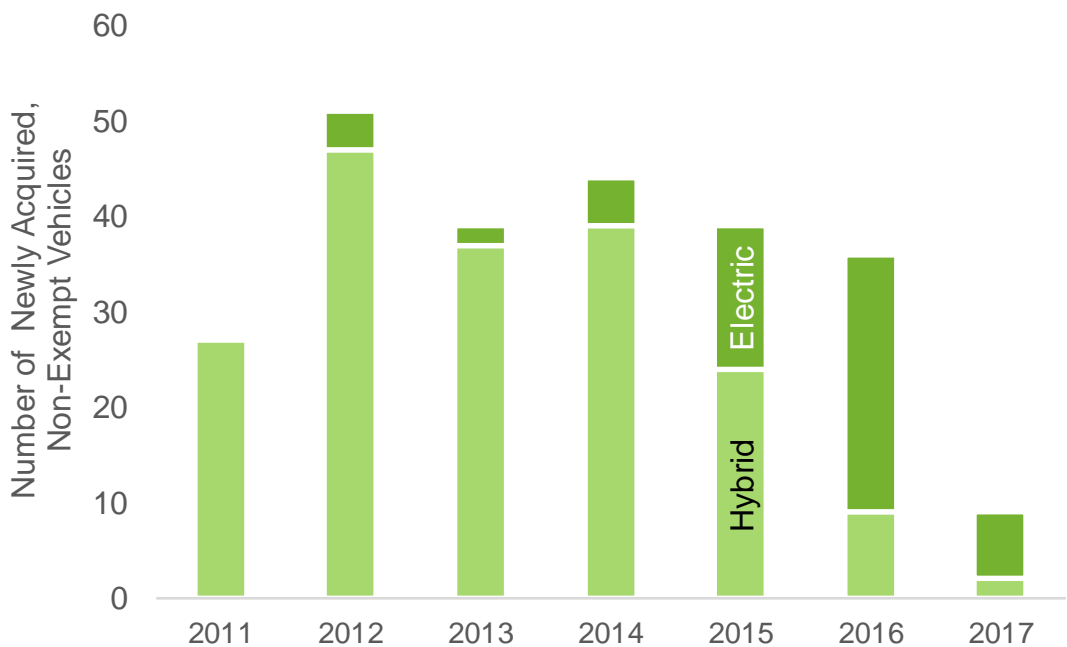
Caption: Boston Public School replaced 250 diesel buses with propane buses, reducing fuel costs, down-time, maintenance costs for parts and labor, greenhouse gas emissions, and air pollution.

# Energy Reductions (cont'd)

Purchases of vehicles began to shift from a focus on smaller, more efficient gasoline or diesel replacement vehicles and hybrid vehicles to electric vehicles in 2015. This shift coincides with the start of Green Community grant funding to enable municipalities to purchase electric vehicles and electric vehicle charging stations in 2015.

The figure below shows electric vehicles represent a greater proportion of new vehicles than hybrids starting in 2016. The number of vehicle purchases and purchases of hybrid and electric vehicles vary greatly by year, depending on vehicles that need to be purchased in each community.<sup>2</sup>

Figure 7. Number of hybrid and electric vehicle purchases by year



Given that the magnitude of the change in fuel economy is much higher for electric vehicles as compared to smaller, more efficient gasoline and diesel vehicles and hybrid vehicles, this shift is also

driving more significant reductions in the average fleet fuel efficiency. The average fuel efficiency of vehicles acquired since the start of the program is 26 miles per gallon.

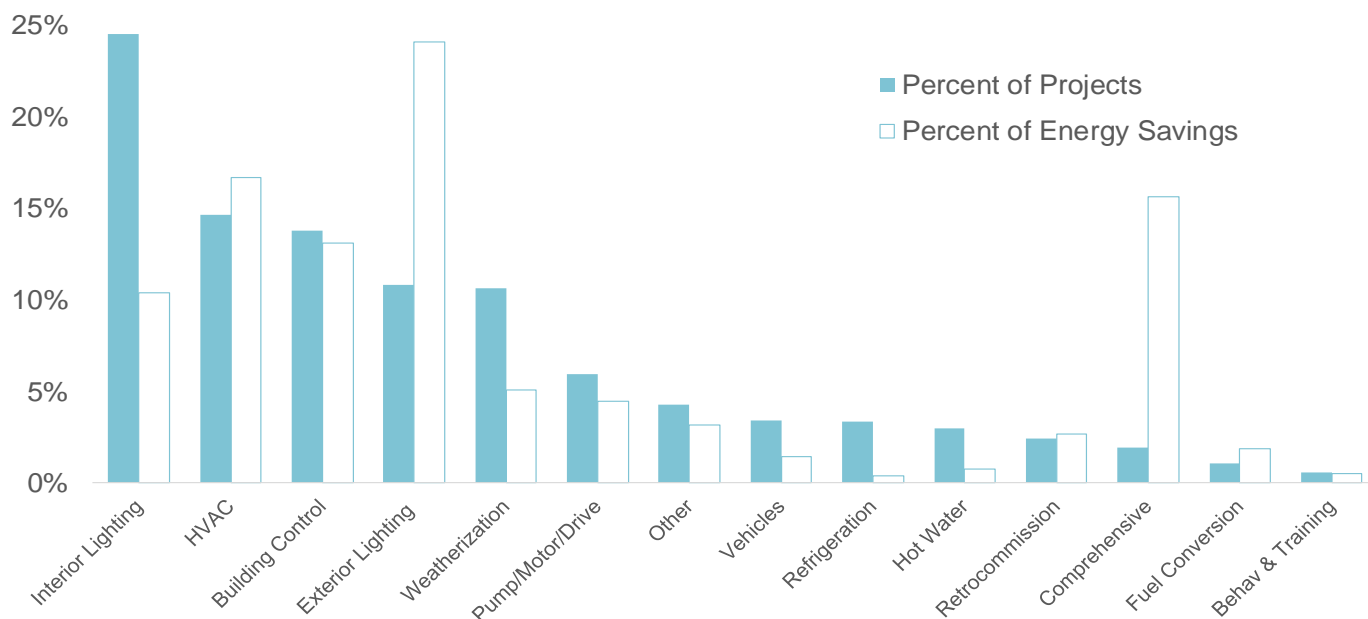
<sup>2</sup> Also, Massachusetts Electric Vehicle Incentive Program (MassEVIP) funds for electric vehicles and charging stations were exhausted during 2017. See the DEP EVIP program website for details at: <https://www.mass.gov/how-to/massevip-fleets>.

Green Communities are predominately focusing their efforts to reduce energy consumption on: lighting; heating, ventilation, and air conditioning (HVAC); and building shell efficiency. The figure below shows three-quarters of projects are classified as interior or exterior lighting, HVAC, building control, or weatherization.

The figure also shows that while communities complete fewer comprehensive projects, these projects account for a substantial portion of the energy savings. Comprehensive projects can

include complete renovations, complete building tear-down and replacements, energy savings performance contracts for one or more buildings, energy savings projects with multiple measures across end uses, LEED certification projects, and zero net energy projects. Green Communities can save more energy in a shorter timeframe by implementing comprehensive projects that address multiple measures at once, either within one building or across several buildings.

Figure 8. Percent of projects and energy savings, by project type



## Greenhouse Gas Emissions Reductions

The energy reductions achieved by municipalities represent considerable decreases in greenhouse gas emissions. The 1.1 million MMBtus in energy

reductions versus the baseline year represent emissions reductions of approximately 87,500 metric tons of CO<sub>2</sub> equivalent.

# Goal Achievement

In this section, we recognize and celebrate communities that achieve the important first step of reducing energy use by at least one-fifth over five years.

Municipalities continue to achieve the ambitious but attainable program goal of reducing energy use by 20 percent. These communities represent 23 percent of the 118 municipalities that were Green Communities for at least five years and are therefore

eligible for this distinction. On average, these communities reached this goal in six years.

The table below shows the municipalities that reached the goal, the year they reached it, the energy reductions they achieved by that year, and the years it took to achieve the goal. The communities are listed in alphabetical order within each year, starting with 2013.

**Table 2. Municipalities achieving the 20 percent energy reduction goal**

Municipality	Year Goal Achieved	Percent Energy Reduction	Baseline Year	Number of Years to Achieve Goal
1 Natick	2013	27%	2008	5
2 Springfield	2013	21%	2008	5
3 Arlington	2014	22%	2008	6
4 Belchertown	2014	25%	2009	5
5 Cambridge	2014	29%	2008	6
6 Palmer	2014	41%	2009	5
7 Sutton	2014	40%	2007	7
8 Acton	2016	26%	2009	7
9 Becket	2016	31%	2009	7
10 Gill	2016	37%	2010	6
11 Greenfield	2016	26%	2008	8
12 Holland	2016	25%	2010	6
13 Holyoke	2016	21%	2009	7
14 Lakeville	2016	20%	2011	5
15 Maynard	2016	22%	2011	5
16 Medford	2016	20%	2009	7
17 Millbury	2016	22%	2009	7
18 New Salem	2016	20%	2009	7
19 Richmond	2016	32%	2010	6
20 Sherborn	2016	25%	2009	7
21 Sunderland	2016	24%	2011	5
22 Tyngsborough	2016	21%	2008	8
23 Wendell	2016	22%	2011	5
24 Williamstown	2016	27%	2008	8
25 Deerfield	2017	20%	2009	8
26 Gardner	2017	25%	2008	9
27 West Tisbury	2017	21%	2011	6
Average				6



Twenty-seven municipalities have accomplished this goal: two in 2013, five more in 2014, seventeen in 2016, and three in 2017. The figure below shows

municipalities that achieved this goal in 2017 and how they achieved it.

Figure 9. Percent change in energy use by category, by community



All communities experienced increases in energy use ranging from 5 to 30 percent for one of the four usage categories. Communities experienced these increases in different categories, including buildings, vehicles, and water and wastewater infrastructure.

To offset these increases in energy use, communities needed to work harder to achieve greater energy reductions in the other categories of energy use. All municipalities reduced street and

traffic light energy use by 30 percent or more. Two of the three municipalities also reduced building energy use by at least 20 percent. We provide more detail on the actions taken to achieve the goal community by community in the Municipal Highlights section.

## Additional Benefits

Green Communities are experiencing benefits beyond energy and associated greenhouse gas emissions reductions. Buildings receiving energy efficiency updates are often better utilized, due to improvements in safety and health and greater comfort for staff, students, and visitors of these buildings. Vehicle improvements also improve safety due to the use of newer vehicles and reduce air emissions due to shifts to higher mile-per-gallon efficiencies and use of cleaner fuels.

Additionally, efforts to educate and engage the local community in the Green Community program have impacts that reach beyond improvements to municipally owned and operated buildings, infrastructure, and vehicles. From increasing exposure to and experience with commercially available technologies that are more energy efficient to establishing new behaviors and practices community-wide, residences and commercial building energy use is more top of mind.



**Caption: Before (above) and after (right) the upgrade to LEDs above the pool at the Town of Westwood's High School. The lighting is anticipated to save 33,256 kWh for a cost savings of \$5,155 per year. In addition, maintenance costs will be greatly reduced, and visibility will be greatly improved.**





# Municipal Highlights

**Deerfield** achieved its goal by reducing energy use 21 percent in buildings and 11 percent in water and wastewater infrastructure.

- The town installed energy efficient measures at three municipal buildings and two wastewater treatment plants.
- The municipality made comprehensive upgrades at one of its elementary schools by investing in lighting, lighting controls, weatherization, variable speed drives, refrigerator and freezer controls, and an energy management system.
- Deerfield also invested in lighting, lighting controls, weatherization, and a boiler replacement for its library, as well as lighting and weatherization for its town hall.
- The two wastewater treatment plants received weatherization, equipment controls, and heating system upgrades.
- The community also achieved street lighting energy use reductions of 41 percent through complete shutoffs, shutoffs from midnight on, and reductions in lumens.

These significant energy reductions offset a 14 percent increase in vehicle energy use due to increases in police department vehicle use, enabling Deerfield to achieve its goal.

**Gardner** reduced its energy use by 23, 13, and 31 percent in buildings, vehicles, and street and traffic lights, respectively, which enabled the community to achieve its goal. The community focused on converting street lighting to LEDs, switching oil heating systems to natural gas, retro-commissioning buildings, weatherizing buildings, and implementing building controls in schools, the town hall, and the senior center via an Energy Savings Performance Contract.

In **West Tisbury**, energy reductions in vehicles and street and traffic lights of 17 and 88 percent, respectively, enabled the community to reach its goal. Changes in vehicle and street lighting energy use are having a larger impact on overall energy use in West Tisbury than in other communities, due to its small size and lack of water and wastewater infrastructure.

- Vehicle fuel reductions come from more efficient vehicles, including electric vehicles, and the retirement of old fire equipment.
- Street lighting reductions are due to removal of some lights and conversion of many of the remaining lights to LEDs. Building energy use increased 29 percent despite several building efficiency measures. These measures included LEED renovation of the library and improvements to the senior center (including installation of lighting, insulation, new windows, and a heat pump).

The addition of cooling in the public safety building and use of ventilation in the library likely led to the increase in building energy use.

## Municipal Highlights (cont'd)

Over a 10-year period, **Andover** reduced its annual energy costs despite expanding municipal services, increasing building utilization, and growing the number of municipally owned and operated buildings. Andover focused its attention on making its high school, the community's largest and most heavily used building, an "energy flagship" building.

The community is using this building to deploy and demonstrate new technologies and methodologies, including an energy planning partnership with citizen volunteers, faculty, and students. Andover High School launched an awareness campaign to educate and engage high school students in the town's Green Community efforts. Due to the community's efforts, the school's energy costs declined \$115,000 and the school was recently awarded an Energy Star Certification for performing in the 96<sup>th</sup> percentile as compared to similar buildings.



Caption: Andover High School, photo by John Phelan, <https://commons.wikimedia.org/w/index.php?curid=15770896>

In 2017, **Northfield** and **Warwick**, both members of the four-town Pioneer Valley Regional School District, opted to amend their Green Communities energy baseline by adding their towns' elementary schools and a proportion of the middle-high school (based on the percentage of each town's enrollment). There were several reasons why the energy committees of these towns determined this was beneficial, as they each have been a Green Community for several years and have few facilities in their building stock needing energy upgrades.

- For Warwick, which has been a Green Community since 2014, the town has already cut energy use in its five municipal buildings by 32 percent. The electricity and heating fuels consumed at the Warwick Community School alone is more than double the consumption of the town with ample opportunities for energy savings.



- Northfield also implemented several projects at its municipal facilities and has 39 percent of its electricity and heat provided by renewable energy. The town's elementary school, parts of which are over 100 years old, has the highest energy costs per square foot of the district and is also ripe for improvements.



By including the regional school district buildings in their baselines, the towns can now spend Green Communities grant funds on more school projects. The school district is struggling fiscally but will now use Green Community grant funds for building upgrades that will help reduce energy costs.

# Impacts of Grants for Water and Wastewater Infrastructure Improvements

The treatment of drinking water and wastewater represents a significant portion of municipalities’ total electricity usage. As large consumers of electricity, drinking water and wastewater treatment facilities are attractive targets for clean energy efforts, including both energy efficiency and renewable energy. Since 2007, there has been a multi-agency effort to identify and implement clean energy projects at these facilities. The Energy Leaders program emerged from this effort in collaboration with many partners, including DOER, MassDEP, Mass Clean Energy Center, U.S. Environmental Protection Agency (EPA), and the electric and gas utilities.

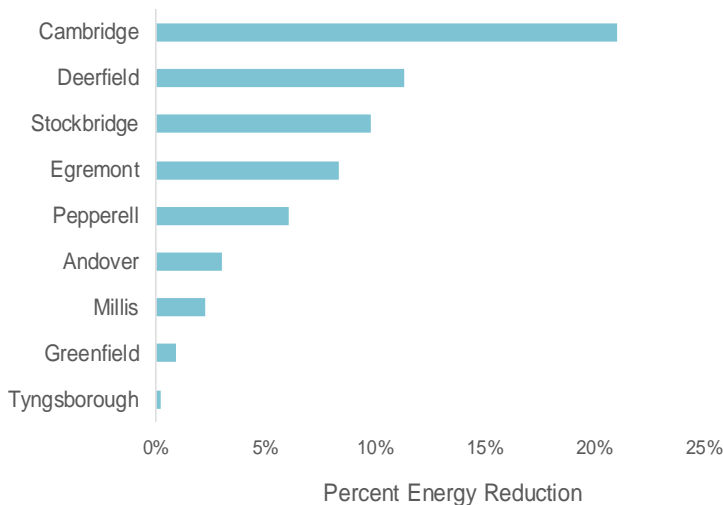
Many Massachusetts water and wastewater facilities have become energy leaders working towards clean energy goals; however, barriers remain to the widespread and sustained implementation of clean energy projects. These barriers include operating budget constraints and the need to limit the number of funding and financing requests proposed to ratepayers. While various incentive programs may partially support clean energy projects, a financial gap frequently remains that prevents the facility from committing to the upgrades. As a result, funding is often only requested in response to an emergency, a

regulatory requirement, or large infrastructure improvements.

To address this barrier, DOER and MassDEP (with funding support through the Massachusetts Clean Energy Center) created a grant opportunity in 2014 to provide “gap” funding to jump-start and implement shovel-ready clean energy projects at these facilities. The Gap Funding program awarded more than \$1.7 million to 21 water and wastewater facilities to help fund 30 clean energy projects. These projects also leveraged nearly \$2 million in utility incentives to install \$10.9 million in clean energy improvement projects. Green Communities receiving water and wastewater infrastructure grant funding reduced their water and wastewater-related energy use by as much as 20 percent.<sup>3</sup>

In April 2018, MassDEP awarded a second round of funding for 36 clean energy improvement projects at water and wastewater facilities across the state. These projects are projected to save \$1.3 million annually; generate approximately 9.68 megawatt-hours in annual electricity savings or on-site energy generation; leverage \$1.15 million in additional energy utility incentives; and result in a good public return-on-investment.

Figure 10. Percent energy reduction by community



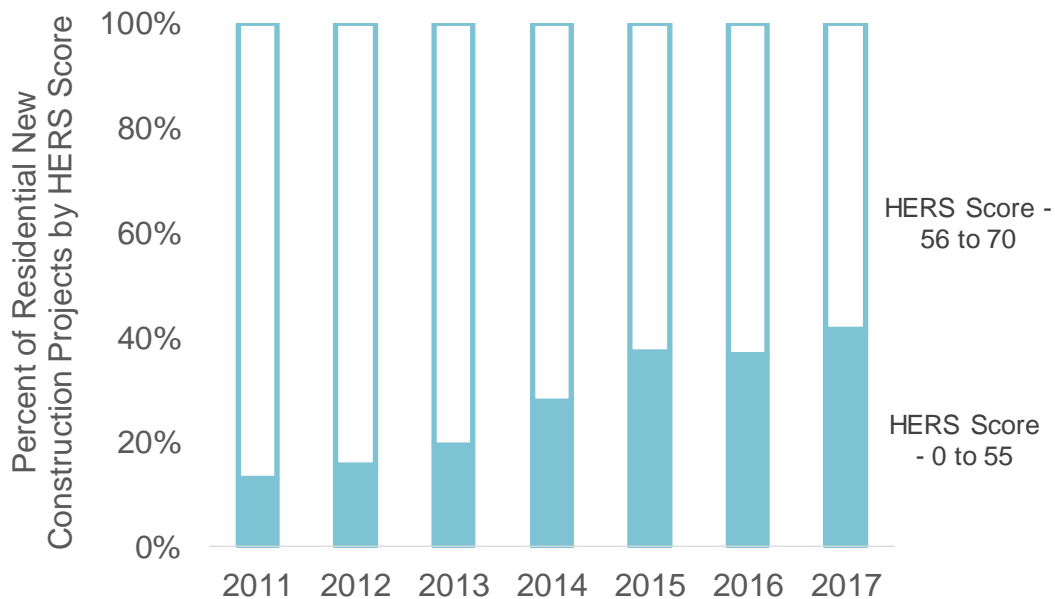
<sup>3</sup> The percent energy reductions result from all Green Community program efforts, not only the efforts funded directly by these grants.

# Impacts of Code Improvements on New Construction

Penetration of the Stretch Code (as defined in 780 CMR Chapter 115 AA: Stretch Energy Code) in Massachusetts communities is high—driven in part by Green Communities requirements. As of June 2018, 241 Massachusetts municipalities had adopted the Stretch Code.<sup>4</sup> This represents more than half of all municipalities. As all Green Communities adopted the Stretch Code, Green Communities represent a substantial portion of the Massachusetts communities adopting the Stretch Code. Since the program started, Green Communities have issued certificates of occupancy for 8,500 new or substantially renovated, high-efficiency homes and buildings. Most projects are residential new construction projects.

The figure below shows the percent of residential projects for several groupings of Home Energy Rating System (HERS) scores, the nationally recognized system for calculating a home's energy performance, over time. From 2011 to 2017, the proportion of projects with HERS scores of 55 and under increased steadily, indicating the efficiency of new homes and homes undergoing major renovation is improving. The improvements in efficiency is attributed to Stretch Code updates as well as increasing awareness and compliance with the codes. A HERS Score of 55 and under is required by the version of the Stretch Code effective in 2017.<sup>5</sup>

Figure 11. Percent of residential projects by HERS score



<sup>4</sup> Please see Massachusetts' Department of Energy Resources Stretch Code Adoption, by Community at: <https://www.mass.gov/service-details/building-energy-codes>.

<sup>5</sup> In January 2017, Massachusetts updated its Base and Stretch Energy Codes. Please see Massachusetts' Department of Energy Resources 2017 Stretch Energy Code Overview at: <https://www.mass.gov/files/documents/2017/11/21/stretch-energy-code-overview.pdf>. Note that some 2017 projects have a HERS score that is higher than 55 due to longer construction timelines for some projects. A HERS score of 100 indicates the home is at the same level of efficiency as a standard new home. A HERS score of 50 indicates the home is 50 percent more energy efficient than a standard new home. A HERS score of 0 indicates the home is so energy efficient that it uses no energy. In other words, the home generates as much renewable energy on-site as it consumes.



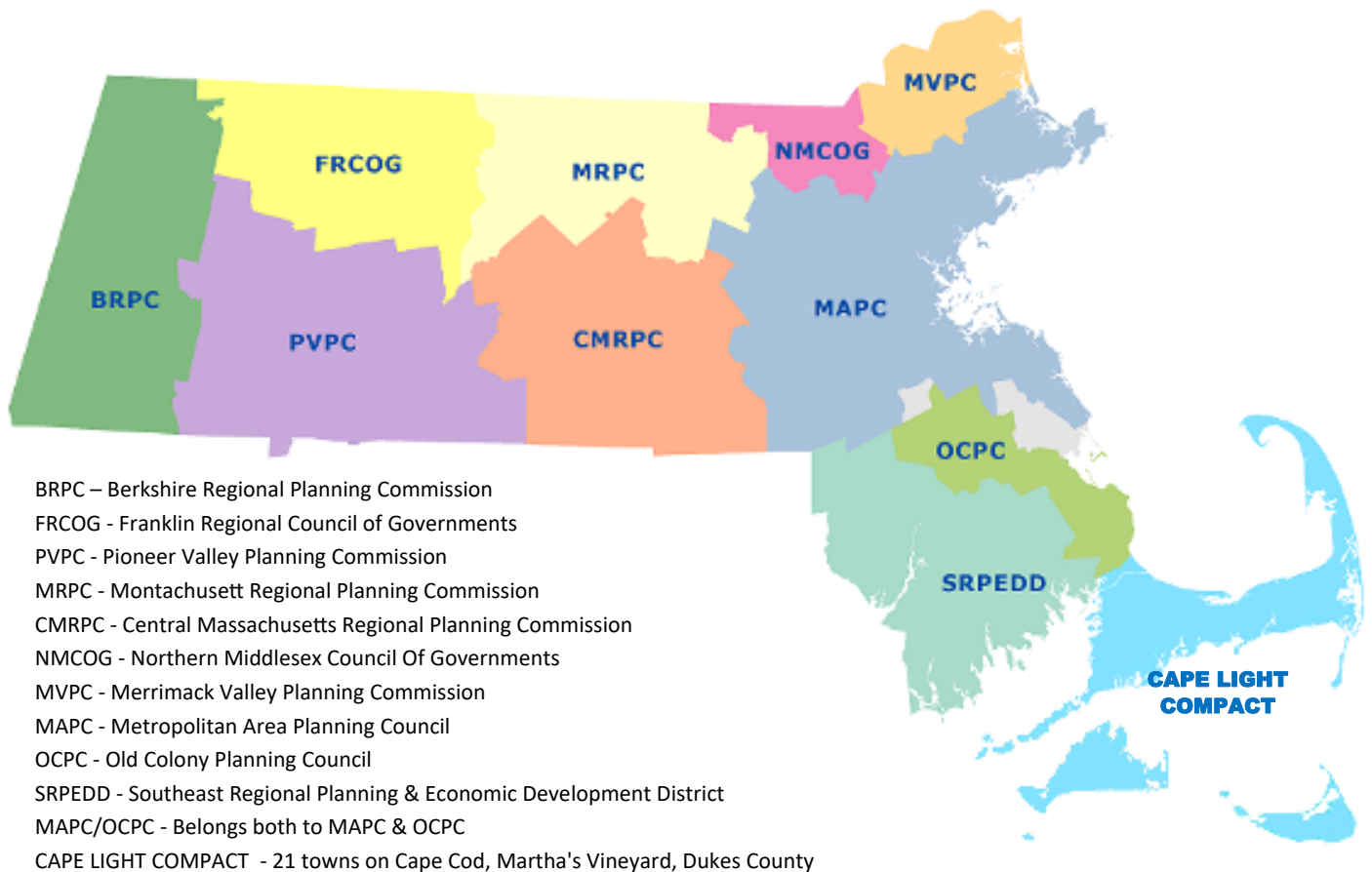
# Regional Partnerships

The continued growth of the municipalities becoming designated is due in part to support provided by regional planning authorities (RPAs) and councils of governments (COGs). Starting in 2015, DOER broadened the scope of its Municipal Energy Technical Assistance (META) grants to include small grants to RPAs to assist cities and towns meet the five criteria required for designation. A few of the regional entities were already providing clean energy support to their member communities and they were able to accelerate their efforts. Others needed more guidance from DOER. In any case, this assistance proved to be valuable, particularly among small communities relying on volunteers to complete much of the work related to Green Communities

designation. Larger, under-resourced communities also benefitted from the assistance, as they had limited staff to dedicate to the effort.

Once a Green Community, municipalities can access support from the regional partners to help with applying for grants, procuring vendors to implement projects, and other administrative tasks. Over time, clean energy staff at the regional entities have grown in number and expertise. They continue to support their member communities and have become key partners with DOER.

Figure 12. Massachusetts Regional Planning Agencies



Source: Adapted from MassGIS Data: Regional Planning Agencies, available at: <https://docs.digital.mass.gov/dataset/massgis-data-regional-planning-agencies>.

# Conclusions/Looking Ahead

To be designated as a Green Community and be eligible for clean energy and energy efficiency grants, Massachusetts municipalities must pledge to cut municipal energy use by an ambitious and achievable goal of 20 percent within five years. Funding availability and a collective and sustained will to move projects forward are a good start.

Cultural and behavioral shifts in how municipalities govern, operate, and plan are also critical to achieving this goal. Meeting the goal requires people to come together in support of a larger vision and work together over the longer term to achieve it. Progress depends on the ability to track, consolidate, organize, and report energy data; share and discuss findings with others; and leverage findings to inform decision-making. A thriving energy reduction effort also entails education, advocacy, training, communication, and coordination. It engages a municipality's various departments, boards, committees, employees, and citizens.

The Green Communities Program breaks down barriers and provides support on all these fronts by:

- providing monetary assistance;
- helping communities evolve organizational structures and improve interactions to drive immediate energy-related improvements; and
- laying the groundwork for a longer-term transformation of energy and water utilities, building, and transportation infrastructure.

As individual municipalities have evolved since the program's first designation "class" of 2010, Green Communities are engaging in broader sustainability efforts. Continued progress toward the 20 percent energy reduction goal remains an important component of a local energy strategy, as it will help contain costs and consumption. However, many of these cities and towns are taking the next step by creating net-zero emissions goals, incorporating energy and resiliency goals in local master plans, and integrating net-zero design elements in new schools and other municipal buildings. As a next step, communities can consider adding these and other elements, including broader transportation and "smart growth" policies, to achieve their sustainability goals.



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