



YOUR GUIDE TO  
Solar Hot Water



### SOLAR HOT WATER: Four Reasons to Switch



LOWER GREENHOUSE  
GAS EMISSIONS



COST  
COMPETITIVE



LESS EXPENSIVE  
SOLAR



VERSATILE

Solar hot water is a hot water system that uses energy from the sun to heat your home's water.

Clean Energy Lives Here  
[MASSCEC.COM/GOCLEAN](http://MASSCEC.COM/GOCLEAN)



## TABLE OF CONTENTS

# Solar Hot Water (SHW)

Technology Overview	3
Is SHW a Good Fit For My Home?	5
Case Studies	6
Benefits of SHW	7
Costs, Incentives, & Financing	8
Making the Switch	9
How Can I Prepare for a SHW Installation?	10
Questions to Ask Your Installer	11



## Solar Hot Water (SHW)

# Technology Overview

**Solar Hot Water** is a hot water system that uses energy from the sun to heat your home's water. Solar collectors, mounted on the roof or ground next to a home, absorb heat from the sun and transfer it through a fluid loop into a solar storage tank (typically located in the basement or mechanical room) that stores preheated water. This heated water is then piped throughout the home to showers, dishwashers, sinks, and washing machines. Solar hot water systems can also be used for pool heating and for space heating.

Due to Massachusetts' location, collectors work most efficiently when they are oriented as close to due south as possible and tilted around 40 degrees to the horizon. Collectors should receive at least 5 hours of unobstructed sunlight each day and be at least 75% shade free.



Hot Water Tank



Solar Hot Water Collectors

Solar hot water systems are typically sized to provide up to 80% of a home's annual domestic hot water needs. Since the sun is stronger in the summer, the solar hot water system can provide all of a home's domestic hot water needs during that season. In the winter, when the days are shorter, a backup heat source (often an electric resistance heating element) is used to provide additional hot water to meet 100% of a home's hot water needs.



## SOLAR HOT WATER (SHW) | The Technology

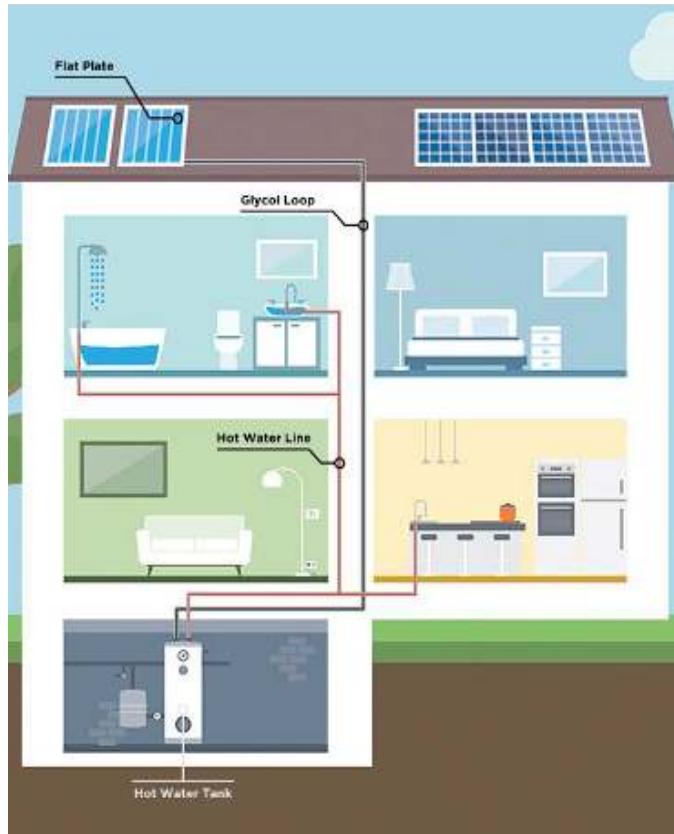
There are two main types of solar hot water collectors.

**Glazed flat plate collectors** are collectors that look similar to solar photovoltaic (electricity) collectors. They have a clear glass or plastic casing over the collector which traps heat like a greenhouse. Flat plate collectors can operate at a wide range of temperatures.

**Evaporated tube collectors** are collectors with thin, copper tubes filled with fluid. This fluid is inside larger vacuum-sealed clear glass or plastic tubes. Evaporated tube collectors typically perform better during the winter than flat plate collectors, but they are not as efficient at all temperatures.

### HOME IMPROVEMENT SCENARIOS THAT WORK WITH SOLAR HOT WATER SYSTEMS:

- Existing home replacing hot water system
- Existing home replacing heating system that also heats hot water
- Existing home doing major renovations
- New home construction



Flat Plate Collector System



Evacuated Tube Collector System



## SOLAR HOT WATER (SHW)

# Is SHW a Good Fit for My Home?

If you answer yes to ANY of the following questions, then solar hot water may be a good fit for your home.

**Do you want to reduce your home's greenhouse gas emissions?**

SHW systems use heat from the sun, instead of burning fossil fuels, to heat your hot water, reducing your home's greenhouse gas emissions.

**Are you looking to just replace your hot water tank? Or are you planning to replace a combination boiler and need a standalone solution for domestic hot water?**

A solar hot water system can replace your existing system in either case. If your existing hot water tank is causing problems, reach out to a solar hot water installer; they can install a solar-ready tank for you now and install the rest of the system later.

**Do you have a suitable location for solar hot water collectors on your roof or in your yard?**

Solar hot water collectors are most efficient when facing due south in Massachusetts, but as long as your roof faces less than 90° east or west of true south, you may have a viable site for solar hot water. At Massachusetts' latitude, the ideal tilt should be about a 40-degree angle to the horizon and collectors should receive at least 5 hours of unobstructed sunlight per day. Installers may be able to tilt collectors up or mount the collectors at an angle on your wall (also called an awning mount) to receive more sunlight. Systems can also be mounted on the ground.

**Is your existing hot water tank over 10 years old or reaching the end of its useful life? Have you had maintenance issues and are you concerned about it failing?**

If your existing hot water tank is reaching the end of its useful life, reach out to a solar hot water installer today and they can install a solar-ready tank for you now and complete the rest of the system later.



Solar hot water collectors installed on the ground.

### Other Hot Water Options:

If solar hot water is not right for you, there are other hot water options to consider.

Heat pump water heaters, which use a highly efficient heat pump to heat your water, are an excellent option to pair with solar hot water or if solar hot water is not an option.

For more information on heat pump water heaters visit the [Department of Energy's \(DOE\) website](#).

Heat pump water heaters use electricity to move heat from one place to another, similar to air-source heat pumps, drawing heat from an indoor space like a basement and moving it into a hot water tank. Heat pump water heaters cool the spaces they are in and do not work as efficiently in a cold space. To operate efficiently, they work best if installed in locations that stay at least 40°F year round. Spaces with excess heat, like a furnace or boiler room, are ideal locations. Additionally, heat pump water heaters require adequate air flow and it is recommended that they be located in a space that is at least 1000 cubic feet with unrestricted airflow.





## SOLAR HOT WATER (SHW) Case Studies

Along with fifty-eight other residents of his community, Tom Ehbrech recently installed Solar Hot Water in his home in Arlington, MA, through HeatSmart Arlington/Winchester. He has been very pleased with the system so far.

"Financially I think it's a winner. Partly because the lifetime warranty of the tank pays for itself, and partly because of the free energy," Tom stated.

One thing he thinks is great about solar hot water panels is that they get a lot of energy from the sun on bright cloudy days or when the sun is not shining directly on the panels, even in the winter. Tom advises homeowners considering installing solar hot water to plan where they want the tank to go ahead of time. He also suggests that if homeowners are considering adding solar PV as well, the installations should be coordinated for efficiency.

Mary Johnson of Ashfield had her automated wood heating system installed in May 2019 and a solar hot water system completed in June 2019. "I am so very happy with them," Mary says of her new clean energy systems. "More than I could have imagined." Her previous antiquated oil system – installed in the 1970s – frequently broke down and proved to be inefficient even after multiple repairs each season. Similarly, the house's oil hot water system was faulty and did not fulfill her family's domestic hot water needs. The wood boiler and the solar hot water system are connected so that the automated wood heating system can serve as a backup for hot water. During the summer season, the wood system remains inactive since the Johnsons' hot water needs are solely provided by the sun. The automated wood boiler provides warmth in the autumn, winter, and spring as the primary source of heating in the home. Mary is impressed with the silence and efficiency of both the solar hot water system and biomass boiler.

With her rebate awards from MassCEC, Mary's total monthly loan payments for both brand-new systems and wood fuel turned out to be less than the cost of her previous monthly heat and hot water bills. As



Tom's roof-mounted solar hot water panels.

the Director of Green America's Carbon Farming Innovation Network, Mary is passionate about contributing to climate change solutions, and feels relieved that her home no longer relies on fossil fuels for heating and domestic hot water. She plans to go all electric with solar panels and an electric vehicle to cover her family's electric usage and transportation.



Mary's solar hot water



## SOLAR HOT WATER (SHW)

# Benefits of SHW

### COST COMPETITIVE

- With strong state and federal incentives, solar hot water systems are not that much more expensive than typical hot water heating systems to install
- Energy from the sun is free! Operating costs are lower than heating hot water with natural gas, oil, propane, or electric resistance
- Since solar hot water systems use energy from the sun to heat your hot water, you do not need to worry about market changes to natural gas, oil, propane, or electric prices

### FLEXIBILITY & FUNCTION

- Solar hot water systems can integrate with any type of backup fuel
- Robust tanks and hardware are built to last 20 years or more
- Requires less space than a solar photovoltaic (PV) system, so it can be an option for homeowners who want to go solar but do not have enough space for solar PV

### GREENHOUSE GAS EMISSIONS:

- Renewable energy minimizes the greenhouse gas impact of your home's hot water





## SOLAR HOT WATER (SHW)

# Cost, Incentives, & Financing

### ESTIMATED COST

The cost to install a solar hot water system in your home will depend on the specifications of your home, the extent to which you are replacing your existing hot water system, the kind of system you choose, and your installer. Costs also depend on the number of collectors and size of thermal storage tanks installed. Solar hot water system costs typically start around \$10,000 before incentives are applied.

### INCENTIVES

There are several incentives available to homeowners in Massachusetts wishing to upgrade their hot water system to solar hot water. Incentives depend on the kind of system installed and the size of the system. Depending on your electric provider, you may be eligible for different incentive programs.

- **Federal Investment Tax Credit:** For systems installed through 2022, 26% of the installed cost of the system may be claimed as a tax credit on your personal income tax return. The amount decreases to 22% in 2023 and is eliminated in 2024. See the [IRS website](#) and/or consult your tax advisor to confirm eligibility.

- **Massachusetts Alternative Energy Certificates (AECs):**

AECs (worth approximately \$3-12 each) are provided to homeowners installing qualified solar hot water systems depending on the number of solar collectors installed, the performance ratings of the system, and site-specific conditions such as shading and orientation. Homeowners apply for AEC credits after their solar hot water system is installed. A two-collector system could receive approximately 100 AECs totaling \$300-\$1,200. See the [Department of Energy Resources \(DOER\) website](#) for more information on AECs.

### FINANCING

- **Mass Save®:** If you are located in Mass Save® territory, then eligible solar hot water systems can be financed through the [Mass Save® HEAT Loan](#), which offers loans of up to \$25,000 at 0% interest over terms of up to 7 years. If unsure whether you are eligible for Mass Save® incentives, check zip code eligibility on the [Mass Save® website](#).
- If you are not eligible for Mass Save® incentives, check with your local municipal electricity provider to see if they have any financing options available for clean energy systems.



*\*Please note that the price of AEC credits is subject to market demand and that the price listed here may be different than the current market price*



SOLAR HOT WATER (SHW)

## Making the Switch



1. **Confirm that solar hot water is the best fit for your home and your home clean energy priorities.**
2. **Understand the costs and plan how you will finance the project.** Check out the [Cost, Incentives, & Financing](#) section to understand the typical costs to install solar hot water.
3. **Contact installers.** MassCEC recommends contacting at least three installers to learn more about installing solar hot water in your home. Visit our [Find An Installer Near You](#) page for a list of installers. Referrals from family, friends, or neighbors is another great way to find an installer.
4. **Install a solar hot water system.** Talk to your installer about how long installation will take. Solar hot water installations typically take 3 days to 1 week, depending on the number of collectors installed, system complexity, and installer and plumber scheduling.



## SOLAR HOT WATER (SHW)

# How Can I Prepare for a Solar Hot Water Installation?

### Think about where you will place your solar hot water collectors.

Collectors should receive at least five hours of unobstructed sunlight per day, so look for a location that faces as close to south as possible (up to 90 degrees east or west of true south may still be viable) and think about trees or other buildings that might shade the collector. An installer can measure the site and accurately predict a system's production.

Most residential solar hot water systems use two or three collectors. This takes up 50-100 square feet of roof space, depending on the collectors used.

For ground-mounted systems, consider the space where the collectors will be mounted. Trenching, property line set back, sewage lines, and distance to your house should all be considered when planning a ground-mounted system.

### If you're planning to install the collectors on your roof, talk to your installer about the suitability of your roof.

If planning to install the solar hot water collectors on your roof, evaluate the condition of your roof before installing a solar hot water system. If your roof is over 10 years old, talk to a solar hot water installer about whether they would recommend roof replacement prior to installation to avoid additional costs of removing and re-installing a solar hot water system at a later date. The additional weight load that solar hot water panels will put on your roof is generally not a barrier to a residential solar hot water project, however, the roof structure must comply with current building code standards. The added load for solar hot water collectors is less than 5 pounds per square foot (similar to solar photovoltaic panels). If necessary, reinforcements can be added to the roof to support the collectors.

### Think about where you will locate the solar hot water tank.

Depending on your current hot water system, you will need to replace your existing hot water tank with a solar compatible tank or add a new solar tank that connects to your existing hot water tank. Solar tanks are usually about 24 inches in diameter and 6 feet high. A foot or two of space should be reserved in front of the tank for equipment that will protrude from the tank, so allow for about 3 feet by 3 feet for solar hot water components or 5 feet by 5 feet if connecting to an existing system.



*Solar hot water collectors installed at an angle on a roof.*



## SOLAR HOT WATER (SHW)

# Questions to Ask Your Installer



During your conversation with installers, consider asking the following questions:

### CONFIGURATION

#### How many collectors are needed for my home and why?

Make sure you understand how your installer determined the number and size of collectors needed for your home. Most installers base the number of collectors on the number of bedrooms or people living in a home.

---

---

---

#### Will my system include remote monitoring?

Many solar hot water systems are installed with internet-connected monitoring. This allows the homeowners and the installers to monitor performance of the system and identify any issues early. Talk to your installer about whether this is a good option for you.

---

---

---



### COST

#### What is the installation price and what incentives are available?

Make sure that you understand upfront who will apply for any incentives that you are pursuing and when you need to apply (before or after installation).

---

---

---

## QUESTIONS TO ASK YOUR INSTALLER (CONT.)

### **What annual costs can I expect (such as regular maintenance or parts)?**

MassCEC suggests that you have your solar hot water system inspected every one to two years. Ask if your installer performs routine maintenance or if they have someone that they recommend.

---

---

---

### **TIMING**

#### **How far in advance can we plan the installation and how long does the installation?**

Be sure to communicate if you have particular time constraints and get a sense when your installer will be available to do the installation. Summer is the busiest time of the year for solar hot water installers and many installers have some delays during the summer season.

---

---

---

### **What should I do to prepare for the installation?**

Make sure you understand from your installer if there is anything you need to do to prepare to have them working in your home.

---

---

---

### **QUALITY ASSURANCE**

#### **Do you provide a warranty for the systems you install? What are the different warranty options?**

Make sure you have a sense of what is covered by any warranty offered by your contractor. Some warranties cover labor, some cover the equipment, and some cover both.

---

---

---

## QUESTIONS TO ASK YOUR INSTALLER (CONT.)

### **What relevant training, certifications, and licenses does your team have? Can you provide references from previous customers?**

As with any home improvement project, it is important to ensure that your installer has the right training and a good track record with past customers.

---

---

---

### **Will you hire subcontractors to complete portions of the project? If so, what will they do? What are the names of these companies and how long have you worked with them?**

Many solar hot water installers sub-contract the plumbing work.

---

---

---

### **Will you provide training for me on how to properly operate and maintain the system?**

Solar hot water systems are relatively simple to operate, but there are a few differences compared to other hot water systems, and your installer should be a good educational resource.

---

---

---

#### **PROFESSIONAL MAINTENANCE**

Talk to your installer about scheduling an annual to bi-annual maintenance check to make sure that everything is running smoothly.



Clean Energy Lives Here.  
[MASSCEC.COM/GOCLEAN](http://MASSCEC.COM/GOCLEAN)

