

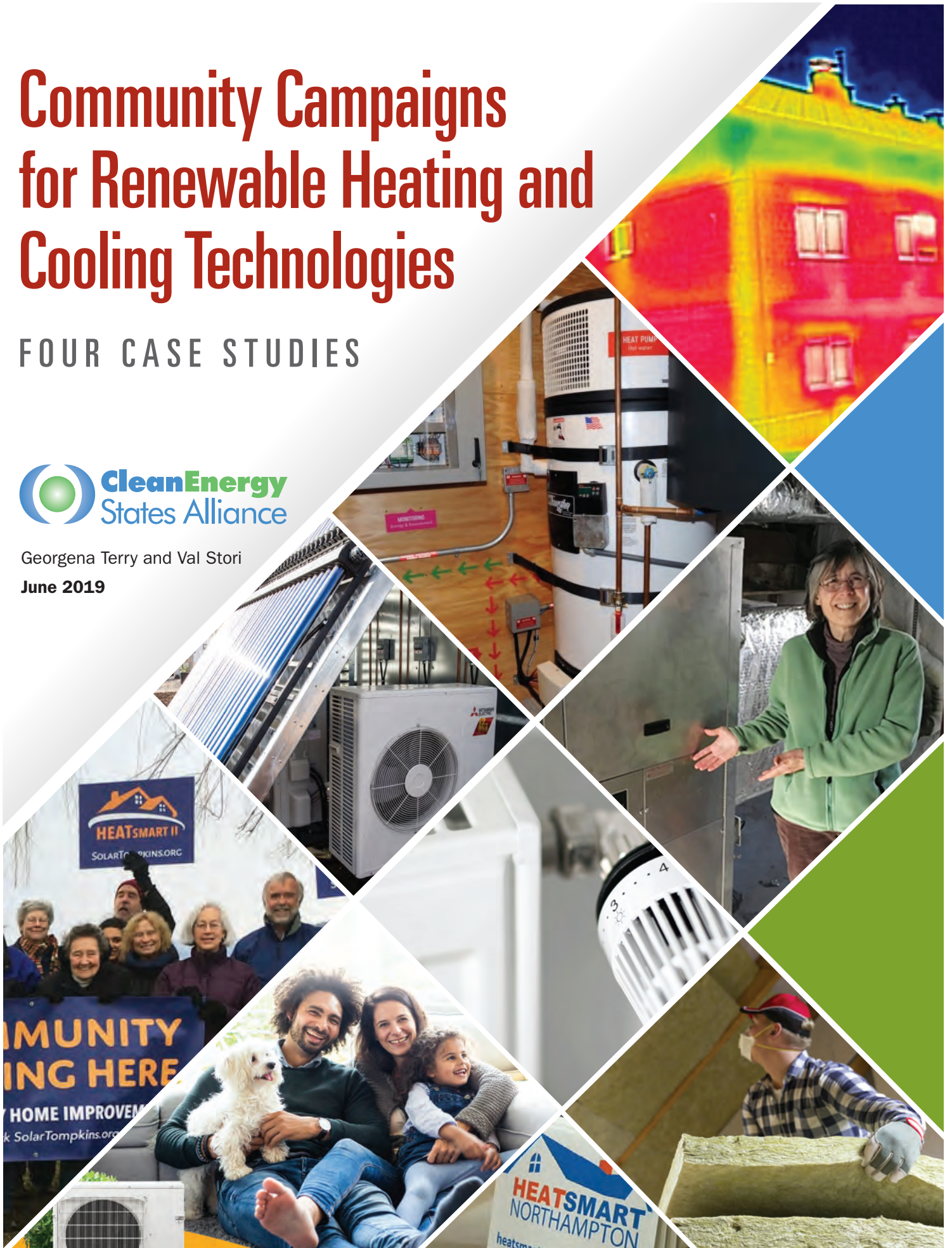
Community Campaigns for Renewable Heating and Cooling Technologies

FOUR CASE STUDIES



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June 2019



About this Report

This summary document was developed by the Clean Energy States Alliance (CESA), a national, nonprofit organization, to highlight several community-based Renewable Heating and Cooling (RH&C) programs in four states. CESA's Building Electrification through Renewable Heating and Cooling project works with its member states to evaluate RH&C technologies and to develop policies and programs that support best practices to further develop the market for renewable thermal technologies.

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Introduction

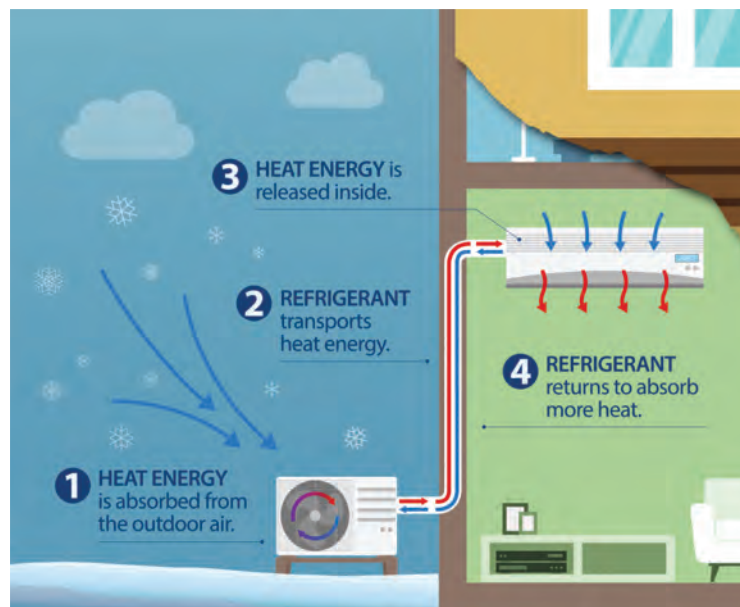
Renewable heating and cooling (RH&C) community campaigns aimed at homeowners and small businesses encourage the installation of renewable thermal technologies for space heating and cooling or for hot water heating through targeted local out-reach efforts and, often, with bulk discount prices. Such campaigns have been piloted across the country, mainly as one-off, group-purchasing programs initiated by municipalities on the leading edge of climate change action. Most have occurred in the Northeast.

This report describes the reasons for, and development of, community-based RH&C campaigns by featuring four case studies of some of the earliest community-led efforts. Although the overarching strategy is the same, each campaign is unique, tailored to meet the needs of its community. The four communities—Boulder (CO), Northampton (MA), Peaks Island (ME), and Tompkins County (NY)—demonstrate the diversity of approaches for organizing, running, and funding community campaigns. They are at the vanguard of reducing thermal energy consumption and associated emissions reductions through the widespread installation of residential and small-scale commercial RH&C equipment. These early programs can serve as guides for program design and can provide multiple “lessons learned” for launching future campaigns.

The Need to Address the Thermal Power Sector

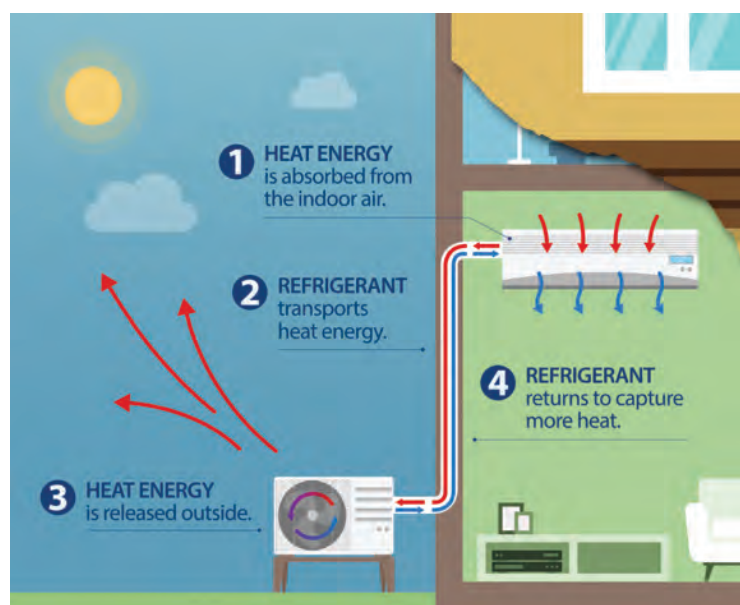
Forty-two percent of the energy used in US homes goes to space heating. Space and water heating combined account for approximately 65 percent of overall home energy use and are primarily served by fossil fuels. Approximately 11 percent of greenhouse gas emissions in the US come from the heating sector. Displacing fossil-fuel heating, especially those systems using oil and propane, is essential for states and cities to achieve their long-term energy and climate goals. RH&C technologies such as air source heat pumps

Figure 1
How an Air Source Heat Pump Works in the **Winter**



Source: Michigan Electric Cooperative Association (MECA)

Figure 2
How an Air Source Heat Pump Works in the **Summer**



Source: Michigan Electric Cooperative Association (MECA)

(see Figure 1 and Figure 2), ground source heat pumps, solar thermal systems, heat pump water heaters, and advanced biomass pellet boilers can use renewable energy sources to provide space heating and cooling and domestic hot water. These technologies can be used for whole home applications or for supplemental heating and cooling.

Transitioning the thermal power sector to RH&C technologies would lead to significant greenhouse gas emissions reductions and help states achieve their climate goals. In addition to this environmental benefit, investing in RH&C systems can stimulate economic development and local job creation.

Polymakers have given much less attention to renewable thermal than to renewable electricity technologies, such as solar photovoltaics (PV) and wind. Even when there are favorable policies, RH&C technologies face market barriers beyond those faced by renewable electricity. For one thing, renewable heat must be used on-site (or very near site). Second, renewable thermal technologies mostly produce low-temperature heat, whereas some heating processes require high heat. Third, the cost of the fossil fuels used in the thermal power sector is currently low. Lastly, beyond these

technical barriers, the public has little awareness of RH&C technologies. For all these reasons, the renewable thermal market has remained relatively dormant.

Applying Group Purchasing and the Solarize Model to RH&C Campaigns

The cities and towns highlighted in this report have designed, implemented, and managed group-purchasing community campaigns to encourage the adoption of RH&C technologies. These campaigns go by several names, most commonly by “HeatSmart,” and are sometimes referred to as “thermalize” programs. They are modeled on the successful residential “Solarize” campaigns that increased solar PV sales and reduced system costs through bulk-purchase discount pricing for the solar panels and community-engaged outreach to expand the customer base. Solarize campaigns have been successful at reducing market barriers, expanding the potential market for PV, speeding up solar project installation contracts, and driving down the cost of PV system installations.

Since 2008, the Solarize model has been widely replicated by communities across the country, receiving significant state and community-level support. It began in Portland, Oregon, with the Southeast Uplift



HeatSmart Tompkins held a meeting to launch its community campaign.

Neighborhood Coalition and the support of Energy Trust of Oregon, to help residents overcome the financial and logistical barriers to installing solar PV systems. The highly successful *Solarize Portland* program tripled the number of PV systems installed in Portland in just six months at costs 20 percent lower than the average system price.¹

Subsequent Solarize campaigns in other parts of the country have demonstrated the effectiveness of creating demand with cost reductions from community bulk purchasing of equipment and by coordinated local outreach to potential solar consumers. Solarize communities in Connecticut achieved 24–65 times the rate of new solar installations than over the previous seven years and at 20–30 percent of the cost.² Moreover, 20 percent of the households in Connecticut that installed PV systems through the Solarize program had never considered installing solar prior to the campaign.³ In Massachusetts, the number of solar PV installations more than doubled in participating communities as a result of Solarize campaigns.⁴

The Solarize model owes its success to a few simple strategies that have not only driven down costs, but also ensured installations of high quality:

1. Bulk/discount pricing
2. Program sponsorship and support by a trusted organization, such as a state energy office
3. An easy sign-up process
4. Consistent messaging and coordinated outreach activities
5. A limited sign-up period with deadlines for customer enrollment
6. A dedicated campaign leader and a team of community volunteers.

A decade of Solarize programs offers several lessons learned that can be applied to thermalize campaigns to increase the adoption of RH&C technologies:

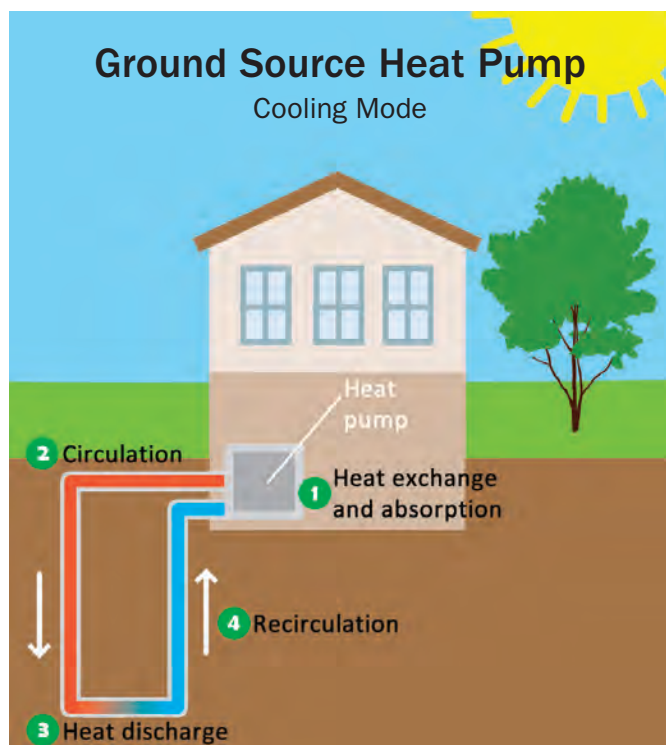
- **Promotional outreach campaigns are vital for creating visibility, but the type of outreach should be tailored to individual communities.** Some communities may respond well to media campaigns, whereas others may see more traction from peer-to-peer interactions such as through homeowner open houses.
- **A dedicated campaign coordinator is paramount.** Whether the coordinator is a volunteer or paid, she/he is instrumental for managing the program, organizing events, coordinating volunteers, and serving as a point-of-contact. Most Solarize campaigns have used municipal staff, a community member, or state energy office staff as the campaign coordinator.
- **Carefully vetting and selecting installers plays a key role in customer satisfaction** and in the program's ability to rapidly scale system deployments. An installer's lack of bandwidth can slow installation rates and damage consumer confidence.

Strategies to Transition Solarize Model to Thermalize

The four thermalize campaigns described in this report's case studies were envisioned to bring renewable thermal solutions to scale by providing outreach and motivation to residents. In addition, by stimulating the RH&C market, they led to local economic benefits, providing job opportunities for local installers. The campaigns sought to address several barriers to RH&C adoption through bulk purchase agreements and community outreach and education; these barriers include a lack of consumer awareness about RH&C technologies, high up-front equipment cost, insufficient installer/contractor base, and limited financing options.

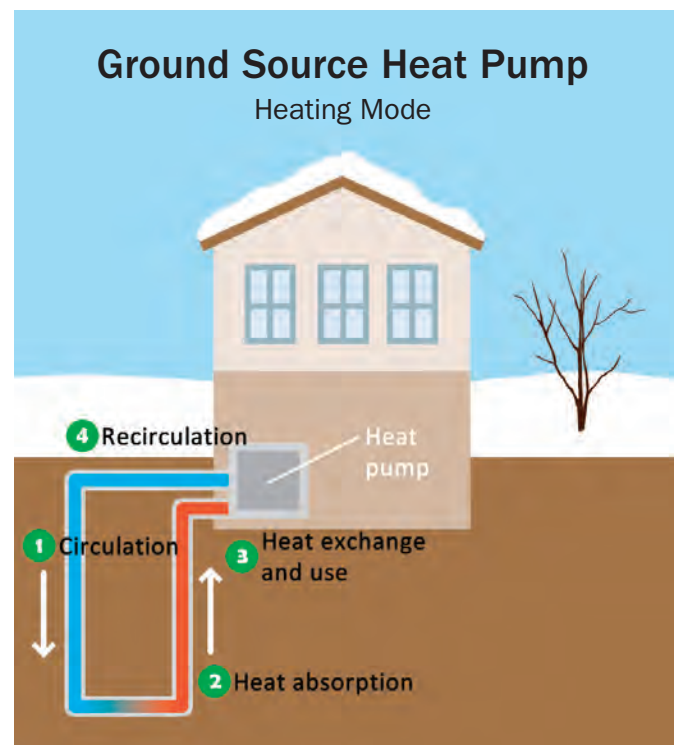
Thermalize campaigns have offered homeowners a variety of RH&C technologies: air source heat pumps, ground source heat pumps (see Figure 3 and Figure 4), solar hot water systems, heat pump water heaters, and advanced wood biomass heating. In addition, some campaigns have encouraged homeowners to consider energy efficiency improvements and home weatherization upgrades. For example, Peaks Island, Maine and Northampton, Massachusetts chose to offer only air source heat pumps; Boulder, Colorado offered air source heat pumps and heat pump water heaters; and Tompkins, New York offered energy efficiency improvements as well as air source heat pump and ground source heat pump installations.

Figure 3
How a Ground Source Heat Pump Works to Cool a Building



Source: EPA

Figure 4
How a Ground Source Heat Pump Works to Heat a Building



Source: EPA

Like the Solarize campaigns, thermalize campaigns are organized and managed by municipalities, counties, and community groups. These entities issue Requests for Proposals (RFPs) to select a qualified installer. This process allows a campaign to select an installer based on a set of desired qualifications and experience. Common installer eligibility requirements include a minimum number of previously installed units and references from several previous clients. Since bulk-purchase, discount pricing is a goal of thermalize programs, most installer RFPs include competitive bid requests as part of the eligibility criteria.

The town of Northampton, Massachusetts required that an installer be a “Primary Installer,” qualified to participate in and submit rebates to the Massachusetts Clean Energy Center’s Clean Heating & Cooling Program.⁵ It required installers to propose discounted fixed-fee costs for installations. The Peaks Island program did not include installer eligibility requirements, but in order for customers to take advantage of Efficiency Maine’s rebate, the installer had to be an Efficiency Maine Registered Vendor.

The four thermalize programs featured in this report had similar outreach strategies, but with slight variations. Modeled after the Solarize programs, they tended to target existing community networks. For example, HeatSmart Tompkins geared its initial outreach to the early clean energy technology adopters who participated in Solarize Tompkins. Similarly, the Northampton HeatSmart program focused its initial outreach on Solarize participants and Solarize campaign contacts; in addition, it relied on two active community groups—Mothers Out Front and Climate Action Now Western Massachusetts—to spread the word and coordinate volunteers. As the HeatSmart Northampton program matured, it relied on targeted housing data from an analysis of attributes such as building fuel type, age of heating system, age of building, and building type.

The City of Boulder used an outreach approach similar to Northampton for its Comfort365 Boulder initiative. Using data “scraping” software, the program identified homeowners with heating appliances reaching replacement age.⁶ The software also identified homeowners

Dennis Schroeder/NREL



Solar hot water system installed next to an air source heat pump.

likely to consider new clean heating and cooling equipment based on customer profiles that included demographic information, social indicators, median income, building characteristics, and previous energy efficiency measures.

Solarize campaigns generally run for a defined, limited period—usually three to five months. This creates a sense of urgency. Thermalize campaigns have largely followed this model, but early program feedback suggests that short time spans may not work for RH&C campaigns for two main reasons:

1. **Lack of consumer awareness**—consumers are unfamiliar with RH&C technologies and more time is needed to educate them about the technologies and their benefits; and
2. **Limited installer capacity**—RH&C installers tend to be extremely busy leading up to and during the heating season.

Initial Lessons Learned

The four case studies featured in this report have revealed some early lessons for planning and implementing thermalize campaigns.

Thermalize Challenges

The group purchasing, community outreach model is proving to be more challenging for RH&C technologies than for solar PV. Due to the growing demand for solar, Solarize campaigns were able to negotiate bulk discount prices for program participants. The early thermalize campaigns have not always been successful at providing cost savings to the participating consumer. The main reasons for the lack of bulk purchasing cost savings are twofold:

1. By offering a diversity of RH&C technologies for consumers to choose from, the potential to achieve scale and needed quantities for discounts for any particular technology is diluted; and
2. Even when equipment discounts were offered, unforeseen installation costs and heating system upgrades (i.e., upgrading electrical system to accommodate an air source heat pump) can add to overall costs.

The early thermalize campaigns, such as HeatSmart Tompkins, relied on an outreach strategy targeted to “low-hanging fruit”—Solarize program participants. But the ongoing challenge for thermalize campaigns lies in attracting new customers beyond those who have installed solar PV. Innovative customer targeting such as with Boulder’s customer segmentation (“scraping”) tool has the potential to provide valuable consumer contacts by identifying homes with heating equipment nearing replacement age.⁷

Additionally, thermalize programs face the added challenge of explaining all the eligible technologies, their potential applications, and the different incentives and finance options for each. The complexity of the various RH&C technologies—and how they integrate with



Get Your Greenbacks Tompkins works with HeatSmart Tompkins to help people reduce their building energy consumption in Ithaca, New York.

existing heating systems—is much more difficult to explain and understand compared to solar PV.

Need for Leadership by State Agencies

To develop the RH&C markets in their states to meet their clean energy goals, the Massachusetts Clean Energy Center (MassCEC), the Massachusetts Department of Energy Resources (DOER) and the New York State Energy Research and Development Authority (NYSERDA) are tapping into the power of community group purchasing with the launch of RH&C community campaign programs.

NYSERDA’s Clean Heating and Cooling Communities program is currently supporting eight community

campaigns with funding to implement outreach and education campaigns.⁸ Over the next five years, NYSERDA will periodically release solicitations for community-based organizations and local governments to apply. The most recent solicitation closed on October 30, 2018, and award announcements are expected in early 2019. The third solicitation is anticipated in 2019.

MassCEC is currently supporting 10 HeatSmart communities and is in its second year of campaigns.⁹ Unlike the NYSERDA program, only municipalities or groups of municipalities are eligible to apply. Selected municipalities are provided with a kick-off best practices guide to help them get their programs up and running. A second solicitation for HeatSmart communities closed in September 2018, and four community groups were chosen in the spring of 2019.

Both states' programs and their participating communities are documenting outreach and marketing strategies and convening roundtables and conference calls to encourage information sharing and lessons learned as the HeatSmart programs mature.

As thermalize programs gain in popularity and demonstrate success, it will be important to include low- to moderate-income households and other underrepresented groups, such as rental households. MassCEC offers an additional \$2,500 to participating HeatSmart municipalities whose median household income is below the state average. This affordable access adder may be used to prepare a specific outreach plan for low- and moderate-income residents and to execute the outreach.

NYSERDA's Clean Heating and Cooling Community Campaigns initiative also seeks to increase low- to moderate-income household participation. It offers awards of up to \$300,000 to communities that propose strategies for increasing the participation of those households.

Need for Program Evaluation Data

Two of the four communities highlighted in this report provided follow-up surveys to all program enrollees. (Anyone who expressed interest in the program and signed up to receive information is a program enrollee regardless of whether he/she installs a heat pump or

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Renewable heating technologies pair well with low-temperature radiators.

other efficiency measure.) Program evaluation data—whether gathered through a survey, equipment performance test, or other means—is essential for developing consumer confidence in RH&C equipment and in the HeatSmart program. Program evaluation can range from the basic assessment of the outputs and activities of the program, such as who participated (what segment of the community, percentage of low-income participation, etc.), to how many efficiency measures were installed. These types of evaluation data are useful for future program activities. In addition, program evaluation should measure how well the program met its objectives. Evaluation questions to consider include:

- Did the program lower costs for consumers?
- Was the equipment properly installed?
- Did the equipment perform as expected?
- Is the program having an impact on carbon reduction or on fossil fuel consumption?
- Did the program grow the installer base?

Need for Effective Communications and Outreach Strategy

Community campaigns rely on community-driven and community-led outreach. As shown in the case studies, several strategies have been implemented, ranging from neighbor-to-neighbor outreach, to tabling at community events, to social media networks. Because

each community is unique, understanding the needs of a community and tailoring outreach efforts to meet the community's needs is a successful strategy. The bigger the program or the larger the community, the more it may make sense to hire a marketing firm to develop an outreach plan and community-specific marketing materials. Partnering with existing groups, including equipment dealers and installers, is also a useful strategy for reaching an engaged audience. For example, Northampton's campaign worked with the group Mothers Out Front to reach a broader and engaged audience. And Boulder worked with heat pump manufacturer Mitsubishi on outreach materials to further promote the technology.

Champions Needed to Educate and Recruit New RH&C Customers

Regardless of community size, champions are needed to promote RH&C technologies and attract new customers. The small and large community campaigns in these case studies relied on volunteers and/or paid staff to raise awareness of the RH&C technologies and of the opportunity to participate in the community campaign programs. The Peaks Island campaign, for example, was spearheaded by one volunteer in that community. Other campaigns, such as the Northampton campaign, relied on community volunteers to be the "boots on the ground." These volunteers went door-to-door throughout the community, approaching homeowners identified as high-value potential customers. Community champions in the HeatSmart Tompkins program held open-house tours so their neighbors could see the RH&C technologies in action.

Need for Financing and Incentives

Energy efficiency measures and the installation of air source heat pumps, ground source heat pumps, and advanced biomass pellet boilers qualify for a variety of federal and state rebates and loans. Grants and incentives are valuable finance tools for homeowners and can significantly reduce costs, making the rate of return on investment more attractive for consumers.

Thermalize programs are effective strategies for raising consumer awareness of RH&C technologies and can help build a local installer base. These programs will be critical for driving the market adoption of RH&C technologies and for helping states meet their clean energy and carbon reduction goals.

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Attic insulation being added for energy efficiency.

Case Studies

The four case studies that follow should inform interested communities and state agencies about program design and implementation as they consider developing similar RH&C campaigns and programs.

Boulder Comfort365 Case Study

PROJECT NAME

Comfort 365

LOCATION

City of Boulder and Boulder County, CO

SIZE OF COMMUNITY

Boulder County: 322,514; Boulder City: 107,125. (U.S. Census Bureau estimate, July 1, 2017)

YEAR(S) IMPLEMENTED

April 2018–April 2019. Two campaigns were initiated. The first campaign focused on the cooling aspect of heat pumps; the second focused on the heating aspect.

TYPE OF THERMAL SYSTEM(S) OFFERED

Air source heat pumps

NUMBER OF SYSTEMS INSTALLED

66 air source heat pumps (2018, estimated)¹⁰

CAMPAIGN TEAM

City of Boulder and Boulder County's EnergySmart Program in partnership with Xcel Energy, Longmont Power and Communications, and heat pump manufacturers, primarily Mitsubishi dealers. Mitsubishi is a major partner in the Comfort365 program.

INSTALLER

Mitsubishi vendor companies

WEBSITE

<https://bouldercolorado.gov/climate/comfort365>

Program Summary

Boulder's Comfort365 program offers residents a way to explore options for using air source heat pumps for heating and cooling. The City of Boulder and Boulder County spearheaded the program, providing free one-on-one time with personal energy advisors, access to a broad array of incentives and rebates, and assistance evaluating bids from pre-qualified, vetted contractors.

Boulder estimated that prior to the Comfort365 program, air source heat pumps were being installed at the rate of 10–15 per year. In 2018, the program set a goal of 20–45 installations and achieved 66 installations. The 2019 goal is 120 installations.

Boulder's Climate Change Efforts

The City of Boulder and Boulder County are leaders in responding to climate change and reducing their energy and carbon footprint. The City has had a long-standing commitment to addressing climate change. In 2002, the City Council passed the Kyoto Resolution to lower

City of Boulder



Campaign advertising air source heat pumps for Boulder's Comfort365 program.

greenhouse gas (GHG) emissions to seven percent below 1990 levels by 2012.¹¹ It then adopted a Climate Commitment in 2016, identifying goals and action areas in energy, resources, and ecosystems. The Climate Commitment was published in May 2017 and guides the City's initiatives on climate action. The City is moving towards its goal of 100 percent renewable electricity by 2030, along with a GHG emissions reduction of 15 percent by 2020 and at least 80 percent below

Bigstock/smuki



Detecting heat loss outside a building using a thermal camera.

2005 levels by 2050.¹² Boulder is three years ahead of its target, achieving a 16 percent emissions reduction in 2017. The Boulder County Commissioners made a similar commitment to reduce 2050 carbon emissions 45 percent below its 2005 levels by 2030 and 90 percent below 2005 levels by 2050.¹³

The City of Boulder's Climate Commitment identified three priority action areas: energy efficiency and conservation, renewable energy, and thermal electrification. It singled out the building sector as one of the three main sectors for reducing GHG emissions. Buildings account for over two-thirds of the total energy consumption in Boulder, with 90 percent of that energy coming from fossil fuels, primarily natural gas.¹⁴ The City found that high performance buildings—buildings with air-tight insulated envelopes, highly efficient equipment (such as air source heat pumps), and on-site renewable energy generation—could lead to a 16 percent reduction in

overall emissions by 2050. Thus, the City recognized it could not meet its Climate Commitment without addressing the heating and cooling sector. It began exploring strategies for decreasing its dependence on natural gas with the use of high-efficiency water heaters and clean energy heating technologies. It also reduced incentives for high efficiency natural gas appliances, with a phase out slated for 2019.

In 2011, Boulder County initiated EnergySmart, a one-stop-shop for home energy and electric vehicle needs, and the program has since engaged over 17,000 homeowners in energy efficiency upgrades, reducing over 14,000 metric tons of CO₂ equivalent annually.¹⁵ The program is managed by Boulder County's Sustainability office and implemented by CLEAResult, a Texas company that provides energy programs and demand-side management strategies.¹⁶

Comfort365 Program Overview

EnergySmart and the City of Boulder launched the Comfort365 program to provide residents with information on cleaner, more efficient, and more comfortable options to heat and cool their homes. Launched during Earth Month in April 2018, the program helps residents explore air source heat pumps and helps connect interested consumers with EnergySmart-registered contractors, evaluate contractor bids, and access rebates and incentives at no charge. City and county staff coordinate the Comfort365 campaign. The program is fully incorporated into existing energy efficiency programs and does not require additional staff. The program works in close partnership with Xcel Energy (a natural gas and electric utility), Longmont Power and Communications (a non-profit municipal electric and internet utility), and air source heat pump manufacturer, Mitsubishi.

Boulder was one of six cities awarded funds from an Urban Sustainability Directors Network grant to work on an electrification/heat pump pilot project.¹⁷ Mitsubishi and seven other leading heat pump manufacturers were identified as key stakeholders through this process. Led by a team from Meister Consultants (now part of the Cadmus Group), Boulder and other cities explored collaboration with these manufacturers. Mitsubishi was the first one to offer to share the costs of launching a series of pilot projects with Boulder and other cities.

The City of Boulder's Climate Action Plan tax provides a source of funding for the Comfort365 program.¹⁸ This voter-approved tax addresses climate action initiatives and is based on the per-capita amount of electricity consumed. EnergySmart's energy advising service is one of the beneficiaries of these tax funds. Boulder County and the City of Boulder have also provided financing through their general funds. Funding from the Carbon Neutral Cities Alliance helped Boulder focus its efforts on promoting air source heat pumps as natural gas heating replacement alternatives.

The Comfort365 program includes a web portal with information on the technologies, incentives, and finance options available to residents online. It also pairs consumers with EnergySmart's one-on-one energy advisors for free; five personal advisors sit on EnergySmart's staff.¹⁹ Up to \$2,000 in incentives are available from Xcel Energy, the City of Boulder, Boulder County, and manufacturers. The incentives are available on a first-come, first-serve basis. Boulder has contributed \$30,000 in incentives to the 2018 program and an additional \$25,000 for insulation and heat pump equipment for 2019. In addition, Elevations Credit Union Home Energy Loans are available at interest rates as low as 2.75 percent.

Outreach Strategy and Customer Engagement

Comfort365's outreach strategy includes informational meetings, targeted mailings, and social marketing by the City, county, and participating manufacturers. As part of the Comfort365 launch, the City live-streamed a local home tour to demonstrate the operation of air source heat pumps and their myriad benefits.²⁰ Mitsubishi initiated its own regional marketing campaign through their Diamond Contractor network and through advertisements.²¹ Another outreach strategy to encourage adoption was run jointly by the City and Mitsubishi. Both ran targeted Google ads. Mitsubishi also used television advertising to promote the program. The various outreach initiatives focused on promoting comfort over savings because air source heat pumps are not yet a cost-effective replacement over natural gas heating.²²

The Comfort365 program employed a unique strategy for finding candidates that are more likely to be inter-

ested in switching to efficient electric heating. The team contracted with Radiant Labs, an energy modeling software company that used a data scraping tool to identify homes with heating equipment nearing replacement age.²³ Data sources included county assessor's data, permit data, utility bills, and census data Assessor records. Building permit data enabled Radiant to predict future energy equipment replacements. Boulder's EnergySmart program filtered Radiant's data through its Salesforce Content Management System to identify potential heat pump candidates.

The Comfort365 team uses the software to approach homeowners before their current heating equipment reaches the end of its life, thereby reaching those most likely to benefit from switching to an air source heat pump. Radiant Labs and Boulder also worked to identify cohorts of homeowners who were likely to consider switching to efficient, renewable technologies:²⁴

- **Early Energy Tech Adopters**—Those who already have made EnergySmart upgrades or installed solar
- **Small Ranch Houses**—Owner-occupied homes under 2,500 sq. ft. likely lacking central air conditioning, built in the 1960s-1970s, which would be able to add cooling if they switched to an air source heat pump
- **Well-To-Do Progressives**—Progressives with spare capital in need of replacing air conditioning (AC) or a furnace in the next five years located within a census block where median income exceeds \$81,000
- **The "Greens"**—"Green-minded" homeowners who have made EnergySmart upgrades and who are in need of replacing AC or a furnace in the next five years
- **AirBnB Rentals Lacking Air Conditioning**—Rental space seeking to improve indoor air temperature and comfort for guests.

This type of targeting strategy has resulted in a 40 percent conversion rate of enrollees to one or more of Comfort365's clean-heating technologies.

Benefits to Homeowners and the Community

The following benefits have been identified regarding the successful Comfort365 program:

1. **GHG Emission Reductions**—Homes heating with natural gas that switch to air source heat pumps reduce the amount of methane released in the atmosphere. As Boulder’s Climate Commitment increases the use of renewable electricity, GHG emissions will decrease for customers who heat with electricity, both because the source of electricity is cleaner and because of the efficiency of air source heat pumps.²⁵
2. **Vetted Installers**—The EnergySmart website directs customers to qualified installers. Rather than rely on RFPs to identify installers, EnergySmart’s stringent installation requirements ensure that only vetted, dependable installers are recommended.
3. **Ease of Application**—Learning about heating and cooling options, connecting with contractors, evaluating bids, and accessing available rebates can be accomplished on EnergySmart’s website.²⁶ The site also pairs interested customers with Energy Smart Advisors who offer free energy advice.

Incentives and Finance Options

Manufacturer’s Rebates

- Mitsubishi offered \$300 rebates on their “Hyper-Heating” cold climate air source heat pumps

County Rebates

The following EnergySmart rebates are available for residents in Boulder County. They can be used alone, or in combination with financing:²⁷

- Cold Climate ENERGY STAR air source heat pumps: 25 percent of the project cost up to \$350
- Non-Cold Climate air source heat pumps: 25 percent of the project cost up to \$200

City Rebates

The City of Boulder’s Climate Action Plan Tax funds these rebates for City of Boulder residents:²⁸

- Cold Climate air source heat pumps: up to \$400
- Non-Cold Climate air source heat pumps: up to \$250

Utility Rebates

- Xcel Energy offers \$300 rebates on ductless mini-split residential heat pumps.
- Longmont Power offers \$500 rebates on residential heat pumps.

Federal Incentives

Federal Residential Energy Efficiency Tax Credit:

- Air source heat pumps achieving the highest efficiency tier established by the Consortium for Energy Efficiency qualified for a \$300 credit (2006–2017).²⁹

Program Results

Comfort365 set a goal of doubling the number of air source heat pump installations in 2018, based on a metric of historic baseline heat pump installations. These were typically between 10–15 each year. Quantifying the exact number of installations is an inexact science given that statistics are drawn from a variety of sources, including city permit data, contractors’ records, and utility demand-side management programs. Based on these references, Comfort365 estimated their 2018 goal was achieved with the installation of 66 air source heat pumps. The 2019 goal is 120 installations.

Testimonials

“We are natural gas free; it was a day of celebration.”

“The outside heat pump and the indoor heads are whisper quiet, which surprised us and delighted our neighbors.”

See more testimonials on the Comfort365 webpage under “testimonials.”³⁰

HeatSmart Northampton

PROJECT NAME

HeatSmart Northampton

LOCATION

Northampton, MA

SIZE OF COMMUNITY

28,593 (U.S. Census Bureau estimate, July 1, 2017)

YEAR(S) IMPLEMENTED

Began in August 2017; concluded in February 2018

TYPE OF THERMAL SYSTEM OFFERED

Cold Climate air source heat pump (central and mini-split)

NUMBER OF SYSTEMS INSTALLED

54

CAMPAIGN TEAM

City of Northampton Energy and Sustainability Department with local volunteer organizations

INSTALLER

Express Plumbing, Heating & Solar Services

WEBSITE

<https://northamptonma.gov/1783/HeatSmart-Northampton-ener-G-save>



Program Summary

HeatSmart Northampton focused its Cold Climate air source heat pump outreach efforts on the owners of one- to four-unit multifamily residential buildings. An active core of volunteers spearheaded the outreach activities with direction from the City of Northampton. The initial program goal was for 60 installations.³¹ The program resulted in the installation of 54 air source heat pump systems within five months. Approximately 67 percent of the installations were supplemental as opposed to replacement installations; 70 percent of the replacement installations were in homes without natural gas.³² Based on average energy prices from the last five years, HeatSmart Northampton estimated homeowner savings of between \$500 and \$1,000 annually depending on the type of heating fuel previously used and what the homeowner currently paid in fuel costs.³³

City of Northampton's Climate Change Efforts

The City of Northampton is a national leader in combatting climate change. The city adopted its first Climate Change Strategy in 2010 and has updated this strategy every three years. The current Northampton Climate Change Strategy runs through 2020 with a goal of reducing greenhouse gas (GHG) emissions by 80 percent by 2050 from 2000 levels. Strategies for reducing GHG emissions include increasing deployments of renewable energy and energy efficiency technologies and promoting local economic development around clean energy technologies.



Infrared thermovision reveals areas of heat loss and areas in need of insulation.

In 2016, Northampton began working with ener-G-save, a nonprofit organization that helps homeowners in Berkshire County access state and utility incentives for home weatherization and energy efficiency upgrades.^{34,35} ener-G-save gathered thermal imaging data on 100,000 area homes, revealing homes that were the best candidates for energy efficiency improvements.³⁶ ener-G-save followed up the thermal assessment by sending letters and thermal images to each homeowner whose home was identified as the most promising for improvements.³⁷ Northampton is promoting ener-G-save and HeatSmart Northampton in tandem.

HeatSmart Northampton Program Overview

Building off the successful 2013 Solarize Northampton campaign, Northampton developed the HeatSmart Northampton program to drive reductions in thermal energy consumption and emissions and to provide opportunities for energy savings and improved home comfort for residents. In June 2017, Northampton released a HeatSmart Northampton Request for Qualifications (RFQs) for air source heat pump installers to participate in the HeatSmart Northampton program, which would run from August 2017 to February 2018.³⁸

Among the goals of the HeatSmart program were:

- Increased awareness of air source heat pumps and their benefits
- Increased adoption of air source heat pumps
- Reduced costs associated with air source heat pump installations

- Increased awareness of the role of thermal energy in contributing to GHG emissions
- Reduced GHG emissions.

Like Solarize, HeatSmart relied heavily on municipal officials, local volunteers, supporting partners, and competitively selected installers to implement a community group-purchasing, outreach, and education campaign. Northampton sought out potential HeatSmart customers by emailing surveys to existing Solarize contacts to ascertain the level of interest in the program. Recipients were asked to forward the email to others. Approximately 600 residents completed the survey.

Northampton also enlisted the Cadmus Group to help evaluate the design of the HeatSmart program and its technology offerings.³⁹ Cadmus identified solar hot water and air source heat pumps as viable technologies for Northampton. HeatSmart Northampton chose to offer only air source heat pumps because they had more recognition than some of the other technologies and were already in use in the area. In addition, Northampton was more inclined to favor air source heat pumps because MassSave rebates and HEAT loans were available to support air source heat pump installation.

Chris Mason, Northampton Energy and Sustainability Officer, led the HeatSmart campaign team. The program relied heavily on volunteers to spearhead outreach. Two local environmental organizations were key in providing volunteers—Mothers Out Front and Climate Action Now—Western Massachusetts.

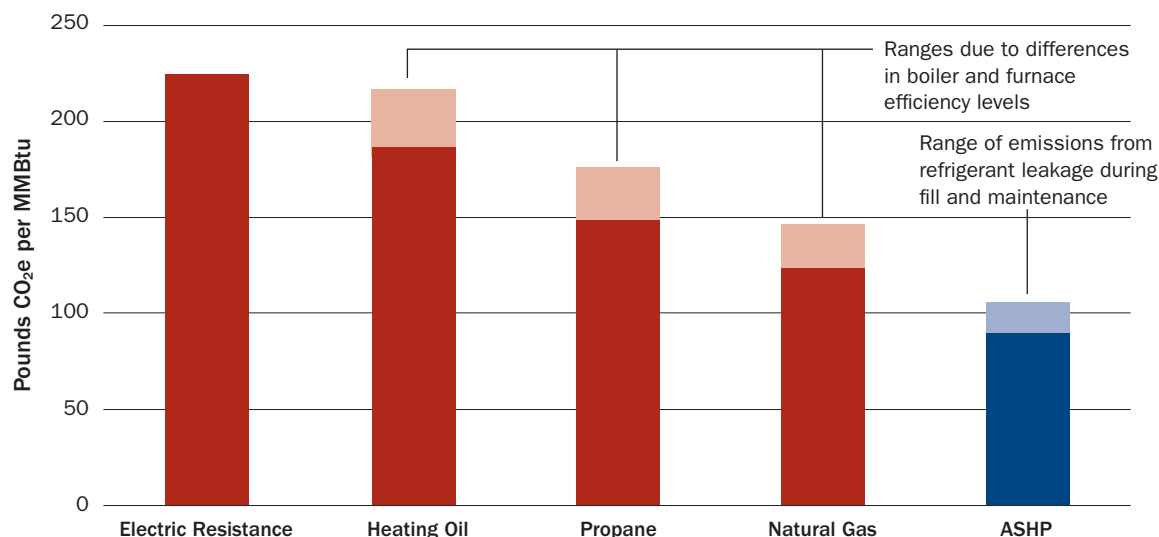
Despite their enthusiasm for climate mitigation, many volunteers were not familiar with air source heat pump technology.⁴⁰ One of the City's first tasks was to educate them about air source heat pumps. Ultimately, these volunteers explained air source heat pump benefits to more than 1,000 residents who were then well-prepared to discuss air source heat pump projects with contractors.⁴¹ Among the many benefits of air source heat pumps is their contribution to greenhouse house emissions reductions. A heat pump in Massachusetts generates fewer greenhouse gas emissions per unit of heat delivered than a traditional, energy-efficient home heating system. See Figure 5 for emissions impacts.⁴²

HeatSmart Northampton, MA



HeatSmart Northampton campaign signs.

Figure 5
Greenhouse Gas Emissions Comparison of Traditional Heating Fuels vs. Air Source Heat Pumps (ASHP)



Sources and Assumptions: COP 2.5 for ASHP and AFUE efficiencies of 75% to 87% for oil systems and 80% to 95% for propane and natural gas systems. Carbon dioxide equivalent (CO₂e) emission coefficients from Massachusetts Department of Energy Resources using Massachusetts electricity emission levels (2016). Source: HeatSmart Northampton

Outreach Strategy and Customer Engagement

Northampton used several outreach strategies to promote HeatSmart. These included educational “Meet the Installer” workshops, open houses at the homes of residents with air source heat pumps, social media and other online outreach, media placements in newspapers and on television and radio, signage, direct mailings, and tabling at farmer’s markets and other local community events.

Installers were recruited through an RFQ.⁴³ To be eligible, an installer had to be a “Primary” installer, meaning she/he was eligible to participate in and submit rebates to the MassCEC Clean Heating & Cooling Program - Small-Scale Air source Heat Pump Program.⁴⁴ At a minimum, MassCEC required installers to be licensed to install air source heat pumps in accordance with the National Electric Code and all applicable federal, state and municipal codes, standards, and regulations. In addition, Northampton required installers to have installed a minimum of 10 air source heat pumps within Hampshire County and to provide at least five references from past customers. Installers were also asked to propose discounted fixed-fee costs for the installation of air source heat pumps.

Only one installer bid on the program, though Northampton would have preferred to select an installer from a larger pool of candidates. Indeed, after the program had started, installers who heard about it for the first time were interested in participating.

There were no specific eligibility requirements for air source heat pump applicants. Through its outreach strategy, the program sought to attract those homeowners who would appreciate the environmental benefits of a clean energy heating solution. HeatSmart Northampton recommended, but did not require, home efficiency and weatherization improvements to make sure the air source heat pump performed as expected. However, the program did require that HeatSmart customers undergo a MassSave energy assessment so that they could access state incentives. Customers were referred to the ener-G-save program for help scheduling an assessment and accessing incentives.

HeatSmart Northampton used Tableau analysis (a visual analytics platform) to create a visual data portfolio, mapping residential building attributes, such as year built, building type, existing heating system, current heating fuel, and existing PV installation, to

identify potential program participants.⁴⁵ Among other things, the maps identified homes using inefficient electric resistance heat as their primary heat source. Volunteers going door-to-door approached homeowners identified by the Tableau analysis as high-value potential customers for air source heat pumps.

Benefits to Homeowners and Community

The following benefits have been identified regarding the HeatSmart Northampton Program:

1. **Cost savings**—Compared to the regional average cost of heat pumps after rebates, the HeatSmart Northampton prices were approximately 3 percent –16 percent lower for the same air source heat pump models.⁴⁶ Based on average energy prices over the last five years, air source heat pumps were predicted to save the homeowner between 30 percent and 60 percent compared to oil, propane, and electric resistance heating.⁴⁷
2. **Vetted installers**—At a minimum, eligible installers were Primary Installers in the MassCEC Clean Heating & Cooling Program, licensed to install air source heat pumps, and with a minimum of 10 air source heat pumps installed within the county.
3. **System reliability**—The equipment installed was required to meet certain standards, such as being certified by the Northeast Energy Efficiency Partnerships, listed as qualified equipment under the MassCEC Clean Heating & Cooling Program, and meeting the relevant efficiency requirements for rebates from MassSave.

Incentives and Finance Options

State Incentives

- **MassCEC Clean Heating & Cooling Program:** Air Source Heat Pump Rebate—Homeowners can apply for a standard rebate of \$625 per eligible, single-head air source heat pump. Some homeowners may qualify for Income-Based Rebate Adders.⁴⁸ The application is made by the homeowner. Those living in a one- to four-unit building must have completed a home energy assessment by ener-G-save within the past four years.⁴⁹ The rebate application is made online by the homeowner.

- **MassSave Mini-Split Heat Pump Rebate:** Varies between \$100–\$625. The rebate application is made online by the homeowner.
- **MassSave 0 percent Interest Heat Loan:** A loan of up to \$25,000 over a seven-year term for qualifying homeowners. Those living in a one- to four-unit building qualify if they have completed an ener-G-save home energy assessment. The rebate application is made online by the homeowner.

Federal Incentives

- **Federal Personal Tax Credit:** Residences are eligible for up to \$300. This credit applied to qualified equipment installed prior to January 1, 2018.⁵⁰

Program Evaluation⁵¹

At the conclusion of the program, HeatSmart Northampton sent an evaluation survey to 458 individuals. This group included HeatSmart Northampton participants and those who had requested information about the program.⁵² Solarize Northampton participants were also surveyed.

Sixty participants responded. Of these, 21 had signed up for the program and installed a heat pump; 23 had signed up for the program but did not install a heat pump; 14 heard about the program but did not sign up; and two had not heard of the program.

According to the survey results, respondents had a positive impression of the installer they worked with. Those who signed a contract with the installer were likely to recommend the installer to others. Those who did not sign a contract were still inclined to work with the installer, in the future, should the occasion arise. Individuals were primarily interested in heat pumps for cooling, energy savings/efficiency, heating, and GHG emission reductions. Less important were the discounted price, dehumidification/indoor air quality benefits, and zoning capabilities.

Most participants had a positive assessment of HeatSmart Northampton and its website, volunteers, and marketing materials. However, they felt that information on other renewable energy/energy efficiency options could have been better presented.

Survey participants who did not move forward with an installation cited the high expense of the systems and lack of cost-effectiveness. Some used another installer. Residents who did not sign up for HeatSmart Northampton noted that they were not sure why they did not sign up or they could not afford it.⁵³

Program Results

One hundred and sixty-two individuals expressed interest in the program through the HeatSmart Northampton website. These initial inquiries led to 130 installer site visits and 106 price quotes. Ultimately, installers installed 54 air source heat pump systems. These consisted of 19 single-zone, 34 multi-zone, and one heat pump water heater. The average system size was 2.7 tons in capacity (about 32,000 BTUs), large enough to heat multiple zones in a large home. In addition, four air source heat pump systems were installed in surrounding towns that were not eligible to participate in the program.⁵⁴

Lessons Learned

Northampton selected the only installer who bid on the program. They would have liked much broader installer participation to select more than one. However, the timing of the release of the RFQ (mid-June) during

peak cooling season may have deterred other candidates from applying. Better timing as well as better promotion of the RFQ might have resulted in more choices.

Northampton's single installer was often overburdened by servicing existing customers during unusually cold weather and had difficulty following up with new air source heat pump customers.

HVAC installers may not appreciate the value of air source heat pump installations to their business as much as solar PV installers. Allying with air source heat pump distributors and manufacturers may lead to more applications.⁵⁵

In retrospect, it's unclear if the door-to-door outreach to neighborhoods identified by the Tableau analysis was effective. The sample size was small, and few people were home to answer their doors. Northampton surmises that people currently heating with electric resistance heat often had already installed supplemental heat (e.g., wood stoves, propane heaters), so there is uncertainty as to whether heating bills were as high as anticipated. It is also possible that, since the time spent on this outreach was relatively short, the door-to-door volunteers did not have time to develop an effective pitch.⁵⁶

Peaks Island Heat Pump Group

PROJECT NAME

Peaks Island Heat Pump Group

LOCATION

Peaks Island, ME

SIZE OF COMMUNITY

864 year-round residents

YEAR(S) IMPLEMENTED

2014, 2015, 2016

TYPE OF THERMAL SYSTEM OFFERED

Ductless mini-split air source heat pump

NUMBER OF SYSTEMS INSTALLED

65 (estimated)

CAMPAIGN TEAM

Sam Saltonstall, Peaks Environmental Action Team (PEAT)

INSTALLER(S)

Goggin Energy, Peaks Island Fuel, Revision Energy

WEBSITE

<https://greenerpeaks.org>

Program Summary

Peaks Island in Casco Bay is part of the City of Portland, Maine. It comprises approximately 762 acres and is home to 864 year-round residents.⁵⁷ The Peaks Environmental Action Team (PEAT), a volunteer community group, initiated and operated the Peaks Island Heat Pump Group for three years from 2014 to 2016. By the conclusion of the 2015 program, approximately 65 homes had installed heat pumps.⁵⁸

Peak Island's Climate Change Efforts

In 2006, community members formed the Peaks Environmental Action Team to “leave a lighter footprint on the Peaks Island environment.”⁵⁹ PEAT tackled several energy-related projects, including home weatherization to improve energy efficiency, the sale of LED light bulbs at discount prices to island residents, the installation of energy efficient storm window inserts, and a test of the island’s wind resource to determine whether a community wind project might be viable. PEAT’s energy efficiency work led to the formation and success of the Island’s heat pump purchasing group.

Bigstock/EricBVD



Peaks Island, Maine is a small island, home to nearly 900 year-round residents.

Peak Island Program Overview

Sam Saltonstall, a member of PEAT, envisioned the heat pump purchasing group. Not only would heat pumps reduce harmful greenhouse gas emissions, but residents would benefit from the collective buying power of the group to reduce the installation charges. Other than generally benefiting the environment and islanders' budgets, no specific goals were set by PEAT. PEAT decided it was best to focus on a single clean energy technology to simplify installer selection, outreach and education efforts, and volunteer recruitment and training. In addition, the group was interested in choosing a technology that was more affordable and thus more appealing to budget-conscious island residents. Accordingly, ductless, mini-split, air source heat pumps were the only technology offered.

The program did not have homeowner eligibility requirements. Homeowners were informed that a discount would be applied when a specified number of contracts were signed. Emails, community meetings, and in-home demonstrations formed the bulk of the group's outreach strategy. Follow-up emails were sent to homeowners who responded to the initial survey.

The project team consisted of two volunteers, including Saltonstall. The team identified three area installers—Revision Energy, Goggin Energy, and Peaks Island Fuel, which had done previous work on the Island, including installing solar thermal and solar PV. Islanders had familiarity with these installers and held them in high regard. The project team sent the installers an RFP requesting price quotes on three sizes of select mini-split heat pumps. The RFP specified six heat pump models by Fujitsu and Mitsubishi. Installers indicated their preference for these manufacturers, whose air source heat pumps dominated much of the local market.

The terms of the RFP stated that the sale and installation of single mini-split heat pumps had to meet state agency Efficiency Maine's Ductless Air Source Mini-Split Heat Pump Installation Guidelines.⁶⁰ In order for customers to be able to receive a \$500 incentive offered by Efficiency Maine, the installer had to be registered as an Efficiency Maine Residential Registered Vendor.⁶¹ Efficiency Maine's registered air source heat pump vendors are required to have heat pump installation training within the last two years provided by an Energy Star manufacturer, a

community college, or the Maine Energy Marketers Association.⁶²

After reviewing the submitted bids, the Project Team chose all three installer applicants to participate in the heat pump program. Goggin Energy and Revision Energy, both mainland companies, were undaunted by the challenge of serving island customers. Peaks Island Fuel, an island-based business supplying oil and propane, attained the necessary certifications to install heat pumps.

Outreach Strategy and Customer Engagement

PEAT presented its plan to the community and emailed Google Form surveys to assess islanders' interest in participating in a heat pump purchasing group. Once there was sufficient interest in installing heat pumps, the Peaks Island Heat Pump Group launched. The installers' bids were shared with residents who had expressed interest in the heat pump purchase group through the Google survey. After the bids were shared, a community meeting was held to provide information about heat pumps and to answer any questions about the technology or the group program. Installers gave short presentations and were available for one-on-one meetings. In addition, homeowners who owned heat pumps were present to talk about their experiences.

Following the community meeting, each interested resident chose an installer with whom to work. Saltonstall provided each installer with a list of prospective customers. At this point, the heat pump group disbanded, and the customers were left to coordinate the project with their chosen contractor. This process was repeated again in 2015 and 2016.

Benefits to Homeowners and Community

1. **Cost Savings**—The group purchasing approach helped the community reduce air source heat pump installation costs. Peaks Island residents primarily use heating oil and propane for heating and, to a lesser extent, kerosene, firewood, and electric resistance heating. Transporting heating oil to the island, which is two and a half miles from the mainland, adds approximately \$1.00 per gallon to heating oil costs.^{63,64} Firewood also costs more on the island than on the mainland. However, since electricity to

Peaks is supplied and serviced by a mainland utility (Central Maine Power), islanders' electricity prices are similar to those on the mainland. Residential electricity rates in Maine have historically been the lowest of the New England states. From 2014 to 2016, state rates ranged between 15.1 and 16.1 cents per kilowatt-hour compared to 17.7 to 18.2 cents per kilowatt-hour in the region.⁶⁵ Using heat pump technology to replace fossil fuel-fired heating systems and firewood was an economically viable alternative. By heating with an efficient electric air source heat pump instead of fuel, islanders can save between 30–40 percent.⁶⁶

In the program's first two years, the installer Request for Proposals (RFP) required each installer to offer a pre-determined bulk discount if eight or more residents contracted with the installer.⁶⁷ In the second year of the program, the RFP increased the minimum number of signed contracts to ten or more for the bulk-discount requirement. The following year, the discount was dependent upon signing the contract by a given deadline. There were no discounts based on the number of units installed.

Efficiency Maine provides a home heating comparison tool on its website that estimates the annual cost of different heating systems.⁶⁸ The tool allows consumers to adjust their current home heating costs and then compare that cost against other fuel types. If, for example, it costs \$3,653 to heat a home with electric baseboard heating or \$2,408 to heat with an ENERGY STAR-rated oil boiler, the tool estimates that it would cost \$1,247 to heat the same space with an air source heat pump.⁶⁹

2. **Vetted Installers**—The three eligible installers had to register as Efficiency Maine Registered Vendors, which includes basic requirements to safeguard consumer protection. Registered vendors also had to submit certificate documentation for refrigerant handling and installation training.
3. **System Reliability**—The program installers were required to offer only six specific heat pumps—three by Fujitsu and three by Mitsubishi. In order to receive Efficiency Maine's \$500 rebate, the mini-splits had to meet a minimum efficiency threshold—HSPF of 12.0 (or HSPF of 10.0 for systems with multiple indoor heads).⁷⁰

Incentives and Finance Options

State Incentives

- **Efficiency Maine \$500 rebate** for single-head units, plus \$250 for each additional indoor unit.
- **Efficiency Maine home energy loans**—Three- to five-year loans up to \$15,000 with no fees and low interest rates. Eligible homeowners must meet a minimum credit score and maximum debt-to-income ratio. They must also have had no recent bankruptcies, foreclosures, or repossessions.

Federal Incentives

- **Federal Residential Energy Efficiency Tax Credit**—Electric heat pumps achieving the highest efficiency tier established by the Consortium for Energy Efficiency qualified for a \$300 credit (2006–2017).

Program Results

Sixty-five homes had installed heat pumps in the program's first two years.

Lessons Learned

During the program's first two years, the installation cost was reduced if at least eight (in 2014) or ten (in 2015) residents showed interest in a heat pump installation. Because not all prospective customers turned into signed contracts in the program's third year, the reduced cost was contingent upon customers signing a contract within one week of receiving it.

Testimonials

"I probably wouldn't have a heat pump in my home now if it weren't for you and I know that probably at least 20 other households would say the same! I so admire your persistence and your ability to get things done."

"Your commitment and the quality of your work will never, ever cease to amaze us. It has provided us with such motivation to be better at what we do and to dream big(ger) when it comes to local energy and climate work."

HeatSmart Tompkins Case Study

PROJECT NAME

HeatSmart Tompkins

LOCATION

Tompkins County, New York and contiguous counties⁷⁴

SIZE OF COMMUNITY

105,000 (Tompkins county) and 322,500 (surrounding counties)

YEAR(S) IMPLEMENTED

HeatSmart I ran from 2015-2016; HeatSmart II ran from 2016–2017; and HeatSmart III began in 2018 and is ongoing

TYPES OF THERMAL SYSTEMS OFFERED

Home energy efficiency improvements, ground source heat pumps, and air source heat pumps, and heat pump water heaters

NUMBER OF SYSTEMS INSTALLED

- HeatSmart I: 12 ground-source heat pumps, 32 air source heat pump, 12 heat pump water heaters.
- HeatSmart II: 6 ground source heat pumps, 18 air source heat pump (space conditioning), 6 heat pump water heaters.
- HeatSmart III: Ongoing

CAMPAIGN TEAM

The nonprofit Solar Tompkins–HeatSmart Tompkins and grassroots campaigns organized by local volunteers. Jonathan Comstock leads the initiative as the paid program director at HeatSmart Tompkins.

INSTALLERS

Halco, NP Environmental & Standard Insulating Company

WEBSITE

<https://www.solartompkins.org>

Program Summary

HeatSmart Tompkins is a residential, bulk purchasing community program that encourages homeowners to heat their homes with clean energy and reduce their dependence on fossil fuels. HeatSmart aggregates purchases within the community, allowing the program installers to offer bulk, discount pricing to program participants.

The program offers air source heat pumps, ground source heat pumps, heat-pump water heaters, and weatherization upgrades to improve the energy efficiency of the homes. The program encourages enrollees to have their building's energy efficiency assessed prior to initiating an investment in a new heating system.

Tompkins' Climate Change Efforts

HeatSmart grew out of the Solar Tompkins program, a not-for-profit New York State corporation that began in 2013. HeatSmart Tompkins began in 2015 with financial support from individual donations and grants. The Park Foundation contributed to HeatSmart I and II.⁷⁵ In 2018, HeatSmart Tompkins received 2.5 years of funding from NYSERDA.

By 2015, 474 solar PV and 37 solar hot water systems had been installed through Solar Tompkins, tripling the amount of residential solar in the county. Solar Tompkins was promoted through community meetings and educational events. It negotiated volume discounts with installers for pricing 20 percent below market prices.⁷⁶ Encouraged by residents' receptivity to solar, the community created the HeatSmart program to promote clean heating and cooling technologies.

The energy used by homes in Tompkins County for heating, cooling, and hot water comes primarily from fossil fuel sources, such as natural gas, propane, and oil. A smaller sector uses electric resistance. A NYSERDA study determined that “The Upstate climate zone is





Heat pump water heater.

Thomas Kelsey

generally the most cost-effective market for heat pumps due to lower equipment and labor costs, and the lowest winter electric costs.”⁷⁷

HeatSmart Tompkins Overview

HeatSmart Tompkins I focused its program outreach on homeowners who had participated in Solar Tompkins. HeatSmart Tompkins II broadened its outreach focus, and HeatSmart III expanded to municipalities outside Tompkins county. Up to five percent of enrollments was opened to residents of neighboring counties. The HeatSmart I program’s initial goal was to deploy clean heating and cooling solutions in 100 households. By the end of its 2015–2016 program cycle, 111 households had installed an air source heat pump, ground source heat pumps, and/or heat pump water heaters, and/or implemented energy efficiency measures. The number of installations in HeatSmart II declined for reasons that are still being analyzed. Final average cost to homeowner: 13 air source heat pumps averaged \$9,760 and five ground source heat pumps averaged \$50,807. These are prices before the NYSERDA incentive of \$1,500/ton or the 30 percent federal tax credit. Building envelope work averaged \$5,890.⁷⁸

Outreach Strategy and Customer Engagement

The community was introduced to HeatSmart through a variety of channels, including public meetings, which were recorded and posted online on HeatSmart’s website as well as on HeatSmart’s YouTube channel.⁷⁹ The

videos include testimonials and educational information about thermal renewable energy.

HeatSmart also offers tours of homes with heat pump installations. Yard signs, pamphlets, local advertisements, email list-servs, the program website, and media coverage are other communication and outreach tools used by HeatSmart. However, most enrollees learn about HeatSmart through friends and word of mouth. Through its outreach efforts, the program helps create local and regional jobs and stimulates the growth of home energy efficiency and heat pump markets.

Jonathan Comstock, the director of HeatSmart Tompkins, leads the campaigns with help from local volunteers. The volunteers help coordinate meetings and help to market the campaigns through a variety of activities, from social marketing to yard signs.

Benefits to Homeowners and Community

1. **GHG emissions reduction**—By enrolling in HeatSmart Tompkins and reducing reliance on fossil fuels, residents are helping the county achieve its 80 percent greenhouse gas emission reduction goal by 2050.
2. **Vetted installers**—HeatSmart installer partners are selected after a thorough competitive process. In addition to the best practice requirements listed above, HeatSmart examines installer partners’ customer service record, employment practices, and safety record, and selects installer partners with vast experience, high work quality, excellent customer service, and affordable prices. Three installer partners were selected for HeatSmart III.
3. **System reliability**—Systems must meet required specifications for space heating units and the design and installation of these units must comply with standards of the Air Conditioning Contractors of America. There are also requirements for heat-pump water heaters.⁸⁰

Incentives and Finance Options

State Incentives

- **NYSERDA Home Performance Program**—Grants up to \$3,000 for qualifying families⁸¹ HeatSmart Tompkins chooses program installers in part based

on the installers' ability to assist customers with enrollment in relevant NYSERDA incentive programs. Installers who can help income-eligible New Yorkers enroll in NYSERDA's Assisted Home Performance with ENERGY STAR program or the EmPower New York program are given selection preference for the HeatSmart program.

- **NYSERDA EmPower New York**—Provides no-cost energy efficiency solutions to income-eligible New Yorkers⁸²
- **NYSERDA Assisted Home Performance Program**—Provides discounts covering 50 percent of the cost of eligible energy efficiency improvements, up to \$5,000 for income-eligible homeowners⁸³
- **NYSERDA NY State Loan Program**—NYSERDA offers a 10 percent discount and additional low-interest financing options to NY State homeowners to improve the energy efficiency of their homes⁸⁴
- **NY State Property Tax Incentive**—Qualifying energy-conservation improvements to homes, including heat pumps, are exempt from real property taxation in NY State to the extent that the addition would increase the value of the home⁸⁵

- **NYSERDA Ground Source Heat Pump Rebate**—A \$1,500/ton rebate (based on cooling capacity) applies to a NYSERDA approved designer or installer.⁸⁶ HeatSmart Tompkins expects ground source heat pumps prices in 2018 to be approximately \$30,500 before applying NYSERDA or Federal incentives. After applying the 30 percent tax credit and the \$1,500/ton NYSERDA rebate, the final price is \$13,850.

Federal Incentives

- **Federal Residential Renewable Energy Tax Credit**—A New York State homeowner may claim a credit of 30 percent of qualified expenditures for a ground source heat pumps system that serves a dwelling unit located in the US that is owned and used as a residence by the taxpayer⁸⁷
- **Weatherization Assistance Program**—This federal incentive, administered by the US Department of Energy, issues grants to states, territories, and some Indian tribes to improve the energy efficiency of low-income homes in their jurisdictions. Low-income homes that qualify for the program will receive free weatherization services, based on the needs of the



Kathleen Gifford

Jonathan Comstock, Director of HeatSmart Tompkins, runs the program with the help of volunteers.

home and the rules established by the state. Heat pumps and heat pump water heaters qualify for rebates⁸⁸

Local Incentives

- **HeatSmart Tompkins's installer partners** may also offer financing options. In addition, resources for consumers are available through local banks. These institutions offer options such as energy efficiency loans and home equity loans.

Program Evaluation

HeatSmart Tompkins sent a survey to the entire HeatSmart mailing list regarding the quality of their new equipment and building improvements. Respondents included those who used HeatSmart installers and those who used installers outside the program. Those who used non-HeatSmart installers did so because of recommendations by friends or builders and/or because they found lower prices outside of the program. However, they acknowledged that the impetus to invest in clean energy came directly from their attendance at a HeatSmart informational meeting.

The recipients of the mailing were asked what kind of installation (building shell work or equipment installation) was performed, who the installer was, and about the quality of the work (exceeded expectations/done all right/unsatisfactory). Both HeatSmart and non-HeatSmart installers scored similarly with respect to overall satisfaction.

Customers were also queried about their satisfaction with the equipment that was installed. Ground source heat pumps and heat pump water heaters received a perfect satisfaction score. Air source heat pumps and shell work received lower scores. Comstock concludes that the lower scores reflect design issues related to the improper sizing of units and not because of equipment failure. Some customers were upset by defrost cycle noises, discrepancies between temperature set points and experienced temperatures (probably due to a poorly located thermostat), and higher-than-anticipated electric bills.

Comstock points out that more outreach is needed to explain the higher electric bills compared to lower propane or oil bills. He explained that customers often fail to consider both sides of the equation, feeling as though the new system has failed to meet their expectations if electric bills go up.

Program Results

HeatSmart I was very successful; its success was mainly due to the participation of Solar Tompkins' participants who were already drawn to the benefits of clean energy. In fact, 60 percent of Solar Tompkins customers participated in HeatSmart Tompkins. The initial goal of HeatSmart Tompkins was to have up to 100 homes install heat pump technology and/or undertake home energy efficiency practices.⁸⁹ By the conclusion of HeatSmart I, 12 homes had installed ground source heat pumps, 32 had installed air source heat pumps, 12 had installed heat pump water heaters, and 55 undertook building envelope improvements.⁹⁰

HeatSmart II's enrollment goals were to double the number of installations, but the number decreased by over 50 percent instead. As mentioned HeatSmart Tompkins followed on the heels of the very successful Solar Tompkins program and modeled itself in a similar fashion. Results show that the community responded differently to thermal technologies than to solar. The mechanics of thermal technologies are not as easy to explain as solar. The solar concept is well understood

HeatSmart Tompkins



A happy homeowner with her new ground-source heat pump.



HeatSmart Tompkins

Air source heat pump interior units come in a variety of models. Here, a floor unit provides heating and cooling.

by most consumers: the sun's rays stimulate the production of electricity by solar panels. But the idea that the air or the ground can be a heat source or heat sink is not quite as obvious. The terminology itself is unfamiliar.

Lessons Learned

The HeatSmart Tompkins program was preceded by Solar Tompkins, which resulted in 474 solar PV and 37 solar thermal system installations in the county. HeatSmart Tompkins hoped to capitalize on the community's enthusiasm for renewable energy with the introduction of other renewable technologies such as air source heat pumps and ground source heat pumps. Unfortunately, the enthusiasm for solar did not translate into an equal enthusiasm for adopting renewable thermal technologies. In Jonathan Comstock's words, solar is "sexy," but that's not the case with air source heat pumps and ground source heat pumps.

HeatSmart Tompkins' challenge was to engage a larger population, not just those who were early adopters of clean energy. A successful campaign also must focus on how the program offers cost effective, affordable thermal solutions and explain the considerable share of total household energy use that goes to space and water heating.

Comstock recommends that the program be a year-long initiative rather than a limited-time offer. Solar Tompkins thrived as a limited-time offer mainly because of aggressive program pricing and high demand for solar. But unlike solar, which often can be incorporated easily and beneficially into an existing site, replacing an existing, functional heating system with an air source heat pump or ground source heat pump requires a longer sales and decision cycle.

When consumers were asked what HeatSmart improvements would be most likely to encourage program participation, lower pricing was cited most often. In a similar vein, high upfront cost was the factor most often holding people back from contracts. Consumers often focus on the cost to the exclusion of the benefits. Other home priorities may take precedent over potentially costlier options.

HeatSmart Tompkins learned that some homeowners found better air source heat pump prices outside of the HeatSmart Tompkins program. Going forward, HeatSmart Tompkins hopes to increase the number of participating installers and to attract some of the lower-priced installers of air source heat pumps in the community who have not yet applied to HeatSmart Tompkins as installers. They would also like to make

access to multiple quotes easier. Simplifying the quotes' pricing structure would help with the perception that some technologies are expensive. When faced with multi-page price schedules and adders, the consumer may fail to accurately calculate the true cost effectiveness of a thermal project.

The HeatSmart Tompkins enrollment period takes about eight months. Unlike solar, there is little existing demand for heat pumps, so the prospect of waiting longer and paying more is a potential barrier to adoption. The lengthy installation period is mostly due to the sign-up and contracting process. The HeatSmart II enrollment process required a building envelope study, contacting and meeting an installer partner, reviewing the recommended renewable energy options and financing, and being placed on the installer's construction schedule. The installer completed all of the project engineering, permitting, and financing paperwork and then began installation. Going forward, HeatSmart plans to improve the application process and make it more attractive to installers.

Surveys of HeatSmart participants indicated that concerns over their carbon footprint and climate change were the most compelling reasons for their interest. The next round of HeatSmart will try to attract a broader group of residents who may not be as motivated by environmental concerns by additionally emphasizing the benefits of increased comfort and cost savings.

HeatSmart Tompkins acknowledges that it has captured only a small segment of consumers for whom renewable thermal technologies are an appropriate investment. To capture a larger demographic, HeatSmart Tompkins has recommended the following strategies:

- Promote heat pump water heaters more effectively
- Emphasize comfort (especially air conditioning) more
- Continue to seek lower pricing and use it to promote the cost effectiveness of thermal technologies
- Explore door-to-door outreach, particularly in areas without gas service. Emphasize engaging, informative conversations rather than sales pitches
- Expand the geographic range of the program beyond Tompkins County
- Focus on special opportunities, such as in neighborhoods where electricity is expensive and heat savings from heat pumps are more dramatic
- Investigate more formal advertising.

Testimonials

"I have asthma, so I really appreciate this clean source of heat."

"The process was very easy and very interesting, and the installation has been totally trouble-free. What surprised me most was the cooling effect in the summer."

"I really can't recommend the program highly enough for being totally user friendly. . . . All the loan paper work . . . all the paperwork, they walked through with us and it was just easy."

*"I'm very popular in my household because of this!"
Tom Butler on the installation of an air source heat pump in his home.*

Access short video clips of satisfied HeatSmart customers talking about their new air source heat pump and ground source heat pumps installations on the Solar Tompkins website under "testimonials."⁹¹

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Clean Energy States Alliance (CESA) is a national, nonprofit coalition of public agencies and organizations working together to advance clean energy. CESA members—mostly state agencies—include many of the most innovative, successful, and influential public funders of clean energy initiatives in the country.

CESA works with state leaders, federal agencies, industry representatives, and other stakeholders to develop and promote clean energy technologies and markets. It supports effective state and local policies, programs, and innovation in the clean energy sector, with an emphasis on renewable energy, power generation, financing strategies, and economic development. CESA facilitates information sharing, provides technical assistance, coordinates multi-state collaborative projects, and communicates the views and achievements of its members.

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