



SHW FOR A COOLER CLIMATE:

THE MASSACHUSETTS SOLAR HOT WATER LANDSCAPE

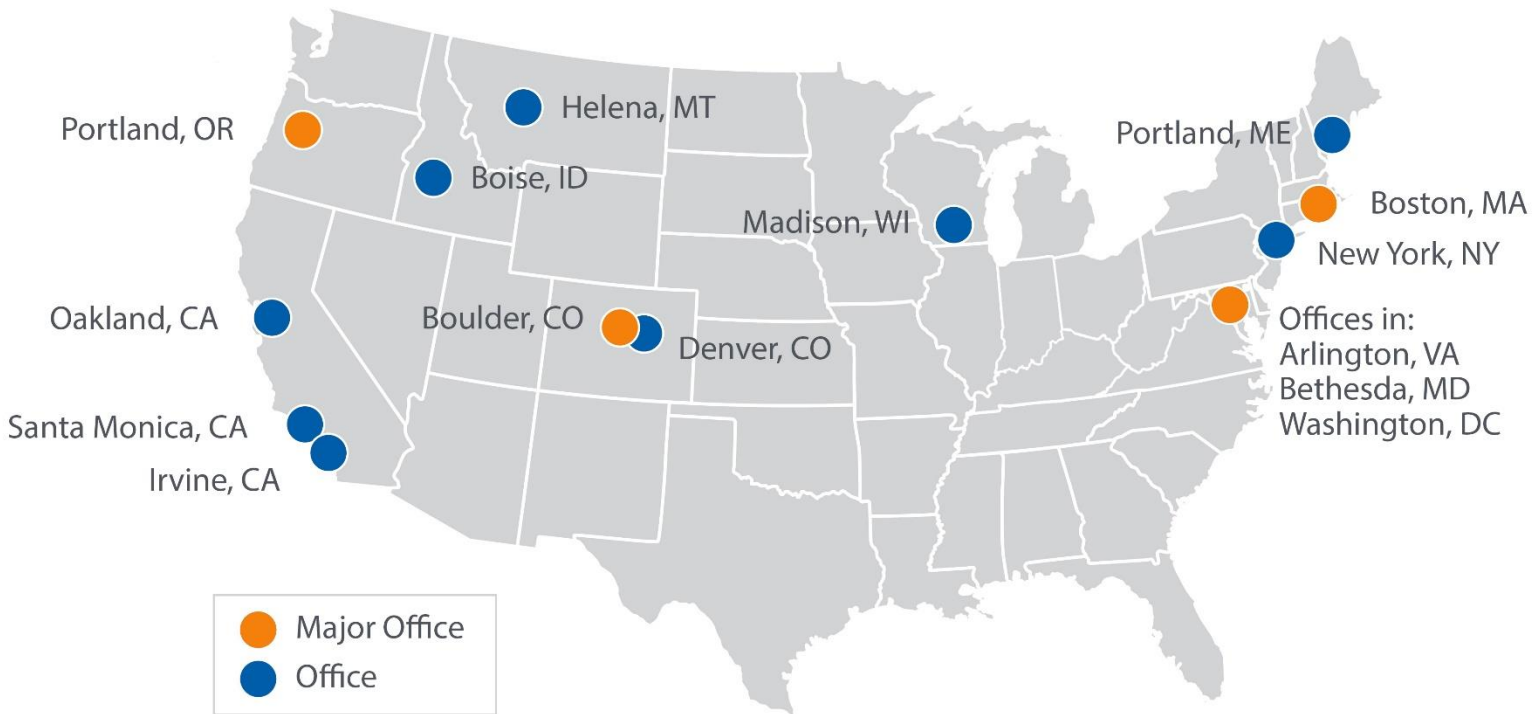
ACEEE HOT WATER FORUM 2018

MARCH 22, 2018





Office Locations

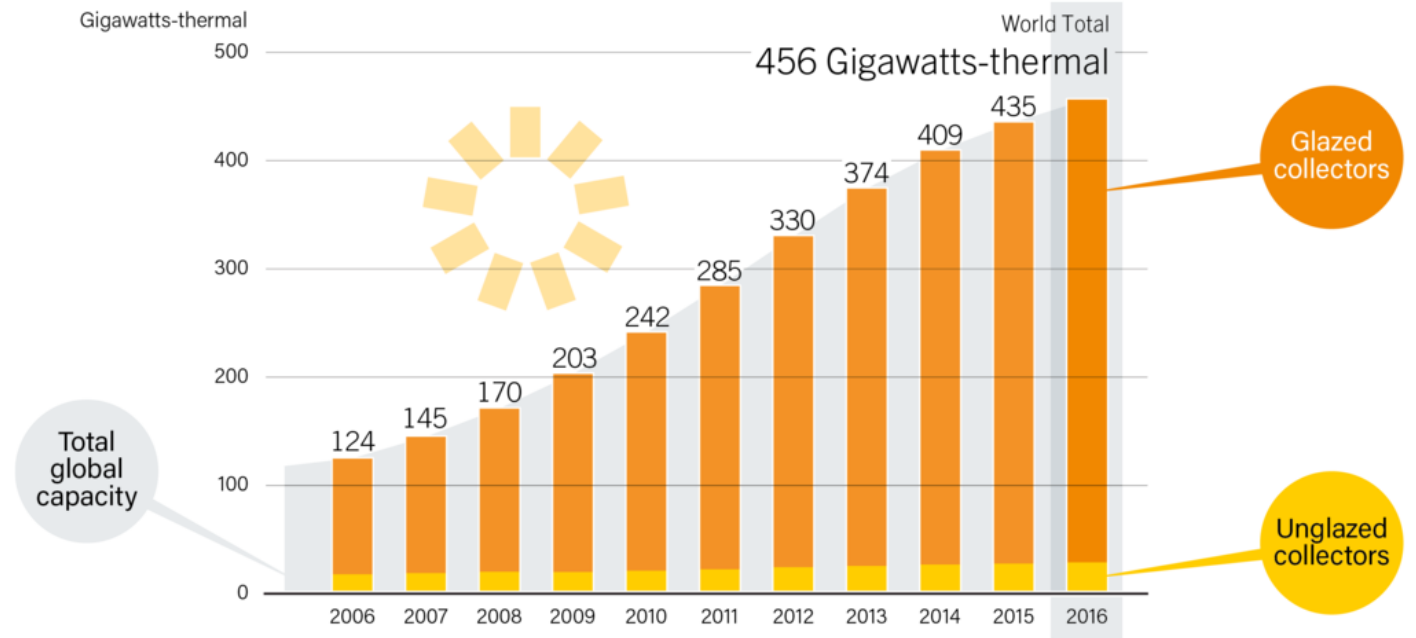


- » **The Cadmus Group** is a strategic and technical consultancy compelled to help solve the world's most challenging problems.
- » We assemble the best teams of leading experts who work seamlessly across disciplines to help you achieve extraordinary results.
- » From energy, water, and transportation to safety, security, and resilience — together, we are strengthening society and the natural world.
- » MCG was acquired by Cadmus in October 2017

Overview | The global solar hot water context

- » Growth in the solar hot water industry has declined internationally
 - › Installations in 2016 down 8.5% internationally compared to 2015
 - › Has not achieved the same level of recognition, growth, or cost reductions as PV
 - › Increased competition with heat pump water heaters

Solar Water Heating Collectors Global Capacity, 2006-2016



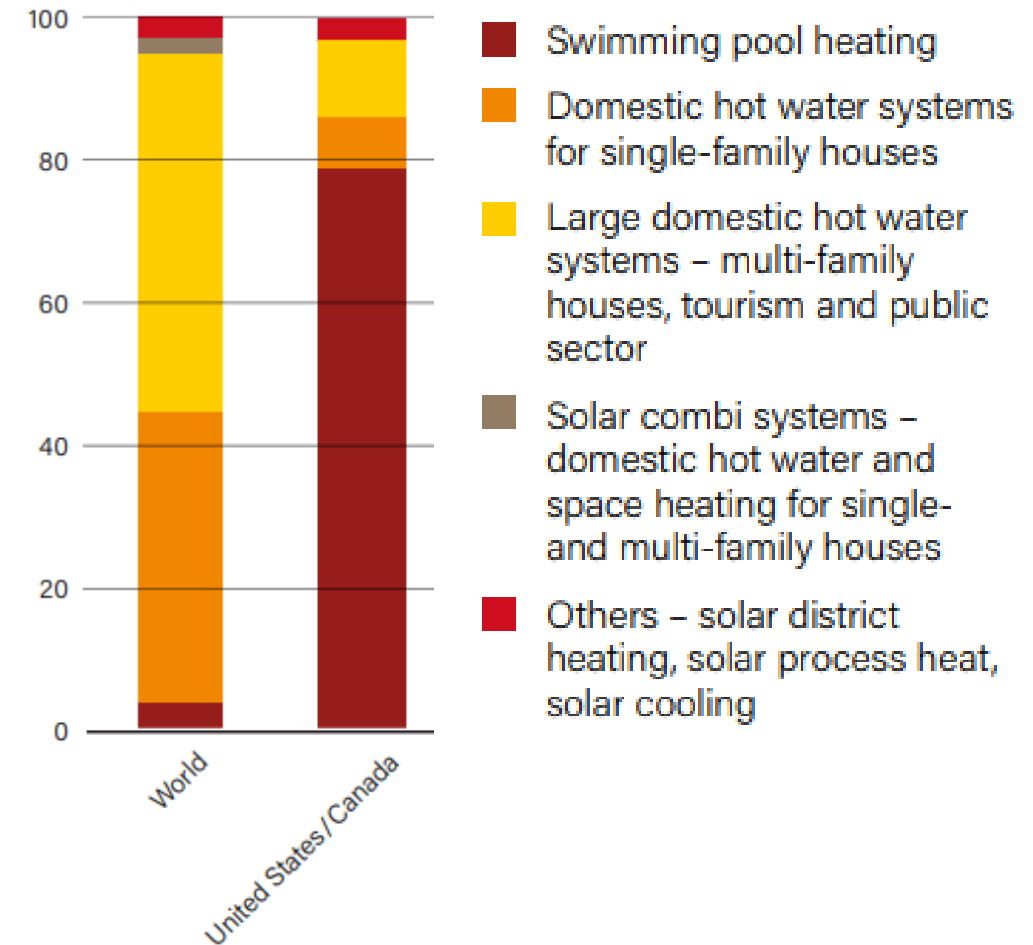
REN21 Renewables 2017 Global Status Report



Overview | The US solar hot water context

- » In the US as a whole, over half of new installs in 2016 were unglazed collectors (e.g. for pool heating)
- » Stagnant growth in glazed systems (e.g. for DHW) maintained by state incentive programs (e.g. CA, MA, NY)
- » Some European manufacturers (e.g. Wagner) exiting US market

Share (%) of installations



Overview | MA solar hot water context: robust incentives

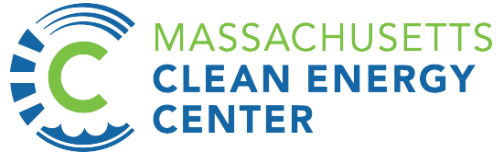


Federal ITC of 30% of installed cost (extended through 2022 with stepdown after 2019)

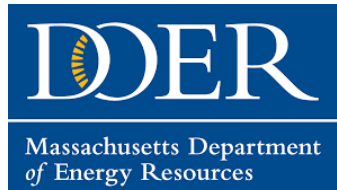


State residential renewable energy tax credit (15% of installed cost up to \$1,000)

Overview | MA solar hot water context: robust incentives



Residential: up to \$3,500 per system + adders for low- and moderate-income
Small-scale non-residential: Up to \$10,500-\$30,500
Large-scale non-residential: Up to \$101,500



Alternative Portfolio Standard awards **Alternative Energy Certificates (AECs)** for solar thermal



0% interest HEAT Loan of up to \$25,000 over 7 years for qualifying homeowners

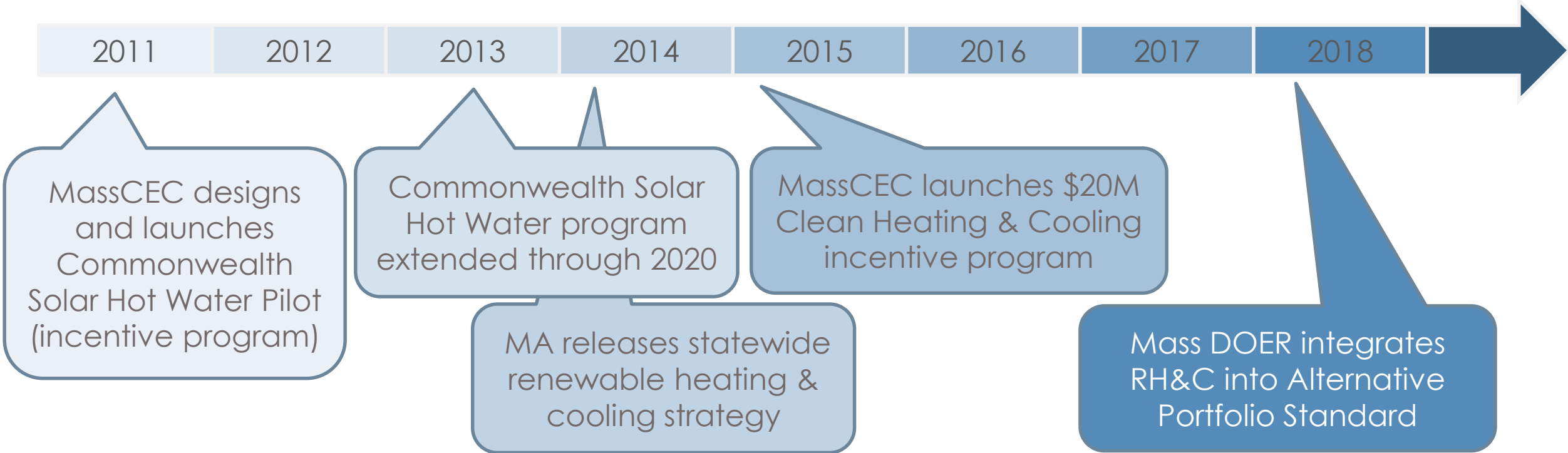
Overview | A closer look at the MA APS

- » MA's Alternative Portfolio Standard is similar to other portfolio standard mechanisms (separate from MA RPS) focused on alternative generation technologies
 - › Previously met entirely by combined heat and power and alternative compliance payments
 - › Jan. 2018: RH&C eligible to receive AECs
- » 2018 ACP rate (ceiling price) of \$22.64/MWh (\$6.64/MMBtu)
- » Intermediate/large systems receive AECs quarterly
- » Small systems receive 10 years of AECs upfront
- » SHW receives 3x multiplier on # of AECs received

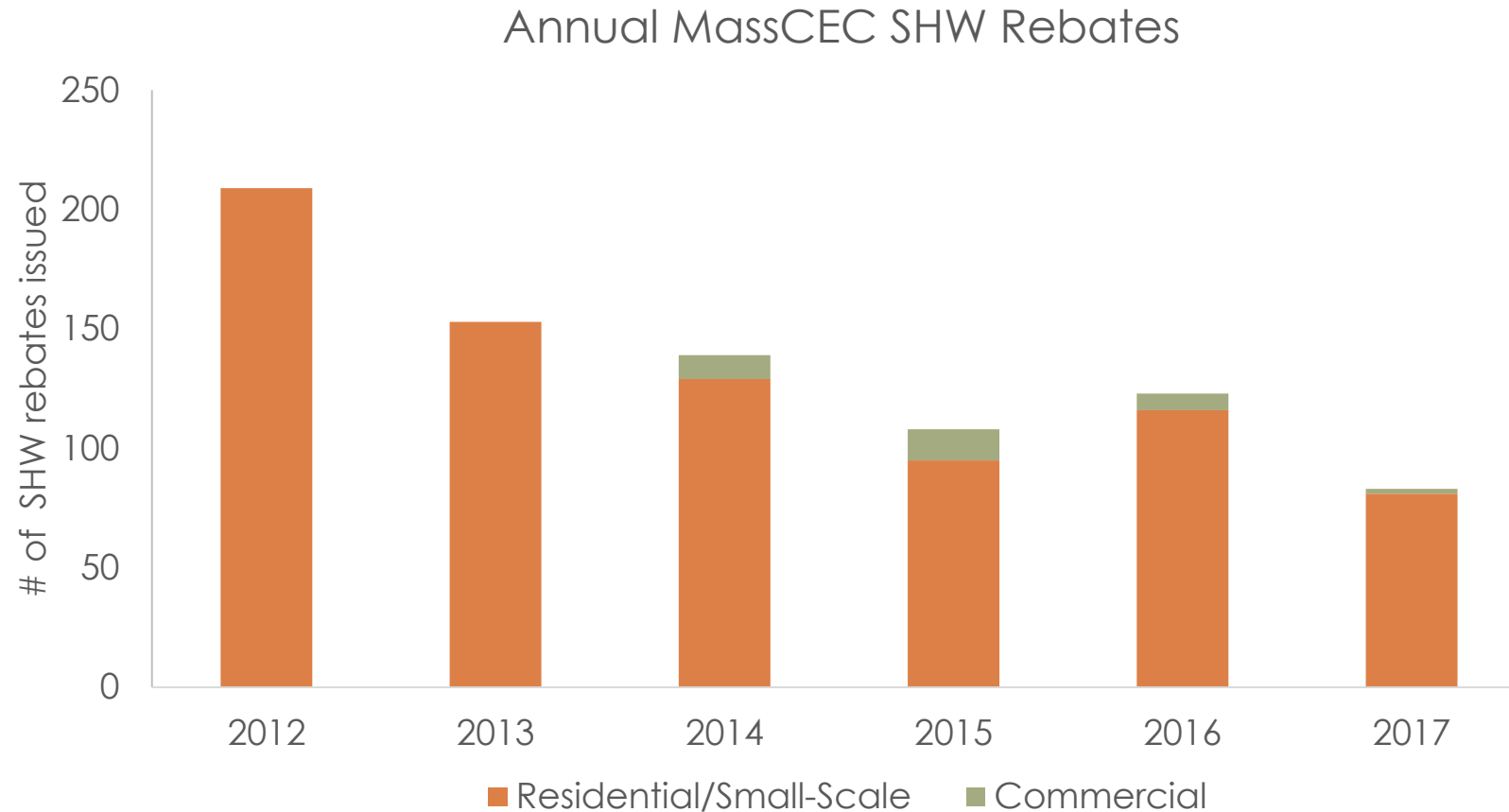
Timeline

- **2012:** Heating and Cooling in the APS report published
- **2014:** Legislature directs DOER to integrate RH&C into APS
- **2014-2017:** Rulemaking period
- **Jan 2018:** APS opens to applications from RH&C system owners

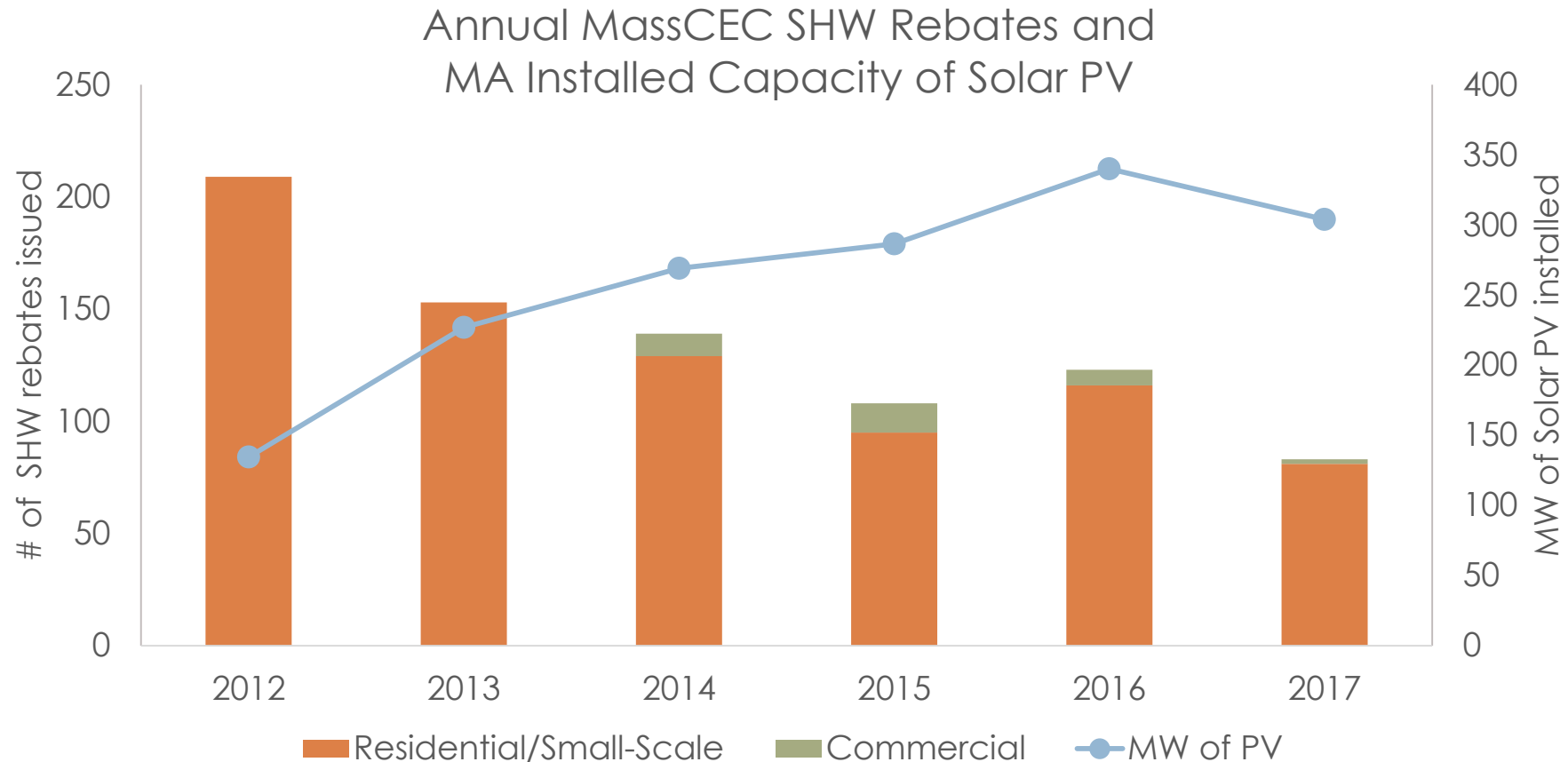
Overview | MA solar hot water context



Overview | MA solar hot water context: declining growth

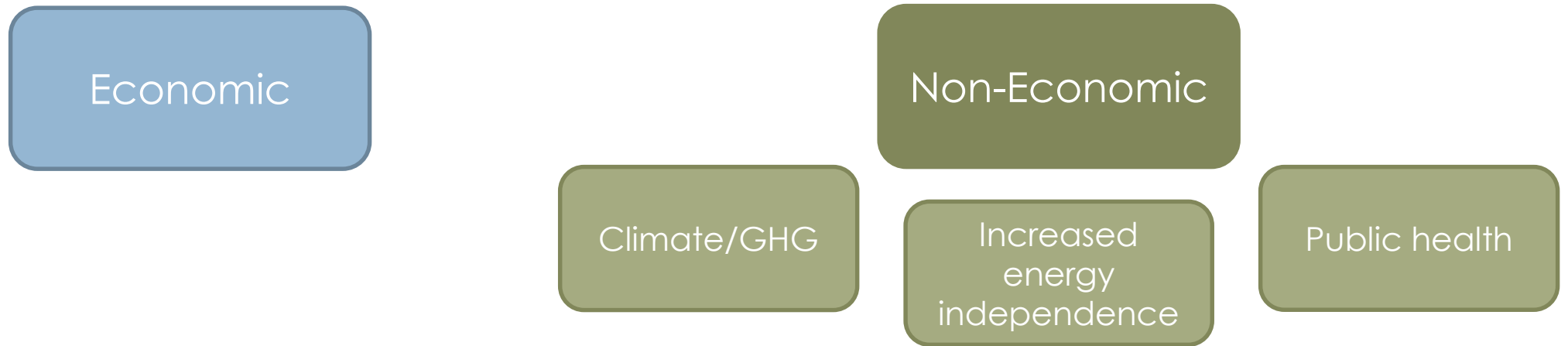


Overview | MA solar hot water context: declining growth



Overview | Continued interest in solar hot water

- » Despite the declining market, there are still reasons why we and the Commonwealth are interested in solar hot water:

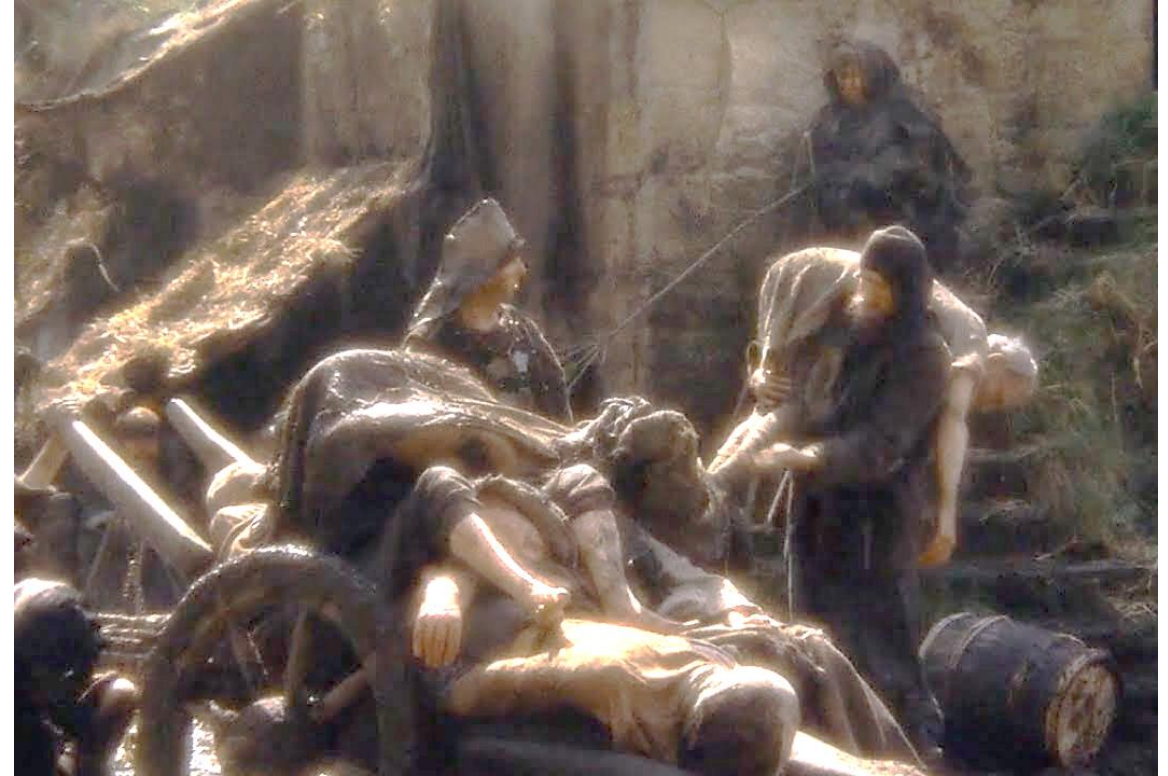


- » There are successful international markets around the world—can we make it work in the US with the right market development initiatives?

Overview | Outlook for solar hot water

A lot of uncertainty regarding the future of SHW and how we might achieve the market scale seen internationally:

- » If it's not incentives, why has the market stalled?
- » What other barriers are holding back market growth?
- » How will the industry react to continued advances in heat pump water heater technology?



...It's not dead yet—and we're here to talk about some of the Commonwealth's new initiatives to raise awareness and drive deployment

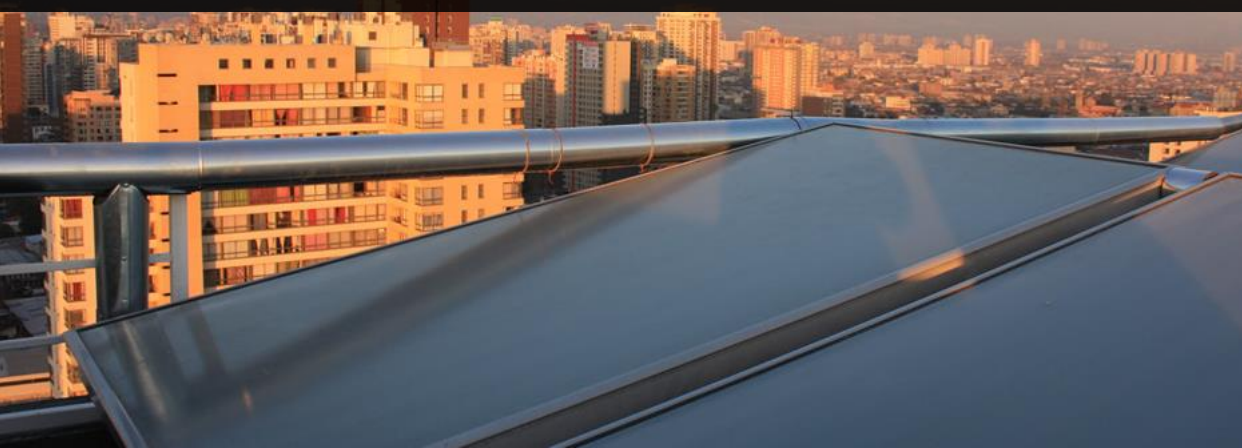


SHW FOR A COOLER CLIMATE:

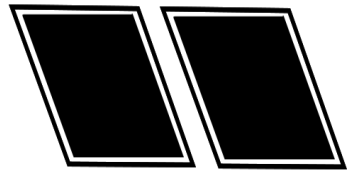
RESIDENTIAL CAMPAIGNS FOR SHW

ACEEE HOT WATER FORUM 2018

MARCH 22, 2018



Typical residential 2-collector system in MA



Two-Collector System

Quote

—

Incentive

=

Final Price

\$10,185

~\$2,800 (rebate)
+
\$3,055 (Federal ITC)
+
\$1,000 (MA Tax Credit)
+
~\$1,300 (AECs)

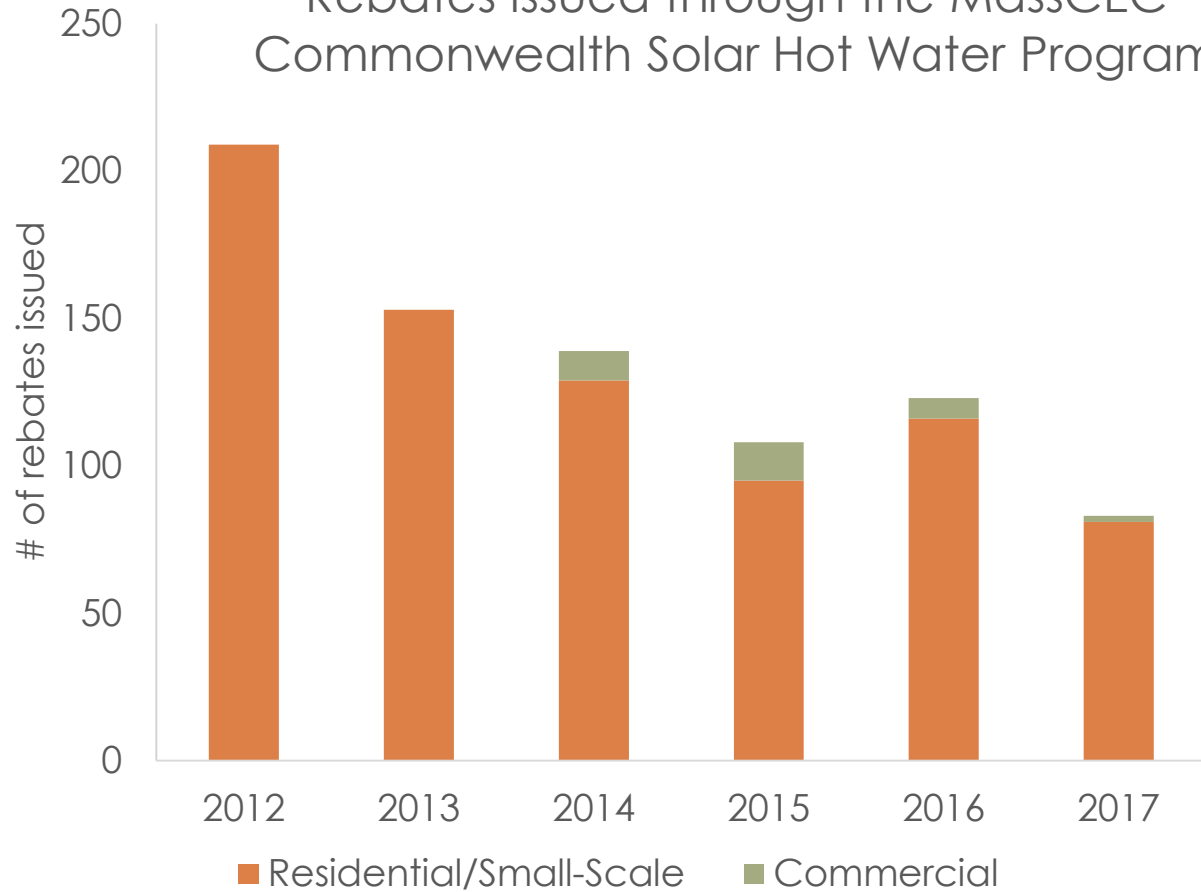
~\$2,000

Sources/Assumptions: Average installed cost of 2-collector system through MassCEC Commonwealth SHW Program; AECs modeled around a site with optimal solar production

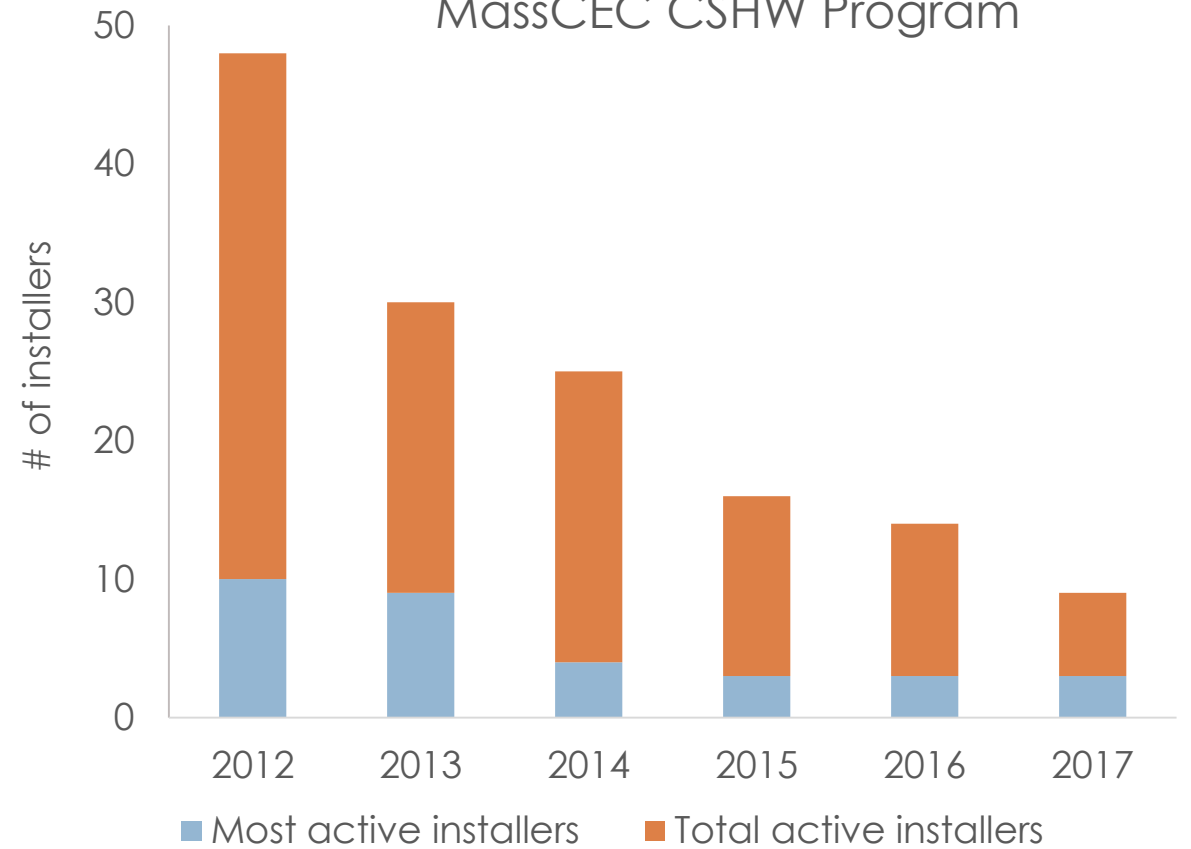
ACEEE Hot Water Forum 2018
SHW for a Cooler Climate: Residential Campaigns
March 22, 2018

MA Residential Background | Declining residential market

Rebates issued through the MassCEC Commonwealth Solar Hot Water Program

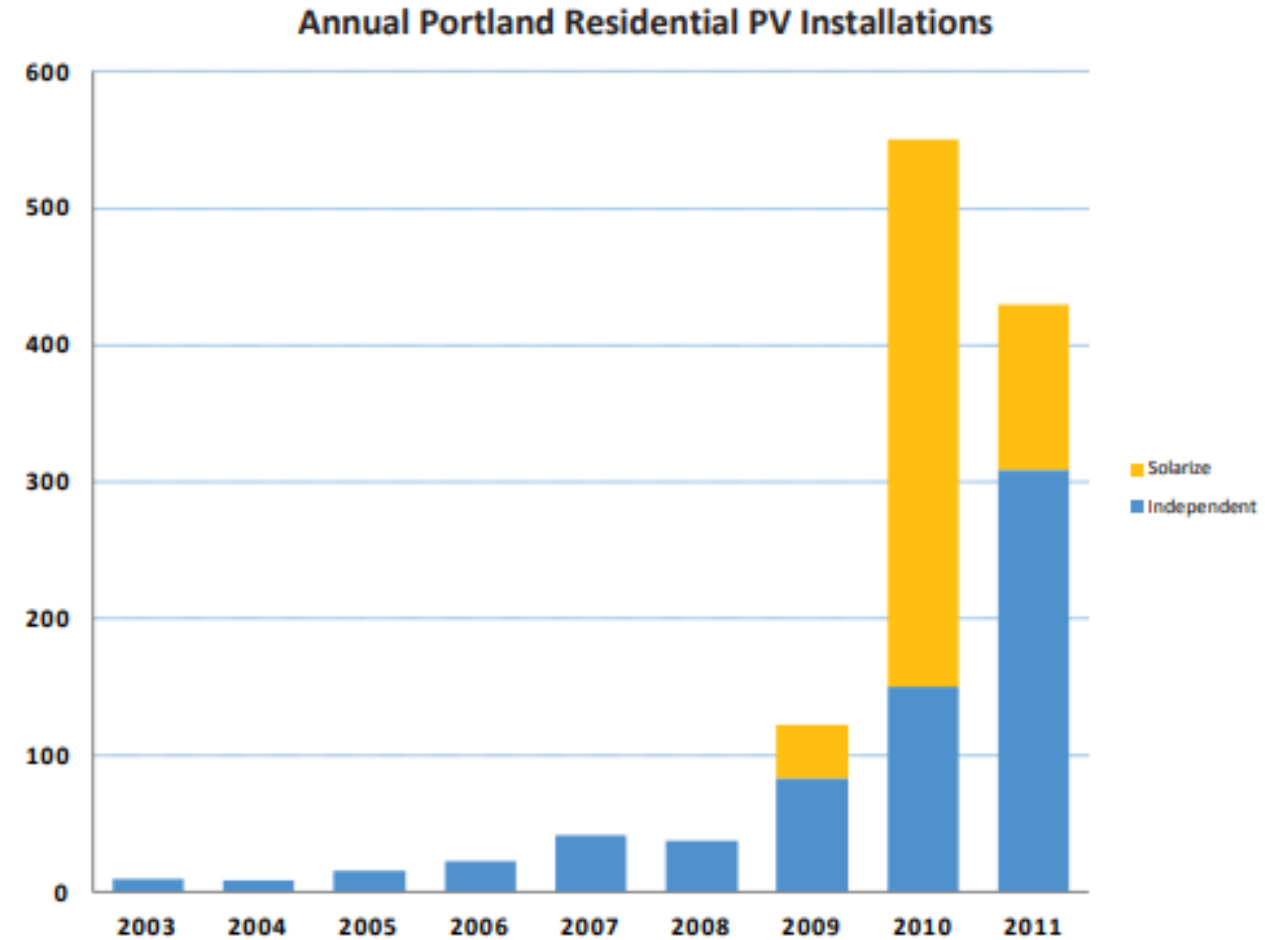


of active residential installers in MassCEC CSHW Program



Background | What is Solarize?

- » Solarize is a model for a **community outreach, education, and group purchasing program**
- » Community-organized, limited-time campaign to purchase PV from a competitively-selected installer offering a discounted group price
- » Piloted in Portland, Oregon in 2009-2011



Background | Benefits of Solarize

Residents

- Group education
- Opportunity to work with vetted community installer
- Special discounts from installer
- “Safety in numbers”

Installers

- Bulk equipment discount + reduced customer acquisition costs can be passed onto customer
- Promotion as trusted community installer
- Direct access to customers

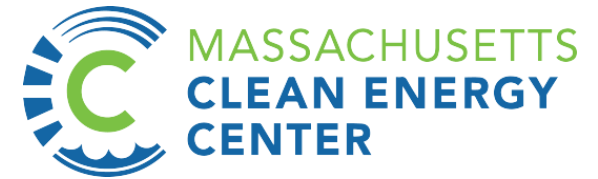
Communities

- Helps achieve community climate goals
- Provides opportunity to save residents money
- Community incentives
- Opportunity for volunteers/community engagement

Background | MA community group purchasing programs

MassCEC quickly adopted the Solarize model (Solarize Mass) after it was piloted in Portland (OR) in 2009-2011

- » 72 communities have participated
- » As of end of 2016:
 - › Over 17,000 leads through Solarize campaigns
 - › Over 3,200 systems totaling nearly 22 MW in capacity
- » In 2015, MassCEC piloted Mass Solar Connect
 - › Statewide model w/ community non-profit partner lead
 - › In pilot round, 261 contracts (1.9 MW)



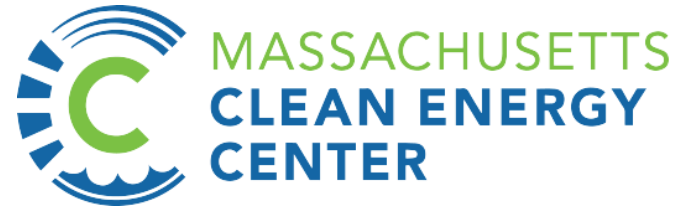
Applying the Solarize Model to Renewable Heating & Cooling

Can the Solarize model work for RH&C and SHW (with some modifications)?

- » Solarize Mass Plus (pairing PV with heat pumps, SHW, or electric vehicles)
- » Solar Thermal Challenge grant to MCG-led team (with Hampshire Council of Governments and MAPC) for regional residential Solarize-style campaigns
- » HeatSmart Mass Pilot Program focused on driving adoption of SHW, air- and ground-source heat pumps, and modern wood heat

(Others are pursuing this model, including HeatSmart Tompkins and NYSERDA's Clean Heating and Cooling Communities program)

Solarize for Solar Hot Water | Three Pilot Programs from MA



Solarize Hot Water:
Western Mass



Pilot Program #1 | Solarize Lincoln-Sudbury-Wayland

July 2017 to Feb 2018



- » Solarize “Plus” program including solar PV and SHW
 - › Communities previously ran Solarize (2012)
 - › Population approx. 38,000
- » Marketed technologies separately (e.g. different ways to go solar)
 - › \$2,500-3,000 after incentives for SHW, \$20,000 after tax credit for PV
- » **Results: ~150 leads → 53 PV systems and 27 SHW systems**
 - › 8 did both at once
 - › SHW installer began offering HPWHs to complement homes that went with PV but wanted DHW
 - › Several SHW installs on homes that already had PV (e.g. awning mounts, tilt-racks on suboptimal roofs for PV)

Pilot Program #1 | Solarize Lincoln-Sudbury-Wayland (cont.)

July 2017 to Feb 2018



- » Can be very effective in communities with high solar PV penetration + previous Solarize campaign
 - › Residents with PV can “take the next step”
 - › Residents with suitable roofs have been weeded out—others might not have suitable roofs for PV but could work for SHW
 - › Credibility lent through Solarize model + previous familiarity valuable for SHW
 - › Could have been good that there was a big gap between Solarize round 1 (2012) and round 2 (2017-18)

Pilot Program #1 | Solarize Lincoln-Sudbury-Wayland (cont.)

July 2017 to Feb 2018



- » Generally strong collaboration between installers
 - › SolarFlair has done 11 campaigns, NESHW largest residential installer in MA
- » Education opportunities extremely valuable for technology
 - › Significant demand for SHW (once people know about it)
 - › “Meet the installer” workshops and tabling at farmer’s markets/composting area at dump most effective
- » AECs were helpful but did not play a huge role in driving SHW adoption (not available/marketed until last 2 months of campaign)

Pilot Program #2 | Solarize Hot Water: Western Mass

March 2018 – July 2018 (in development)



- » Regional model (western half of state) focusing on SHW
 - › Identify community leaders within HCG's territory to lead localized outreach and events
 - › Combine with region-wide marketing from HCG
 - › Western MA has low population density, SHW industry expects to serve broad geographic area
- » HCG working with towns of Amherst, Pelham, and Williamsburg
 - › Recruited towns based on a regional market analysis to identify towns with homeowners who might be most likely to adopt SHW (e.g. heating fuel, previous community efforts, single-family homes, access to incentives)

Pilot Program #3 | HeatSmart Nantucket

April 2018 – Fall 2018 (in development)



- » Extensive load reduction measures to avoid building an additional transmission line to island
 - › Island has no natural gas access with mostly propane/oil used by year-round residents (higher cost than mainland)
 - › ~20% of population (approx. 12,000) is year-round
- » Nantucket launching a SHW + air source heat pump HeatSmart pilot program
- » Focused on year-round residents who heat with expensive heating fuels and can take advantage of year-round energy savings
 - › SHW combi-systems can be great for seasonal residents with radiant heat

Thank you!

Questions?

Jeremy Koo | Associate

jeremy.koo@mc-group.com
617.209.4960



Meister Consultants Group |
A Cadmus Company

One Center Plaza, Suite 320
Boston, MA 02108
www.mc-group.com