

NET ZERO WILLIAMSTOWN

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Background

01

Clients

Williamstown COOL Committee

Nancy Nylan



Wendy Penner



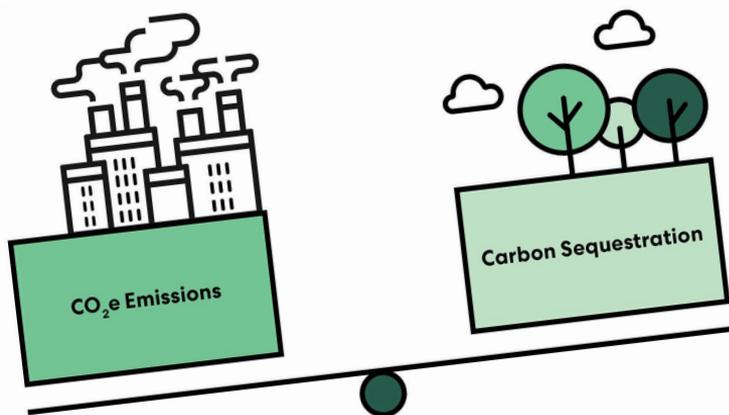
Net Zero Resolution

The Resolution to reach net zero greenhouse gas (GHG) emissions goal by 2050

- Passed June 2021
- Requires a comprehensive climate action plan by 2023

What is Net Zero?

Net zero means that on average, a building, town, country or other type of entity, is balancing their greenhouse gas emissions with the amount removed and stored by carbon sinks.





Project Goal:

To create a clear roadmap for the decarbonization of Williamstown Municipal buildings and fleet to contribute to the Net Zero Carbon Emissions Action Plan



Methodology

02

Methods

Primary Research

- Interviews
 - 4 with experts
 - 7 with building managers
- Site Visits

Secondary Research

- Internal Sources
 - Reports provided by the clients
- External Sources
 - EPA
 - EnergyStar
 - Acton, MA sources

Data Analysis

- Data from MassEnergyInsights and energy bills
- Calculations of thermal profiles, EUIs, etc.

Tanja Srebotnjak



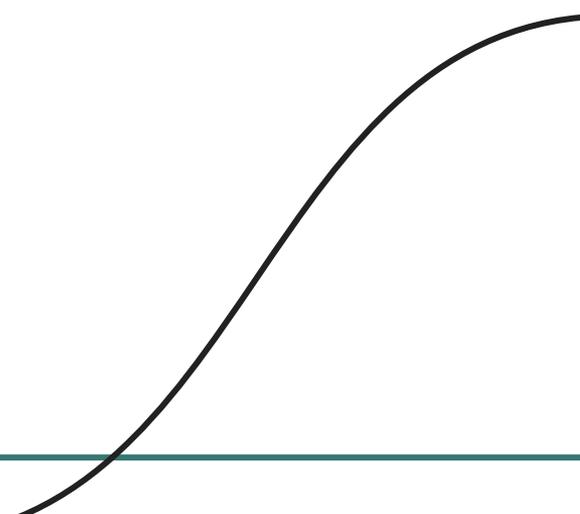
Jason Moran



Bob Menicocci



Todd Holland



Electricity in Massachusetts

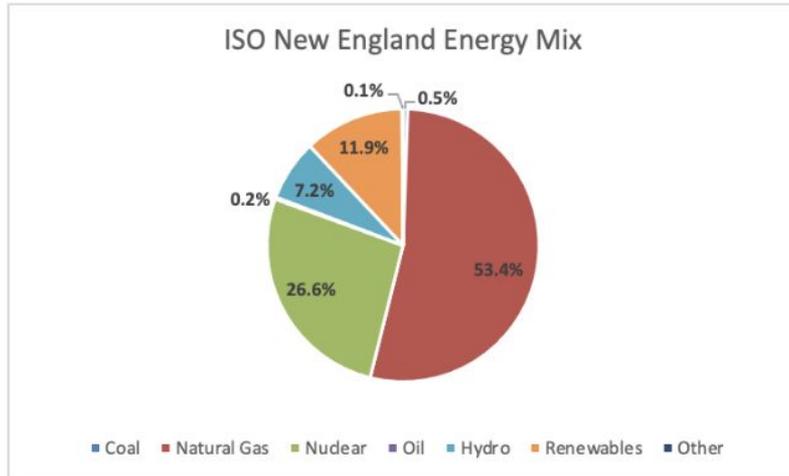
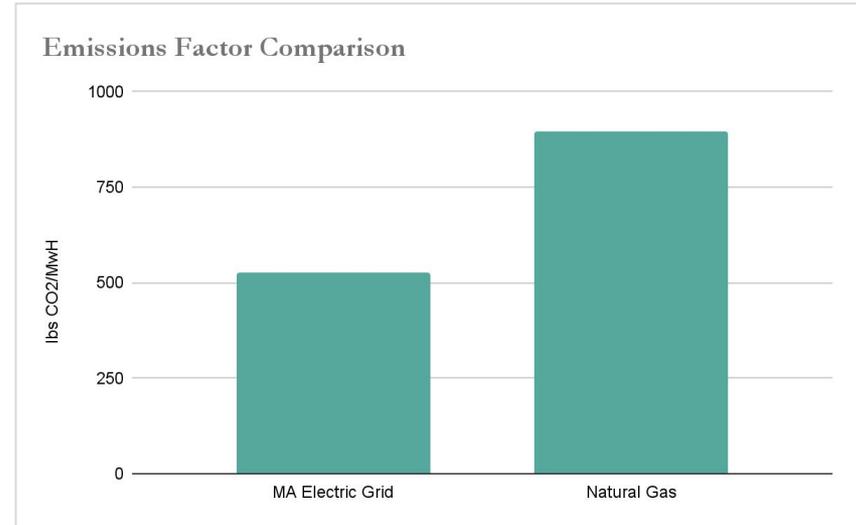


Figure 1: ISO New England Energy Resource Mix



Electric Grid in Williamstown

- 0 available hosting capacity
- MA needs to upgrade the electrical grid

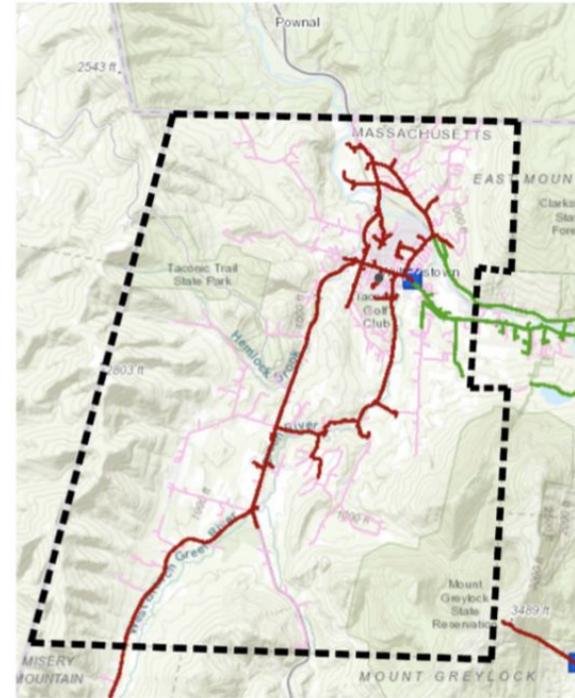
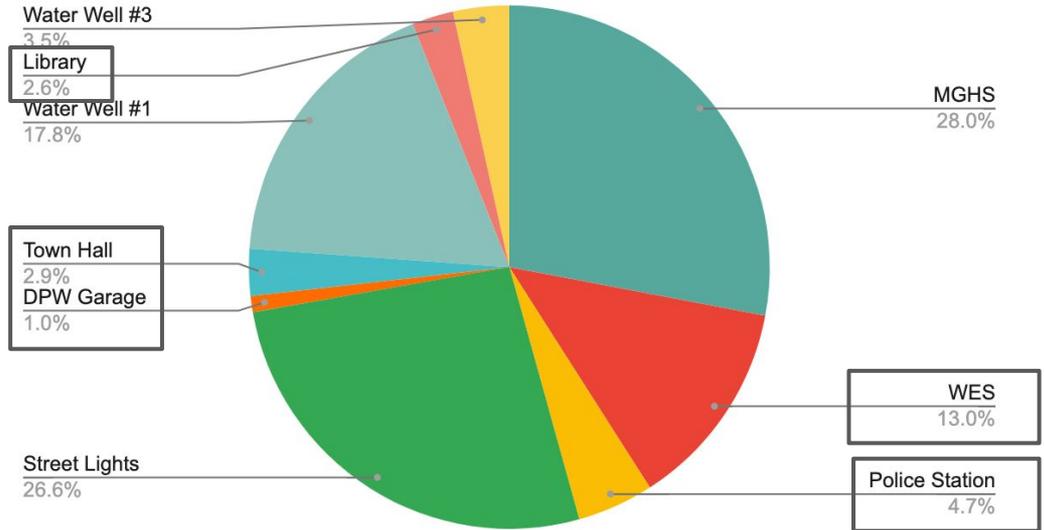


Figure: Borders and National Grid of Williamstown

Landfill Solar Field

In 2021, the Town Solar Field produced 2,046 mwh of electricity

Landfill Solar Array Allocation





Findings

03

1. Existing Buildings Systems

2. Energy Profiles

Based on 2021 energy usage

3. Energy Efficiency and Conservation Measures

4. Decarbonization Options



Town Hall

(willamistecord.com, n.d.)



Department of Public Works

at 675 Simonds Road

(Google Maps, n.d.)



Harper Center

(iberkshires.com, n.d.)



Milne Library

(Google review, n.d.)

Parks & Cemetery



Elementary School



Police Department



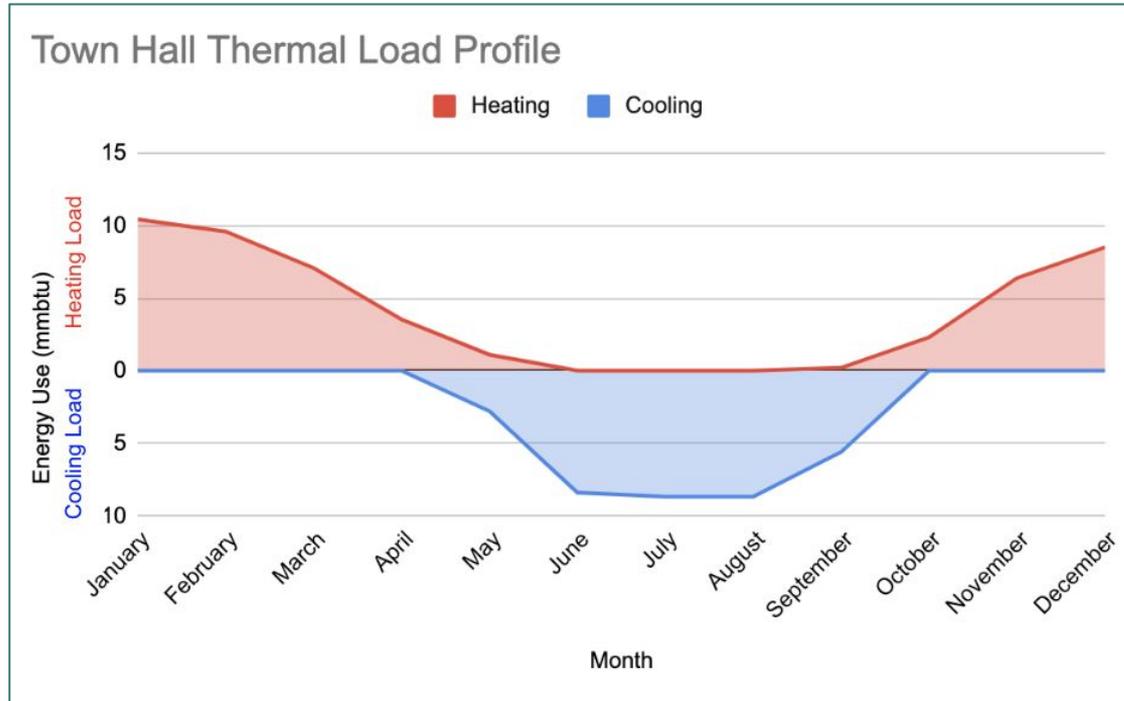
Building Energy Audits



Buildings' Profile

	Age	Size (sq. ft.)	Classification
Town Hall	1927	14,222	Office
Harper Center/Council on Aging	1985	4,298	Social/Meeting Hall
Dept. of public works	1985	25,800	Office
Milne Library	1967	18,833	Library
Parks & Cemetery - Office & Shop	1966	2,042	Office
Parks & Cemetery - Sherman Chapel	1936	1,100	Church
Police Department	2019	12,000	Police Station
Elementary School	2003	89,000	School

Buildings' Thermal Load Profiles



Buildings' Profile


 least energy efficient → most energy efficient

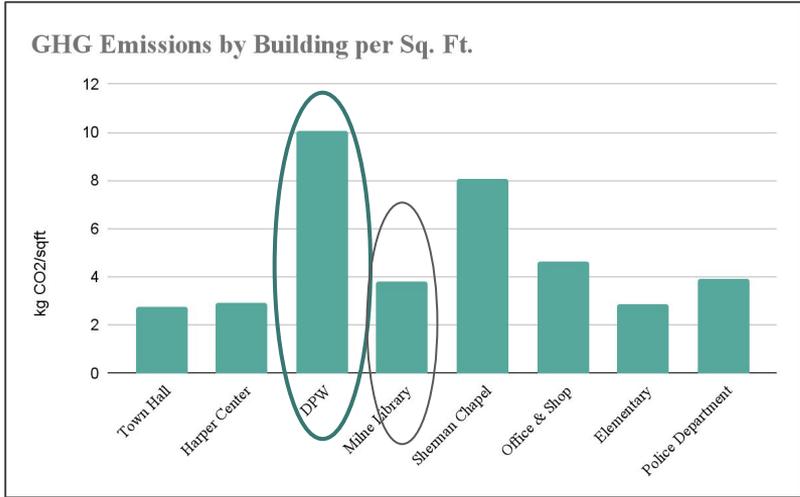
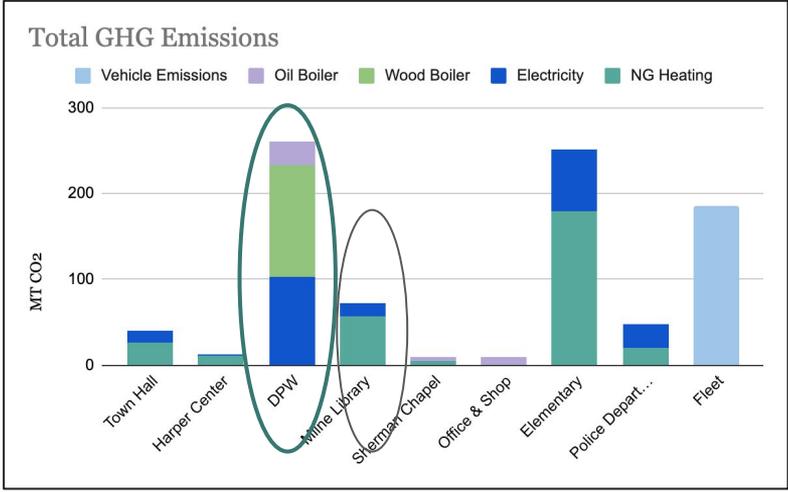
Building	Lighting	Window Type	Insulated?	Heating/Cooling System	Other notes
Town Hall	T8 Fluorescent Bulbs	Double Glazed (Town Manager Office Single Glazed Window with Storm Panels)	Yes	Window AC Units Natural Gas Boiler Heating	
Department of Public Works	T5 Fluorescent Bulbs	Double Paned (Installed in 1999)	Yes	Wood / Oil Boiler Heating and Cooling	Existing 16.56 kw Solar Array
Milne Library	T8 Bulbs	Double Paned (Outdated)	No	Mini Split Cooling Hot Water Radiant Heating	Existing 2.4 kw Solar Array
Police Department	LED	Double Paned	Yes	Heat Pump Cooling and Heating Natural Gas Water Heating	

Buildings' Profile


 least energy efficient → most energy efficient

Building	Lighting	Window Type	Insulated?	Heating/Cooling System	Other Notes
Elementary School	LED	Double Paned	Yes	Natural Gas Boiler Heating Electric Cooling	Existing 20 kw Solar Array Heat Recovery Unit
Cemetery Office & Shop	T8 Fluorescent Bulbs	Double Paned (Installed in 2021)	Yes (Two walls not insulated)	Oil boiler Window Unit Cooling	Existing 9.75 kw Solar Array 10 Fossil Fuel Mowers 2 Fossil Fuel Trimmers 1 Electric Mower 1 Electric Trimmer
Sherman Burbank Memorial Chapel	LED	Single Paned	No	Oil Boiler and Backup Natural Gas Boiler	
Harper Center	T8 Fluorescent Bulbs	Double Paned	Yes	Heat Pump Cooling and Heating	

Buildings' Greenhouse Gas Emissions



Buildings' Energy Use Intensity

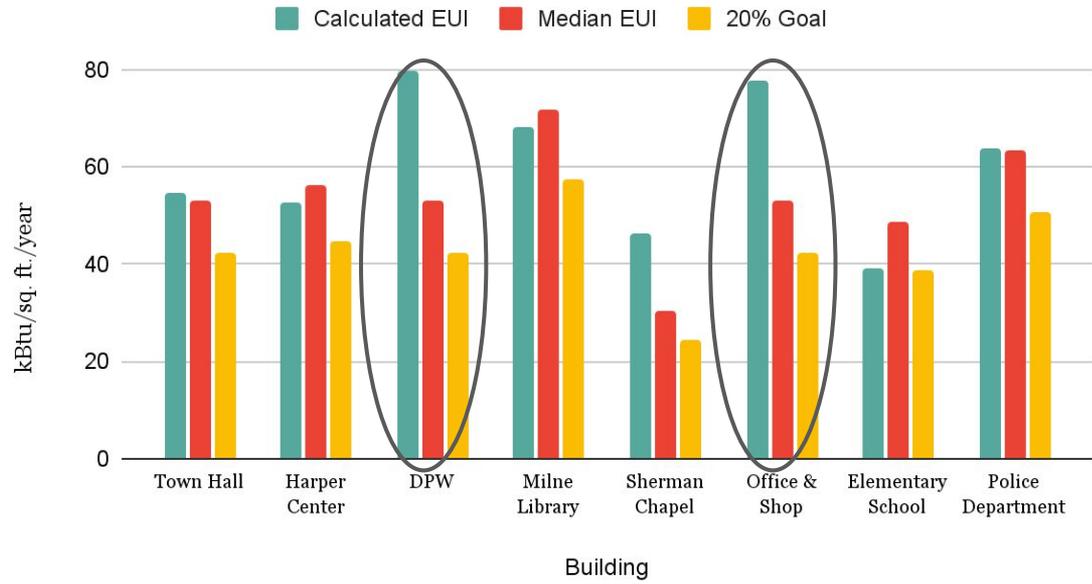
Energy Use Intensity:

A measure of a building's total energy use per square foot of area for each year

Goal

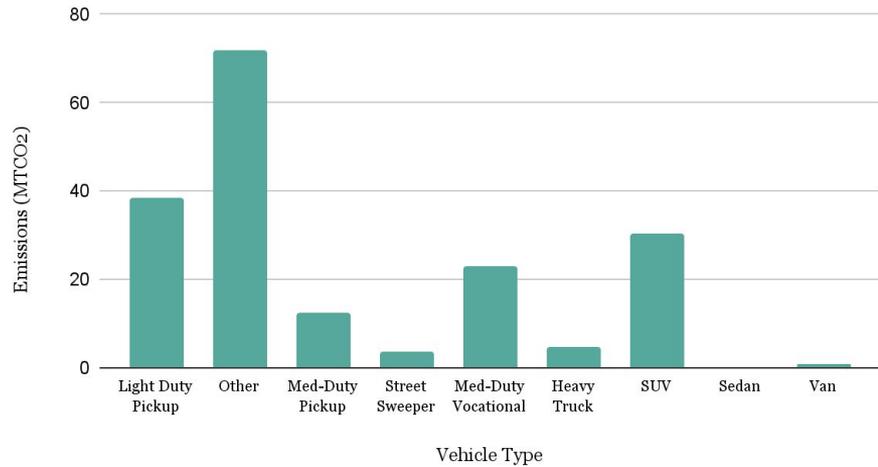
Reduce EUI to 20% below median EUI for the associated building type to become "net zero ready"

EUI Comparison



Williamstown Fleet

Emissions (MTCO₂) vs. Vehicle Type



36 On-Road Vehicles		
Average Fuel Consumption per Car (Gallons/yr)	Average Fuel Costs per Car (\$/yr)	Total Fleet Emissions (MTCO ₂ e/yr)
547.9	1,471.06	185.13



Recommendations

04

Recommendations

1. Fleet Recommendations

2. Building by Building Recommendations

3. Electrification Options

4. General Recommendations

Fleet Recommendations

Car Type	Alternative Option	Notes
Snow Plow and Maintenance Trucks	Optimus Technology Biodiesel Fuel (B20-B100)	Can be used in any diesel engine but blends above 20% require engine upgrades - payback period <1 year
Light-Duty Pickup	Ford F-150 Lightning	Difficulty acquiring vehicles due to long wait times
Police Cruisers	Ford - Mustang Mach-E Select RWD Standard Range	

Building Recommendations

Building	ECM	Decarbonization Measures
Townhall	Replace fluorescent light bulbs with LEDs Envelope Improvements (Air Sealing, Improve Insulation)	<ol style="list-style-type: none"> 1. Implement Heat Pump AC system to replace window AC 2. Heat pump heating replacement
Dept. of Public Works	Envelope Improvements (Add Storm Window, Insulation, Air Sealing) Replace fluorescent light bulbs with LEDs	<ol style="list-style-type: none"> 1. Heat Pump Heating/Cooling in Office 2. Upgrade Wood Boiler 3. Eventually Replace Wood Boiler with emerging technologies
Milne Library	Envelope Improvements (Building Insulation, Window Replacement, Air Sealing) HVAC Tune-Up and Upgrades Reconnect online tracking for solar array	<ol style="list-style-type: none"> 1. Heat Pump Heating Replacement 2. Exploration of Expansion of Solar Array
Police Department	Additional Temperature Controls	<ol style="list-style-type: none"> 1. Exploration of rooftop solar installation 2. Electric Water Heating Systems

Building Recommendations

Building	ECM	Decarbonization Measures
Harper Center	Changing the T8 fluorescent lights for LEDs Tighten building envelope	Explore adding a rooftop solar array
Elementary School	Fixing the inverter so that the solar panels work	Explore expansion of solar array Long term: installation of heat pumps
Cemetery	Increase insulation	Replace heating/cooling system with heat pumps
Sherman Burbank Memorial Chapel	Tighten Building envelope (add insulation where possible and insulate windows)	Explore installation of heat pump system

Heat Pumps

Air Source

- Transfers heat to and from the outdoor air
- Can be used in forced air and radiant HVAC systems
- Much lower upfront cost than ground source heat pumps

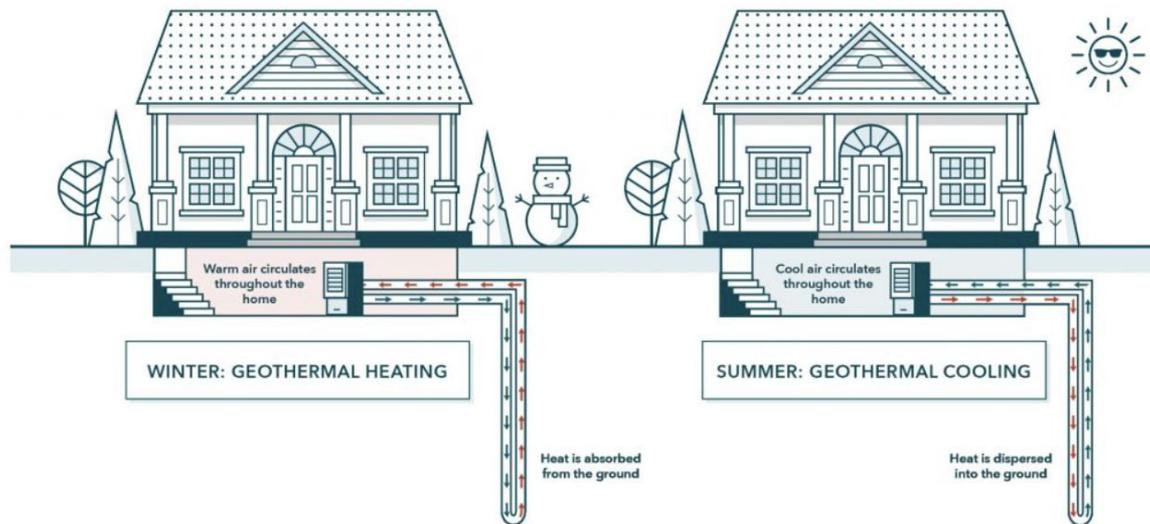
Ground Source

- Transfers heat to and from the ground
- Higher upfront costs

Air Source Heat Pumps



Ground Source Heat Pumps



Heat Pumps

	Estimated Cost	Efficiency	Service Life	Average Payback Period	Benefits
Air Source Heat Pumps	\$3,300-\$7,500	High	15-20 years	4.7 years	Easy installation
Ground Source Heat Pumps	\$13,000-\$36,000	High	Heat Pump: 20+ years Ground Infrastructure: 25-50 years	5-10 years	High Performance in Cold Temperatures

Additional Recommendations



Energy Manager

Responsible for coordinating the town's energy efficiency efforts and overseeing the process of making the town net-zero



Annual Check Ins

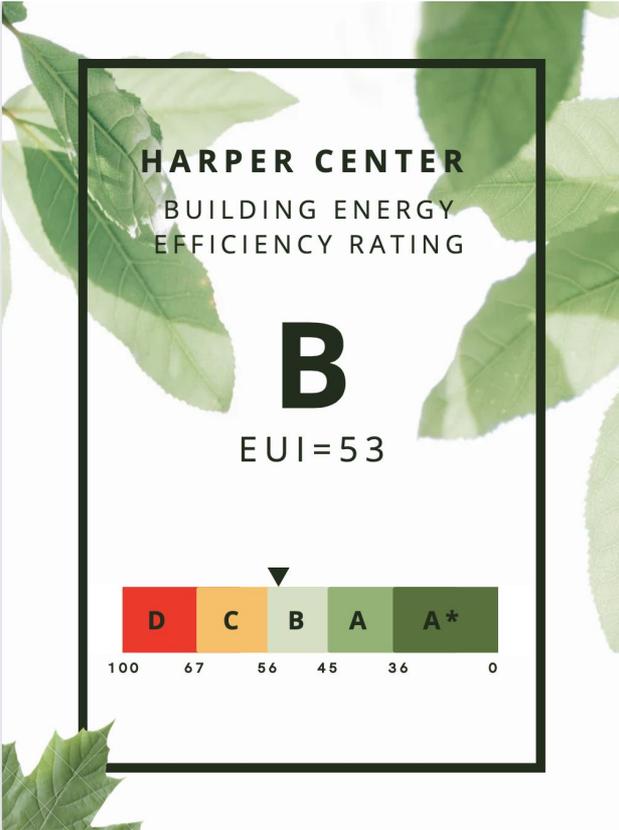
With all building managers to be able to keep updated knowledge regarding the state of all buildings, within the context of sustainability



Building Rating System

A system that will allow for comparison of municipal buildings in terms of energy efficiency, transparency as well as remind of the commitment of Williamstown to reach Net Zero

Additional Recommendations





Next Steps

05

Next Steps

1. Funding Prospects

2. Roadmap Summary

Green Communities Competitive Grants

To cover energy conservation measures, the purchase of electric vehicles, the replacement of heating systems, etc.

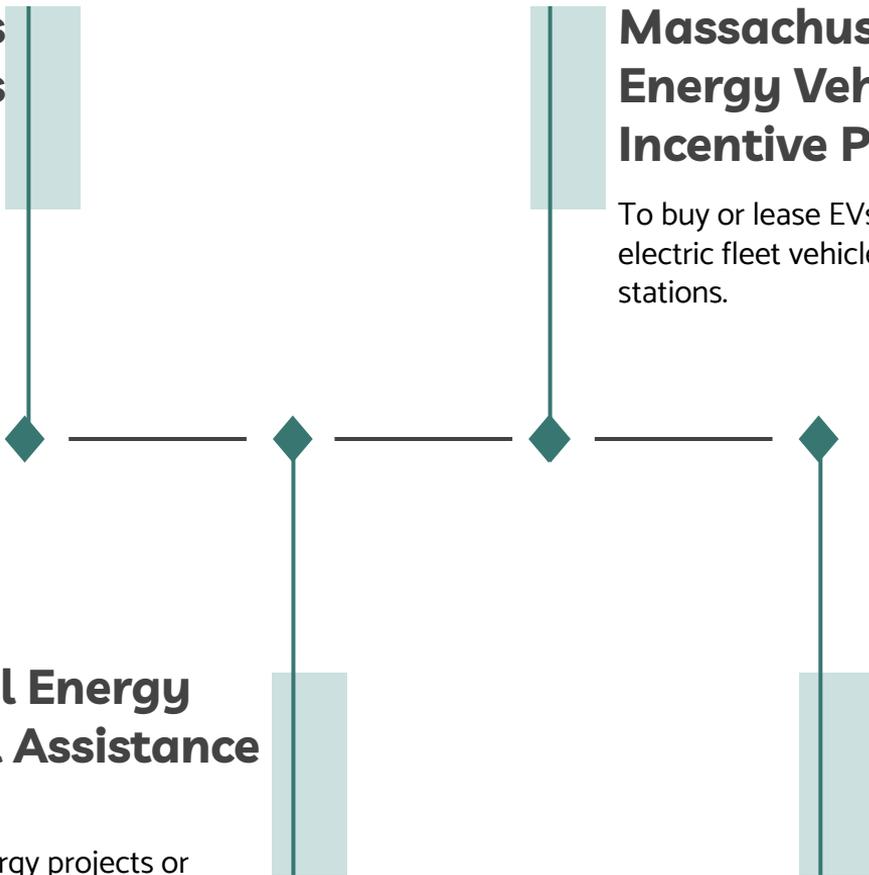
Massachusetts Energy Vehicle Incentive Program

To buy or lease EVs and buy electric fleet vehicle charging stations.

Municipal Energy Technical Assistance Grants

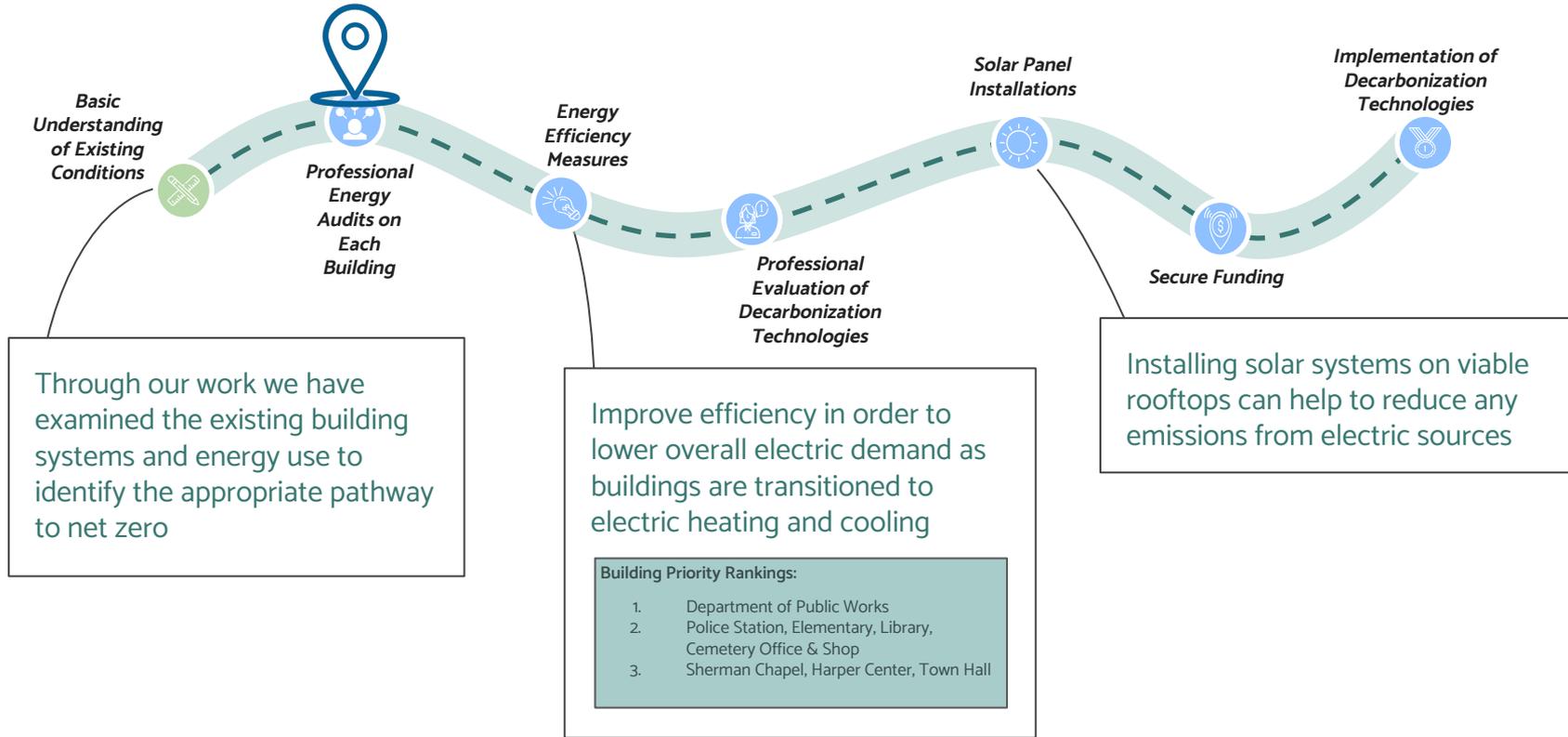
To develop energy projects or conduct feasibility studies

MassSave Rebate Incentives or Community Grants



Roadmap

Williamstown, MA



Immediate Action Items

- Fix Elementary School Solar Inverter
- Check in on Milne Library solar array tracking
- DPW and Library Window Replacement
- Evaluate replacement options for DPW heating system

Special Thanks

Building and Facilities Managers:

- Pat McLeod at the Milne Library
- Kenny McAlpine at the Town Hall
- Brian O'Grady at the Harper Center
- Chris Lemoine at the DPW
- Justin Olansky at the Parks & Cemetery
- Michael Ziemba at the Police Station
- Jim O'Brien at the Elementary School

Professor Sarah Gardner

Bob Menicocci, Tanja Srebotnjak, Jason Moran, and Todd Holland

Our Clients, Nancy Nysten and Wendy Penner



Questions?

