

Eco-Friendly Living in Marblehead

The Ultimate Toolkit for Reducing Energy and Enhancing Efficiency in Your Home



Abbot Hall in Marblehead is heated and cooled by geothermal energy.

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Introduction

Welcome to your journey towards transforming your home into a model of sustainability! This toolkit will guide you through practical and impactful changes that not only enhance your home's efficiency but also support a

healthier planet. From cutting energy bills to adopting green technologies, you'll find actionable steps to lead a more sustainable lifestyle.

As a resident of Marblehead, you play a crucial role in the Town's goal to achieve net zero carbon emissions by 2040. Contribute to our vision of a sustainable future by installing energy efficient upgrades and implementing the practices in your home that are described in this guide. Together, we can make a significant impact on our community and the planet. Join us in taking big and small steps to create a greener, healthier environment for future generations.

Climate Change: A Call to Action for Marblehead

Climate change is a pressing reality that impacts our coastal community. In Marblehead, a staggering 44% of our carbon emissions come from residential buildings. This represents an annual output of 70,900 metric tons of carbon. As global temperatures rise largely from these planet-warming emissions, we face existential risks, including increased instances of flooding from more severe storms and declining marine ecosystems.

Taking action is essential, especially through the transition to green homes and buildings. Here are some key reasons why this is crucial:

- **Significant Emission Reductions:** Transitioning to energy-efficient buildings can drastically lower our carbon footprint, addressing the 44% of local emissions that come from residential structures.
- **Cost Savings:** Green homes can reduce energy bills through more efficient hvac systems, appliances and insulation, allowing residents to save money while lowering emissions.
- **Greater safety:** If used improperly, burning natural gas, propane or oil in a home can cause carbon monoxide poisoning, which can result in severe health complications or even death.
- **Improved Indoor Air Quality:** Sustainable building materials and ventilation systems enhance air quality, benefiting the health of residents and reducing respiratory issues.

- **Increased Property Value:** Homes built or retrofitted with sustainable practices often see a rise in property value, making them a wise investment for the future.

Join us in championing green homes and buildings in Marblehead. Together, we can combat climate change, protect our community, and secure a sustainable future!

Sustainability Goals and Benefits

Sustainability in the home is about creating a living environment that minimizes resource use and environmental impact while maximizing well-being and comfort. Achieving sustainability involves various goals and benefits:

- **Reducing Energy Consumption:** By adopting energy-efficient practices and technologies, you can significantly cut down on your energy bills. Integrating renewable energy sources, advanced insulation, and passive heating strategies can lead all the way to net-zero energy consumption.
- **Water Conservation:** Efficient water use and management can reduce waste and lower utility bills. A prime example are water management systems, which incorporates rainwater harvesting and greywater recycling.
- **Sustainable Materials:** Using eco-friendly, sustainable building materials and low-impact construction practices can minimize environmental impact.
- **Indoor Air Quality:** Improved ventilation and the use of non-toxic materials can enhance indoor air quality, contributing to a healthier living environment. The [Living Building Challenge](#) (LBC) sets rigorous standards for air quality, encouraging practices that ensure a healthier space for occupants.
- **Waste Reduction:** Implementing waste reduction strategies like buying less, reusing and repurposing things, recycling and composting can significantly decrease the amount of waste sent to landfills and reduce the amount of planet-warming methane released into the atmosphere.

The [Zero Waste Home](#) movement demonstrates how everyday habits can contribute to waste reduction on a large scale.

Sustainable Marblehead Organization

This eBook was produced by the volunteers at Sustainable Marblehead. We are a grassroots organization of volunteers who believe that the changes needed to combat the global climate and environmental crises should start locally. We have working groups that provide outreach and education about how our residents can live a more sustainable lifestyle.

Please check out the information on our [website](#) or volunteer to help with a working group or an event. We are a registered 501c3 nonprofit, tax-exempt organization. If you find the information in this eBook helpful, consider making a donation to our organization.

Rebates and Incentive Programs

Upgrading homes and installing new equipment can be expensive. Fortunately, there are a number of programs that can help offset the costs and make green upgrades more affordable. The amount of rebates and incentives will be covered in each of the sections of this eBook where they apply. The following briefly describes the available programs and who can take advantage of them. Note that all rebates are subject to change, and should therefore be verified at program websites for the most up-to-date information.

Federal Income Tax Rebates: As part of the Inflation Reduction Act of 2022, the federal government offers tax credits for a number of types of home upgrades that reduce carbon output. These credits will reduce the amount that a taxpayer has to pay (or increase their refund) when filing their taxes. In order to receive these credits, the homeowner only needs to have a total tax liability that is at least as much as their eligible tax credits. A tax liability is the amount of taxes due based on taxable income. It's not the same as the payment due after withholdings. The tax credit will either reduce the amount that the taxpayer needs to pay with their filing or will

increase the amount of their tax refund. For example, if the homeowner's tax form shows a total tax amount of \$5,000, then they can take a \$2,000 tax credit for a heat pump installation since their total tax is larger than their eligible tax credit. Consult with your tax advisor about how to take advantage of these tax credits when you file your return.

Massachusetts State Tax Incentives: The state of Massachusetts offers tax incentives for solar installations. A \$1,000 state tax credit is available for solar installations as long as the homeowner has at least a \$1,000 total income tax liability to the state. Also, the state does not collect sales taxes for solar installations nor can assessed property values be increased due to the installation of solar panels.

Mass Save: This program is a collaborative between the investor-owned electric and natural gas utilities in the state. The program offers free energy audit services, rebates for carbon reducing upgrades and low-cost loan programs. Since electricity in Marblehead comes from our Marblehead Municipal Light Department (MMLD), and not an investor-owned utility, only properties in our town that use natural gas from National Grid for heating are eligible for the Mass Save program offerings. More information on Mass Save can be found here: <https://www.masssave.com/>.

Mass Lean: This program, offered by Mass Save, is directed towards income eligible residents who meet the Mass Save requirements of using natural gas for home heating (or live in a town that gets electric service from an investor owned utility). The second requirement is that the household residents have a combined gross annual earnings amount that is less than the program threshold level. The threshold levels are published on the Mass Lean website found here: <https://masslean.org/>. If these qualifications are met, then residents can apply for no cost insulation upgrades and a no cost heat pump installation. This program is offered to renters who meet the income thresholds.

NextZero: This is the program that MMLD uses to administer programs and rebates to its customers. Since every property in Marblehead gets

electricity from MMLD, all properties in our town are eligible for the NextZero offerings. More information on NextZero can be found here: <https://nextzero.org/marblehead/>.

Chapter 1: Reducing Energy Consumption

Energy Audits

Energy audits are an important first step for anyone looking to optimize their energy use and reduce costs. The insights gained by bringing a professional to evaluate your home energy usage can lead to significant improvements in efficiency, comfort, and sustainability. An energy audit report will identify opportunities to reduce energy consumption, reduce carbon output and lower utility costs. They typically involve a thorough examination of various systems and components within the property, such as heating and cooling, insulation, windows, appliances, and lighting.

Key Components of an Energy Audit

- **Preliminary Assessment:** This involves a review of your energy bills and an initial discussion about energy concerns and goals.
- **On-Site Inspection:** An auditor inspects the building, checking for insulation quality, air leaks, heating and cooling systems, appliances, and lighting. This may include thermal imaging or a door blower test to identify heat loss.
- **Energy Modeling:** Using software tools, auditors may create a model of your energy usage, comparing it to similar buildings to identify inefficiencies.
- **Recommendations:** After the assessment, auditors provide a report with specific recommendations for improvements, including potential upgrades and their estimated costs and savings.
- **Follow-Up:** Some audits may include follow-up visits to assess the implementation of recommendations or further energy-saving measures.

Benefits of Energy Audits

- **Cost Savings:** Identifying and implementing energy-saving measures can lead to significant reductions in monthly utility bills.
- **Increased Comfort:** Improving insulation and sealing air leaks can enhance comfort levels by maintaining more consistent temperatures.
- **Environmental Impact:** By reducing energy consumption, you decrease your carbon footprint and contribute to sustainability efforts.
- **Increased Property Value:** Energy-efficient homes often have higher market value and appeal to environmentally conscious buyers.
- **Incentives and Rebates:** An audit is required to unlock the rebates for an insulation upgrade and, in some cases, is also required for the rebates for a heat pump installation.
- **Enhanced Safety:** An audit can identify potential safety issues, such as gas leaks or faulty wiring, ensuring a safer living environment.

Scheduling an Audit

NextZero: Call 888-333-7525 to schedule an in-house audit with NextZero.

Mass Save: Call 866-527-7283 to schedule an in-house audit with Mass Save.

Most of the auditors who work with the Mass Save program will also install insulation. Some will even install heat pumps. Be aware that you don't need to use the same company that does your audit to install insulation or a heat pump. But you do need to use a Mass Save approved installer to qualify for their rebates. The list of Mass Save approved installers for insulation and heat pumps is fairly extensive and listed on their website [here](#).

Energy-Efficient Lighting

Energy-efficient lighting is an essential aspect of modern sustainability efforts, aiming to reduce electricity consumption while maintaining or enhancing illumination quality. Switching to energy-efficient lighting is a simple yet impactful way to contribute to energy conservation and sustainability. By selecting the right lighting solutions and implementing smart practices, individuals and businesses can significantly reduce energy consumption, save money, and promote a healthier environment.

Types of Energy-Efficient Lighting

- **LED (Light Emitting Diodes)**
 - **Efficiency:** LEDs use up to 80% less energy than traditional incandescent bulbs.
 - **Longevity:** They can last up to 25,000 hours or more, significantly reducing replacement costs.
 - **Versatility:** Available in various colors and intensities, making them suitable for diverse applications.
- **CFL (Compact Fluorescent Lamps)**
 - **Energy Use:** Consume about 75% less energy than incandescent bulbs.
 - **Lifespan:** Typically last around 10,000 hours.
 - **Environmental Impact:** Contain a small amount of mercury, so proper disposal is essential.
- **Halogen Bulbs**
 - **Efficiency:** More efficient than traditional incandescent bulbs but less so than LEDs and CFLs. Can get very hot.
 - **Brightness:** Offer bright, crisp light and are often used in track lighting and outdoor fixtures.

Benefits of Energy-Efficient Lighting

- **Cost Savings:** Reduced energy bills due to lower electricity consumption.
- **Environmental Impact:** Decreased carbon footprint and lower greenhouse gas emissions.
- **Improved Lighting Quality:** Many energy-efficient options offer better color rendering and brightness control.
- **Reduced Heat Emission:** Lower heat output minimizes cooling costs in warm months.

Tips for Maximizing Energy Efficiency

- **Choose the Right Fixtures:** Ensure fixtures are compatible with energy-efficient bulbs.

- **Utilize Natural Light:** Maximize daylight through window placement and reflective surfaces.
- **Install Dimmers and Timers:** Control lighting levels and reduce usage when not needed.
- **Opt for Smart Lighting:** Smart bulbs and systems can optimize energy use through automation and remote control.

Smart Thermostats

What Are Smart Thermostats?

Smart thermostats are advanced devices designed to help manage your home's heating and cooling systems more efficiently. They connect to your Wi-Fi network, allowing you to control them remotely via a smartphone app or voice commands, and they often come with features that learn your habits and preferences over time. Smart thermostats offer a combination of convenience, energy savings, and increased comfort, making them a worthwhile investment for many homeowners. Whether you prioritize advanced features or user-friendly interfaces, there's likely a model that fits your needs perfectly.

Mass Save offers rebates up to \$100 for smart thermostats and MMLD will take \$5 per month off your bill for each smart thermostat that is enrolled in the [Connected Homes](#) program.

Key Features and Options:

- **Learning Capability:** Some models, like the Nest Learning Thermostat, can learn your schedule and automatically adjust temperatures based on your habits, optimizing comfort and energy use.
- **Remote Access:** You can control your thermostat from anywhere using a smartphone app, enabling you to adjust settings when you're away from home.
- **Energy Reports:** Many smart thermostats provide insights into your energy usage, helping you identify ways to save on your bills.

- **Integration with Smart Home Systems:** They can work with other smart devices, such as Amazon Alexa, Google Assistant, or Apple HomeKit, allowing for seamless control through voice commands or routines.
- **Geofencing:** This feature uses your phone's GPS to detect when you leave or return home, automatically adjusting the temperature for energy savings.
- **Multiple Zones:** Some smart thermostats allow for zoning, letting you control different areas of your home independently for greater comfort and efficiency.
- **Alerts and Maintenance Reminders:** They can send alerts for unusual temperature changes or remind you when it's time to change the air filter.

Benefits

- **Energy Efficiency:** By optimizing heating and cooling based on your patterns, smart thermostats can significantly reduce energy consumption, leading to lower utility bills.
- **Increased Comfort:** You can easily customize your home's temperature to suit your preferences, ensuring a comfortable environment at all times.
- **Convenience:** Remote access and automation mean you don't have to constantly adjust settings, saving time and effort.
- **Environmental Impact:** Reducing energy usage not only saves money but also lessens your carbon footprint, contributing to a more sustainable lifestyle.
- **Informed Decisions:** The data provided by smart thermostats helps you understand your energy usage patterns, empowering you to make informed choices about your energy consumption.

Popular Options For Smart Thermostats

- **Nest Learning Thermostat:** Known for its learning capabilities and sleek design.

- **Ecobee SmartThermostat:** Features a built-in speaker and supports Alexa, along with room sensors for better temperature management.
- **Honeywell Home T9:** Offers smart room sensors and easy scheduling, with a user-friendly interface.
- **Emerson Sensi Touch:** A budget-friendly option with a simple app and compatibility with various HVAC systems.

Chapter 2: Insulation

Basic physics shows that warm air naturally wants to travel to a cooler place. Insulation, by providing a barrier, prevents the air that's been warmed inside a house from leaking outside in the winter. In the summer, insulation keeps the hot air from coming inside a house. It is one of the most cost effective ways to reduce energy bills and carbon output from a home. Improved insulation will also decrease the amount of temperature fluctuations within a home.

If you're planning to insulate your home, you want a sustainable, durable, high-quality insulating material. The measurement of the effectiveness of an insulating material is something called an R-value. It provides a comparative measurement of how much a material withstands heat conduction and how resistant it is to thermal conductivity. The higher this value is, the better the material is at slowing the airflow and maintaining a comfortable temperature. The R-value will increase as more insulating material is added to make it thicker. For example, the R-value of a 5 inch thick layer of cellulose insulation will double when the thickness is increased to 10 inches.

Building codes that were in effect before 1980 typically didn't require proper insulation. If your home was built before 1980 and hasn't been upgraded for better insulation since then, it won't likely meet today's recommended standards. The table below provides the recommended R-values for homes in New England.

Attic	2x4 Walls	2x6 Walls	Floors
R-49 to R-60	R-13 to R-15	R-19 to R-21	R-25 to R-30

Insulation Choices

Not all insulation is created equal, and various types exist for different applications. Here, we outline the details of the most commonly installed residential insulation options.

- **Fibreglass** is one of the most widely used insulation materials. It typically comes in batts or rolls of a predefined width designed to fit snugly between attic joists or wall studs. Fibreglass can also come as a loose-fill material. It has a typical initial R-value of 2.2 to 3.2 per inch of thickness. Fibreglass has the following advantages: cost-effectiveness and non-flammable. However, it will lose its effectiveness if gaps develop due to movement of the materials or improper installation. It has an average lifespan of about 15 years but can last up to 30 years if kept dry and in good condition. If installed as a roll or batt, fibreglass insulation can be easily pulled up and discarded at the end of its useful life. Loose-fill fibreglass can be vacuumed up.
- **Blown-in cellulose** is a natural product that is plant based. However, a chemical such as borate is often added to make the insulation fire retardant and resistant to pests. Overall, its manufacturing process has the lowest carbon footprint of all the commonly used insulation materials. Cellulose has an R-value of about 3.2 to 3.8 per inch. While this is lower than the R-value of spray foam, it is typically installed in thicker applications when put on flat surfaces such as an attic floor. Other advantages of blown-in cellulose are its superior sound insulation qualities and its resistance to bugs and pests. One disadvantage is that it can settle over time. While this isn't a problem when cellulose is installed on an attic floor, if it's been installed inside walls, there can be

uninsulated gaps in the upper portion of the walls due to settling. Blown-in cellulose will be effective from 25 to 50 years and can be vacuumed up when it's time to be replaced.

- **Spray foam** is made of polyurethane and comes in two general types—closed cell which is rigid and open cell which is more flexible. Open cell spray foam has an R-value of about 3.6 to 3.8 per inch while the R-value of closed cell foam is about 6.0 to 7.0 per inch. Advantages of spray foam insulation include its high R-value and ability to stick to surfaces so it can be applied directly to a basement ceiling or the underside of a roof. It has a life expectancy of 80 to 100 years making it the longest lasting insulation choice. Disadvantages include chemical outgassing that can affect a resident's health. Spray foam is a more expensive choice than the other materials. Both types of spray foam are very difficult to remove at their end of life.
- **Rigid insulation boards** are commonly used as a wrap that's installed just inside the exterior siding. Even if the walls are insulated between the studs, the studs themselves will conduct cold air into the house. Rigid insulation boards protect that from happening. They can also be cut to smaller sizes and installed around the rim joists of a basement. The boards are made of a type of polystyrene. Their R-values can be between 4.0 and 6.5 per inch depending on the construction of the board. They can last up to 100 years and they are fairly easy to remove.

Areas to Insulate

Before contracting for an insulation project, homeowners should schedule an Energy Audit through the Marblehead Light Department or Mass Save. Ask if it's possible for the auditor to bring a thermal imaging camera which will identify specific areas of heat loss from a house. The following sections will cover the areas that generate the most heat loss and the most effective ways to improve their insulation.

- **Attics:** If the attic is unfinished and has no wallboard or flooring, then it's relatively easy to put down fiberglass insulation, blown-in cellulose or spray foam between the joists. When installing fiberglass or cellulose, air sealing with targeted applications of spray foam to the perimeter and all cracks is advised. Dams should be built around recessed lighting fixtures when either spray foam or blown in cellulose is installed to keep the light fixtures from becoming entombed within the insulation.

Some contractors prefer to spray the underside of the roof and the gable walls with foam. This is a suboptimal solution as it will result in the entire attic being heated.

Finished attics are more difficult to insulate if the work hasn't already been done. Holes will need to be opened in the wall boards that cover the roof underside and the knee boards so that either spray foam or blown-in cellulose can be installed. The holes will need to be patched and painted after the insulation is installed.

- **Walls:** Many older homes were built without any insulation added to the walls. An energy audit will detect the presence or lack of wall insulation.

If your home does not have wall insulation installed, the easiest way to add it is to have an insulation contractor remove a row of siding around the house, cut holes between the studs and then blow in the insulation. Either cellulose, open cell foam or closed cell foam could be good choices for insulation material.

Electrical outlets and light switches that are placed on exterior walls can be significant sources of heating leaks. These problems can be addressed relatively easily and at little cost by installing insulating gaskets which are available at hardware stores.

- **Basements:** The easiest and most cost effective way to improve a basement's insulation is to add rigid foam boards to the rim joists as a thermal barrier. Also be sure that all of the holes that were created to bring in utility lines for electrical and plumbing needs are properly air sealed. Further improvements can be made by applying spray foam to the basement walls and to the basement ceiling.
- **Windows and Doors:** Upgrading from single pane to double pane windows will provide a significant reduction in heat loss. Triple pane windows provide even more insulating properties. However, if the seals in an insulating window fail, then the insulating properties are nearly eliminated. You can tell if the seal has failed if you see fog or condensation between the layers of window glass.

Further heat retention can be achieved by using honey-comb window shades and pulling them down when the sun isn't shining through the window. Installing storm windows is another effective solution for retaining heat throughout the winter.

Insulating doors typically have a polyurethane core that keeps heat from passing through. The door should also have weatherstripping around the outside that is in good shape and provides a tight seal.

Rebates and Incentives for Weatherization

Rebates and tax credits are available for several types of weatherization upgrades.

MMLD gives a \$500 rebate per year for the cost of new insulation. The rebate terms require that the customer have an energy audit done prior to the insulation project. The audit must show that the house has at least one area that is insufficiently insulated.

Mass Save will pay between 75% and 100% of the cost of insulation. Like MMLD's program, Mass Save requires an energy audit be done first. Most, if not all, of the Mass Save auditors also install insulation but you are not

required to use them to qualify for the incentives. Mass Save will also provide \$75 for every insulating window that's been installed.

Federal tax incentives are available for insulation, insulating windows and insulating doors. The tax credit for insulation is 30% of the cost of the project up to a maximum of \$1,200 per year. The tax credit for insulating windows is 30% of their cost up to a maximum of \$600 per year.

And the tax credit for installing insulating doors is 30% of their cost up to a maximum of \$250 per door with a total max of \$500 (or two doors) per year. Only doors that are Energy Star certified will qualify for the credit. The Energy Star [website](#) has a list of doors that qualify for the credit. The maximum amount of tax credits for all home efficiency upgrades combined (insulation, windows, doors and air source heat pumps) is \$3,200 per year. Note that geothermal heat pumps don't count against the \$3,200 limit as they are covered by a different type of credit. When doing multiple home efficiency upgrades, the best way to maximize tax credits collected is to spread projects over 2 or more calendar years. For example, you can get \$3,200 in tax credits for a year in which you add insulation and install an air source heat pump. Then you can earn another \$1,100 in tax credits the next year when you install new insulating windows and two new insulated doors.

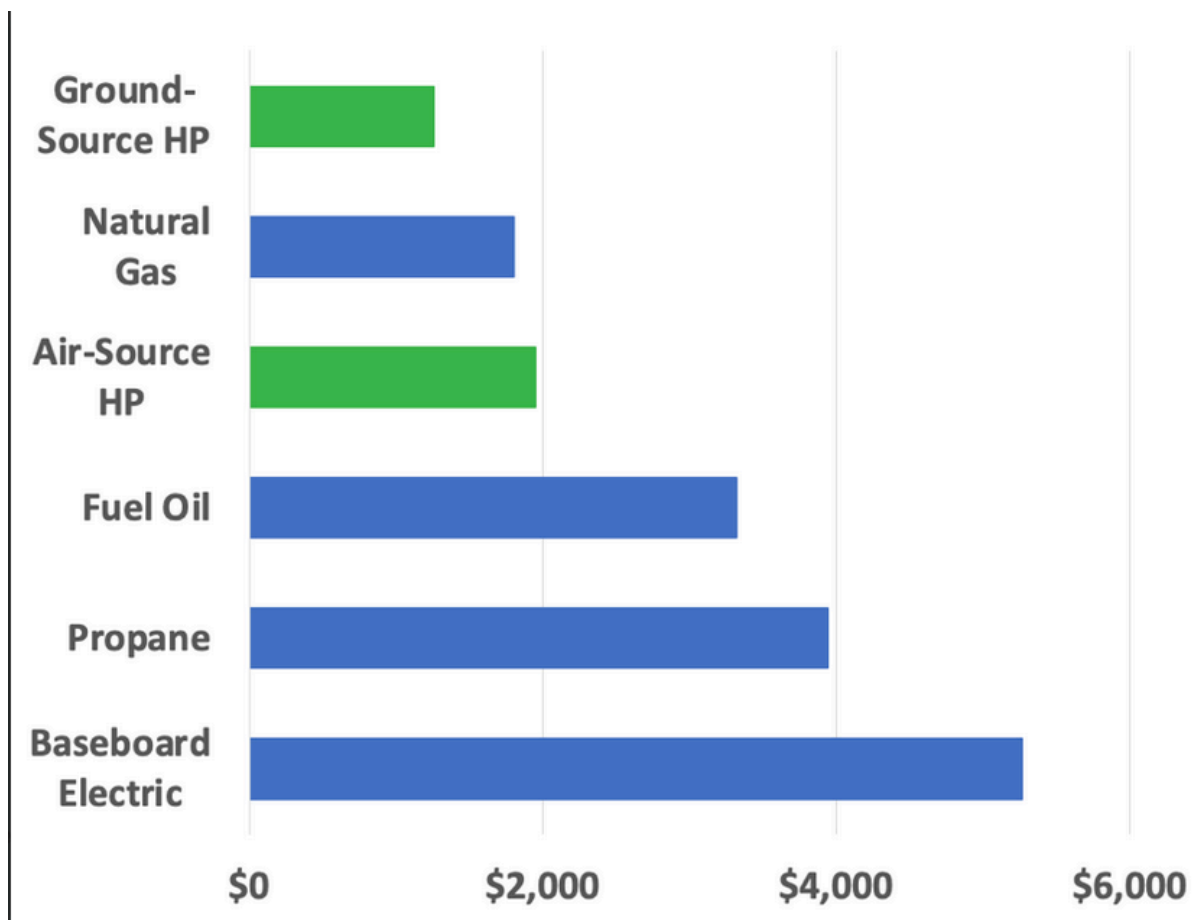
Chapter 3: Green Heating

Heat pumps are by far the most efficient way to heat a home in the winter and provide cooling in the summer. All while lowering greenhouse gas emissions. This clean technology is environmentally friendly, affordable to operate, and more durable than other heating and cooling systems. Heat pumps work by moving heat indoors in the winter and drawing heat outdoors in the summer. Instead of burning fossil fuels, they're powered by electricity to move heat—rather than create it—keeping your home or business at a comfortable temperature year-round. Today's cold climate heat pumps can be up to 2 to 3 times more efficient than a furnace or boiler

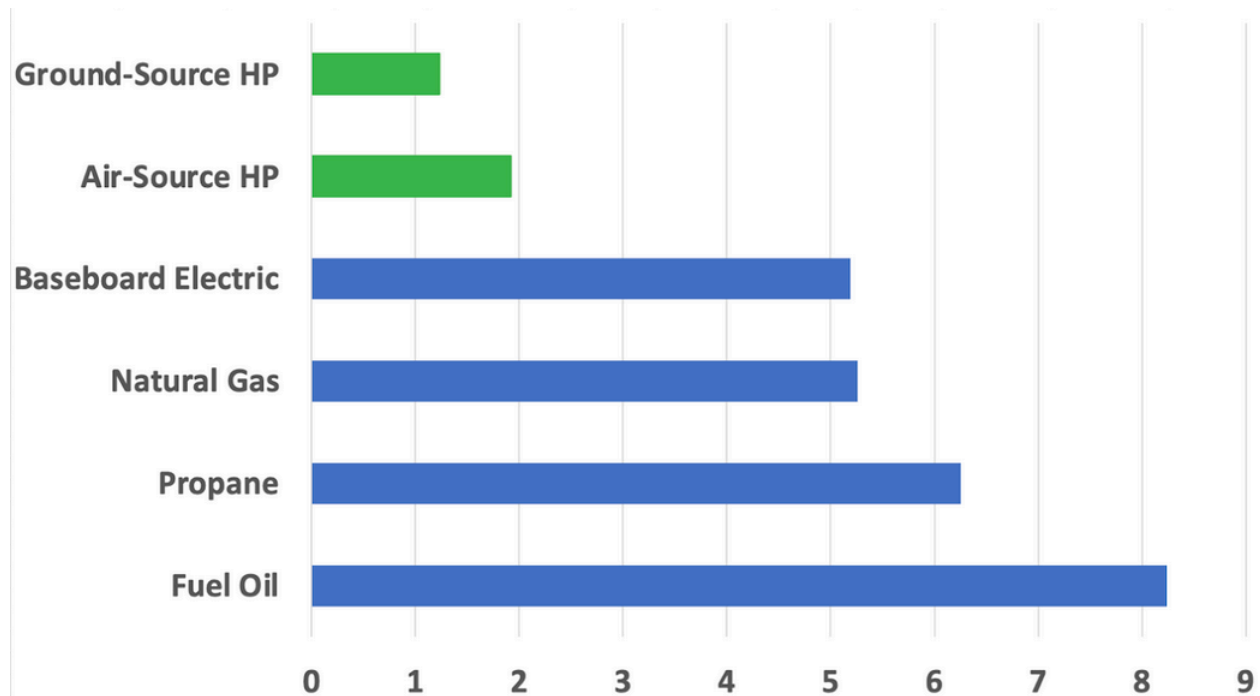
and many provide efficient heating at outdoor temperatures as low as -20°F.

Heat pumps can be used to heat an entire house or just a few rooms. They are easy to install in existing homes, operate quietly and provide an immediate reduction in your home's carbon footprint. Homeowners that install solar panels along with heat pumps can reduce their greenhouse emissions from heating and cooling to zero.

Average Annual Heating Costs By Fuel Source



Average Annual Carbon Emissions By Fuel Source (Metric Tons)



Benefits of Heat Pumps

- Carbon output is reduced by an average of 60% when oil boilers are replaced by heat pumps and 42% when natural gas furnaces or boilers are converted.
- Customers that convert to heat pumps can save 30 to 40% off their energy bills. The greatest savings come when converting from baseboard electric, propane or fuel oil heating systems. Use this [calculator](#) from Mass Save to get an estimate of how much you can save.
- Ductless heat pumps avoid the loss of moving forced air heating or cooling through ducts. This leakage can be up to 30% of the energy produced.
- Each indoor unit can be operated separately. Therefore, only rooms that are occupied need to be fully heated or cooled.
- Heat pumps deliver warm (in winter) or cool (in summer) air more consistently than a boiler, furnace, or air conditioner which shuts off after

reaching the thermostat's setting. This results in far less temperature variation within a room.

- Heat pumps eliminate any risk of carbon monoxide poisoning that can occur when burning fossil fuels within a home.

Heat Pump Myths

- 1) *Heat pumps won't work well in temperatures below freezing.* An air source heat pump can extract heat from the atmosphere and move it along its refrigerant lines at full capacity to comfortably warm a home until the outdoor temperatures reach 20°F below. Ground source heat pumps can work to even much lower outdoor temperatures than that because the ground, below the first few feet from the surface, will maintain its heat throughout the winter. Heat pumps are proven as sole-source heating systems for cold weather climates such as New England, Alaska and Scandinavia. However, warm-weather heat pumps that only work to 25 or 30°F are available for more temperate climates and some contractors may try to sell them because they cost a little less. The installer may also push a supplemental heating system to be used in very cold weather. It's important to ask your installer for the low temperature heat pump specification. If the specification isn't as low as negative 15°F degrees, then look for another option because there are many that are available. Don't be talked into adding a supplemental heating system when you don't need one.
- 2) *Heat pumps are very expensive to install.* A new heat pump system for an entire house costs about the same as a new boiler and a new central air conditioner combined. After all, it can replace each of these types of systems. There are a number of rebates and incentives that are available for heat pump installations which will reduce those top-line costs and make heat pumps more affordable than installing a new boiler and new central A/C. Those rebates and incentives are covered in the next section. An online estimator of the cost of an air source heat pump system before rebates can be found on the Mass Clean Energy Center found [here](#).

- 3) *Heat pumps require the installation of wall mounted mini splits.* In some cases, heat pumps can be integrated with a home's existing radiators or registers and no new mini split installations will be needed. When choosing mini splits, they are available in wall-mount, floor standing and ceiling flush-mounted units (provided there is an unfinished attic above the room).

- 4) *Heat pumps aren't any more efficient than high-efficiency gas boilers or furnaces.* The performance of a heating system is measured by the Coefficient of Performance (COP). It's calculated as the ratio of the amount of energy put into a heating system with the amount that it puts out as useful heat, to warm the home. A COP of 1 means that each unit of energy used to run the system returns 1 unit of heat – corresponding to 100% efficiency. Fossil fuel boilers are never 100% efficient because some of the heat is lost when the gasses vent out the flue. Even more can be lost in leaky ductwork. Instead, most gas boilers operate at around 85% efficiency, which is equivalent to a COP of 0.85. Gas boilers that have more recently been installed may be rated as high as 97% efficiency. In contrast, heat pumps use electricity to gather extra heat from the outside air or ground. As a result, they typically generate at least 2 units of heat for each unit of input. This means they can have a COP of 2 or above, meaning they are 200% or even more efficient than systems that burn natural gas.

- 5) *Using electricity from the grid is no better for the environment than burning gas for heat.* In addition to the efficiency advantage of heat pumps described in the last item, the grid is getting cleaner year-by-year. As of today, MMLD gets 42% of its electricity from non-carbon emitted sources. This includes wind power, solar power, hydro power and nuclear power. MMLD is on track to get a minimum of 50% of its electricity from non-carbon sources by 2030 as is required by Massachusetts state law. The net result is that heating a home with electricity from the grid emits far less carbon than heating a home by burning fossil fuels.

6) *The grid can't handle more heat pump installations.* Claims that heat pump installations (and electric vehicles) will overwhelm the grid are based on the unrealistic assumption that nearly everyone will convert their existing boilers and trade-in gas powered vehicles for EVs within the next year or two. That's an unrealistic assumption. Both ISO New England, the organization that manages our regional electric grid, and MMLD are planning for an orderly increase in the demand for electricity from new electric heating systems, electric vehicle charging as well as population increases. Additional green power generating sources from solar, wind and hydro are being developed and will be brought online. The transmission network will also be expanded. We won't be running out of electricity needed to power our lives even after we've fully transitioned to electrified building heating and electric vehicles.

7) *Heat pumps won't work in an electrical outage but boilers and furnaces will.* The answer is that no heating system will operate during a power outage unless there is an onsite generator available to run them. Boilers and furnaces require electricity to run their motors and fans and will also be down in the event of a power outage.

Heat Pump Options

Air Source Heat Pumps

The most common types of heat pumps are called **air-to-air** and use an outdoor compressor to collect heat from the atmosphere which is moved inside to one or more mini split units. These are called "ductless" systems because refrigerant lines, rather than air ducts, are used to move the heat.

Homes with existing ductwork can be retrofitted with a ducted air-to-air heat pump system, which, with the addition of an air handler unit, converts the extracted heat to warm air that is pumped through the ductwork and out the home's existing registers.

Another type of air source heat pump is an **air-to-water** heat pump. These work similarly to the air-to-air heat pumps except they use water, instead of air, to distribute hot or cold air. They can sometimes be installed to use existing radiators or baseboard heaters. Be aware, though, that far fewer companies are capable of installing air-to-water heat pumps than air-to-air heat pumps. As a result, installation costs can also be quite a bit higher, as much as double the cost for similarly sized houses.

Geothermal Heat Pumps

These systems transfer heat between the ground and the house. In the summer, they can be run in reverse to provide cooling to the house. Geothermal heat pumps are the most energy-efficient way to heat a home or building and they can also replace hot water heaters.

A geothermal heat pump system is used to heat and cool Marblehead's Abbot Hall. These systems require sufficient yard space to drill wells to install the heating tubes deep underground. Geothermal heat pumps are the most expensive type to install but are twice as efficient to run. As a result, a homeowner will only have to pay 50% of the monthly electric bill for the same amount of heating as compared to a home using an air-to-air or air-to-water heat pump. Geothermal systems also have lifespans of nearly 50 years and come with the highest rebates and incentives.

Rebates and Incentives for Heat Pumps

A new heat pump system for an entire house costs about the same as a new boiler and a new central air conditioner. However, rebates and incentives can greatly reduce those costs. A list of those incentives are found below.

- For customers replacing natural gas burning heating systems, Mass Save offers [rebates](#) up to \$10,000 for newly installed air source heat pumps and up to \$15,000 for newly installed ground source heat pumps. Mass Save heat pump rebates require that an energy audit first be completed for any home built before 2000. The program also requires

that a Mass Save approved contractor install the heat pump. See the Mass Save [website](#) for details.

- The Mass Lean program provides a no cost heat pump installation to qualifying residents. To be eligible, residents must meet the Mass Save requirements of using natural gas for home heating (or live in a town that gets electric service from an investor owned utility). The second requirement is that the household residents have a combined gross annual earnings amount that is less than the program threshold level. The threshold levels are published on the Mass Lean website found here: <https://masslean.org/>. This program is offered to renters who meet the income thresholds.
- For customers replacing other types of heating systems, [Marblehead Municipal Light Department](#) offers new systems rebates up to \$1,500 for air source heat pumps and \$2,250 for ground source heat pumps.
- The federal government provides a 30% tax credit (with a \$2,000 limit) for new installations of either air sourced or ground source heat pumps.
- Mass Save, through their [HEAT loan program](#), offers zero interest loans of up to \$50,000 to pay for the cost of a heat pump installation.
- If not eligible for Mass Save, then many installers offer zero or low interest loans through their financing partners.

Heat Pump Assessment Service

Considering a heat pump for your home, but don't know where to start? Schedule a no-cost, no-obligation consultation heat pump assessment by using a program offered for Marblehead Municipal Light Department (MMLD) customers. They will receive expert advice and assistance with choosing a system that is optimally suited for their home. The program is administered by the Center for EcoTechnology (CET) and teaches customers how the technology works, how heat pumps can reduce home heating costs, and provides guidance on using heat pumps for supplementary or whole-home heating. This assessment will ensure that the heat pump size and configuration is optimized for the customer's home and heating and cooling goals, helping to avoid the risk of an oversized or undersized system and outsized bills. Following installation, CET will

inspect your heat pump system to ensure it aligns with the pre-approved design. Customers who are interested in the Heat Pump Assessment Program can go to [CET's website](#) for more information or call (888) 333-7525 to schedule an assessment. Get yours today!

Finding Qualified Installers

When you're ready to get quotes from installers, you can utilize the free and no-obligation services of Energy Sage who will provide you with quotes from qualified installers who work in Marblehead. Here is their website: <https://www.energysage.com>.

Heat pumps are designed with very advanced technologies and require a good deal of expertise to be properly installed. While most HVAC plumbers can read the writing on the wall and see that more and more of their customers want heat pumps, not all of them have the necessary skills to properly install a heat pump system. Be leery of using an installer who does not install heat pumps in the majority of their heating projects and have extensive experience with them. Their website will offer clues about how much expertise they have in heat pump technology vs how to install a standard oil or gas burner. Insufficiently experienced installers can end up giving you bad advice (such as heat pumps won't work in cold weather), an improperly sized system, or a poorly installed system. For a list of questions to ask installers before signing a contract, go to this [webpage](#).

You also should insist on getting a load calculation if you plan to heat your entire house. This means the installer measures the dimensions of each room to be heated, measures window surface areas, and determines the r-values of the insulation in the attic, walls and basement. All are needed to calculate the amount of heating and cooling to keep a home comfortable. This is often called a "Manual J". An insufficiently sized system will struggle to keep a home comfortable. But systems that are oversized can also cause significant performance issues in addition to leaving you paying more than you need for a heating system.

Heat pumps are in high demand across the globe and lead times for installation are long. Don't wait until your boiler fails before researching which heat pump option is best for your home.

Additional Considerations

Heat pumps require electrical circuits to operate. If your existing electrical panel has insufficient capacity for new circuits or more load, you may need to upgrade it. In that case, the federal government provides a tax credit of up to \$600 to help offset the costs.

Other costs may be incurred for removing the old equipment such as the boiler, oil tank or in room registers that are no longer used. If your boiler is also heating your hot water tank, then you'll need a new one. A heat pump hot water heater is a great option because it's the most efficient type of water heater and comes with hefty rebates from the federal government, Mass Save and MMLD.

Also, some spaces such as small bathrooms may be too small to easily accommodate a mini split. In these situations, an electric resistance heater can be installed along the baseboard or in the ceiling for use when the room is occupied.

Other Heating Options

Radiant Floor Heating

These systems supply heat directly to the floors which then radiates out to warm the room. They are more efficient than forced air, baseboard or radiator heating. While there are several design choices, the most effective are hydronic which move the heated water through under-floor tubes. Unless doing a new home build or a gut-renovation, radiant floor heating is typically best done for a single room such as a bathroom. Unfortunately, there are no rebates or incentives to offset the costs of a radiant floor heating system installation.

Summary of Online Tools

Here again are all of the online tools and services available when considering a heat pump for your house:

- [Calculator](#) from Mass Save to get an estimate of how much you can save on your utility bills.
- [Estimator](#) from the Mass Clean Energy Center of the cost before rebates to install an air source heat pump system.
- [Rebates](#) from MMLD.
- [Rebates](#) from Mass Save.
- [Program](#) from Mass Lean that gives a no cost heat pump installation to income qualifying residents.
- [Zero interest loan](#) program for heat pumps through Mass Save.
- No cost [heat pump assessment service](#) from the Center for EcoTechnology.
- [Competitive quotes](#) from qualified installers through the free services of Energy Sage.

Chapter 4: Rooftop Solar

Photovoltaic (solar) power is one the most widely utilized alternative energy sources for homes and buildings. Not only does it help minimize dependence on fossil fuels but it also reduces the overall carbon footprint. It's been around for many decades. Jimmy Carter had solar panels installed on the roof of the White House during his presidency.

Adding rooftop solar panels can deliver a clean source of electricity for your home. They're designed to last for many decades providing electricity that's generated from the power of the sun. Even in our New England climate, they perform well all year, but their output will vary seasonally. The cost savings from solar panels will often pay for themselves in an average of 6 to 9 years although it may take a little longer in Marblehead because our electric rates are lower than the state average.

Benefits of Solar Power

- Lowers your electric bill and protects you from future price increases.

- Generates financial credits from excess production during daylight hours allowing you to offset the cost of consuming power from the grid after sundown.
- Greatly reduces carbon output. The average home in New England that installs photovoltaic rooftop solar has the same emission reduction effect as planting 150 new trees every year.
- Increases the resale value of your home (but not your assessed value for property taxes).

Things to consider

- How much energy does your household use now, and what do you anticipate future electrical energy use to be? Will you be buying an electric vehicle (EV) or a heat pump, or electrifying a hot water heater and appliances?
- Understand that when it's too cloudy, stormy, or dark, the system will need energy from the grid.
- Installation can be expensive – work through the economics in detail regarding the project needs, budgets allocated, and any available incentives, credits, and loans.
- Solar projects take time – it can take from 5 to 7 months from initial agreement through design, engineering, permitting, installations, inspections before officially 'Going Live' to create power.

Online Tools

Use Google's Project Sunroof (<https://sunroof.withgoogle.com/>) or a tool from the National Renewable Energy Lab (<https://pvwatts.nrel.gov/>) to get an initial estimate of your solar potential, solar system size requirements, annual savings, and payback period.

Solar Panels vs Solar Shingles

A solar panel consists of a series of many photovoltaic cells arranged on a rectangular plate. To generate sufficient electric power for residential use, multiple solar panels must be connected to one another in what's called "an array" and positioned to ensure maximum sun exposure. Solar panels are

installed on top of the roof of your home, garage or outdoor patio using fitted mounting brackets. Generally, there is a gap between the panels and the roof.

Solar shingles are also known as solar roof tiles. They look similar to traditional roofing materials or asphalt tiles and are of a similar size. Besides protecting the roof, solar shingles are also capable of generating electricity in a similar fashion as traditional solar panels. Solar shingles are like mini solar panels that utilize the same photovoltaic effect to generate electricity from sunlight, but they are much smaller. They are installed as a part of the roof rather than as a separate component mounted atop the roof.

One of the key differences between solar panels and shingles is the cost. Solar shingles cost about the same as new solar tiles and a new roof combined. From an economic viewpoint, they make more sense to install when the roof needs replacing and the homeowner wants to install solar at the same time.

Another consideration is that solar shingles are less efficient per square foot at producing electricity. Unlike solar panels, they cannot be tilted for maximum sunlight exposure. They have to follow the roof line. Also, because solar shingles are directly attached to the roof there's no airflow underneath them. This results in more heat dissipation and less efficiency.

The major advantage of solar shingles is their aesthetics. They look like a normal roof. Also note that solar shingles are still a niche product. There are far less manufacturers and installers than there are for traditional solar panels.

Finding Installers

When you're ready to get quotes from qualified solar installers, you can utilize the free and no-obligation services of Energy Sage. Here is their website: <https://www.energysage.com>. You can also find helpful tools for cost estimates, monthly savings, and payback periods.

Solar Power Storage Batteries

Rather than sending excess solar power back to the grid, some property owners would prefer to store it onsite using batteries. MMLD has recently approved the installation of batteries by Marblehead homeowners who follow the application process described in the next section. There are different types of battery technologies offered by different manufacturers. A good source for researching available options is found on the New England Clean Energy website found [here](#).

MMLD application process

The Marblehead Municipal Light Department has several requirements that must be completed BEFORE a solar or battery installation is started. An Installation Sign-off Form must be completed with signatures from the Marblehead Building Department, Wire Department and MMLD. Building and electrical permits must be included with the submission of the Installation Sign-off Form. An Customer Interconnect Application and Service Agreement also needs to be completed and submitted to MMLD. Finally, the following additional documents are required before MMLD will approve the start of the project:

- Engineering letter regarding structural roof loads (for rooftop solar)
- Copy of agreement between installer company and MMLD customer
- All drawings showing proposed array(s) (for rooftop solar)
- Racking and roof mounting details (for rooftop solar)
- Electrical schematic drawing

Copies of the submission forms can be found [here](#) on the MMLD website.

Rebates and Incentives for Rooftop Solar

The federal government provides income tax credits for solar and battery installations equal to 30% of the project costs. There is no maximum limit on the amount of tax credits that can be claimed other than the taxpayer that claims the credit must have a tax liability that is at least as much as the credit being claimed. A tax liability is the amount of taxes due based on

taxable income. It's not the same as the payment due after withholdings. The tax credit will either reduce the amount that the taxpayer needs to pay with their filing or will increase the amount of their tax refund.

The state of Massachusetts also provides a tax credit of 15% of the cost of a solar installation. The state credit has a maximum limit of \$1000 per installation. And like the tax credit from the federal government, the state tax credit requires that the taxpayer have a tax liability of at least as much as the amount of the credit. Finally, the state offers yearly credits for solar battery installations. The amount of the credit is based on the storage capacity of the battery. The program is a bit complicated but Energy Sage provides helpful advice on their website [here](#).

While there aren't any government programs available with subsidized financing for solar installation projects, most solar installers will offer market rate financing through a credit partner. These loans will typically be offered at rates that are close to a Home Equity Loan and have a duration of 10 to 15 years.

Chapter 5: Water Heating

Home owners that want to lower their carbon output by going fully electric may need to look at replacing their hot water heating system. Fortunately, there are a number of very good choices.

Hot Water Heating Options

Heat Pump Hot Water Heater

These are extremely energy-efficient systems that collect heat from the surrounding air and then transfer it into a water tank to heat the water. Electricity powers the transfer. In very high demand situations, there is a backup of electric resistance water heating for quicker response times. Heat pump hot water heaters will last from 13 to 15 years and use as little as one-third the amount of energy as a standard hot water heater.

On-demand/Tankless Hot Water Heater

On-demand/tankless water heaters are more efficient than a tank-based water heater. They only operate when needed to provide hot water. As a result, they are up to 30% more efficient than a standard hot water heater. Their compact size makes for versatile choices in their installation location. They cost more to install but pay for themselves through significantly lower utility bills. Since they don't rust, tankless heaters can last more than 20 years.

Electric Resistance Hot Water Heater

The most conventional method to heat water that doesn't burn fossil fuels directly to heat water is the kind that uses electric resistance. However, they tend to draw a lot more electricity to keep the water in the tank at an optimal temperature. Therefore, they are costly to operate and result in much higher utility bills. Their life expectancy is typically between 8 to 12 years.

Rebates and Incentives for Water Heating

The federal government offers tax credits for high efficiency hot water heaters. The amount of the credit is dependent on the type of hot water heater that is installed. The largest credits are available for newly installed heat pump hot water heaters and they can be as large as \$2000. Systems that are eligible for the tax credits must meet minimum efficiency standards. Consult your tax advisor or the [IRS.gov](https://www.irs.gov) website for details on the hot water systems that are eligible for tax credits.

For the installation of a heat pump hot water heater, MMLD offers customers a \$500 rebate while Mass Save offers a \$750 rebate.

Chapter 6: Sustainable Practices in the Kitchen

The kitchen is one of the most energy- and resource-intensive areas of the home, but it also presents great opportunities for sustainability. By adopting eco-friendly practices, you can minimize waste, conserve energy, and even support local services and businesses that promote sustainability. This chapter explores a range of sustainable kitchen practices—from energy-efficient appliances to composting, water conservation, and more. Small changes, such as opting for energy-efficient appliances, using beeswax wraps, and composting food scraps, can accumulate over time to create a greener, more sustainable home. Additionally, supporting local services and taking advantage of available tax credits helps you align your kitchen with broader environmental goals, contributing to a healthier planet for future generations.

Appliances and Energy Efficiency

Choose Energy-Efficient Appliances

Look for Energy Star Ratings: When purchasing new appliances like refrigerators, dishwashers, ovens, and stovetops, choose those that are Energy Star certified. These models consume less energy, reducing both your electricity bill and your carbon footprint.

Induction Cooktops vs. Gas or Electric

Induction cooktops use magnetic fields to directly heat cookware, which makes them more efficient than traditional electric or gas stoves. They require less time to heat up, reducing energy consumption. Also, scientists have long known that gas stoves emit pollutants that irritate human airways and can cause or exacerbate respiratory problems. And studies show that a gas stove [increases the odds of children developing a respiratory illness](#) such as asthma by about 20 percent.

Consider Size and Capacity: Oversized appliances consume more energy than necessary. Choose the appropriate size for your household's needs to avoid excess energy use.

Efficient Refrigeration: The refrigerator is one of the highest energy consumers in the kitchen. Look for energy-efficient models with features such as adjustable thermostats, well-insulated doors, and LED lighting. Consider a fridge that has a top freezer, which is typically more energy-efficient than side-by-side models.

Regular Maintenance

Keep your appliances in good working order with regular maintenance. Clean refrigerator coils, defrost freezers, and replace worn-out seals on doors to maintain their efficiency.

Practical Sustainable Kitchen Tips

Cooking with Less Energy

Use Smaller Cookware for Smaller Portions: Cooking smaller amounts of food with smaller pots or pans requires less energy than large cookware. Additionally, using lids on pots helps retain heat, speeding up cooking times.

Batch Cooking and Leftovers: Cooking larger quantities at once and storing leftovers for future meals reduces the need to use appliances multiple times, saving both energy and time.

Pressure Cooking & Slow Cookers: Pressure cookers and slow cookers are excellent for energy-efficient cooking. Pressure cookers reduce cooking time by increasing pressure, while slow cookers require less energy for longer cooking periods.

Beeswax Wraps vs. Plastic Wrap: Instead of using disposable plastic wrap to store food, opt for reusable beeswax wraps. These wraps can be washed and used multiple times, providing an eco-friendly alternative to single-use plastics.

Sustainable Cooking Tools

Invest in Quality Cookware: High-quality, durable cookware, such as cast iron or stainless steel, can last for generations and offers better heat retention, requiring less energy.

Use a Toaster Oven: A toaster oven consumes less energy than a full-size oven and is ideal for small meals, toasting, or reheating leftovers.

Composting: Turning Waste into Resource

Composting is an essential part of sustainable kitchen practices. By composting food scraps and organic waste, you can reduce landfill waste and methane emissions while creating nutrient-rich soil for gardening or community programs.

What to Compost

Fruit and Vegetable Scraps: Peels, cores, and stems from fruits and vegetables are perfect for composting.

Coffee Grounds & Tea Bags: Used coffee grounds and tea bags are rich in nitrogen and make excellent compost material.

Eggshells: Crushed eggshells provide calcium for compost and are beneficial to the soil.

Kitchen Paper Towels and Napkins: If they're free of oils and chemicals, these can be composted as well.

What Not to Compost

Meat, Dairy, and Greasy Foods: These can attract pests and create unpleasant odors in your compost. However, these can all be composted if using the Black Earth service.

Processed Foods: Packaged and processed foods are often not compostable and can disrupt the balance of your compost pile.

Plastic or Non-Biodegradable Materials: Never compost plastics, metals, or other non-organic waste.

Composting Methods

Home Composting: A simple compost bin in the backyard or even a countertop compost container can help you get started. For larger amounts of food waste, consider building or purchasing a compost pile.

Composting Services: If you don't have the space or time for home composting, companies like Black Earth Compost offer residential composting pickup. They collect food scraps and compost them at industrial facilities, helping to close the loop on waste. They also accept far more materials for composting than is advisable for home composting systems. Check their [website](#) for a list of the items that they will collect.

Local Services Supporting Sustainability

Supporting local services that prioritize sustainability can reduce your environmental impact and contribute to a circular economy.

Composting Services

Black Earth Compost: Black Earth Compost is a local service that provides curbside composting pickup. They accept food scraps, yard waste, and other compostable materials, reducing the amount of organic waste sent to landfills. This service is available for all Marblehead residents for a monthly subscription charge. They also provide free bins at the Transfer Station. You can find more information on their [website](#).

Local Farmers and Food Co-ops: Many local farms and food cooperatives offer composting services or accept food scraps for composting.

Community Programs

Farmers Markets: Buy locally grown, seasonal produce to support sustainable farming practices. Many farmers markets also accept compostable waste and can help you reduce packaging waste.

Zero-Waste Stores: Some stores may offer bulk buying options, reusable containers, and eco-friendly kitchen products, helping you reduce packaging waste in the kitchen. MacRae's Sustainable Goods at 108 Washington Street in Marblehead is a very good local store with options for reducing waste, especially plastics.

Rebates and Incentives for Kitchen Appliances

MMLD customers are eligible for a \$50 rebate check when purchasing a new Energy Star certified refrigerator. They also offer a \$500 rebate for new induction stoves when replacing a stove that burns natural gas or propane. If the induction stove replaces an electric stove, then the rebate is \$100.

Mass Save will give a \$500 rebate for new induction stoves if they are replacing a stove that burns natural gas or propane.

Water Conservation in the Kitchen

Water conservation is a key component of sustainable living. Simple changes in the kitchen can lead to significant water savings.

Use Tap Water Instead of Bottled Water

Invest in a water filter. Instead of buying bottled water, invest in a good water filter. Filtered tap water is just as clean, more cost-effective, and much better for the environment since it reduces plastic waste.

Reusable Water Bottles: Use a reusable water bottle to carry water around, reducing the need for disposable plastic bottles.

Fix Leaks Promptly

Leaky faucets, dishwashers, and refrigerators can waste gallons of water over time. Address leaks quickly to avoid unnecessary water waste.

Water-Efficient Faucets and Dishwashers

Install low-flow faucets and aerators in your kitchen to reduce water consumption. This can make a big difference without affecting performance.

Use your dishwasher only when it's fully loaded, and choose energy-efficient models that use less water. Many newer dishwashers offer “eco” modes that reduce water usage.

Practice Smart Watering for Plants

If you have houseplants, avoid over-watering them. Water-efficient techniques like drip irrigation or watering early in the morning or late in the evening can minimize water loss due to evaporation. Installing outdoor rain barrels also saves on water usage.

Chapter 7: Sustainable Laundry Practices

Laundry is an essential part of our lives, but it can also have a significant environmental impact. By adopting sustainable laundry practices, we can reduce water and energy consumption, lower our carbon footprint, and promote a healthier planet.

Washing Machines

- **Choose Energy-Efficient Models**
 - Look for machines with the ENERGY STAR label, which indicates they meet energy efficiency guidelines set by the U.S. Environmental Protection Agency.
 - Front-loading machines typically use less water and energy than top-loading machines.
- **Wash Full Loads**

- Always aim to wash full loads to maximize water and energy usage. If you have small loads, consider adjusting the water level settings if your machine allows it.
- **Select Cold Water Settings**
 - Washing in cold water (60°F or lower) is effective for most laundry and can save energy. Heating water accounts for a significant portion of a washing machine's energy use.
- **Use Eco-Friendly Detergents**
 - Choose biodegradable and phosphate-free detergents that are less harmful to the environment. Consider using detergent pods or powders to minimize packaging waste.
- **Optimize Wash Cycles**
 - Use shorter cycles for lightly soiled clothes and avoid using heavy-duty cycles unless necessary. Many modern machines have eco or quick wash settings that save water and energy.

Dryers

When it comes to drying clothes, it's worth asking: do you really need to use your dryer? Here are some thought-provoking points to consider:

Energy Consumption: Dryers consume a substantial amount of energy, often contributing to higher utility bills and increased carbon footprints. Could you save money and reduce your environmental impact by air drying instead?

Fabric Longevity: Heat can damage fabrics over time, causing them to wear out faster. Are there certain items in your wardrobe that could last longer if you skipped the dryer?

Natural Benefits: Sunlight not only dries clothes but also acts as a natural disinfectant and deodorizer. Have you ever noticed how fresh clothes smell after air drying in the sun?

Flexibility and Space: Dryers can take up significant space in your home. If you live in a small space, could a drying rack or clothesline be a more efficient solution?

Seasonal Considerations: In the warmer months, outdoor drying can be a simple and effective option. Can you adapt your laundry routine to take advantage of the seasons?

Rethink Laundry Frequency: Do you always need to wash and dry items after a single wear? Could you air out clothes or spot clean instead, saving both time and energy?

When using a dryer:

- **Opt for Energy-Efficient Models**
 - Similar to washing machines, select ENERGY STAR-certified dryers. Heat pump dryers are particularly efficient, using significantly less energy than conventional models.
- **Dry Full Loads**
 - Like washing, drying full loads is more efficient. Try to dry similar fabric types together for even drying.
- **Use Moisture Sensors**
 - If your dryer has a moisture sensor, use it. This feature automatically stops the drying cycle when clothes are dry, preventing over-drying and saving energy.
- **Clean the Lint Trap**
 - Regularly clean the lint trap to maintain efficiency and reduce fire hazards. A clean trap also helps the dryer work more effectively.
- **Consider Air Drying**
 - Whenever possible, limit dryer use. Air drying is the most sustainable option, conserving energy and reducing wear on clothes.

Drying Racks and Clotheslines

- **Invest in a Drying Rack**

- Use a drying rack indoors or outdoors to air dry clothes. This method is energy-efficient and can help prolong the life of your garments.
- **Use Clotheslines**
 - Hanging clothes outside on a clothesline is one of the most eco-friendly drying methods. Sunlight helps naturally bleach and freshen fabrics.
- **Optimize Drying Space**
 - Position your drying rack or clothesline in a well-ventilated area for quicker drying. Sunlight and wind can significantly reduce drying time.
- **Fold or Hang Immediately**
 - To minimize wrinkles, fold or hang clothes as soon as they're dry. This will reduce the need for ironing, saving energy.
- **Be Mindful of Weather Conditions**
 - In cooler or humid conditions, consider using an indoor drying rack to prevent dampness and mildew. If using a clothesline outside, check the weather forecast to avoid rain.

Rebates and Incentives for Laundry Appliances

MMLD provides \$500 rebates for new heat pump clothes dryers. There are also \$50 rebates for standard electric dryers and another \$50 for washing machines. All-in-one washing and drying appliances can get a \$75 rebate. All appliances must be Energy Star Certified to qualify for these rebates.

Mass Save has \$150 rebates for new washing machines, \$200 rebates for heat pump dryers and \$50 rebates for standard clothes dryers that operate on natural gas. All appliances must be Energy Star Certified to qualify for these rebates.

Chapter 8: Sustainable Practices in the Bathroom

The bathroom is one of the most water-intensive areas of the home, yet it offers some of the easiest opportunities to implement sustainable practices. Thoughtful upgrades, such as installing water-efficient fixtures and advanced technologies, can significantly reduce water consumption, lower

utility costs, and contribute to the preservation of this vital resource. In this chapter, we'll explore how to incorporate water-saving solutions into your bathroom design, from low-flow fixtures to cutting-edge technologies, all while enhancing your overall sustainability efforts.

Understanding the Bathroom's Water Footprint

The bathroom is responsible for a significant portion of a household's water consumption. According to the Environmental Protection Agency (EPA), the average American family uses over 300 gallons of water per day, and nearly 70% of this water is used in the bathroom. This includes:

- **Toilets** (27% of total water usage)
- **Showers** (17% of total water usage)
- **Faucets** (16% of total water usage)

Fortunately, through mindful choices in fixtures and practices, you can reduce this impact and help conserve water. The key lies in installing water-efficient devices and making small behavioral changes.

Low-Flow Fixtures: A Simple Solution to Big Savings

Low-flow fixtures are one of the easiest and most effective ways to conserve water in the bathroom. By reducing the amount of water used in daily routines like showering and flushing, you can save hundreds of gallons each year. Let's take a look at the most common low-flow fixtures and how they work.

Low-Flow Toilets:

Older toilets can use as much as 5-7 gallons of water per flush, but modern low-flow toilets use as little as 1.28 gallons per flush (or less), which can reduce water consumption by more than 60%. These toilets are designed to maintain strong flushing power despite the reduced water volume, ensuring efficiency and hygiene.

Tips for Choosing the Right Low-Flow Toilet:

- Look for the **WaterSense label**, which indicates the toilet meets EPA's water efficiency standards.
- Consider **dual-flush toilets**, which offer two options: one for liquid waste (using less water) and one for solid waste (using a bit more water, but still efficient).
- When shopping for a toilet, check reviews for flushing performance. Even low-flow models can vary in terms of effectiveness.

Low-Flow Showerheads:

Showering accounts for nearly 17% of bathroom water usage, with traditional shower heads consuming up to 5 gallons of water per minute. Low-flow showerheads, on the other hand, use between 1.5 to 2.5 gallons per minute while still providing a satisfying shower experience.

What to Look for in a Low-Flow Showerhead:

- Choose models with the **WaterSense** label, ensuring they meet EPA standards for water efficiency.
- Opt for showerheads with **pressure-compensating technology** to maintain a satisfying water flow even with reduced water use.
- If you prefer a more luxurious shower experience, consider models with **multi-function** settings that allow for different water patterns, such as mist, rain, and massage, all while staying within water-efficient limits.

Low-Flow Faucets:

Bathroom sinks are also a major source of water waste, with traditional faucets using around 2.2 gallons per minute. Low-flow faucets, however, use just 1.5 gallons per minute while still providing sufficient water pressure.

Choosing the Best Low-Flow Faucet:

- Look for faucets with **aerators** that blend air into the water stream, reducing the amount of water used while maintaining a steady flow.

- Consider **motion-sensor faucets** that only release water when hands are detected, helping to eliminate waste from forgetful users.

Water-Saving Technologies: Innovations for the Eco-Conscious Bathroom

In addition to installing low-flow fixtures, several advanced water-saving technologies can help you take your bathroom's sustainability efforts to the next level.

Smart Toilets:

Smart toilets are equipped with sensors, self-cleaning features, and other high-tech mechanisms that not only make them more water-efficient but also offer enhanced convenience and hygiene. Some smart toilets include features like automatic flushing which ensures that the toilet only uses the necessary amount of water, preventing overuse.

Greywater Recycling Systems:

Greywater recycling systems allow you to reuse water from sinks, showers, and bathtubs for non-potable purposes such as toilet flushing or landscape irrigation. This innovative technology reduces overall water consumption while providing a sustainable solution to water waste.

How It Works:

- Greywater is filtered and treated before being rerouted to be used for other purposes in your home.
- Some systems are DIY-friendly, while others require professional installation, especially in homes with more advanced plumbing systems.

Simple Behavioral Changes for Water Conservation

While installing water-efficient fixtures and technologies is important, small behavioral changes can have a significant impact as well. Here are some easy, everyday actions you can take to reduce your bathroom's water footprint:

- **Turn off the water while brushing your teeth** or shaving to avoid unnecessary water wastage.
- **Take shorter showers** or install a shower timer to help remind yourself when it's time to get out.
- **Fix leaks immediately:** A dripping faucet or leaky toilet can waste gallons of water per day, so don't delay in fixing any small leaks you notice.
- **Don't overfill the bathtub:** Avoid filling the tub to the brim when taking a bath to save both water and energy.

The Benefits of Going Green in the Bathroom

Making your bathroom more sustainable isn't just about conserving water; it's also about creating a healthier, more eco-friendly home environment. Here are some of the added benefits of implementing low-flow fixtures and water-saving technologies:

- **Cost savings:** Reducing water consumption lowers your water bill, and energy-efficient water heaters reduce your electricity or gas bill as well.
- **Improved home value:** Homes with sustainable features are increasingly attractive to environmentally conscious buyers.
- **Environmental impact:** Conserving water helps protect local water supplies and supports broader efforts to combat water scarcity, especially in regions facing drought.

Chapter 9: Sustainable Practices in the Home Office

Creating a sustainable home office involves reducing waste, conserving energy, and using eco-friendly products. Here are some of the best practices:

Energy Efficiency

- **Use LED Lighting:** Replace traditional bulbs with energy-efficient LEDs.
- **Unplug Electronics:** Use a power strip with an on/off switch to easily turn off devices when not in use.

- Enable Power-Saving Modes: Activate sleep or eco modes on computers, monitors, and printers.
- Natural Lighting: Position your desk near a window to maximize daylight and reduce the need for artificial lighting.

Sustainable Furniture

- Opt for Sustainable Materials: Choose desks and chairs made from recycled or responsibly sourced materials.
- Buy Secondhand: Look for gently used furniture to extend its life cycle.
- Ergonomic and Durable Design: Invest in high-quality, long-lasting furniture to reduce waste.

Eco-Friendly Office Supplies

- Use Recycled Paper: Opt for post-consumer recycled paper for printing or note-taking.
- Digital Notes: Use apps and cloud-based platforms to minimize paper usage.
- Refillable Supplies: Choose refillable pens, markers, and staplers.
- Recycle Old Electronics: Donate, recycle, or responsibly dispose of outdated tech.

Waste Reduction

- Go Paperless: Use digital tools like e-signatures and cloud storage to minimize printing.
- Set printer to use 2-sided printing by default.
- Reusable Products: Swap disposable items (e.g., single-use coffee pods) for reusable alternatives.
- Recycle a wide variety of home and office products, including single use batteries, at Staples. They list what they will take for recycling on their [website](#).

Chapter 10: Battery Powered Yard Tools and Equipment

Benefits of Battery Powered Yard Tools and Equipment

Battery-powered yard tools are available for just about any task that a homeowner needs. They offer several advantages over their gas-powered or corded electric counterparts. Here are their key benefits:

- **Environmentally Friendly**
 - Zero Emissions: Battery-powered tools produce no direct emissions, making them a greener choice compared to gas-powered tools.
 - Lower Carbon Footprint: They contribute less to air pollution, reducing their environmental impact.
- **Quieter Operations**
 - Battery-powered tools operate much more quietly than gas-powered ones, which is particularly advantageous in noise-sensitive areas or for early-morning use.
- **Ease of Use**
 - Lightweight Design: They are often lighter than gas-powered models, reducing user fatigue.
 - No Fuel Storage: Eliminates the need to store gasoline in a garage or shed.
 - Push-Button Start: Starts instantly without the hassle of pulling a cord.
- **Cost Efficiency**
 - Lower Operating Costs: No need to purchase gas, oil, or spark plugs.
 - Reduced Maintenance: Fewer moving parts mean less maintenance over time compared to gas engines.
- **Mobility and Flexibility**
 - Cordless Freedom: Unlike corded tools, battery-powered ones offer full mobility without being tethered to an outlet.
 - Suitable for Small to Medium Yards: Ideal for most residential tasks, especially where power outlets are not easily accessible.
- **Improved Technology**

- High-Performance Batteries: Modern lithium-ion batteries provide long run times, quick charging, and consistent power.
- Interchangeable Batteries: Many brands allow the same battery to be used across a range of tools, reducing costs and clutter.
- **Safer Operation**
 - Reduced Heat and Exhaust: Unlike gas engines, battery tools do not produce heat or harmful exhaust.
 - Instant Off: Tools stop immediately when powered down, improving safety.
- **Convenience**
 - Storage: Battery powered tools can be stored without the risk of fuel odors or leaks.
 - Transport: Easier to transport since they are lighter and don't require fuel tanks or special handling.

Rebates and Incentives for Battery Powered Yard Tools

MMLD offers its customers Electric Yard Equipment rebates for rechargeable lawn and outdoor equipment. Refer to the table below for the types of equipment that qualify and rebate amounts for each.

Rechargeable Battery Powered Equipment	Rebate
Lawn Mower	\$100
Snow Blower *	\$100
Hedge Trimmer	\$40
Pressure Washer	\$40
Rototiller	\$40
Chain or Pole Saw	\$40
Snow Thrower/Snow Shovel	\$40

Leaf Blower	\$25
String Trimmer	\$25

*Select models only. [Here is a list of approved snow blower models.](#)

Similarly, Mass Save gives rebates for battery powered yard equipment in the amounts shown in the table below.

Rechargeable Battery Powered Equipment	Rebate
Lawnmower	\$75
Leaf Blower	\$30
String Trimmer	\$30
Chainsaw	\$30

Chapter 11: Recycling and Trash Management

Recycling is very important for reducing the natural resources that we consume, reducing the amount of energy we use and reducing the amount of waste in our landfills. There are only 6 landfills operating in Massachusetts and they are forecasted to be filled by 2030. Here are some things you can do to increase the amount of materials that you recycle and reduce the amount of waste.

- Reduce your use of plastic – learn how by reading our [fact sheet](#).
- Recycle everything you can – for information on what can be recycled click [here](#).
- Recycle plastic bags at some grocery stores like Stop and Shop or at Home Depot since they aren't accepted curbside.

- Black Earth and MacRae's Sustainable Living at 108 Washington Street in Marblehead both collect hard to recycle items.
- Avoid polystyrene (Styrofoam) which can't be recycled in Marblehead. If you do have some to recycle, take it to Save That Stuff at 200 Terminal St. in Charlestown.
- Put your trash and recycling in bins with lids that are tightly closed so they don't litter the street when there's a strong wind or an attraction to animals.