

CESA Webinar

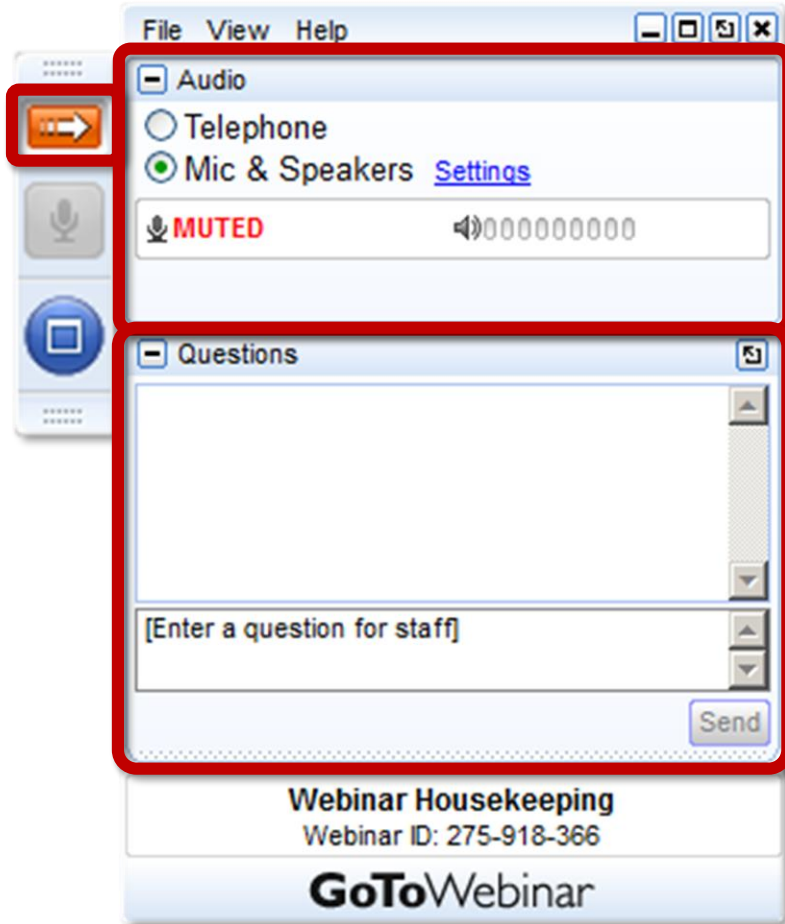
Community Campaigns for Renewable Heating and Cooling Technologies, Part 1

Hosted by
Val Stori, Project Director, CESA

July 29, 2019



Housekeeping



Join audio:

- Choose Mic & Speakers to use VoIP
- Choose Telephone and dial using the information provided

Use the orange arrow to open and close your control panel

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CleanEnergy States Alliance



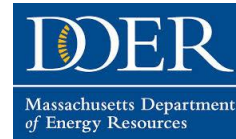
Wisconsin Office of Energy Innovation



Maryland
Energy
Administration



Department of Commerce
Innovation is in our nature.



OREGON
DEPARTMENT OF
ENERGY



Illinois
Department of Commerce
& Economic Opportunity



Office of the People's Counsel
District of Columbia
Advocating, Protecting and Educating DC Consumers



Smart Electric
Power Alliance



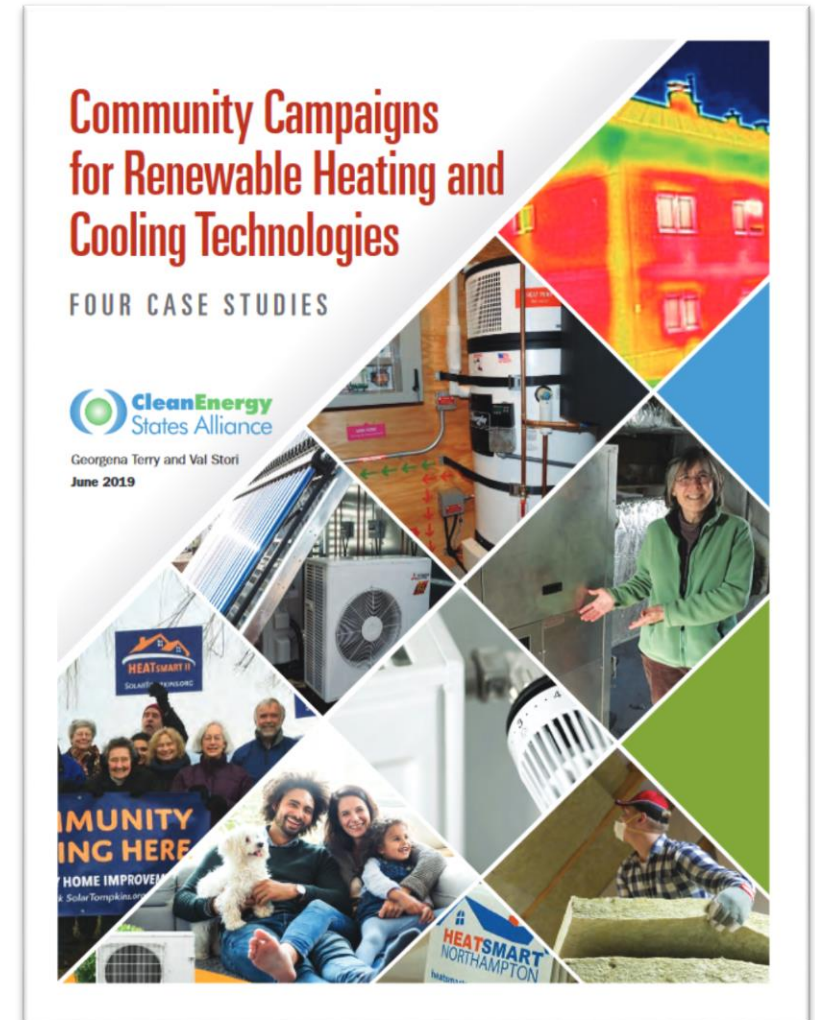
ACEP
Alaska Center for Energy and Power

Community Campaigns for Renewable Heating and Cooling Technologies: Four Case Studies

By Georgena Terry and Val Stori for the
Clean Energy States Alliance, June 2019

Available at:

<https://www.cesa.org/resource-library/resource/community-campaigns-for-renewable-heating-and-cooling-technologies-four-case-studies>



Webinar Speakers



Carolyn Elam

Energy Program
Strategy Manager, City
of Boulder, Colorado



Meg Howard

Program Manager,
Renewable Thermal,
Massachusetts Clean
Energy Center



Val Stori

Project Director, Clean
Energy States Alliance
(moderator)

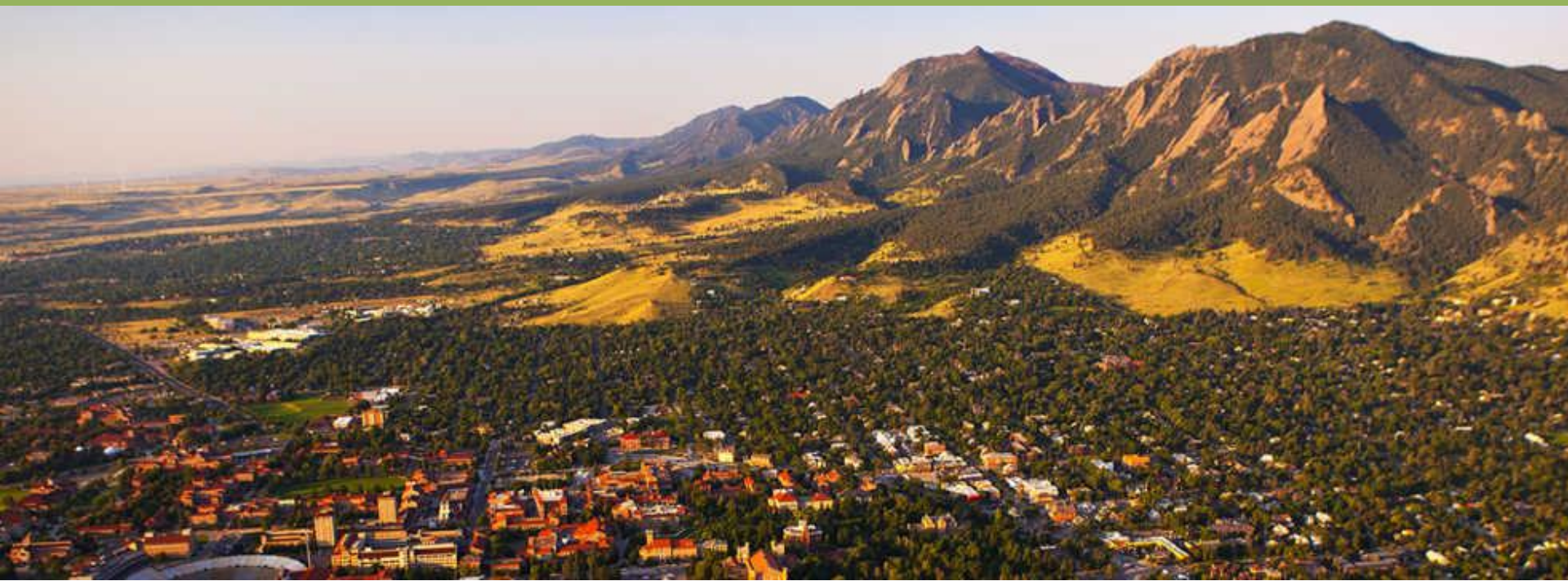


Georgena Terry

Volunteer Research
Associate, Clean Energy
States Alliance
(moderator)



RESIDENTIAL ELECTRIFICATION CAMPAIGN: *RENEWABLE HEATING & COOLING*



Local Context

- Population: 110,000
- Home to CU Boulder, a thriving science and tech industry
- Large industry and marijuana facilities
- Beer and gear!



10+ Years of Climate Action



GIVE BOULDER THE POWER
VOTE YES ON 2B AND 2C

ClimateSmart™
LOAN PROGRAM

TWO TECHS & A TRUCK



BOULDER ENERGY CHALLENGE



energySMART
Your Efficiency Solutions



RESIDENTIAL
ENERGY
AUDIT
PROGRAM



Boulder's
ENERGY FUTURE
You Have the Power to Decide



TRANSPORTATION MASTER PLAN



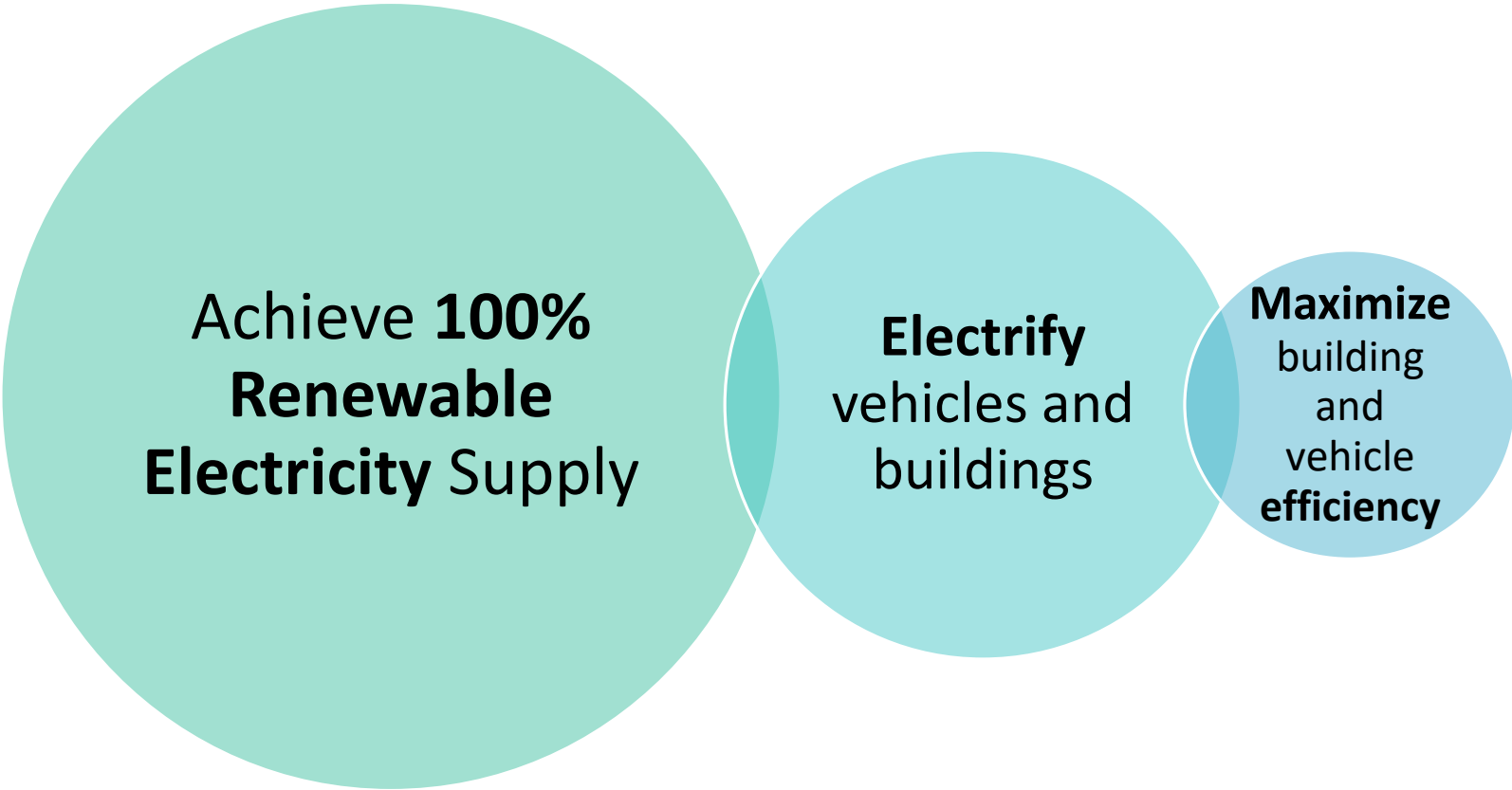
Climate Emergency (July 2019)

“Incremental linear changes to the present socioeconomic systems are not enough to stabilize the Earth System.

Widespread, rapid and fundamental transformations will likely be required to reduce the risk of crossing the threshold and locking in the Hothouse Earth pathway...”

Steffen et al. *Trajectories of the Earth System in the Anthropocene*. PNAS Journal vol 115. No 33.

Energy Action—3 Major Actions



**Achieve 100%
Renewable
Electricity Supply**

**Electrify
vehicles and
buildings**

**Maximize
building
and
vehicle
efficiency**

What's the Big Deal about Methane “Natural” Gas?

65% of the wells in Boulder County leak

8X increased risk of cancer

30% increased indoor air pollution

84X the Impact of CO₂

Natural Gas Reduction Goals

	2015	2020	2030	2050
Reduction in Residential Natural Gas	1%	15%	40%	85%
Reduction in Commercial and Industrial Natural Gas	5%	6%	15%	35%

Replace

Replace all building systems that rely on fossil fuels, particularly heating and cooling systems and water heating. In other words, switch from natural gas equipment to electric equipment, such as air, water or ground-source heat pumps.

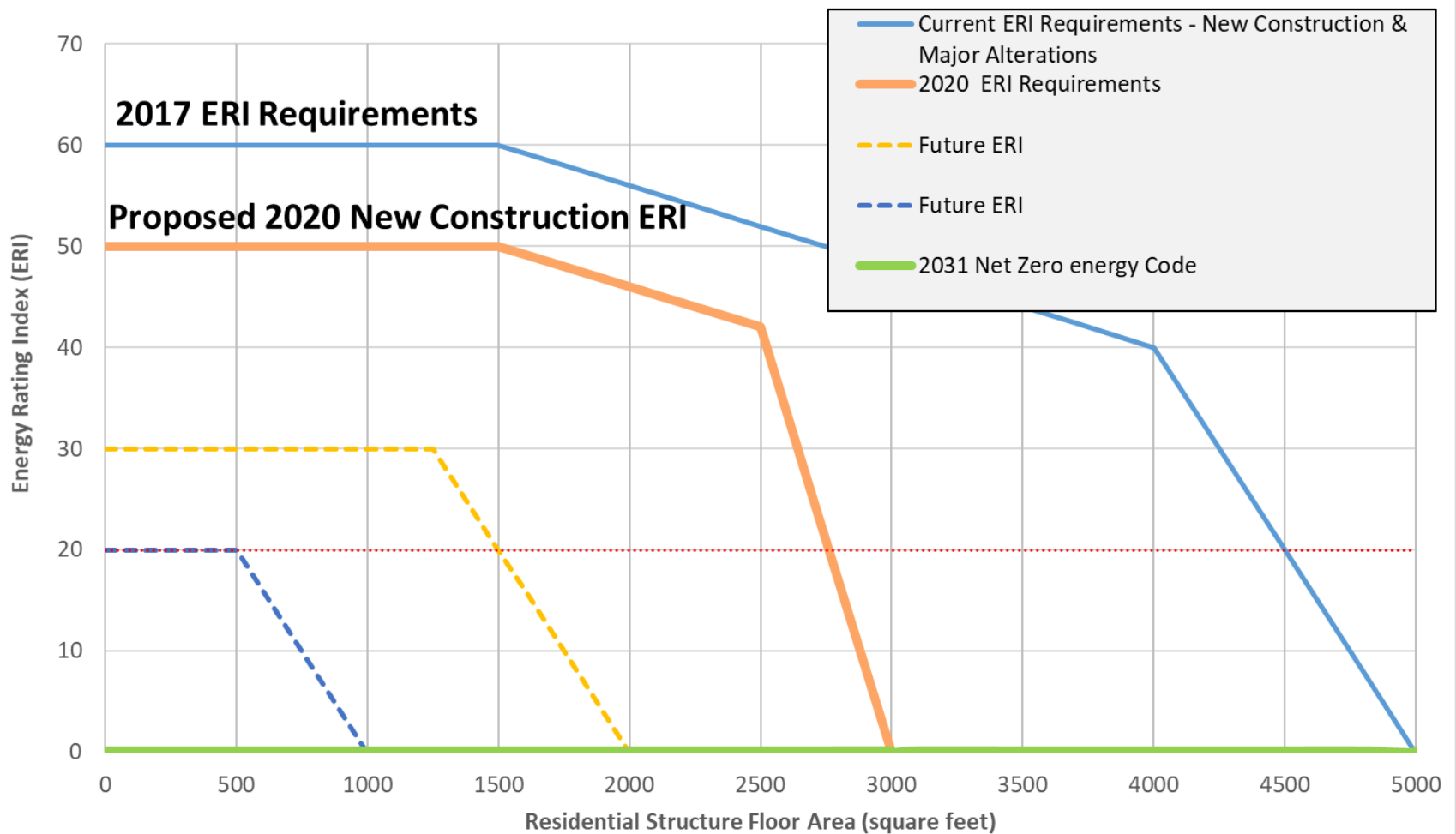


Building Codes

- ▶ Net zero for all new construction by 2031
 - ▶ New Construction
 - ▶ Major Renovations
- ▶ Solar-ready and EV requirements



RESIDENTIAL BUILDING CODES



Tackling Existing Building Stock

World's Leading Heat Pump Manufacturers



Haier



Panasonic

DAIKIN

STIEBEL ELTRON

FUJITSU



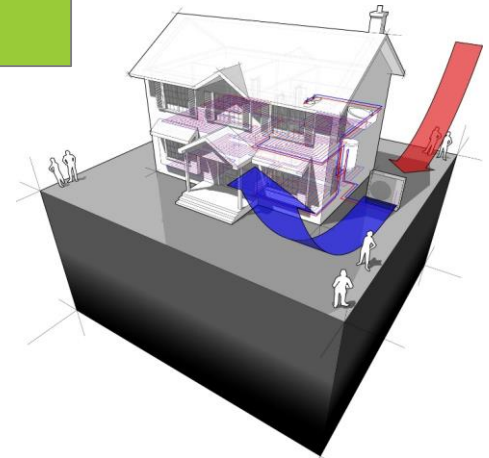
Leading US Cities



City of Boston
Martin J. Walsh, Mayor
Department of Neighborhood Development
Sheila A. Dillon, Chief and Director

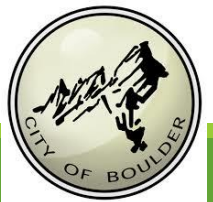
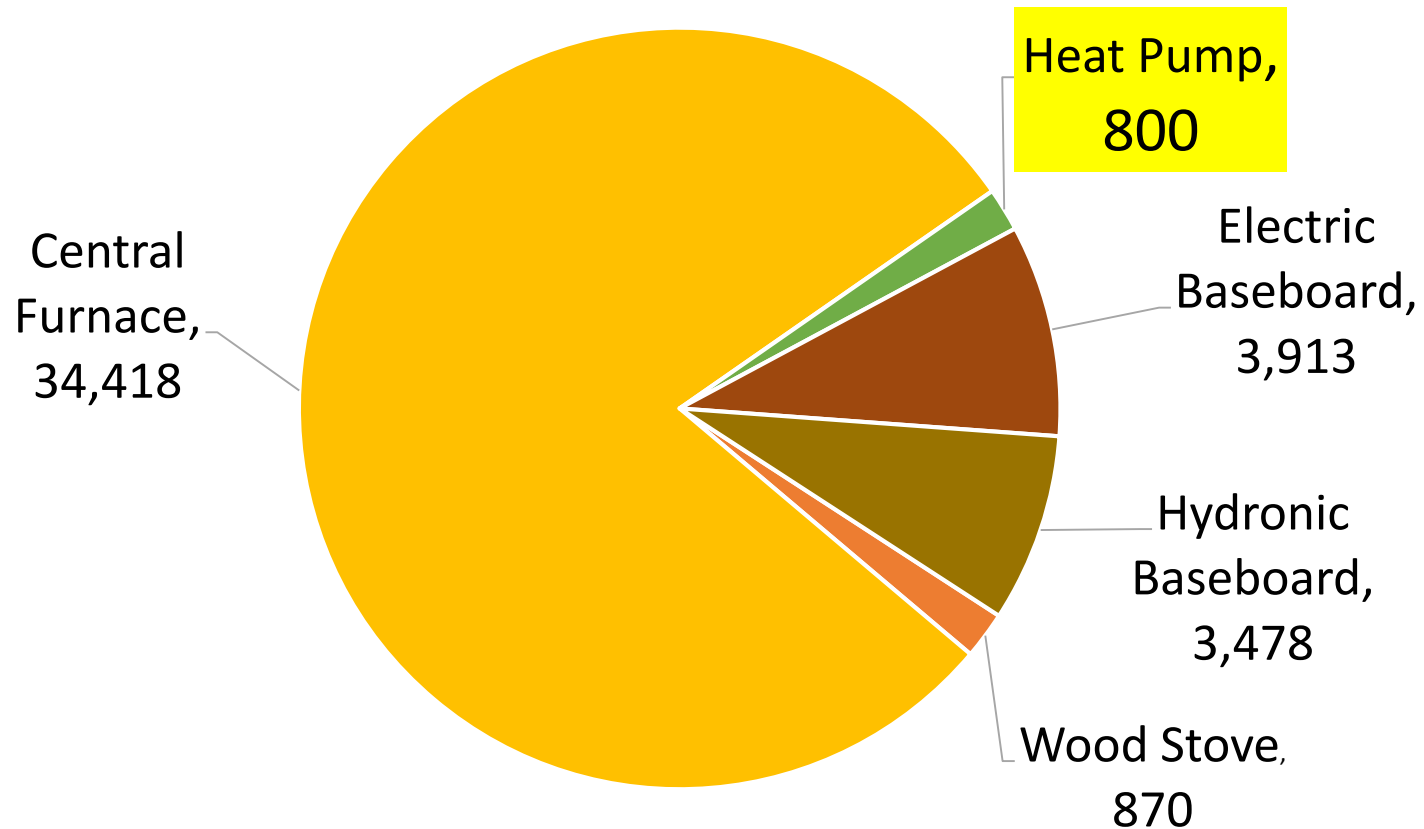


Washington
DC



Large-Scale
Adoption
Market
Transformation

Current Projected Heating System Demographics



Natural Gas Appliance Replacement Campaign

<https://vimeo.com/239169109>

Boulder Renewable Cooling & Heating Campaign

A Better way to cool and heat your home

- » **Enhanced comfort.** High-efficiency electric heat pumps give you more control over the comfort levels in your home.
- » **Health.** Burning natural gas (methane) inside our homes can create indoor air pollution that is dangerous to our health
- » **Flexibility.** Heat pumps are a flexible technology that can be installed in buildings of all shapes and sizes with different needs.
- » **Efficient heating and cooling.** Heat pumps provide heating and cooling in the same system.
- » **Lower your carbon footprint.** Heat pumps can be powered by renewable electricity like wind or solar
- » **Rebates available now !**



Boulder Heat Pump Marketing Campaign

COMFORT365
RENEWABLE COOLING & HEATING

COMFORT365
RENEWABLE HEATING & COOLING

3 Phase Campaign

Spring—Cooling focus with push on true greens

Summer—Neighborhood focus

Winter—Heating focus



	Incentive amount			
Entities	HP Heating/Cooling	Efficiency Levels	HP Water Heaters	Efficiency Levels
City of Boulder	Cold Climate Rated Up to \$400	HSPF ≥10/EER ≥12.5/SEER≥18/COP ≥ 1.75@5 ° F.	Up to \$250 of the total project cost	Must be rated minimum of 2.00 Energy Factor.
	Non-Cold Climate Up to \$250	HSPF ≥9/EER ≥12.5/SEER ≥16 Maximum rebate amount per home.		
Boulder County	Cold Climate Rated 25% of project cost up to \$350	HSPF ≥10/EER ≥12.5/SEER≥18/COP ≥ 1.75@5 ° F.	Receive 25% of project cost up to \$250	Must be Energy Star certified
	Receive 25% of project cost up to \$200	HSPF ≥9/EER ≥12.5/SEER ≥16 Maximum rebate amount per home.		
Xcel	\$300		\$450	
Mitsubishi	\$300			

~\$1,000-\$1,400

~\$900

Bundled Measure Pilot

Residential Roadmap to Renewable Energy Living

*Upgrading your household energy system
towards a sustainable energy future*



Jennifer & Keith Harper
2825 La Grange Cir, Boulder, CO 80305

Up to an addition \$1500

A Theory of Change

ENERGY SYSTEM CHANGE =

Awareness + Compelling Alternatives +

Adoption Support + Status Quo Friction + Social Norms

Comfort 365 Electrification Campaign



**Increased
annual
adoption by
~300%**

Challenges:

- Not all systems get permitted
- Not everyone went through rebate program
- High system cost
- Limitations of technology choices

The Challenge: The Daunting Up-Front Cost of Transition



EE Retrofit

\$5,000



Appliance
Replacement

\$18,000



PV Install

\$15,000

Total
Household
\$38,000

All 18,000 Boulder Single Family Households
\$684,000,000

What comes next?

Rebates and Voluntary Programs Insufficient

- » **Continued Awareness Campaigns and Rebate Programs**
 - › Grow awareness of technology
 - › Intercept people at decision points
- » **Focus On Breaking Down Financial Barriers**
 - › State-level policy changes
 - › Partnerships for energy services
 - › TBD



Thank You!

Carolyn Elam

Energy Manager, Climate Initiatives

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COMMUNITY CAMPAIGNS FOR RENEWABLE HEATING AND COOLING TECHNOLOGIES: HEATSMART MASS

Meg Howard
Program Manager
July 29, 2019



HEATSMART MASS MOTIVATION

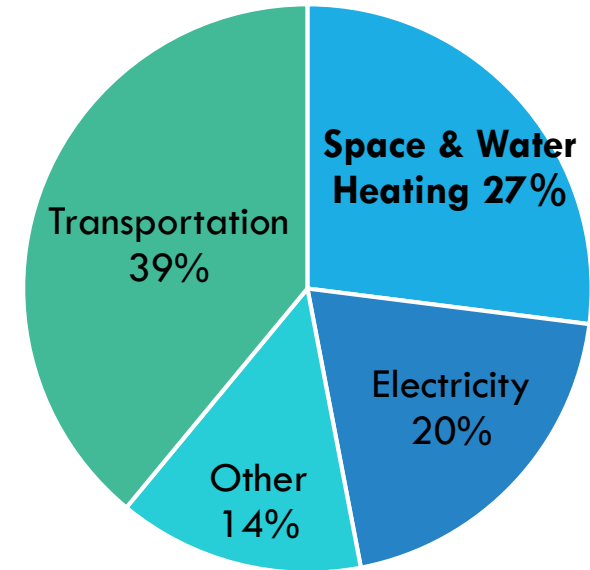
Space and water heating represent a significant portion of the emissions in MA

Massachusetts Comprehensive Energy Plan (Dec 2018) shows need for clean heating and cooling adoption

Lack of awareness of these technologies

Can we replicate the successes of Solarize Mass?

MA GHG Emissions



Comprehensive Energy Plan: “The recommendations and analysis produced in this plan illustrate a changing energy landscape that will require a focus on energy efficiency improvements and **the utilization of electricity to heat our homes** and power our transportation sector,” said **Governor Charlie Baker**.

TIMELINE OF COMMUNITY CLEAN ENERGY PROGRAMS IN MASSACHUSETTS

- **2011:** MassCEC launches Solarize Mass
- **2017:** Carbon Neutral Cities Alliance (CNCA) funds five New England renewable thermal community campaigns (including HeatSmart Northampton)
- **2017:** MassCEC launches Solarize Mass Plus
- **2018:** Massachusetts Clean Energy Center launches HeatSmart pilot with four partner communities, using same technical consultant as CNCA campaigns (Cadmus)
- **2019:** Ongoing second round of HeatSmart Mass with four additional partner communities



HEATSMART MASS MODEL



MassCEC/ DOER

- Town RFPs
- Engage tech. consultants
- Manage Installer RFPs
- Marketing/ Education

Community Organizers

- Installer Selection
- HeatSmart Coach
- Municipality
- Volunteers
- Outreach

Community Members

- Sign up for a Site Assessment
- Home Energy Audit & efficiency upgrades
- Talk to neighbors!

Installers

- Free Site Assessments
- Pricing
- Contracting
- Installation
- Servicing & Maintenance

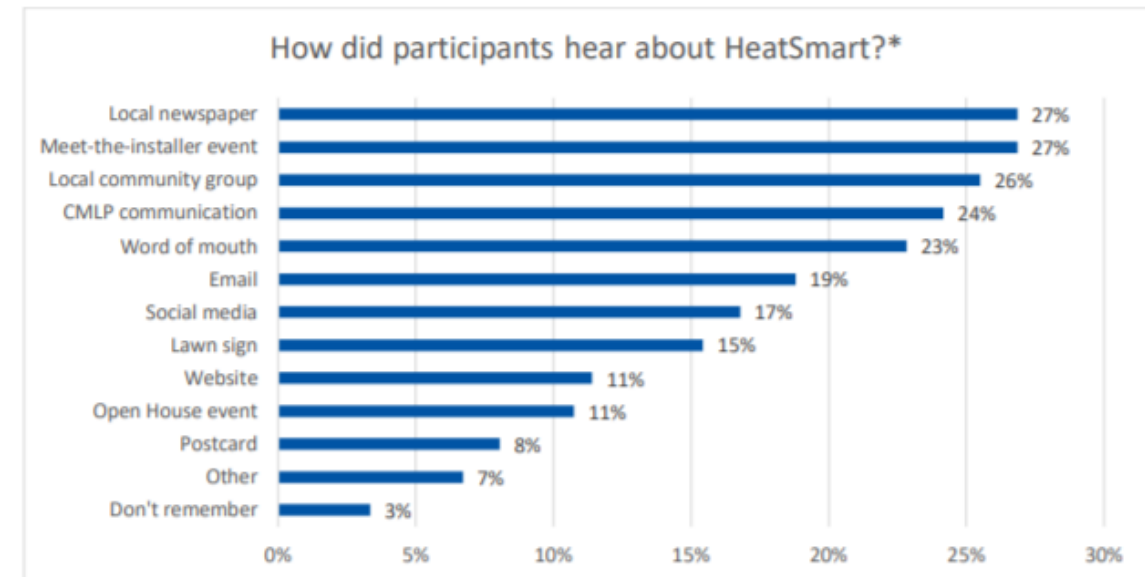


OUTREACH STRATEGIES

Varies by community!

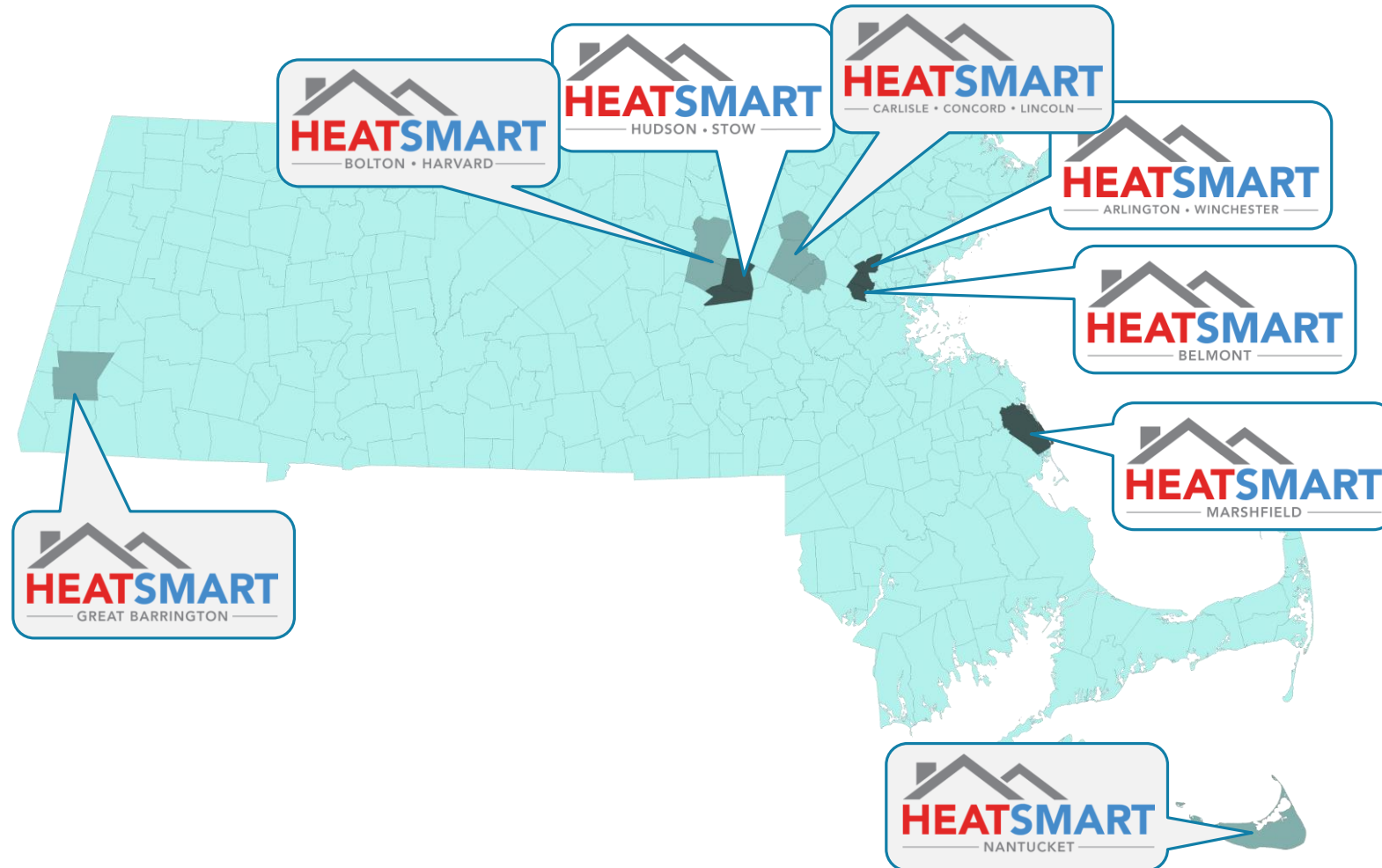
Some successful strategies included:

- Meet the Installer Night
- Website
- Outreach through community groups
- Social Media (including ads)
- Traditional media
- Mailers and utility bill inserts
- Tabling at farmers markets, town days, other events
- Banners and lawn signs
- Open houses



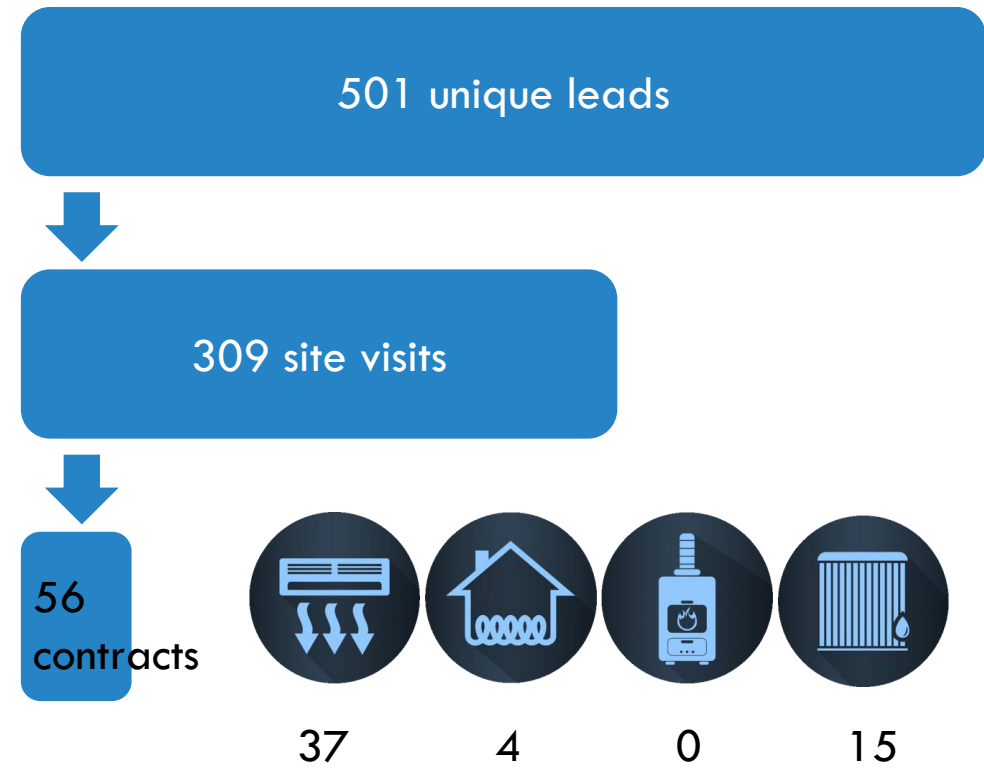
*149 respondents across the three communities. Totals exceed 100%, as respondents were invited to choose all that applied.

MAP OF PARTICIPATING COMMUNITIES

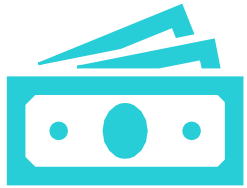


PILOT RESULTS

2019 COMMUNITIES (AS OF 7/19/19)



HEATSMART PILOT IMPACTS



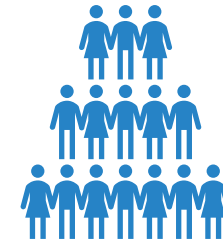
Target: 15% project cost reductions compared to state average

**Result: +7-47% of statewide average
+/- 3% of regional average**



Target: 10% contract closure rate

Result: 17% contract closure rate



Target: Double the number of residential CH&C projects contracted in each participating community during the Program relative to all prior MassCEC rebate awards in that community for the selected technologies.

Result: 58% increase in HeatSmart contracts vs. 2015-2017 rebates

HEATSMART PILOT IMPACTS



3.5% of households participated



Participants went from not very/somewhat knowledgeable (2.5 out of 5) to knowledgeable (4 out of 5)

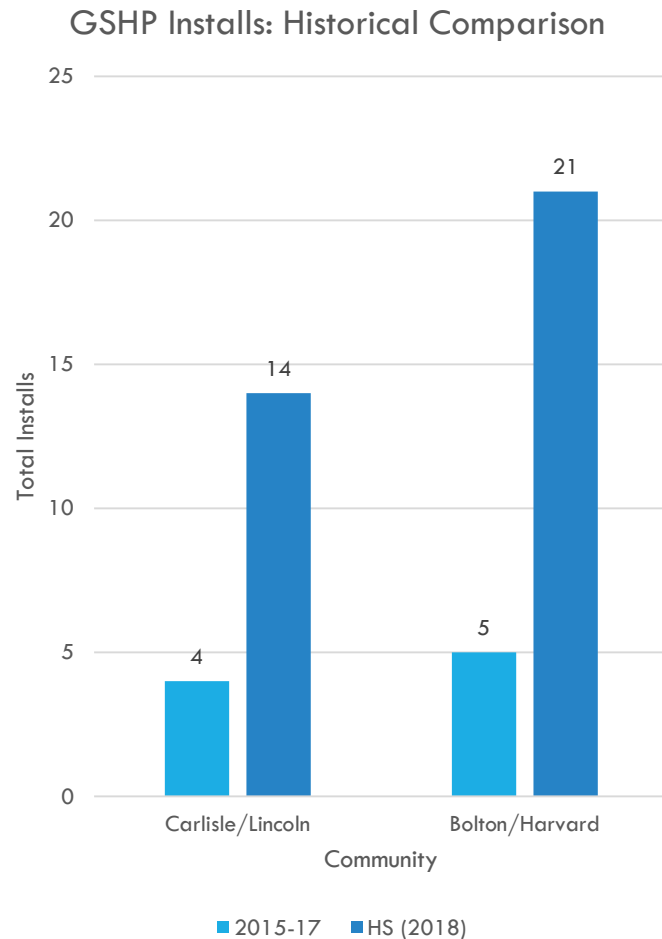


80% of contracted participants said the vetted installer and equipment were very important



7,062 MtCO₂eq lifetime reduction
Equivalent to taking 67 cars off the road annually

SUCCESS STORY: GROUND-SOURCE HEAT PUMPS

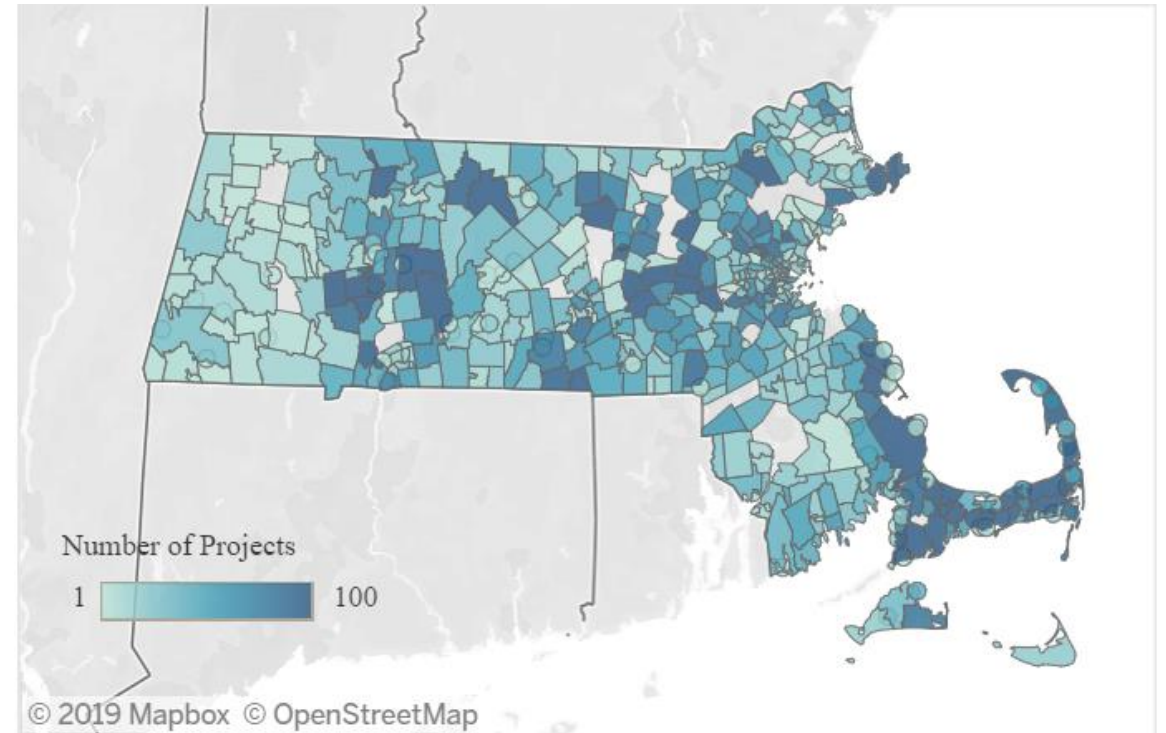


- Initially, no pilot communities selected GSHPs
- MassCEC encouraged Bolton-Harvard and Carlisle-Concord-Lincoln to promote GSHPs.
- 35 GSHP contracts (30% of all contracts)
- For some communities, education around GSHPs can make a big difference!

LESSONS LEARNED: FINDING INSTALLERS

Difficult to find installers in some areas

- Initially had no air-source heat pump installers respond to Great Barrington and Nantucket
- Less of an installer base in some parts of the state
- HVAC installers see less value in this type of program than PV installers
- Seasonal nature: Installers at full capacity in the summer
- Approach for Round 2: We did installer outreach earlier in the process. Less of an issue for location of Round 2 communities.

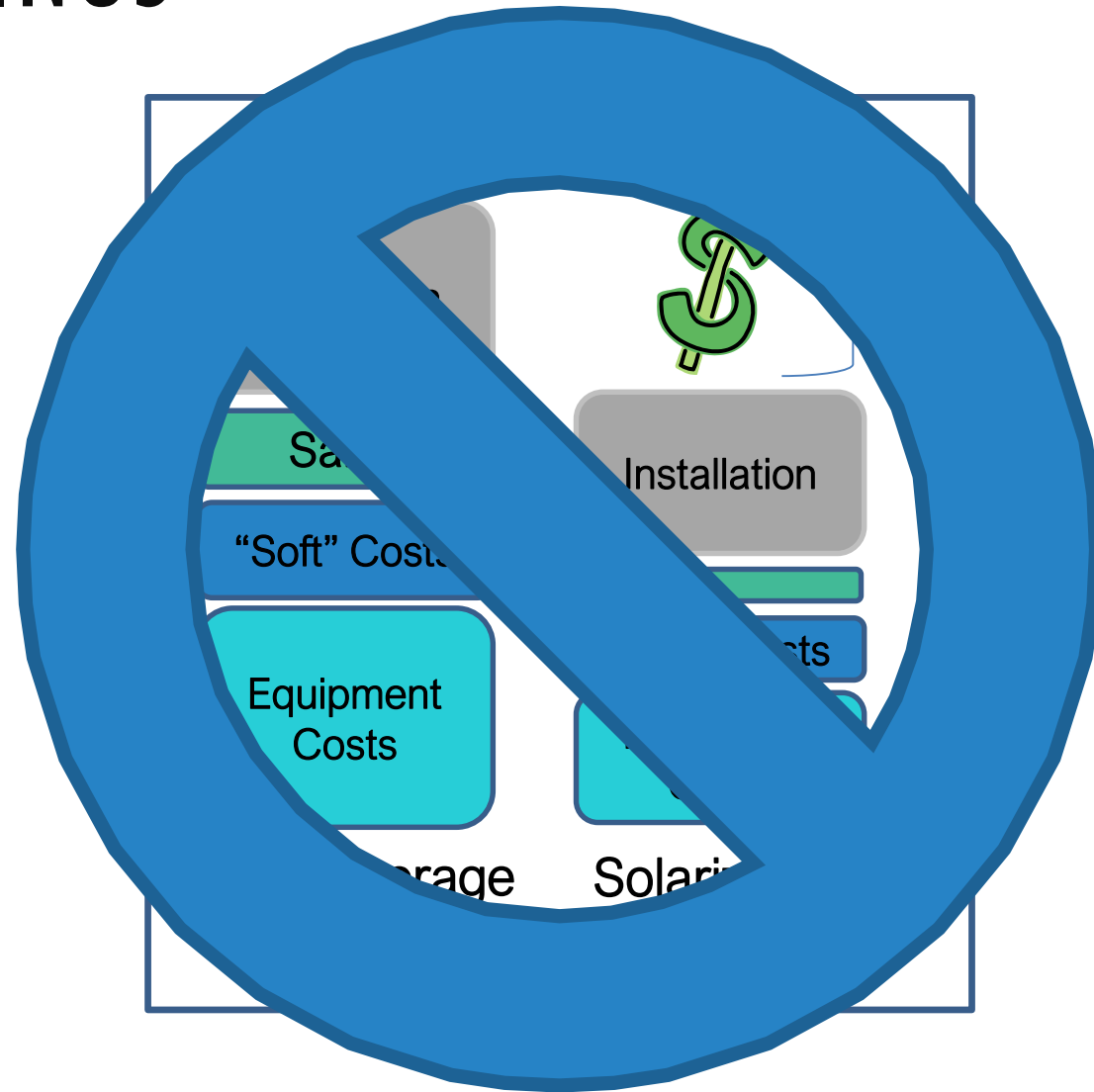


MassCEC's air-source heat pump rebate data shows that certain parts of the state had a higher concentration of rebate applications.

LESSONS LEARNED: COST SAVINGS

Did not achieve cost savings

- Regional costs of labor
- Community members prioritized quality during installer selection
- Less ability to get discounts from bulk purchasing
- HVAC industry has lower customer acquisition costs
- Pilot communities opted for more adders
- Approach for Round 2: Reframe the program and try to manage expectations.
 - Transparent pricing
 - Vetted installer: Top quality installers at about regional average prices



LESSONS LEARNED: STANDARDIZING PRICING

Difficult to standardize prices

- Does not align with industry practice
- Projects really are unique and more individually engineered than PV projects.
- Approach for Round 2: We had a better sense of which adders would be used so we could require prices on certain adders, which made it easier to evaluate installer proposal

Attachment B. 2019 HeatSmart Mass: Pricing, Cost Adders, and Equipment Form - Ground-Source Heat Pumps				
Instructions:	Please provide costs for the adders below and indicate whether you expect it to be a high-use adder. Costs for adders can be given as a range. If you do not plan to offer an adder for a project factor, you may keep it blank. Applicants can list other adders under the "Other" section heading. If selected, an installer may alter the list of approved cost adders during the course of the HeatSmart Mass program upon review and pre-approval by MassCEC's technical consultant.			
Factors	Adder (\$)	Adder units (if applicable)	High use adder? Please indicate if over 50% of systems will require this adder (Y/N)	Notes on Cost Adder
Ground Loop				
Additional borings needed for a closed-loop vertical system (beyond the base scenario)	\$800+	Per Borehole	N	Adder covers cost of additional 40' of casing only.
Additional borehole depth for a closed-loop vertical system (beyond the base scenario)	\$22	Per Foot	N	
Additional SCW well depth needed (beyond the base scenario)	\$22	Per Foot	N	
Open loop diffusion/recirc (instead of the standard SCW) configuration	NA	Per Project	N	
Additional horizontal piping length needed (beyond base scenario)	NA	Per heating ton of peak heating load	N	
Standing Column Pump Upgrades	NA		N	
Trenching cost to connect Vertical-Closed Loop, Horizontal-Closed Loop and Standing-Column-Wall from the well field to the home (beyond the base case scenario)	\$50	Per Foot	N	If distance is greater than 100' from the house.
Heat Pumps/Distribution				
Multiple heat pump types (i.e. water to water and water to air)	\$6,000 to \$20,000	each	N	Site specific.
Internal distribution upgrades (i.e. new ductwork)	\$3,100 to \$3,600	per ton	Unknown	Site specific.
Monitoring system	\$800 to \$1,600	per home	N	Varies depending on type and quantity of equipment installed. Customer must provide well connection.
Geopipe/water	\$500	each	Y	
Heat or Energy Recovery Ventilator	\$3,500	each	N	
General				
Removal of existing oil tank	NA			EnergySmart will assist homeowner in finding a suitable company to complete this task.
Variable speed circulator pump	NA			Only offered with Variable Speed equipment listed below.
Other				
Upgrade to Nest thermostat	\$180	each	N	
Ductwork modifications to fit new GSHP unit onto existing ductwork	\$1500 to \$3000	per air handler	Y	Varies depending on condition of existing ductwork.
Upgrade to Water Furnace Variable Speed geothermal heat pump	\$6,300	per heat pump	N	May not be appropriate for all homes.
Additional casing beyond 40'	\$18	per foot	Unknown	Casing to depth of bedrock is required for all closed loop systems.
Subsoil	\$422	each	N	Recommended for G2 and G22 models of heat pumps to prevent light leakage. Needs to be factory installed.
Electrical service upgrade	\$1,000+	per home	N	Where home's electrical service is not sufficient to support the proposed GSHP equipment.
Deaerating	\$2,500 plus \$0.18/gallon	per home	N	
Wellhead	\$500	per home	N	
Conservation Commission Storage	\$1,500+	per home	N	May be required if drilling area is within wetland boundaries.
Sand bedding for horizontal trenching	\$100	per yard	Y	Quantity of sand depends on site conditions and distance between boreholes and house.
Payment via credit card (Visa or MasterCard only)	up to 3.5%	per transaction	N	Check is the preferred method of payment but some homeowners may wish to pay with credit card.
ADD zoning to new ductwork	\$3,200+	per additional zone	N	Varies by project.
Removal and disposal of existing air handlers, condensers, boiler only	\$1,100 to \$2,500	per house	Y	Does not include: radiators, steam pipes, hot water lines.

LESSONS LEARNED: DIFFERENT VALUE PROPOSITION THAN PV

Economics of heating with clean heating & cooling technologies vary depending on previous heating fuel.

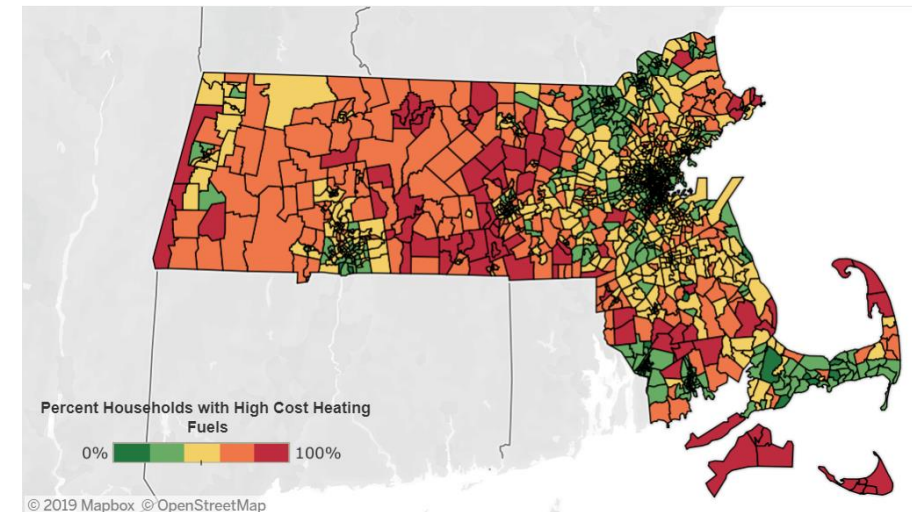
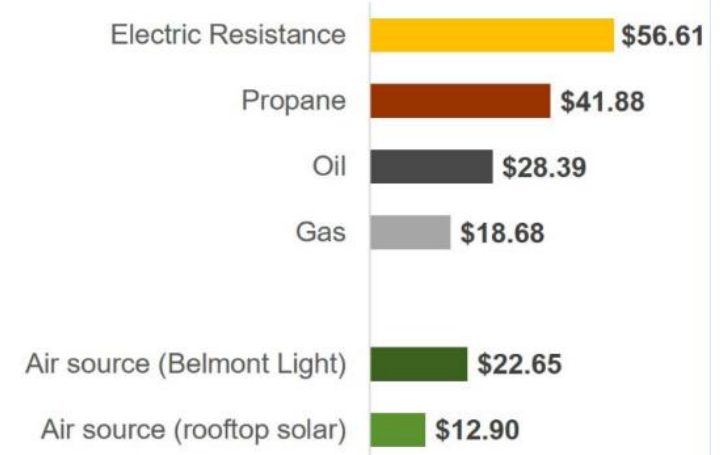
Natural gas is generally a more cost-effective heating fuel.

Unlike PV (with current MA incentives), clean heating & cooling cannot be sold as a pure investment.

Approach for Round 2:

- Continue to target high cost heating fuel households
- Focus on other benefits of the technologies (improved comfort, zoning, environmental)

Heating fuel costs (\$/MMBtu)



LESSONS LEARNED FROM THE PILOT

Area for improvement: integrating with energy efficiency

Valuable learning for MassCEC to identify adoption barriers

- E.g., electrical service upgrades
- Skepticism from local “energy influencers” (led to myth busting event)
- Better understand workforce and supply constraints
- Better understand what is driving (or delaying) consumer decisions

Summary: The program design generally works well in some communities, but is less effective in others. MassCEC continues to refine our approach to better serve more communities.

Upcoming Webinar

Community Campaigns for Renewable Heating and Cooling Technologies, Part 2

Monday, August 5, 2-3 pm ET

Read more and register at: www.cesa.org/webinars

Thank you for attending our webinar

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