Solar Thermal Challenge

Metropolitan Area Planning Council (MAPC)

Municipal Solar Thermal Procurement Pilot

MAPC
METROPOLITAN AREA PLANNING COUNCIL

MAPC: About Us

- Regional Planning Agency
- 101 cities and towns
- 80+ employees
- Wide range of planning expertise

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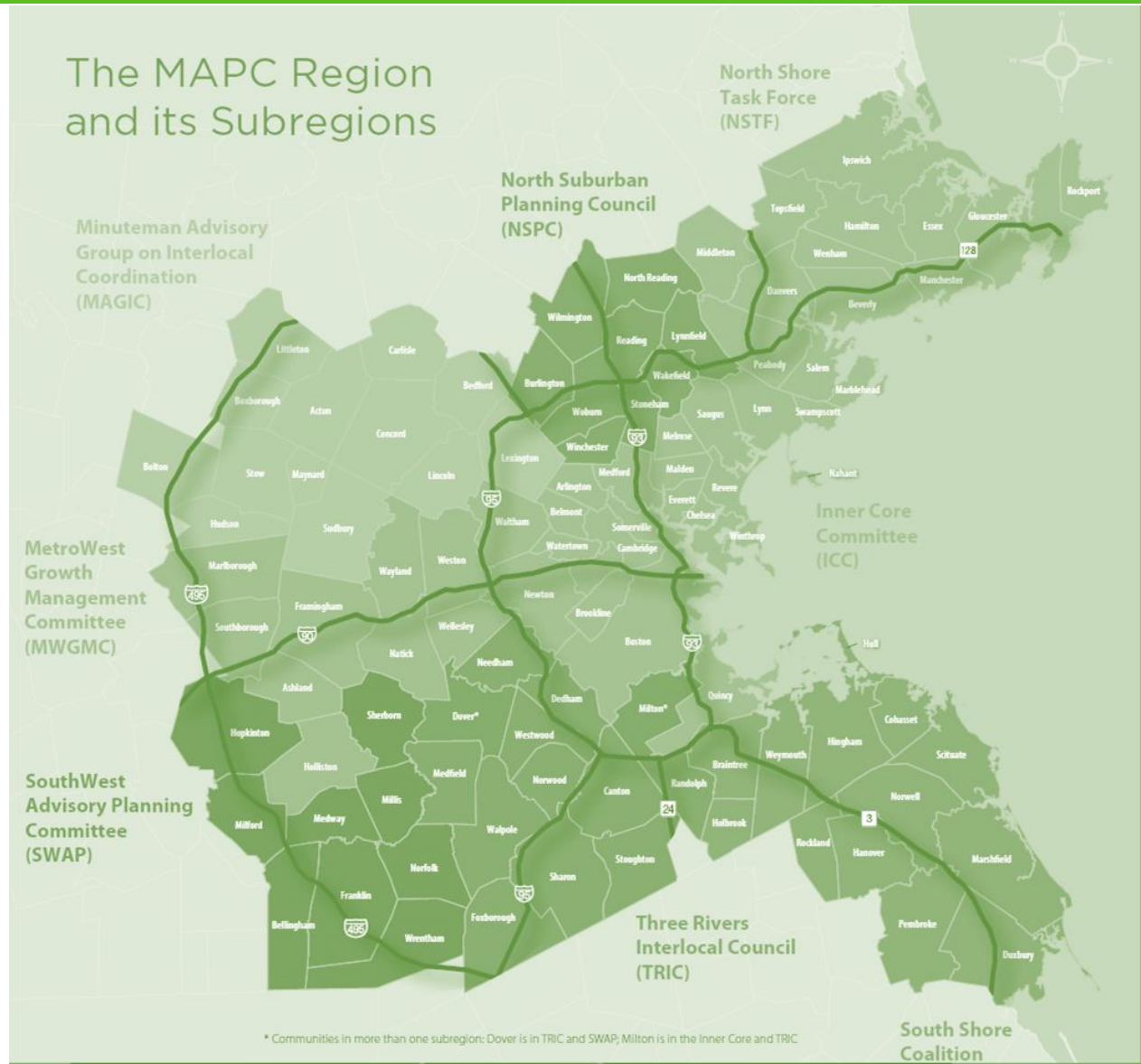
Smart Growth & Regional Collaboration



MAPC: Clean Energy

1. Regional Energy Projects

- **ESCO Procurement**
- **Regional Solar Initiative**
- **LED Streetlight Purchasing Program**
- **Community Aggregation**
- **Hybrid Conversion Technology**
- **Energy Resiliency**

2. Local Energy Action Program

- **Connecting municipalities with incentives + plug-and-play programs**
- **Community energy and climate baselining, planning, and strategizing**
- **Outreach programming and education**
- **Net Zero Planning**

3. Energy Technical Assistance

- **Grant Writing**
- **Green Communities Designation**
- **Methane Leaks**
- **Solar Permitting and Zoning**
- **State and Local Policy**
- **Net Zero Guidance and Education**

Project Team

MEISTER CONSULTANTS GROUP | A CADMUS COMPANY

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Agenda

1. MassCEC Solar Hot Water Outreach
2. Incentives for Solar Thermal Systems
3. MCG program with Hampshire Council of Governments
4. How Solar Thermal Systems Work
5. Municipal Solar Procurement Pilot

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MassCEC Solar Hot Water Outreach:

Center for Ecotechnology

- Outreach and Technical Assistance
  - Commercial customers with significant year-round hot water needs
  - Work with solar installers to identify potential efficiencies to reduce costs
- **Center for Sustainable Technology:**
  - Solar Thermal Water Heating Case Studies:
    - *Putnam Green* in Cambridge, MA
    - *Wales Street* Pine Street Inn in Boston, MA
    - *51 Allen Street Apartments* Olive Street Development in Greenfield, MA
- **Meister Consultants Group:**
  - **Metropolitan Area Planning Council**
    - *Pilot Municipal Procurement Program* with Chelsea, Winthrop, Concord, and Quincy
  - Hampshire Council of Governments
    - *Pilot Solar Hot Water Challenge* with Amherst, Williamsburg and Pelham

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MASSACHUSETTS CLEAN ENERGY CENTER

Solar Thermal Challenge:

Pilot Solar Hot Water Challenge

Hampshire Council of Governments

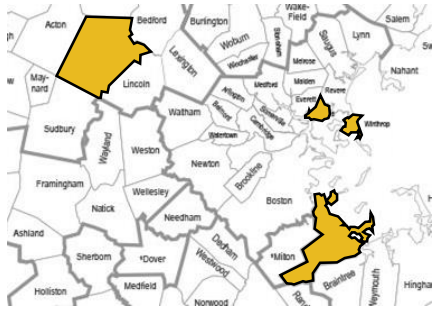
Amherst, Williamsburg and Pelham

- For **residents** interested in installing solar thermal
- Many residences in the region currently use oil for heat
- Small-scale systems
- Program is structured in a similar way to Solarize programs

Pilot Municipal Procurement Program

Metropolitan Area Planning Council

Chelsea, Winthrop, Concord, and Quincy



- For **municipalities** interested in installing solar thermal on municipal buildings
- Procurement for feasibility studies and second procurement for installation contracts
- Both small-scale and commercial-scale systems

Solar Thermal Incentives

Feasibility Study Rebate:

- up to $5,000 rebate with a cost share of 5%

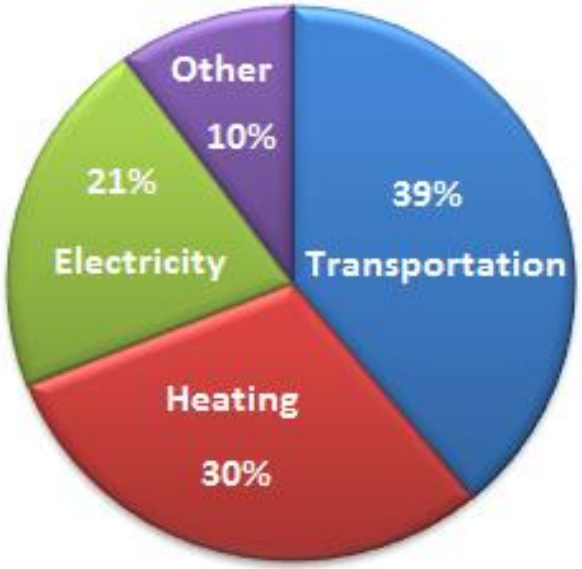
Installation Rebate:

	Non-Profit/Public Entity Rebate
Rebate Formula	SRCC OG-100 rating x # of collectors x $150
Rebate Adders	If Applicable: + Massachusetts Manufactured Component Adder ($200) +Solar PV Co-location Adder ($500)
Maximum Rebate before Metering	65% of Eligible Project Costs, limited to $100,000
Metering Adder	100% of metering equipment costs, limited to $1,500
Maximum Total Rebate	$101,500

Thermal energy emissions: achieving 80x50

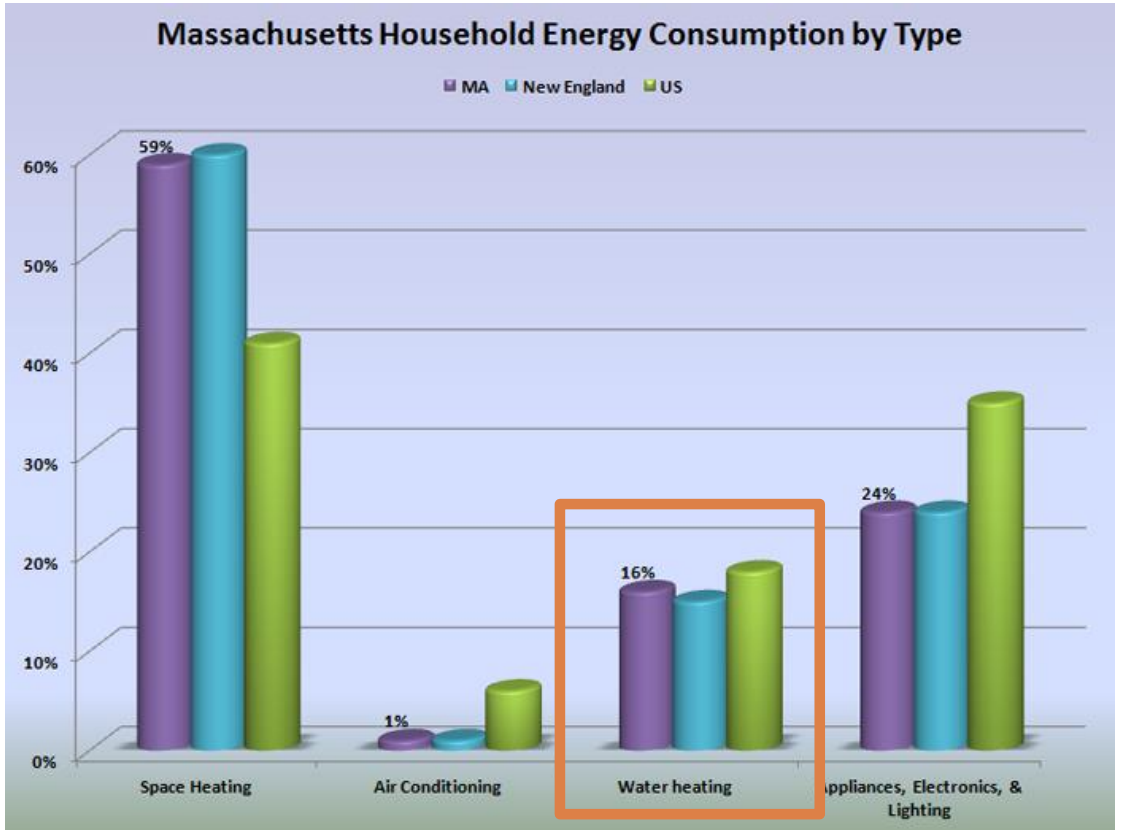
- Thermal energy accounts for over 30% of emissions in Massachusetts
- Achieving the deep GHG reduction targets (80x50) set by the state and communities across the state will require transitioning to renewable heating and cooling (RH&C) technologies
  - 2014: Commonwealth Accelerated Renewable Thermal Strategy

GHG Emissions (MA)



Why solar thermal?

- Water heating accounts for over 21% of the average Massachusetts household's thermal energy usage
  - Additionally, certain types of commercial, non-profit, and government buildings may have significant hot water loads
- **Solar thermal** systems can displace the majority of a home's hot water usage and associated emissions
  - **Solar hot water** most common/ mature application of solar thermal technology with most incentive support

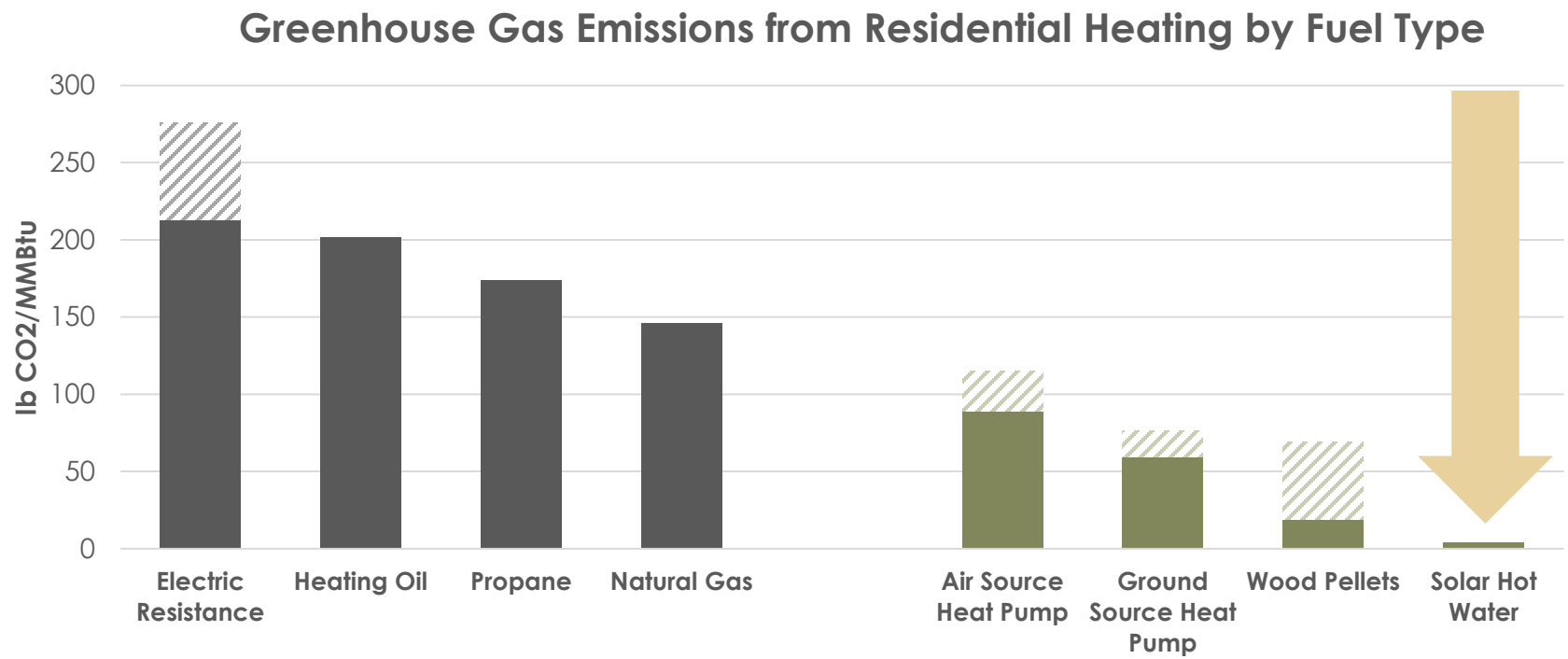


Sources: Massachusetts Dept. of Energy Resources

Solar thermal emissions reduction potential

Solar hot water significantly reduces emissions from water heating

» Solar hot water systems can greatly reduce household emissions by offsetting fossil fuel or non-renewable electricity usage



Sources & Assumptions: COP of 2.4 for ASHP, COP of 3.6 for GSHP, and AFUE efficiencies of 80% for oil, propane, and gas; 2014 ISO New England Electric Generator Air Emissions Report (range between annual system and LMU marginal emissions); EIA Fuel Conversion; EIA (2016) Carbon Dioxide Emissions Coefficients; AEA (2009) Carbon factor for wood fuels for the Supplier Obligation

Accelerating Solar Thermal Adoption in Massachusetts

The MassCEC Solar Thermal Challenge

- MassCEC has funded three solar thermal outreach campaigns with the goals to:
  - **Accelerate adoption of solar thermal** technology across the Commonwealth
  - **Increase awareness of solar thermal** as a viable cost and emission reducing technology
  - Develop and test strategies to **reduce solar thermal costs**, primarily customer acquisition and installation costs

Residential & Municipal	MAPC Metropolitan Area Planning Council; HCG; Merrimack Valley Planning Commission; Meister Consultants Group | A Cadmus Company
Commercial	CET Center for EcoTechnology
Multifamily	Center for Sustainable Energy; New Ecology, Community-Based Sustainable Development

Our Solar Thermal Challenge project

- Our team seeks to **increase deployment of residential solar thermal** by using a community group purchasing campaign model
  - Program will be **implemented in three RPA/COG territories** across the Commonwealth, starting with an HCG pilot
  - Each community partner will lead **a solar thermal outreach and community purchasing campaign** in their territory with support from local communities and residents
- MAPC is also designing a **solar thermal procurement vehicle** for municipal facilities

HCG

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Merrimack Valley Planning Commission

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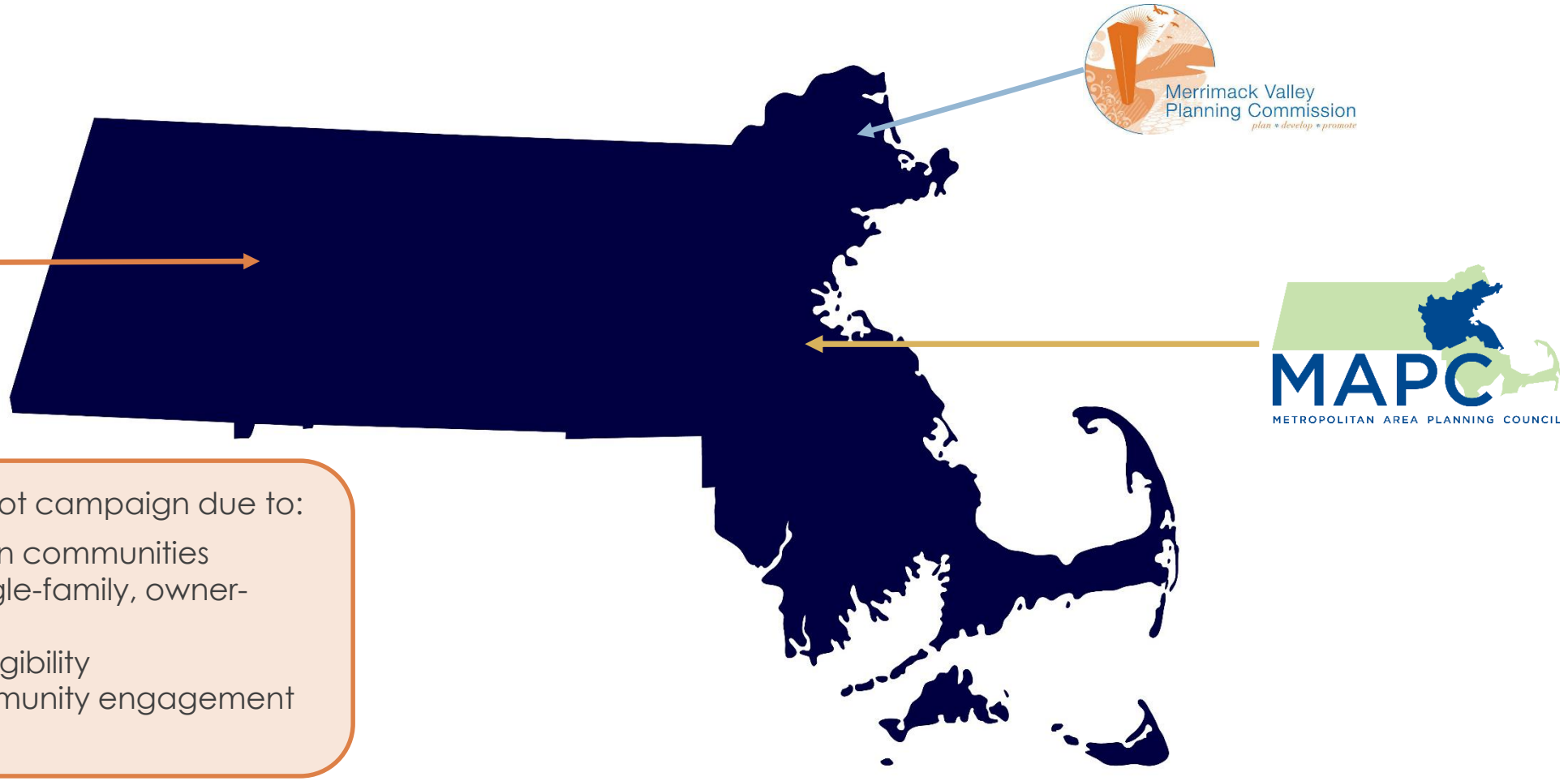
POWERED BY:
MASSACHUSETTS CLEAN ENERGY CENTER

Our Solar Thermal Challenge project

Partner Territories

Pilot Partner

HCG



HCG selected for pilot campaign due to:

- Low gas access in communities
- High share of single-family, owner-occupied homes
- High incentive eligibility
- Strong prior community engagement via Solarize

Progress update: Western Mass Solar Hot Water Challenge

HCG is planning on launching the **Western Mass Solar Hot Water Challenge** in February 2018

- **Campaign structure:** Based on Solarize model but regionalized
  - HCG is the campaign lead, but has recruited municipal implementing partners to drive outreach within their communities
  - Amherst, Pelham, and Williamsburg have committed to being community champions, with several other communities who may support outreach
- **Current status:** Installer RFP released in December, bids due next week

HCG

AMHERST, MASSACHUSETTS FOUNDED 1759

TOWN OF PELHAM TOWN SEAL MASSACHUSETTS

TOWN OF WILLIAMSBURG MASSACHUSETTS

UMass Clean Energy Extension Research & Outreach

What is solar thermal?

» Not to be confused with solar photovoltaics (PV)!

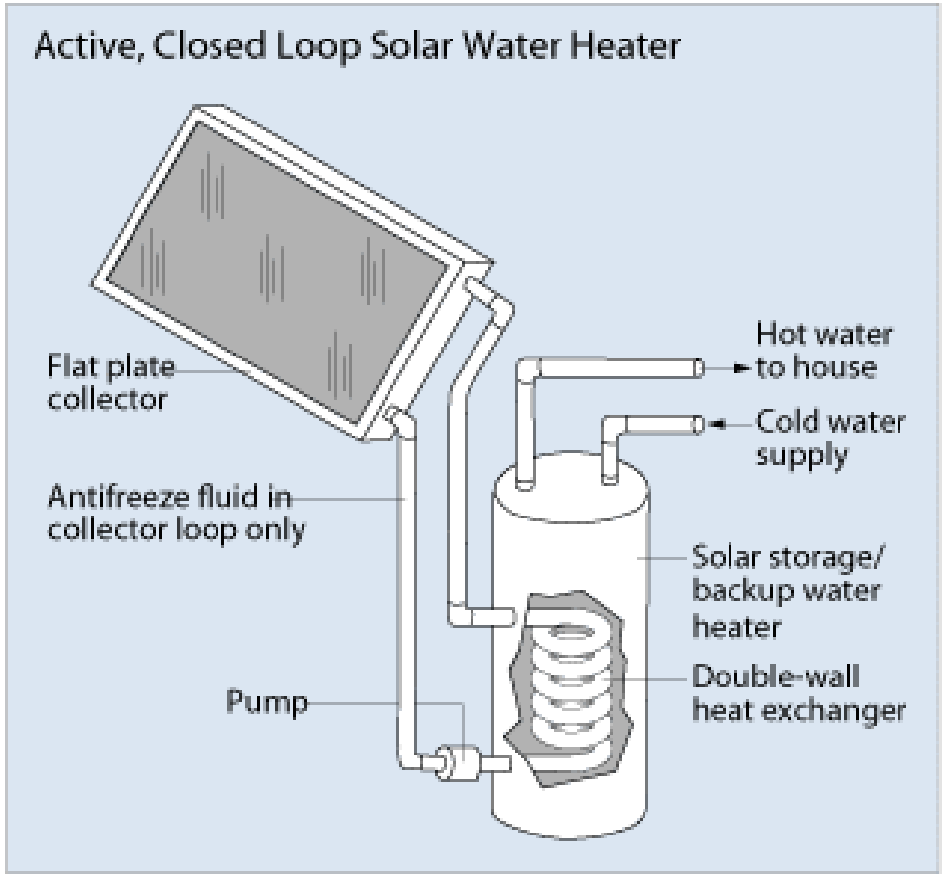
Solar PV: converts sunlight into electricity

Solar thermal: uses solar energy to directly provide thermal energy to a building

» Solar thermal systems typically are **solar hot water systems**, using solar energy to heat water

» With good sun exposure, solar hot water systems **can offset 60-70+% of a home's annual hot water** demand.

How does a solar hot water system work?



Note: some systems are installed with two tanks using the existing water heater

1. Sunlight heats antifreeze fluid (glycol) in the solar collector
2. Heat from glycol transferred to hot water through heat exchanger
3. Hot water provided to home
   - Backup heating provided in storage tank/existing heater when necessary

Image credit: U.S. Dept. of Energy

Types of solar hot water collectors

Flat plate collector

- Accounts for nearly 90% of systems installed through MassCEC program
- Generally slightly cheaper to install
- Melts snow more quickly

Evacuated tube collector

- Accounts for most systems installed in Europe and China
- Better performance in colder temperatures
- Can provide higher temperature water

Municipal Solar Thermal Procurement Pilot

Research
- Market Research on Vendors
- Research on Solar Thermal Systems

Outreach
- Invitation for Municipality Participation
- Signed Letters of Intent

Feasibility Studies
- Request for Quotes for Chelsea and Winthrop
- RES Solar (the selected vendor) completes studies

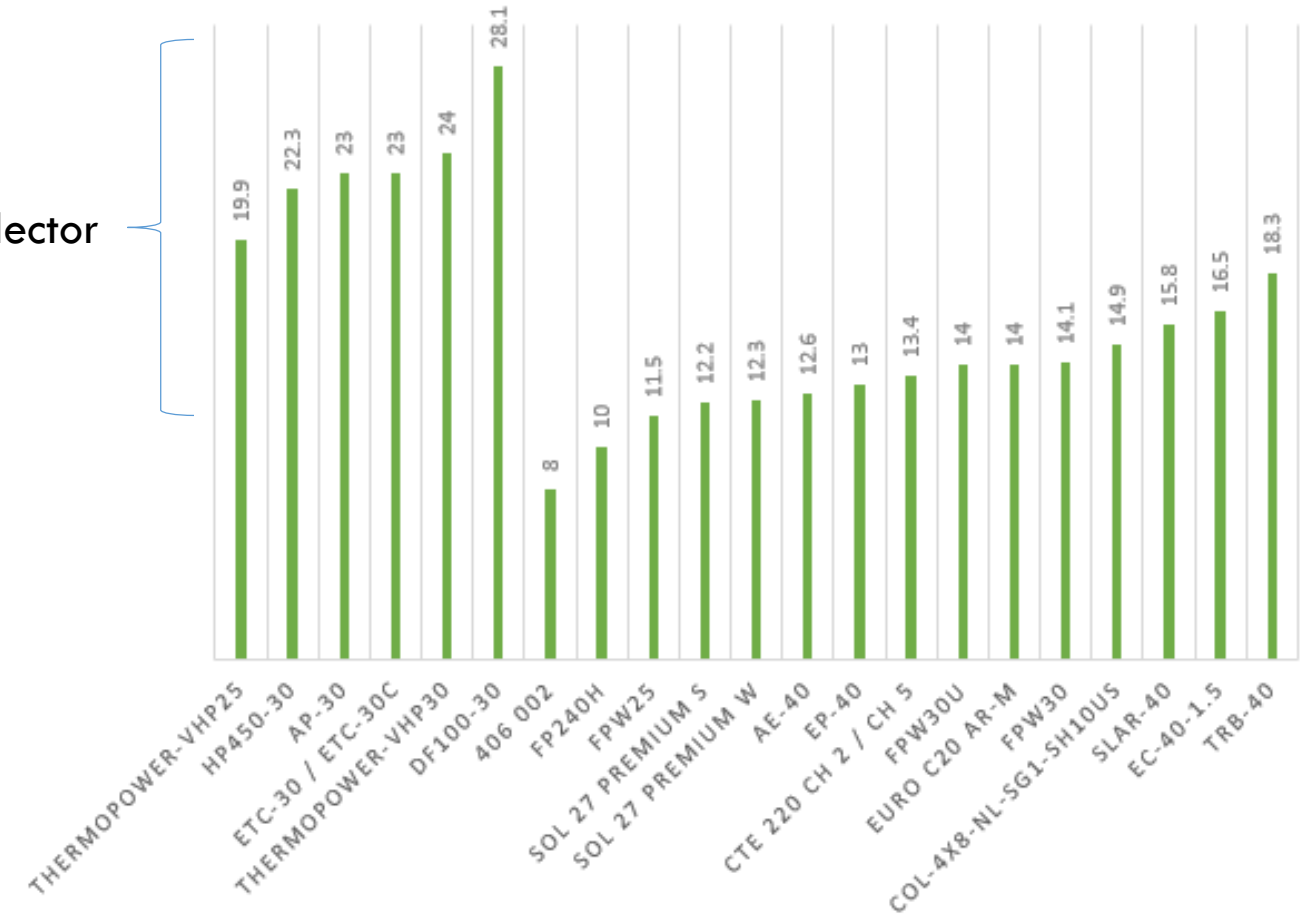
Contracting
- Invitation for Bids for Chelsea, Winthrop, and Concord
- Selection committee chooses installation vendor

Support
- Ongoing technical assistance and support for contracting and installation

SRCC Rating

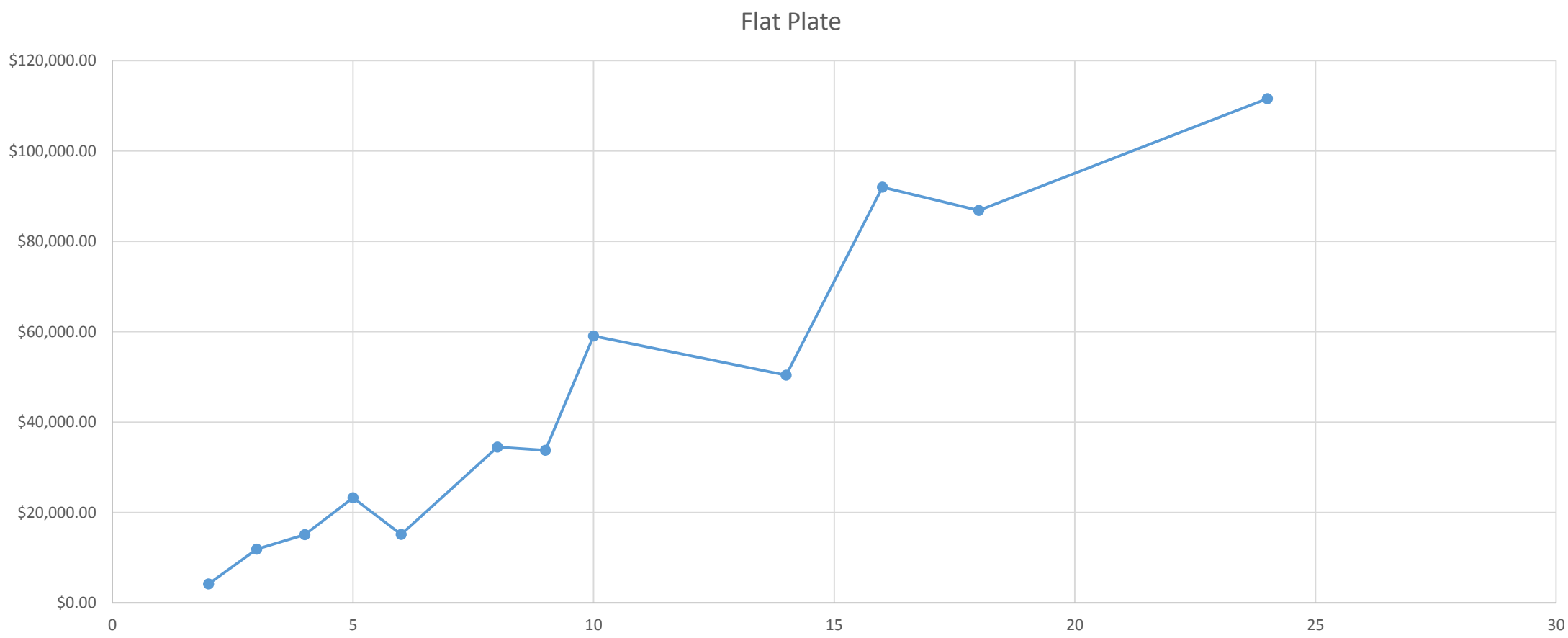
Measures the KBTU's generated per day, per panel.

Evacuated Tube Collector

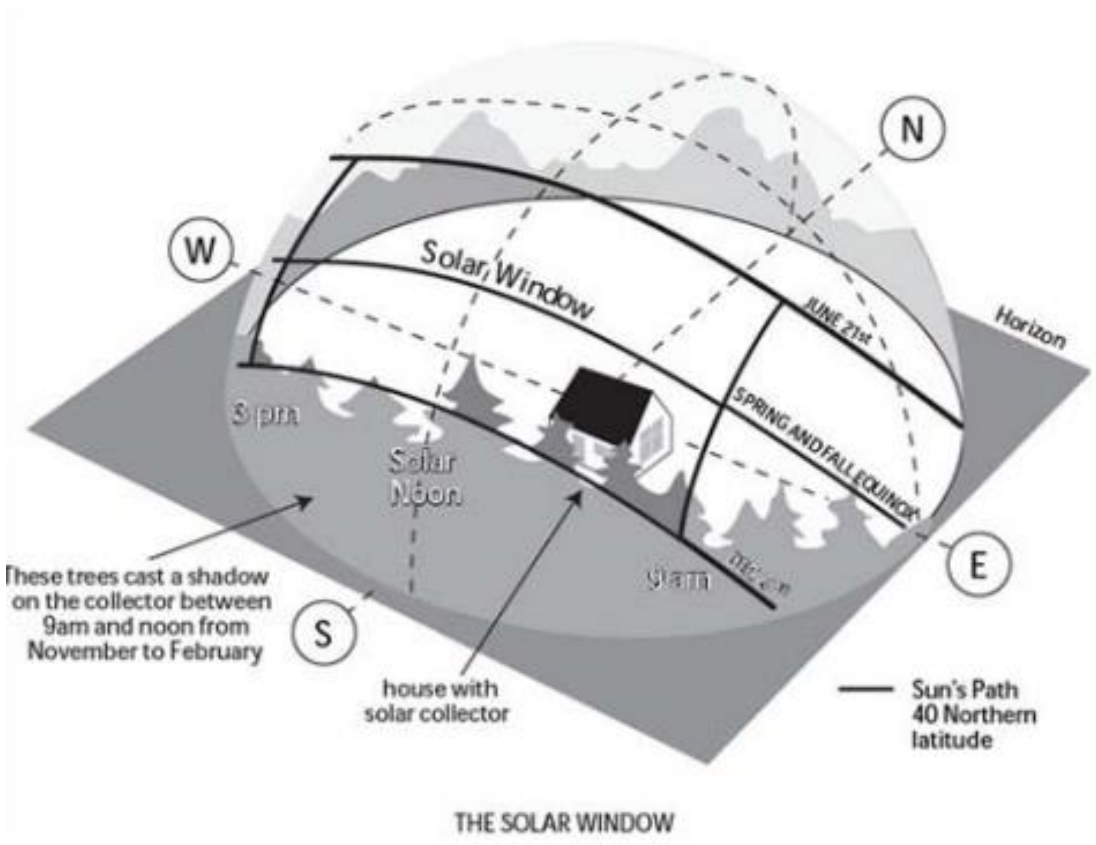


Flat Plate Collector

Average Cost of Commercial Systems



Siting Solar Thermal vs. Solar Photovoltiac



THE SOLAR WINDOW

Source: NABCEP Solar Hot Water Installer Resource Guide p.13 from Solar Energy International http://www.nabcep.org/wp-content/uploads/2013/08/NABCEP-SH-Guide-8-5-13.pdf

- Less roof area used than PV. Need less roof support
- Easier to re-roof around SHW. The re-roofing process for PV is usually to un-install and re-install the system

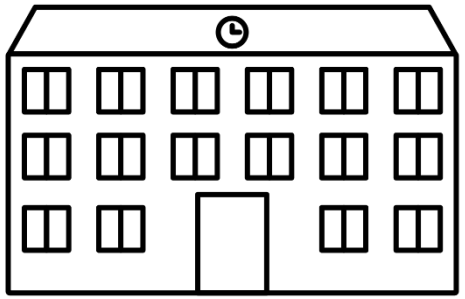
Good Candidates for Solar Thermal Systems:

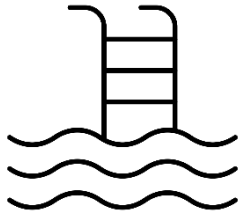
Looking for:

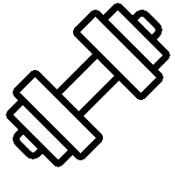
- Building with high hot water use
- Consistent hot water needs throughout the day
- Ideally uses some hot water year-round

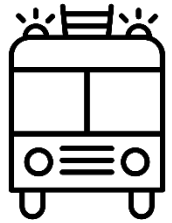
Good Candidates:

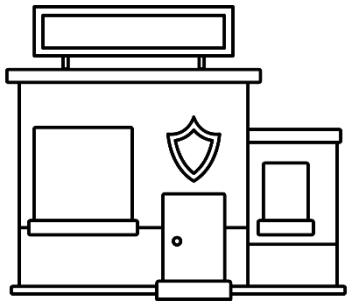
- A building with a gym or showers
- Rec center with a pool
- Ice skating rink (showers and Zamboni)
- School buildings with pools or gyms
- Police and Fire Stations



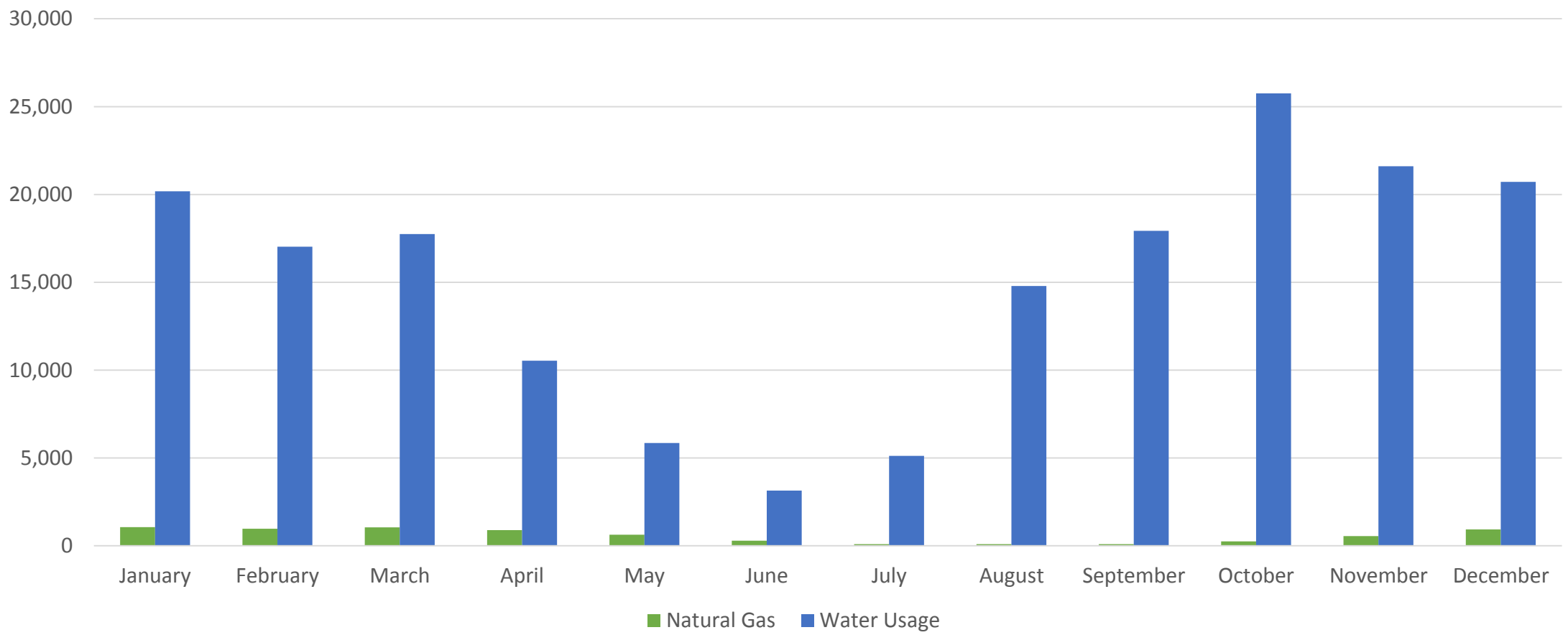




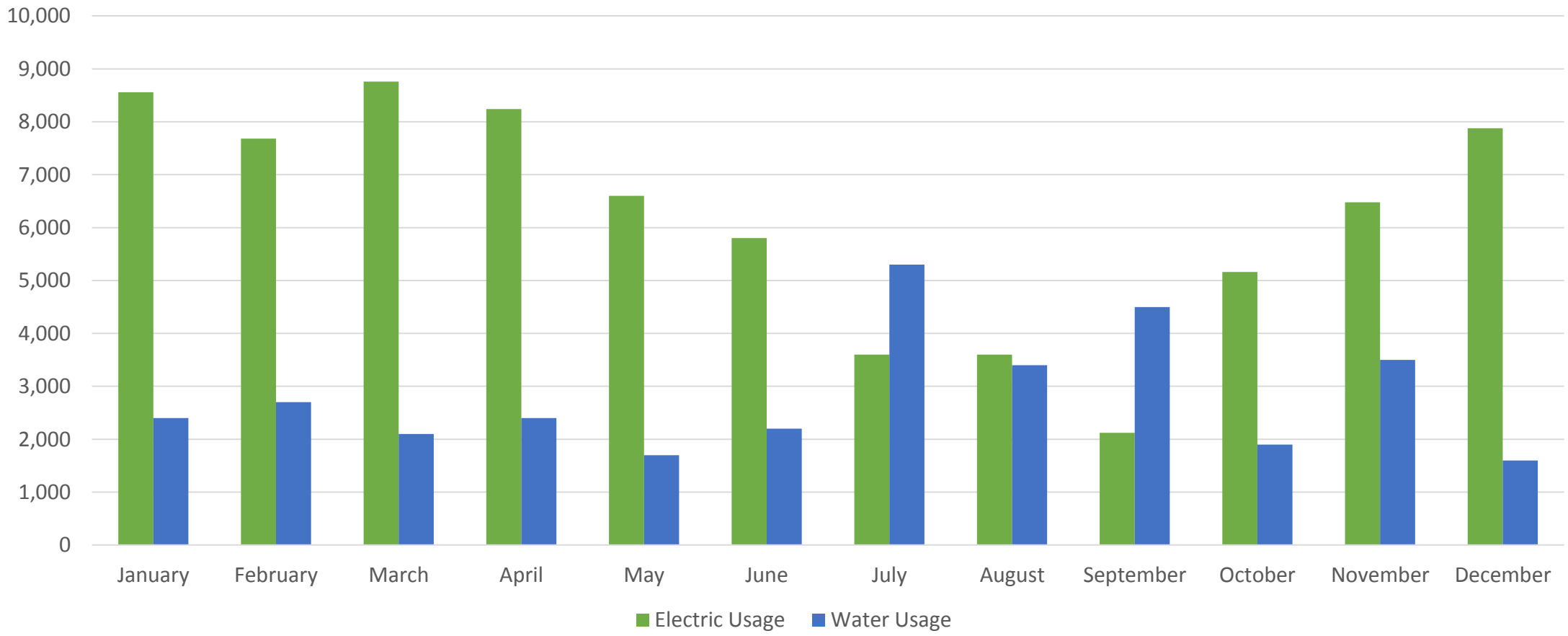




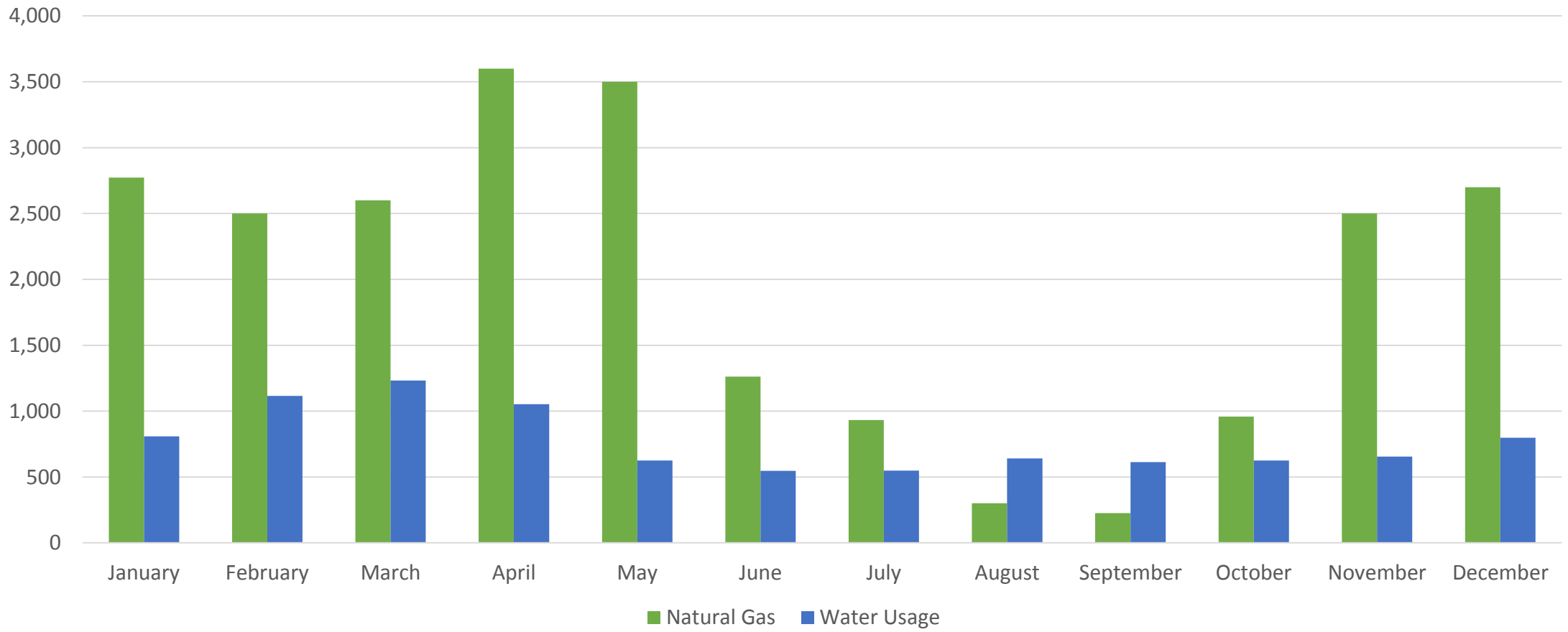
Skating Rink With Showers



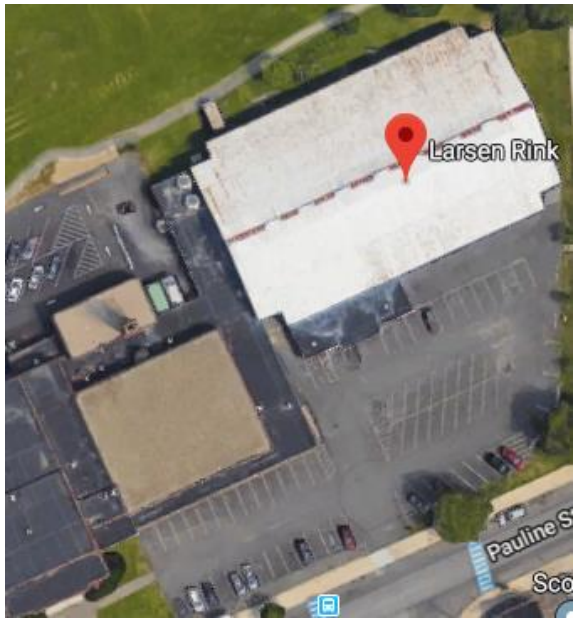
School with Swimming Pool:



Police Station with Showers:



Feasibility Studies



Winthrop Ice Rink

Chelsea Central Fire Station

Chelsea Police Department

What to Expect:

- ❑ A **Preliminary Walk-Through** if assessing multiple sites
- ❑ A **Few Hours** on site to:
  - ❑ measure roof supports
  - ❑ install water metering
  - ❑ Assess current equipment and measure space
  - ❑ Assess roof quality and measure solar insulation on site.
- ❑ Flowmeter testing for **One Week** on site for data collection
- ❑ An analysis and energy model with **RETScreen, T-Sol**, or **PolySun** tools
- ❑ An **Economic Model** including applicable incentives
- ❑ Vendor to **Apply** for feasibility study rebate

Next Steps:

January:

- Development of Invitation For Bids

February:

- Select an Installation Vendor

March:

- Outreach for procurement templates for feasibility studies and installation
- Continuing Support and Technical Assistance

Questions and Answers:

Resources and Links

- MassCEC Commonwealth Solar Hot Water: http://www.masscec.com/commonwealth-solar-hot-water-outreach-efforts
- MassCEC Solar Hot Water Installer Resources: http://www.masscec.com/solar-hot-water-installer-resources
- MassCEC Commercial-Scale Solar Hot Water Program Manual: http://files.masscec.com/get-clean-energy/residential/commonwealth-solar-hot-water/SHW_Program_Manual_Commercial_Scale.pdf
- For Residents: Residential Guide to Solar Hot Water http://files.masscec.com/uploads/attachments/SolarHotWaterResidentialGuidebook.pdf and MassCEC Solar Hot Water http://www.masscec.com/solar-hot-water
- NABCEP Solar Thermal Installation Resources Guide: http://www.nabcep.org/wp-content/uploads/2013/08/NABCEP-SH-Guide-8-5-13.pdf

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