ZERO to 101

Clean Energy Supply

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MAPC

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Contents

MAPC's Municipal Net Zero Playbook

A strategic guide for municipal action to reduce community-wide greenhouse gas emissions to net zero by 2050

MAPC's Municipal Net Zero Playbook ("the Playbook") provides guidance and tools to equip cities and towns with the resources to tackle their climate goals in an efficient and equitable manner. The Playbook is an interdisciplinary tool for municipal planners, energy/sustainability staff, and community members that seeks to empower cities and towns to implement net zero actions within their communities. These resources will help local net zero action implementers understand their role in advancing greenhouse gas (GHG) emissions reductions, adopting local policies, and accelerating state-level policy changes.

Explore all of MAPC's resources on Net Zero Planning: https://www.mapc.org/net-zero/

How to Use the Playbook

START HERE

MAPC developed two guiding frameworks to help communities navigate the Net Zero approach as they start on, or ramp up, their Net Zero journeys. Cities and towns can use these frameworks to inform community engagement, plan development, and strategy prioritization as they seek to customize their local Net Zero Action Plans.

Framework for Action

Learn how to navigate the Net Zero planning process and evaluate priority actions for a local net zero plan.

Framework for Equity

Learn how to develop Net Zero Plans that assess and acknowledge existing inequities and work to uplift and provide direct benefits to underserved communities.

Zero Emissions Mobility

Tackle GHG emissions reductions from how people get around a community.

Net Zero Buildings

Make buildings highly efficient and optimize clean energy for electricity, heating, and cooling.

Clean Energy Supply

Transition to 100 percent renewable sources of energy across a community.

Climate-Smart Zoning and Permitting

Take a strategic approach to local zoning and permitting updates.

CHOOSE YOUR OWN ADVENTURE

Drawing on our years of experience working with cities and towns on clean energy and climate, MAPC has compiled information on the best practices and actions municipalities can implement in their plans to advance toward Net Zero. You can start with the Chapter you are most interesting in tackling, or review each in depth.

The Playbook provides a starting point for each priority action, with links to resources, at MAPC and beyond, that offer more detailed guidance on implementation.

WHAT'S NEXT?

As our work with communities expands, we plan to continue to add and update chapters to the Playbook that touch on emerging best practices.

To help our communities reach net zero GHG emissions by 2050, we need to meet the energy needs of our homes, businesses, and vehicles with 100 percent renewable sources of energy.

A clean energy supply is essential for communities to reach net zero. In addition to making our buildings and transportation as energy efficient as possible, the remaining energy we need must be fossil-free and renewable. Siting this renewable energy locally whenever possible is preferred for a number of reasons. Local renewable energy provides benefits such as improved air quality, reduced transmission and distribution infrastructure and efficiency losses, and resilience benefits and local job opportunities. When projects cannot be sited within or near your community, utility-scale and smaller-scale non-local renewable energy projects provide many benefits as well and are needed to make our energy supply renewable. The actions illustrated in this chapter outline ways that municipalities can expand and encourage local clean energy supply.

The following strategies for advancing **Clean Energy Supply** provide your community with recommended actions that draw on best practices and innovations from across the Commonwealth of Massachusetts and the country to:

Increase renewable energy generation, use, and access

Build smart and resilient energy infrastructure

Reduce the carbon impact of the energy system, from the grid to building scale

The Playbook provides a selection of priority actions to advance each of these strategies in your community. Each action's urgency factor of 2025, 2030, or 2050 provides a recommended timeframe by which to fully implement the action. For each action, the Playbook outlines the **action type, urgency, timeframe, local and national examples, scale of impact, type of expense, lead implementer and key partners, and performance indicators.** Where available, we have also identified funding opportunities and tools to measure action impacts.

Playbook Indicators

Timeframe

Short-term *(Less than one year)*

Intermediate *(1 to 5 years)*

Long-term *(5 years or more)*

Ongoing

Type of Expense

Staff

Capital

Operations

Benefits and Impacts

The listed benefits and impacts are in addition to reductions in greenhouse gas emissions.

Equity

Environmental

Economic

Energy

Health

Calculating Tool

Playbook Terms

Type Actions are sorted into the categories of advocacy, financing, plan, policy, program, or outreach.

Urgency Each action is assigned an urgency factor of 2025, 2030, or 2030, providing a recommended timeframe by which to fully implement the action.

Feasibility A sampling of local, national, or international examples is provided to illustrate on-the-ground implementation. Some actions we have assessed to be impactful have not yet been demonstrated in other communities – these actions are identified as leadership opportunities.

Lead Implementer Each action includes a suggested municipal staff person or department responsible for leading the execution of the action and any decision-making involved.

Key Partner(s) We identified partners within the municipality and the broader community who will be critical to successful implementation of the action.

Scale of Impact Actions have been identified as either an enabling action, hard to measure and high impact, or measurable and high impact. A high impact action is based on whether or not there is a direct connection with emissions reductions within a priority sector. Enabling actions may not have a direct connection to emissions reductions, but they are essential to put in place early on to support greater emissions reductions over time.

Performance Indicators Each action includes suggested metrics to track success and impact during implementation of the action.

Strategy:

Increase renewable energy generation, use, and access

Action A:
Implement a green municipal aggregation program.

This includes an evaluation of the feasibility and economic impacts of purchasing 100% renewable energy through a municipal aggregation program by 2030.

Type
Program

Timeframe
Short-term
(Less than one year)

Urgency
By 2025

Feasibility
Many MAPC municipalities, including the Arlington Community Electricity[1], Watertown Electricity Choice[2], and Brookline Green Electricity[3] programs, include more than 5% additional renewable energy in their offerings

Performance Indicators
- Number of customers in the green municipal aggregation
- Number of customers that opt-up to greener options
- Additional renewable energy purchased

Scale of Impact

Measurable / high impact

Type of Expense
Staff time

Key Partners
Municipal Chief Executive Officer, Sustainability Department and/or Committee, energy brokers, electricity supply vendors, community volunteers, Department of Public Utilities (DPU), Department of Energy Resources (DOER)

Lead Implementer
Select Board / City Council

Benefits and Impacts
Environmental – Improved outdoor air quality
Economic – Increased protection for residents from the predatory practices of some retail electricity suppliers via more stable and less variable electricity prices
Energy – Increased demand for new renewable energy generation from higher percentage of renewables in the electricity supply than required by state law

Implement a green municipal aggregation program.

Green municipal aggregation (GMA) allows municipalities to procure their electricity supply for the community from competitive suppliers who can offer more renewable energy than the local investor-owned utility does at competitive prices. Municipal aggregation is also known as community choice aggregation and community choice electricity.

- Seek authorization at Town Meeting or from the City Council and prepare an aggregation plan, typically with support from an aggregation broker and in consultation with DOER. This process typically takes about one and a half to two years and requires approval of the final plan by the DPU and the Select Board or City Council.
- Establish a default option that includes at least five percentage points or more additional renewable energy over the statewide requirements in the Renewable Portfolio Standard (RPS).[4] The program should ensure that all renewable energy in the program is from MA Class I Renewable Energy Certificates (RECs).
- Launch the program in tandem with an outreach campaign to encourage residents and businesses to opt up to 100% MA Class I RECs to amplify the demand for renewables and emissions reductions.
- Consider including a very small operational adder (typically $.001 per KWh consumed) to fund related green priorities, such as building a local renewable energy project, a local energy efficiency program supporting lower-income households, or funding a sustainability or energy manager position.

Equity Considerations

Implementing or expanding a green municipal aggregation program allows all residents and businesses to participate in the advancement of renewable energy in the community. Any electricity customers on low-income rates can maintain their rate status and participate in the aggregation. Municipalities should pay particular attention to the costs of participating compared to utility electricity costs and provide a default rate that is competitive with these prices. Municipalities may also be able to connect their program to a particular solar installation in Massachusetts that provides a KWh discount to low-income customers via the Solar Massachusetts Renewable Target (SMART) program.[5]

Additionally, municipalities should partner with trusted community-based organizations on messaging and outreach for the program. Since marketing language from predatory electricity supply vendors can look similar to materials about green municipal aggregation programs, municipalities should pay particular attention to consumer protection and education. This could include workshops in partnership with community-based organizations to share information about the program and provide an outlet for questions and concerns. To ensure accessibility, municipalities should utilize translation and interpretation services.

Immediate Next Step

Municipalities can start by authorizing municipal aggregation by majority vote from their City Council or at Town Meeting. This authorization is typically uncomplicated and does not require the municipality to move forward. Rather, it allows the municipality to explore program design.

Municipalities with existing municipal aggregation programs can expand their programs by procuring additional amounts of renewable energy and/or by using an operational adder in the next iteration of their program.

Explore MAPC's step-by-step toolkit on Green Municipal Aggregation: https://www.mapc.org/planning101/green-municipal-aggregation-toolkit-support-renewable-energy/

Review aggregation resources from the Department of Energy Resources: https://www.mass.gov/info-details/municipal-aggregation

MA Class I Renewable Energy Credits (RECs)

MA Class I RECs have been a major driver in the growth of renewable energy. One REC is created when an eligible renewable energy source generates one megawatt-hour (MWh) of electricity for the electric grid, and RECs represent the environmental benefits of energy generated. MA Class I RECs come from new renewable energy projects, and the state's Renewable Portfolio Standard (RPS) requires an increasing amount of MA Class I RECs each year in every electricity supply. As a result, the RPS drives electricity suppliers to demand new renewables be built so they can meet their higher RPS requirements. Including at least five extra percentage points of MA Class I RECs in the default rate of a GMA program can allow for competitive prices with cost savings compared to the utility's basic service. Since aggregations are opt-out, typically 90 percent of customers or more remain with the default rate. Across the entire aggregation, the extra percentage point purchases can add up to a significant amount of renewable energy. Effectively, the approach raises the RPS, demanding even more renewable generation than would have been built otherwise, also known as additionality.

Action B:
Develop community shared solar programs.

Lease municipal land or rooftop space to set up a program that benefits low-income residents in your community.

Type
Program

Timeframe
Intermediate
(1 to 5 years)

Urgency
By 2025

Feasibility
Local examples – Beverly Community Solar[6], Pilot Projects in Boston[7], Newton Community Shared Solar initiative[8], DC Solar for All[9]

Lead Implementer
Sustainability Department and/or Committee

Key Partners
Community groups and organizers, low-income residents, community shared solar developer, electric utility, public housing authority

Scale of Impact
Measurable / high impact

Performance Indicators
- Number of low-income customers served and average monthly bill savings
- Number of community shared solar projects implemented
- Kilowatts (kWs) of solar the municipality has developed for low-income customers

Type of Expense
Capital expenditure

Benefits and Impacts
Environmental – Improved outdoor air quality
Economic – Reduced monthly electric bill costs for low-income customers
Equity – Increased benefits for low-income residents
Energy – Increased solar energy on the grid

Develop a community shared solar program.

A community shared solar (CSS) project allows multiple energy users in a community to benefit from that project. CSS projects use virtual net metering to allow participants to subscribe to a project and receive credits for a portion of the energy generated on their utility bill.

- Develop CSS projects in your community that benefit low-income residents. This can include building CSS projects on municipal roofs or land with all or part of the energy generated credited to low-income residents. Municipalities can lease the space and have a third party own and operate the project or can choose to own the project directly. Alternatively, in some CSS projects, the subscribers each own a share of the project.
- Ensure that low-income residents are involved during project design, development, and outreach. Municipalities should work with their Housing Authority to connect to potential program customers.
- Where developing projects on municipal property is not feasible, encourage projects on private sites with community partners via outreach about CSS.

Equity Considerations

Low-income CSS builds access to solar for residents who may have been excluded from other solar models, since participation does not depend on owning a home or having a roof in good condition and a suitable location for installing solar. To ensure that low-income residents are able to participate, municipal staff should include residents in the development of the program and ask for contract terms from vendors that will eliminate barriers to participation and provide consumer protection (e.g., clear contract terms and easy opt-out options or support if unable to pay utility bills). Supportive contract terms can include: eliminating a minimum credit score requirement; offering short-term purchasing options, such as annual contract lengths or flexible cancellation; and guaranteeing energy savings for a prescribed contract price.

Immediate Next Step

Municipalities can begin by identifying community partners and potential land or rooftop space they could use for a CSS project. Cities and towns can learn more about project models on MAPC's community shared solar site.

Explore MAPC's Community Shared Solar for Municipalities resources:
https://www.mapc.org/our-work/expertise/clean-energy/solar-contracting/community-shared-solar/css-municipalities/

SMART Incentive and Net Zero

The Solar Massachusetts Renewable Target (SMART) program[10] is the current solar incentive program in Massachusetts. The amount of the SMART incentive is dependent on the system's size, timing, location, and use case. SMART is structured in a series of declining blocks, with adders for certain prioritized locations and use cases. RECs that each solar project produces utilizing the SMART incentive go to the utility company to which the project is interconnected. Therefore, a municipality cannot count these RECs toward their climate mitigation commitments. Municipalities looking to develop renewable energy in pursuit of net zero have to weigh the benefits of the SMART incentive against the benefits of their direct GHG emissions reductions and accounting. One community might find it cost effective to use the SMART incentive for a system and purchase MA Class I RECs from elsewhere (e.g., unbundled REC purchases) whereas another may value the inclusion of local renewable credits in their portfolio over cost. The right decision for a project depends on municipal priorities and feasibility.

There are a few adders in the SMART program that help make municipal solar more affordable by providing larger incentives. Systems sited on municipal buildings or land or on brownfield sites can qualify for a location-based adder. Other relevant adders include those for CSS systems designed to serve low- to moderate-income residents, solar installed with storage, and solar canopies, among others. In many cases, these adders can be combined together. As municipalities are generally well-positioned to take advantage of numerous adders, solar developers may want to collaborate with cities and towns under SMART. Municipalities can use competitive procurements[11] to identify prospective solar developers and should also detail which SMART adders should be included, or whether SMART would be used at all, to create clarity for vendors and result in more accurate and competitive project bids.

Timeframe
Short-term
(Less than one year)

Urgency
By 2025

Feasibility
Local examples – Medford Wind Turbine[12], Natick Renewable Energy Page[13], Hull Wind Turbine[14], Melrose Middle and High School Solar Installations[15]

Lead Implementer
Facilities Department

Key Partners
Sustainability Department and/or Committee, electric utility, Municipal Chief Executive Officer, energy auditor, School Superintendent and Board

Type
Program

Action C:
Maximize renewable energy generation on municipal property.

This includes installation of all viable rooftop solar, solar canopies, and ground-mounted solar PV systems. It can also include solar thermal, wind, or geothermal generation.

Type of Expense
Capital and operations

Performance Indicators
- **Number of municipal renewable energy systems installed**
- **Amount of renewable energy offered to residents**
- **Reduction in municipal energy use from non-renewable sources**

Scale of Impact
Measurable / high impact

Benefits and Impacts
Environmental – Improved outdoor air quality
Energy – Increased use of renewable sources within municipal energy consumption
Economic – Reduced municipal energy bills

Maximize renewable energy generation on municipal property.

Municipalities can install solar PV in multiple configurations – on municipal rooftops, as parking canopies, or as ground-mounted installations. They can also install other renewables, such as wind turbines, solar thermal systems for hot water heating in municipal buildings,[16] and geothermal generation via ground source heat pumps.[17] Renewable energy installations reduce the GHG emissions of the municipal portfolio and allow a community to lead by example, showing residents and businesses what is possible.

- ○ Issue a Request for Qualifications (RFQ) or Request for Proposals (RFP) to identify a vendor to conduct a feasibility study that assesses all municipally owned sites for renewable energy potential. This study could be technology specific, or if resources allow, could seek a vendor who is experienced and well-versed in multiple types of renewable energy technologies so they can provide a wide range of viable options.
- ○ Based on the results of the feasibility study, prioritize and procure renewable energy installations for viable locations identified. Municipalities often choose to have the project developer own the system and purchase the electricity from the project via a Power Purchase Agreement (PPA),[18] but they may also opt to own the renewable energy installation directly and retain and retire the RECs generated by that project, enabling them to count those emissions reductions in their GHG accounting (see more on the SMART program and REC options on page 15).
- ○ Conduct outreach and education in your community once renewable energy projects are installed to increase awareness. This could include offering tours of the installation and information about how residents can install renewable energy on their homes.

Equity Considerations

Municipalities should consult community members to understand their priorities for installations, especially those that affect community centers, schools, and open space. For vacant lot space, municipalities should consider other community priorities for that land, such as affordable housing and public parks, and consider how renewable energy could be included in those projects. Projects on schools can be designed to have an educational component. Municipalities can also dedicate a portion of solar installed on municipal property to low-income residents via a community shared solar program (see **Action B**) and prioritize minority and women-owned businesses in their procurements.

Immediate Next Step

Begin internal discussions on goals and criteria to develop an RFQ or RFP for a municipal renewable energy feasibility study.

Explore MAPC's Solar Thermal Challenge resources: http://www.mapc.org/wp-content/uploads/2018/04/Municipal-Solar-Thermal-Templates-and-Lessons-Learned.pdf

Review MAPC's past solar PV Request for Qualifications: https://www.mapc.org/our-work/expertise/clean-energy/solar-contracting/#solar-contracting

Solar Potential Tools and Resources

NREL's Re-optTM Lite Tool is a publicly available resource for evaluating solar, wind and battery storage site potential[19]

NREL's PVWattsR Calculator allows users to estimate the energy production potential and cost of grid-connected solar PV installations[20]

Project Sunroof is a Google tool that provides a basic solar rooftop analysis[21]

Increasing Residential and Commercial Renewable Energy Generation

In addition to the strategies highlighted in this section, the Net Zero Buildings and the Climate-Smart Zoning and Permitting chapters of the Playbook highlight additional programs and policies that municipalities can deploy to decrease emissions in the residential and commercial sectors:

- **Partner on Clean Energy Outreach Programs:** Municipalities can support clean energy in households and businesses by partnering with service providers on clean energy outreach programs. Often called Solarize, HeatSmart, or Solarize Plus, municipalities organize these programs by identifying and vetting qualified vendors, typically via an RFP process. The programs offer residents, and potentially nonprofits and small businesses, the chance to purchase and have installed a suite of clean energy technologies by selected vendors. The bulk purchasing model provides discounts to residents, making the installations more affordable and logistically simpler. Programs can focus on offering multiple technology options, such as solar PV, battery storage, air source and ground source heat pumps, electric vehicle charging stations, and energy efficiency improvements. Municipalities can design their programs to focus on outreach to those who face greater barriers to participation, and also structure income-tiered incentives using available funding sources. See **Action D** in the Net Zero Buildings chapter for more details.

- **Allow By-right the Installation and Operation of Net Zero Enabling Technologies**: Local governments can create enabling conditions that allow residential and commercial property owners to install clean energy technologies such as solar PV, solar hot water, and storage systems. Municipalities can review their zoning codes to allow these technologies to be installed by-right in most areas of a community. At the same time, local governments can also review their building or electrical permitting processes for clean energy installations to ensure the processes are as streamlined as possible while also prioritizing safety. Municipalities implementing this action in phases or only in certain zones should consider selecting areas where the action will benefit renters, people of color, low-income residents, and other identified populations. See **Action A** in the Climate-Smart Zoning and Permitting chapter for more details.
- **Require or Strongly Encourage All New Construction and Roof Replacements to Implement an Eco-Roof**: Municipal governments can require that any new building or roof replacement in their community implement an eco-roof, which refers to a roof that provides climate-smart benefits. For instance, rooftop solar generates renewable energy, green and blue roofs manage stormwater, and green and white roofs reduce urban heat impact. This policy can help to rapidly increase the number of beneficial rooftops in a community. Policy design should take into account financial barriers for low- and moderate-income households. See **Action F** in the Climate-Smart Zoning and Permitting chapter for more details.

Action D:
Advocate for equitable clean energy access and policy within your community and statewide.

This includes advocating for the Commonwealth to establish a Clean Energy Community Benefits Fund and Commission on Energy Justice.

Benefits and Impacts
Energy – Increased renewable energy projects in the Commonwealth
Economic – Projects advanced that lower energy costs and employ local minority and women-owned businesses
Equity – Increased benefits for Environmental Justice communities and mitigation of further harm

Scale of Impact
Enabling Action

Type of Expense
Staff Time

Type
Policy

Timeframe
Intermediate
(1 to 5 years)

Urgency
By 2025

Performance Indicators
- Number of written and oral testimonies submitted
- Legislation and/or regulations successfully adopted
- State dollars directly funding clean energy programs for frontline communities

Lead Implementer
Municipal Chief Executive Officer

Feasibility
National examples – Portland, OR Clean Energy Benefits Fund[22], New York State Climate Justice Working Group[23]

Key Partners
Sustainability Department and/or Committee, Diversity, Equity, and Inclusion Staff and/or Committee, Select Board or City Council, local environmental justice and community organizations, neighboring municipalities, state legislators, local elected officials, EEA Environmental Justice Office

Advocate for equitable clean energy access and policy within your community and statewide.

The transition to a clean energy future must be just and ensure that low-income communities, communities of color, and other populations on the frontlines of experiencing climate impacts can fully participate and directly benefit. Municipalities can advocate for an equitable clean energy future by supporting legislation and regulations that center energy justice. This includes encouraging the establishment of a Clean Energy Community Benefits Fund and a Commission on Energy Justice to direct benefits to Environmental Justice (EJ) communities.[24] Such a fund could support renewable energy installations and energy efficiency projects, clean energy jobs training, and green infrastructure projects for EJ communities. The Commission would oversee the fund's implementation and coordinate with the Department of Energy Resources (DOER) and the Department of Public Utilities (DPU) to ensure equitable structures and benefit distribution within statewide programs. This and other policies to transition to a clean energy future are included in MetroCommon 2050, MAPC's long-range plan for the Metro Boston Region.[25]

- Meet with state legislators to discuss your net zero goals, the need for a just energy transition, and resources to support communities in making that transition.
- Monitor and support legislation and regulation that advances energy and environmental justice in the Commonwealth. Support can include preparing advocacy letters, providing written and oral testimony, and meeting with your legislators.
- Lead by example and design local clean energy programs that encourage and support participation by EJ communities.
- Stay in touch with MAPC and peer municipalities on state and local equity-centered clean energy and climate policy advocacy. Look to MAPC's Health, Housing, Energy, Equity training series for a place to start.[26]

Equity Consideration

Many state clean energy programs have traditionally offered smaller carve-outs for low-income residents. Future advocacy should aim to support legislation and programs that center low-income residents, communities of color, and other groups underserved by current programs. As part of their advocacy, municipalities can build partnerships and conduct outreach in their municipality to help raise the voices of those who have been most impacted by climate and other environmental harms and partner with peer municipalities or regional organizations to amplify those voices.

Immediate Next Step

Municipalities can start by learning more about EJ resources and recommendations underway and by meeting with their state representatives to discuss energy justice and potential legislation.

Strategy:

Build smart and resilient energy infrastructure

Action E:

Align zoning and permitting to support public and private sector centralized clean energy systems.

This includes district energy, variable refrigerant flow (VRF) heat pumps, and microgrids fueled by renewable energy.

Type
Plan

Timeframe
Intermediate
(1 to 5 years)

Urgency
By 2030

Feasibility
Local and national examples – Cambridge Low Carbon Energy Supply Study[27], Boston Smart Utilities Project[28], Boston Community Energy Study[29], and San Francisco, CA District-Scale Energy Planning[30]

Type of Expense
Staff time

Scale of Impact
Enabling action

Performance Indicators
- Zoning reviewed and updated
- Permitting processes reviewed and updated

Benefits and Impacts
Health – Improved indoor air quality and enhanced occupant comfort
Energy – Increased energy resilience in the case of grid outages

Key Partners
Sustainability Department and/or Committee, Assessors Department, Zoning Board, electric utility, building owners and developers, community-based organizations

Lead Implementer
Planning Department

Align zoning and permitting to support public and private sector centralized clean energy systems.

Municipalities can plan for and support centralized clean energy systems, such as district energy and microgrids, among multiple buildings via zoning and permitting policies. District energy uses networks of insulated pipes that carry steam or water to heat and cool buildings. Microgrids are localized electrical grids powered by renewables and with control capability that allows them to operate autonomously from the main electrical grid.

- Identify priority areas or districts in the municipality for centralized clean energy system development. These should include areas with high energy load and areas that are anticipated for future higher-density development, such as densely populated mixed-use neighborhoods, educational or business campuses, areas with industrial or commercial energy loads close together, and areas with critical facilities.
- Review municipal zoning and permitting to identify any barriers to these systems in prioritized locations (e.g., more extensive or expensive permitting processes or zoning that prohibits this type of development in priority areas). See **Action K** in the Climate-Smart Zoning and Permitting Chapter for more information.
- Pursue zoning changes, such as a district energy/microgrid zoning overlay, and processes to streamline permitting, such as an expedited street-opening process for district energy installations. Zoning changes could include incentives to encourage centralized clean energy installations or requirements that new construction in designated areas be designed ready for centralized clean energy installations in the future (e.g., requiring that mechanical systems in that designated area connect to the microgrid or district energy system).

Equity Considerations

Since centralized clean energy systems can provide resilient and clean energy, municipalities should consider prioritizing and incentivizing these developments in areas that serve communities of color, renters, older adults, and low-income residents. An equitable approach is to prioritize feedback and insights from these populations while pursuing zoning or permitting updates. If using zoning or permitting incentives, municipalities should also ensure that they do not disincentivize affordable housing at the same time.

Immediate Next Step

Municipalities can begin by reviewing their master or neighborhood plans to identify areas to consider prioritizing for centralized clean energy systems.

Developing A Publicly Accessible Community Energy Map

A municipality can develop a publicly accessible community energy map that identifies opportunities for, and demonstrates the feasibility of, deploying distributed energy resources such as solar PV, district energy, energy storage, and microgrids throughout the community. Communities that have developed these maps typically collaborate with a university or hire a technical consultant to support this effort. Creating a map involves working with a municipality's electric and gas utilities to gather publicly available information to analyze. An energy map includes an analysis of the locations of essential energy loads, such as schools, emergency shelters, or emergency services, and locations of critical energy infrastructure, such as electric substations, to understand how they can best be connected. A map might also include available grid capacity by area, types of heating and cooling fuels used, existing renewable energy generation, existing energy storage resources, and clean energy potential.

With this data assembled, a municipality can plan for the strategic deployment of clean energy systems. The analysis may also help the municipality to plan for expenses, such as interconnection and feeder costs, if upgrades may be needed. The accessibility and transparency of this mapping exercise can also improve energy resiliency and increase clean energy supply in disadvantaged communities. Boston's Community Energy Study provides an example of what a mapping and planning process can look like.[31]

Timeframe
Long-term
(5 years or more)

Urgency
By 2030

Feasibility
Leadership opportunity – HEET GeoMicroDistrict feasibility study[32]

Lead Implementer
Sustainability Department and/or Committee

Type
Program

Action F:
Support pilots of centralized clean heating projects that transition neighborhoods or districts off fossil fuels.

Target neighborhoods with high prevalence of leak-prone natural gas pipelines.

Benefits and Impacts
Health – Improved indoor air quality and enhance occupant comfort
Environmental – Reduced street tree mortality from gas leaks

Key Partners
Planning Department, electric utility, building owners and developers, School Superintendent and Facilities Manager, community-based organizations, clean heating system vendors

Performance Indicators
- **Number of systems piloted**

Type of Expense
Capital expenditure and staff time

Scale of Impact
Measurable / high impact

Support pilots of centralized clean heating projects that transition neighborhoods or districts off fossil fuels.

Help pilot the implementation of centralized heating and cooling systems planned for in **Action E**. These systems could include water- or steam-based district energy or GeoMicroDistricts.[33, 34] In this action, a neighborhood or campus would be served by one centralized heating system, ideally powered by renewable energy.

- Based on the priority areas identified in **Action E** for centralized heating and cooling systems, identify and convene potential partners to lead or support project implementation. This should include larger building owners and institutions, municipal properties such as schools, community organization partners, and potential system owners or vendors.
- Seek funding to support a feasibility study for a centralized heating and cooling system in the prioritized location.
- If municipal properties are adjacent to potential sites for a centralized clean heating project, consider including a municipal building or school in the feasibility study and potential pilot project.

Equity Considerations

To implement equity in this pilot, focus efforts and engagement on neighborhoods that have higher populations of people who have historically been impacted by fossil fuel infrastructure. This may include communities of color, older adults, and low- to moderate-income residents. Ensure the project feasibility studies take into account anticipated user costs and plan to mitigate any expected increases in energy costs for low- and moderate-income participating households. Implementation can also be prioritized in neighborhoods with a high prevalence of leak-prone natural gas infrastructure to improve air quality in those communities and help transition away from fossil fuels (see **Action J** for more details on gas leaks).

Immediate Next Step

Municipalities should reach out to potential partners to begin discussions about a pilot project. Consider targeting available federal funds, such as American Rescue Plan Act (ARPA) dollars, to support the infrastructure transition.

Type
Program

Action G:
Pilot microgrids fueled by renewable energy.

Prioritize sites that provide essential services to increase community resiliency.

Timeframe
Long-term
(5 years or more)

Urgency
By 2030

Feasibility
Local examples – MassCEC Community Microgrids Program,[35] Boston Smart Utilities Policy[36], ResilientUrban Neighborhoods and Green Justice Coalition (RUN-GJC) Microgrid Project in Chelsea and Boston's Chinatown[37]

Type of Expense
Capital and operations

Scale of Impact
Measurable / high impact

Benefits and Impacts
Environmental – Improved outdoor air quality
Energy – Increased energy resilience in the case of grid outages

Performance Indicators
- Number of systems piloted

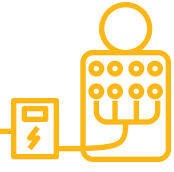
Lead Implementer
Sustainability Department and/or Committee

Key Partners
Electric utility, Planning Department, Facilities Department, building owners and developers, community-based organizations

Pilot microgrids fueled by renewable energy.

Microgrids can operate independently from the larger electrical grid and serve a specified area, usually at least several buildings with proximate energy loads. They include battery storage and controls and should be powered by renewable sources like solar PV, rather than with fossil fuels, to help meet net zero goals. Microgrids with energy storage build resiliency into the local clean energy supply because the storage system allows for energy to be used at different times of day than it is produced and to power some or all of the grid during a power outage.

- Identify potential sites in your municipality to host a microgrid. Microgrid infrastructure should be co-located with facilities that provide essential services when feasible and strategic. This could include buildings such as a fire department, health center, assisted living facility, community shelter, school, water pumping station, or emergency cooling center.
- Begin discussions early with your electric utility about project feasibility and discuss any written approvals needed for a microgrid from the utility if the infrastructure will cross multiple property owners' boundaries.
- Engage partners and members of the community who would be impacted by or benefit from the project early on to get input.
- Pursue funding to commission a feasibility study for the project.



Equity Considerations

Microgrids can provide resiliency to neighborhoods impacted by urban heat island effect or that face increased power outages and other climate risks from storm events. Municipalities should engage these neighborhoods early on to understand priorities and concerns about energy resilience and climate change, and to explore potential sites for a microgrid in partnership with the community. Care should be taken to ensure that new microgrid energy infrastructure does not impose environmental burdens on a community or supersede other community priorities and concerns, but instead can complement those priorities.

Immediate Next Step

Cities and towns can look to MAPC's resources on community resiliency and microgrids and begin considering potential sites to prioritize.[38]

Type
Program

Timeframe
Intermediate
(1 to 5 years)

Urgency
By 2030

Action H:
Deploy energy storage at critical facilities.

Pair these systems with renewable energy generation (**Action C**).

Feasibility
Local examples - Massachusetts Advancing Commonwealth Energy Storage (ACES) demonstration projects[39]

Lead Implementer
Sustainability Department and/or Committee

Key Partners
Electric utility, building owners and developers, Building Inspector, Fire Chief, Police, Chief, medical centers, School Superintendent and Facilities Manager

Performance Indicators
- Number of storage systems deployed
- Performance during outages
- Energy and costs saved via participation in demand management programs

Type of Expense
Capital and operations

Scale of Impact
Measurable / high impact

Benefits and Impacts
Health – Increased access to critical facilities during grid outages
Energy – Increased energy resilience in the case of grid outages

Deploy energy storage at critical facilities.

Energy storage refers to a suite of technologies that allow for energy to be stored for later use. At the building level, storage can provide demand management services, allowing a building to scale back its grid energy use at peak times and supply energy to the grid at times when more is needed. Energy storage can also increase resiliency by providing power during outages and make onsite renewable energy more efficient when paired together. Most building-level storage solutions are comprised of different types of batteries; lithium ion, lead acid, and flow are the most common, with new types such as highly efficient iron-air batteries nearing market viability as well. Energy storage systems can work with electric or thermal energy.

- ○ Identify key priorities for energy storage, how long that storage would ideally provide power during an emergency or regular basis, and critical facilities in the community, either municipal or privately-owned, that might be well-suited to host a storage system.
- ○ Reach out to staff who own and operate a prioritized building to discuss the potential for energy storage paired with renewables onsite. Coordinate with the Fire Chief and Inspections Department.
- ○ Draft and release an RFP for a vendor to conduct a feasibility study for the project. A good feasibility study will respond to the goals for the system and review energy load and variation onsite, logistics of interconnection, system size, design, lifespan, approximate cost, past energy usage (up to one year of previous data), safety, and appropriate opportunities for funding.
- ○ Identify funding and financing opportunities for the project (see more information on page 40).
- ○ With funding secured, release an RFP for engineering and construction of the project.

Equity Considerations

Energy storage projects can be designed to improve shelters and services for populations who are most vulnerable during climate events, such as hurricanes and nor'easters, severe rain events, and high heat days when power outages are most likely. When identifying priorities for a project and potential sites, a municipality should consider prioritizing buildings that can serve as emergency shelters and that provide critical services to community members during extreme weather events.

Immediate Next Step

Municipalities should convene key staff and partners – planning staff, sustainability staff, the Fire and Police Chiefs, the Building Inspector, the School Superintendent, and medical center leaders – to review priorities for energy storage and discuss potential project sites.

Funding Resources for Energy Storage

Municipal Vulnerability Preparedness (MVP) Program Action Grant: This state grant program offers the opportunity for municipalities to seek funding for climate action implementation that relates to resilience. In past years, energy storage projects have been eligible.[40]

Solar Massachusetts Renewable Target (**SMART**): Offers financial incentives for storage systems installed with new solar systems as one project at the same time. Cannot be used for energy storage on its own.[41]

Eversource **and** National Grid **Demand Response Programs**: For storage systems with the main target of reducing energy load in a building during times of peak grid energy use. If served by a municipal utility, please check with your provider for program options.[42, 43]

Federal Investment Tax Credit (ITC): Battery storage systems can be eligible for the federal ITC when connected to renewable energy generation and regularly charged by that power source.[44]

Clean Peak Standard: Larger storage systems can apply to be a Clean Peak Resource (CPR) in the state's Clean Peak Standard program, which requires utilities to deliver a percentage of electricity from eligible clean peak resources during peak hours of demand on the electric grid. CPRs generate Clean Peak Energy Certificates (CPECs) that can be sold to retail electricity suppliers, producing a revenue stream for project owners.[45]

Strategy:

Reduce the carbon impact of the energy system, from the electric grid down to the building-scale

Action I
pg 42

Action J
pg 45

Action I:
Participate and invest in demand management programs.

Tap into incentive programs from the utility and ISO New England, the regional grid system operator, and install building energy technologies that enable load management tactics (**Action H**).

Type
Program

Timeframe
Long-term
(5 years or more)

Urgency
By 2040

Feasibility
Local examples – Wayland smart inverter project[46], Sterling Municipal Light Plant battery project[47], Boston Public Schools and Medford municipal buildings[48]

Performance Indicators
- **Number of buildings participating in demand management programs**
- **Cost savings achieved**
- **Supportive technologies installed**

Lead Implementer
Facilities Manager

Key Partners
Electric utilities, Sustainability Department and/or Committee, School Superintendent and Facilities Manager

Scale of Impact
Measurable / high impact

Type of Expense
Capital and operations

Benefits and Impacts
Economic – Reduced energy costs for large building owners
Energy – Stabilized energy demand by shifting electricity load to off-peak hours and reduced impact on the electric grid at peak times of demand

Participate and invest in demand management.

Municipalities and other larger building owners can participate in demand management programs. During times of peak grid energy use, dirtier and more inefficient fossil fuel sources are often brought online to meet demand. Larger buildings are generally best suited for demand management programs and participate by reducing their energy use during times of peak strain on the electric grid. This reduces energy demand on the grid, the need for additional energy generation, and GHG emissions when less dirty energy is used. In turn, participants that pay demand charges on their electric bills can save on their energy costs when reducing during peak times.

- Reach out to the electric utility to understand program options and incentives. MAPC also offers a service that provides free alerts to municipalities when peak demand days are possible.[49]
- Develop a plan for a building or portfolio of buildings to regularly review and understand electricity use onsite and strategies to reduce energy use, particularly during peak demand.
- Consider installing supportive technologies to help monitor and reduce onsite energy loads, including energy management systems, smart thermostats, smart inverters, and energy storage paired with renewables.

Equity Considerations

Since participation in demand management programs can be financially beneficial to a municipality, a community should consider how a portion of the savings can be used meaningfully to advance a community's climate equity goals. For example, a municipality might choose to use their savings to help offset the cost of community shared solar subscriptions for low-income residents.

Immediate Next Step

Municipalities can start by signing up for MAPC's Peak Demand Notification Program[50] and by researching the participation requirements of utility demand management programs (e.g., National Grid's Connection Solutions program[51] and Eversource's demand response program[52]). As many municipalities find that school buildings make up a considerable portion of their municipal energy consumption and pay hefty amounts in demand charges, working with the School Superintendent and Facilities Manager could help a municipality to leverage significant energy, GHG, and cost savings.

Explore MAPC's Peak Demand Notification Program and resources:
https://www.mapc.org/our-work/expertise/clean-energy/peak-demand/

Action J:
Coordinate with utilities to address major gas leaks.

Consider partnering with neighboring municipalities and regional entities to amplify impact and streamline solutions.

Type
Program

Timeframe
Ongoing

Urgency
By 2025

Feasibility
Local examples: Worcester Cooperative Patching Program[53], Bedford Gas Leaks and Trees[54], Wellesley Gas Leaks[55], Boston Utility Coordination Software[56]

Scale of Impact
Hard to measure / high impact

Benefits and Impacts
Health – Increased public safety
Environmental – Improved outdoor air quality and health of street trees and other green infrastructure
Energy – Reduced natural gas demand with less gas lost from leaky system

Type of Expense
Staff time and operations

Performance Indicators
- Number of gas leaks eliminated
- Number of coordination meetings held annually between municipality and utility

Lead Implementer
Department of Public Works and Municipal Executives

Key Partners
Natural gas utility, Energy/Sustainability Manager, Planning Department, Inspectional Services Department, Department of Public Utilities, community-based organizations, neighboring municipalities (if a regional effort)

Coordinate with utilities to address major gas leaks.

Municipalities can advocate for the repair of super-emitter gas leaks in their communities and coordinate information and data sharing with the gas utility. Repairing gas leaks improves residents' health, makes the gas network more efficient, and helps to eliminate difficult-to-account-for GHG emissions.

- Convene key staff in your municipality, such as the Department of Public Works, Planning, and Inspectional Services. Review MAPC and Home Energy Efficiency Team's (HEET's) Fix Our Pipes Study[57] and the HEET's gas leaks map[58] for your municipality to understand the landscape of repairs needed in your municipality.
- Establish an internal policy to coordinate municipal paving, water, and sewer infrastructure planning efforts.
- Ahead of each construction season, hold a coordination meeting with your gas company to align infrastructure repair schedules and establish communications, restoration, paving, and inspection procedures. Use this meeting to check-in on the repair status of gas leaks, including Grade 3 super-emitters, those that they are larger than 2,000 square feet and have Significant Environmental Impact (SEI).
- Check in on progress internally and with the gas utility regularly throughout the construction season. Where possible, consider expediting permitting for projects that will involve gas leak repair.
- Encourage the replacement or alternative use of gas pipelines in your community with renewable energy sources. While the repair of major gas leaks is a very significant measure in reducing GHG emissions and improving public health and safety, the replacement of fossil fuel energy sources in your community with more clean energy will lead to the greatest impact and enable longer-term change.

Equity Considerations

Municipalities can advocate for and prioritize fixing Grade 1 and 2 gas leaks and Grade 3 SEI leaks that are near communities of color, low-income residents, and other populations that have historically suffered disproportionately from environmental harms. Cities and towns can also partner with local community groups in the assessment and implementation of this action, as there may be community organizations already active in advocating for gas leak repair.

Immediate Next Step

Cities and towns can work with their Department of Public Works to map out planned street repairs and re-pavement schedules. They can set up regular meetings both to share that information with the gas utility and hear from the utility updates on its pipe repair and replacement schedule.

Review MAPC's and HEET's Fix Our Pipes Study: http://fixourpipes.org/

Explore HEET's online map of gas leaks across Massachusetts: https://heet.org/gas-leaks/gas-leak-maps/

End Notes

1 Town of Arlington: Arlington Community Choice Aggregation Program: https://arlingtoncca.com

2 City of Watertown Electricity Choice Program: https://masspowerchoice.com/watertown

3 Town of Brookline Green Electricity Program: https://www.brooklinema.gov/BrooklineGreen

4 Renewable Energy Portfolio Standard: https://www.mass.gov/renewable-energy-portfolio-standard

5 SMART Program CSS Guidelines: https://www.mass.gov/doc/alternative-licss-and-css-programs-guideline-october-2020/download

6 Beverly Community Solar Project: https://www.beverlyma.gov/736/NEW-Community-Solar-on-former-landfill

7 Resonant Energy Solar Stories: https://www.resonant.energy/solar-stories- 1

8 Newton CoSSI Community Shared Solar Initiative: https://www.mapc.org/planning101/newtons-community-solar-share-initiative-sometimes-the-answer-is-hidden-in-plain-sight/

9 Washington, D.C. Solar for All Program: https://doee.dc.gov/solarforall

10 SMART Massachusetts Solar Program: https://masmartsolar.com/

11 MAPC Solar Contracting: https://www.mapc.org/our-work/expertise/clean-energy/solar-contracting/

12 Medford wind turbine: https://medfordenergy.org/gogreen/medford-wind-turbine/

13 Natick Renewable Energy: https://www.natickma.gov/1233/Renewable-Energy

14 Hull wind turbine: https://www.town.hull.ma.us/hull-municipal-light-plant/pages/hull-wind-turbine-information

15 AMERESCO: City of Melrose Solar Panels: https://www.ameresco.com/city-melrose-solar-panels/

16 MAPC Solar Thermal Challenge: http://www.mapc.org/wp-content/uploads/2018/04/Municipal-Solar-Thermal-Templates-and-Lessons-Learned.pdf

17 MAPC Clean Heating and Cooling: https://www.mapc.org/resource-library/clean-heating-and-cooling/

18 A Power Purchase Agreement (PPA) is a financial agreement between a renewable energy developer and a property owner for sale of power generated by a renewable energy installation on the property owner's land or rooftop, often at rates lower than the utility's basic service. More on PPAs is available from SEIA: https://www.seia.org/research-resources/solar-power-purchase-agreements

19 NREL Re-optTM Lite Tool: https://reopt.nrel.gov/

20 NREL PVWattsR Calculator: https://pvwatts.nrel.gov/index.php

21 Google's Project Sunroof: https://www.google.com/get/sunroof

22 Portland, OR Clean Energy Community Benefits Fund: https://www.portland.gov/bps/cleanenergy

23 New York State Climate Justice Working Group: https://climate.ny.gov/Climate-Justice-Working-Group

24 EEA Environmental Justice Community definition: https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

25 MAPC's regional plan, MetroCommon 2050, clean energy future policies, https://metrocommon.mapc.org/system/refinery/resources/W1siZiIsIjIwMjEvMDUvMTIvN2k3OXdkbGRqcV9Qb2xpY3lfUmVjX0NsZWFuX0VuZXJneV9GdXR1cmUucGRmIl1d/Policy%20Rec_Clean%20Energy%20Future.pdf

26 MAPC Health, Housing, Energy, Equity Trainings: https://www.mapc.org/resource-library/aarc-training/

27 Cambridge Low Carbon Energy Supply Strategy: https://www.cambridgema.gov/CDD/climateandenergy/climatechangeplanning/lowcarbonenergysupplystrategy

28 Boston Planning and Development Agency: Boston Smart Utilities Project: http://www.bostonplans.org/planning/planning-initiatives/boston-smart-utilities-project

29 Boston Community Energy Study: http://www.bostonplans.org/planning/planning-initiatives/boston-community-energy-study

30 San Francisco, CA: District-Scale Energy Planning: https://archive.epa.gov/epa/sites/production/files/2015-06/documents/sf_district_energy_planning.pdf

31 Boston Community Energy Study: http://www.bostonplans.org/planning/planning-initiatives/boston-community-energy-study

32 HEET Feasibility Study RFP: https://heetma.org/feasibility-study-rfp/

33 HEET GeoMicroDistric Feasibility Study: https://heet.org/wp-content/uploads/2019/11/HEET-BH-GeoMicroDistrict-Final-Report-v2.pdf and map of potential sites: https://heet.org/potential-geomicrodistrict-sites/

34 MAPC Water-based District Energy Presentation: https://www.districtenergy.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=592c81db-ee0a-d94a-a36f-c662ce3f97e8&forceDialog=0

35 MassCEC Community Microgrids Program Awardees: https://files.masscec.com/Community%20Microgrid%20Awardee%20Summary.pdf

36 Boston Smart Utilities Program: http://www.bostonplans.org/planning/planning-initiatives/boston-smart-utilities-program

37 RUN-GJC Microgrid Project: https://greenjusticecoalition.org/blog/community_microgrids-2/

38 MAPC Community Clean Energy Resiliency: https://www.mapc.org/resource-library/community-clean-energy-resiliency/

39 ACES demonstration projects: https://files-cdn.masscec.com/ACES_Projects%20Summary_1.pdf

40 MVP Program Action Grant: https://www.mass.gov/service-details/mvp-action-grant

41 SMART Program: https://www.mass.gov/info-details/solar-massachusetts-renewable-target-smart-program

42 Eversource Demand Response Program: https://www.eversource.com/content/ema-c/business/save-money-energy/manage-energy-costs-usage/demand-response

43 National Grid Demand Response Program: https://www.nationalgridus.com/media/pdfs/bus-ways-to-save/connectedsolutions-ciprogrammaterials.pdf

44 NREL Federal Tax Incentives for Energy Storage Systems : https://www.nrel.gov/docs/fy18osti/70384.pdf

45 Clean Peak Standard: https://www.mass.gov/clean-peak-energy-standard

46 Wayland Smart Inverter: https://www.mapc.org/planning101/clean-tech-and-climate-resilience-converge-in-wayland/

47 Sterling Municipal Light Plant Energy Storage System: http://www.energysterling.com/batterystorage.asp

48 View the Boston Public Schools and City of Medford examples starting at minute 43:30 of this MAPC webinar on demand mangement: https://www.youtube.com/watch?v=VHEOPg7jUEg

49 MAPC Peak Demand Notification Program: https://www.mapc.org/our-work/expertise/clean-energy/peak-demand/

50 MAPC Peak Demand Notification Program: https://www.mapc.org/our-work/expertise/clean-energy/peak-demand/

51 National Grid Connected Solutions Program: https://www.nationalgridus.com/connectedsolutions

52 Eversource Demand Response Program: https://www.eversource.com/content/ema-c/residential/save-money-energy/manage-energy-costs-usage/demand-response/battery-storage-demand-response

53 MAPC and HEET Fix Our Pipes Study; p.53 Worcester Cooperative Patching Program: http://www.mapc.org/wp-content/uploads/2018/06/Fixing-Our-Pipes_MAPC-HEET_10-2016-FINAL.pdf

54 Bedford Gas Leaks and Trees: https://www.bedfordma.gov/arbor-resource-committee/pages/gas-leaks-and-trees

55 Wellesley Gas Leaks: https://wellesleyma.gov/449/Gas-Leaks

56 City of Boston Utility Coordination Software User Guide: https://www.cityofboston.gov/images_documents/COBUCS%20User%20Guide%202014_tcm3-25790.pdf

57 MAPC and HEET Fix Our Pipes webpage: http://fixourpipes.org/about/

58 HEET Gas Leaks Map: https://heet.org/gas-leaks/gas-leak-maps/#town-maps