HEATSMART TOMPKINS

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Home Energy Efficiency, Heat Pumps, and Community Mobilization

HeatSmart
is a program of
SOLAR TOMPKINS

Solar Tompkins History

2013-2014 First solarize effort in just three townships

109 solar PV & 37 solar thermal hot water

2014-2015 Full-county solarize effort (pop. ca 100,000)

365 solar PV systems

2015-2016 First HeatSmart effort, full county

12 GSHP

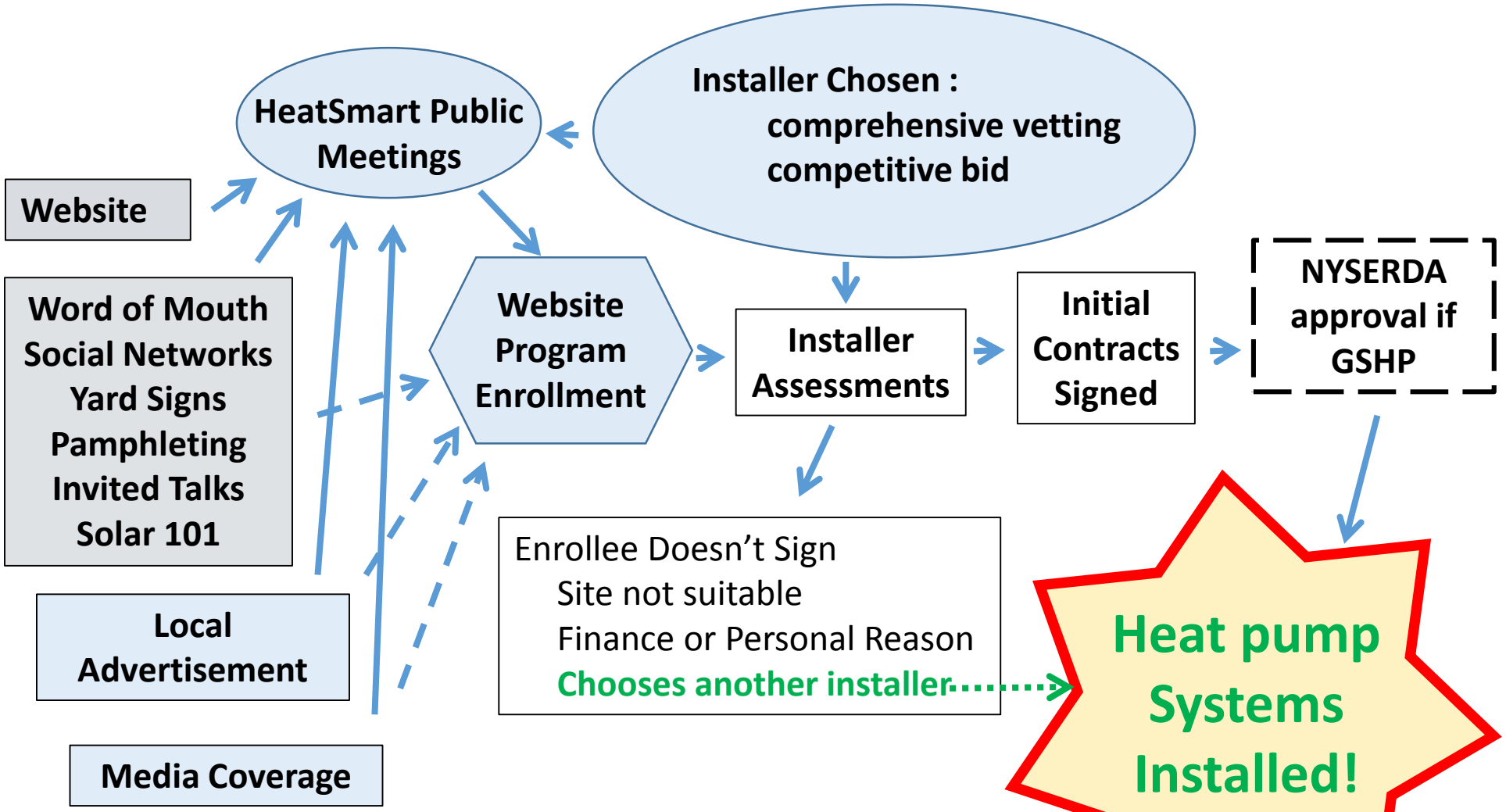
32 ASHP (space conditioning)

12 ASHP (domestic hot water)

55 Building envelop improvements

2016-2017 Second HeatSmart effort- in progress

Community Mobilization



Results!!!

How to Make a Difference?

HeatSmart is a Grass roots campaign organized by local volunteers

We are focused on solutions, not complaints!

Our goal is to remove barriers to the strength of individual action

- **Generating confidence in a path forward**
- **Providing accessible information**
- **Lowering the costs**

Confidence in a Path Forward

- Moral assurance- the right thing to do
- Economic assurance- cost effective, affordable
- Super energy efficient with low operating costs
- Personal experience assurance
  - Improved comfort
  - Air conditioning
  - Zonal control
- Begin with building shell efficiency: air sealing & insulation
- Technical confidence in products
  - Performance issues and reliability
  - Demystifying heat pumps
- Who is a reliable installer?

Providing Accessible information

We consider ourselves, first and foremost, an educational effort

- 20 public meetings throughout the county (also via video online)
- We held 12 home tours of existing heat pump installations
- Fact sheets and testimonial videos on line
- Links to other sites

Price comparisons of participating installers are posted

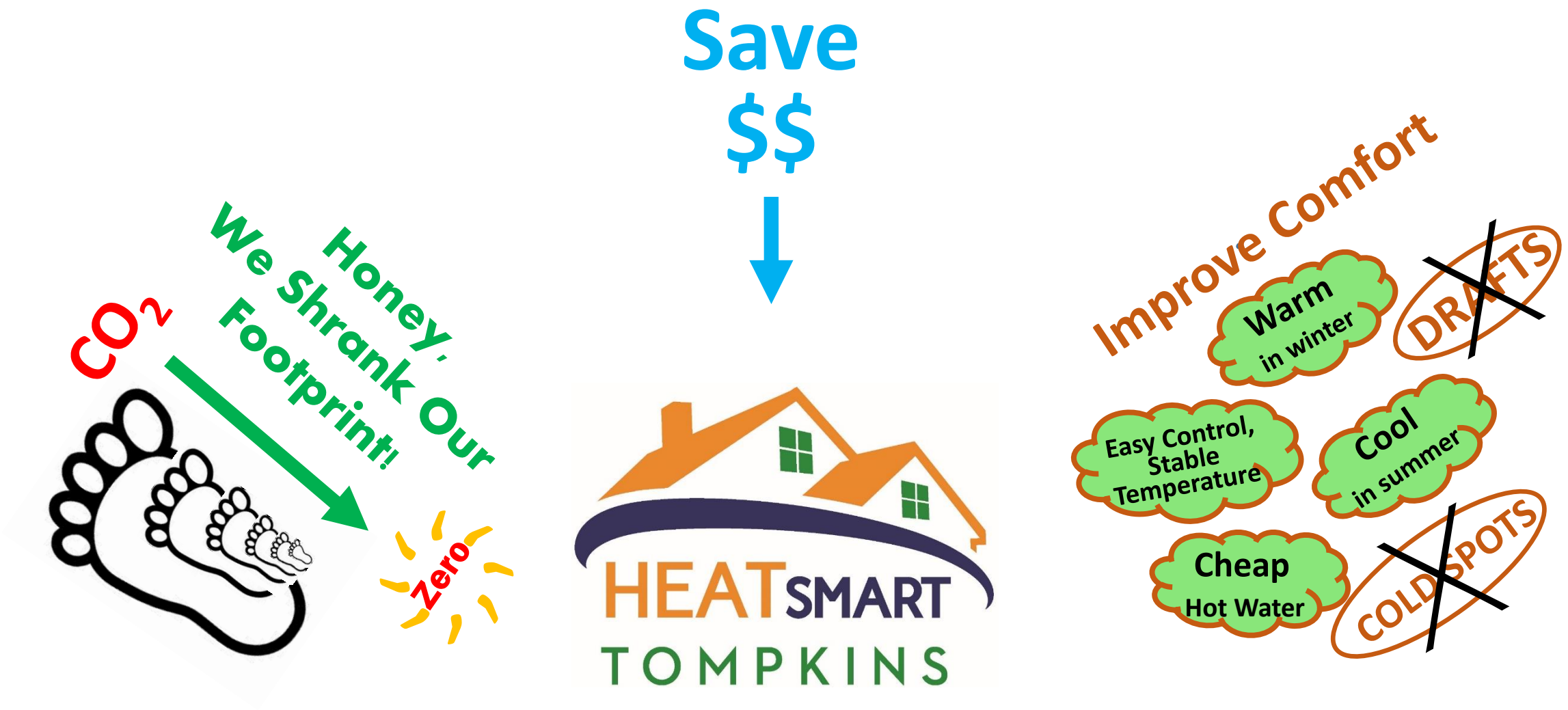
HeatSmart Best Practices are posted including:

- Required certifications and/or credentials
- Installation requirement details
- Allowable equipment and materials

Videos and links to Installers

Lowering the Costs

- Reducing soft costs- by generating leads, higher conversion rates
  1) The effort to pay-off ratio gets a lot of discussion with the installers
  2) Market is very down right now so it is sometimes challenging to recognize the boost
- Having multiple installers helps guarantee some price competition. Of our three slots, two are strongly biased in favor of local businesses and the third is open.
- We have seen other businesses in the area lower costs to compete.
- Our installers tell us the pricing is 15-20% lower than their normal pricing, but we have no market standard to judge that against


Save
$$
Honey, We Shrank Our Footprint!
CO_2
Zero
HEATSMART
TOMPKINS
Improve Comfort
Warm in winter
DRAFTS
Easy Control, Stable Temperature
Cool in summer
Cheap Hot Water
COLD SPOTS

HeatSmart Enrollment

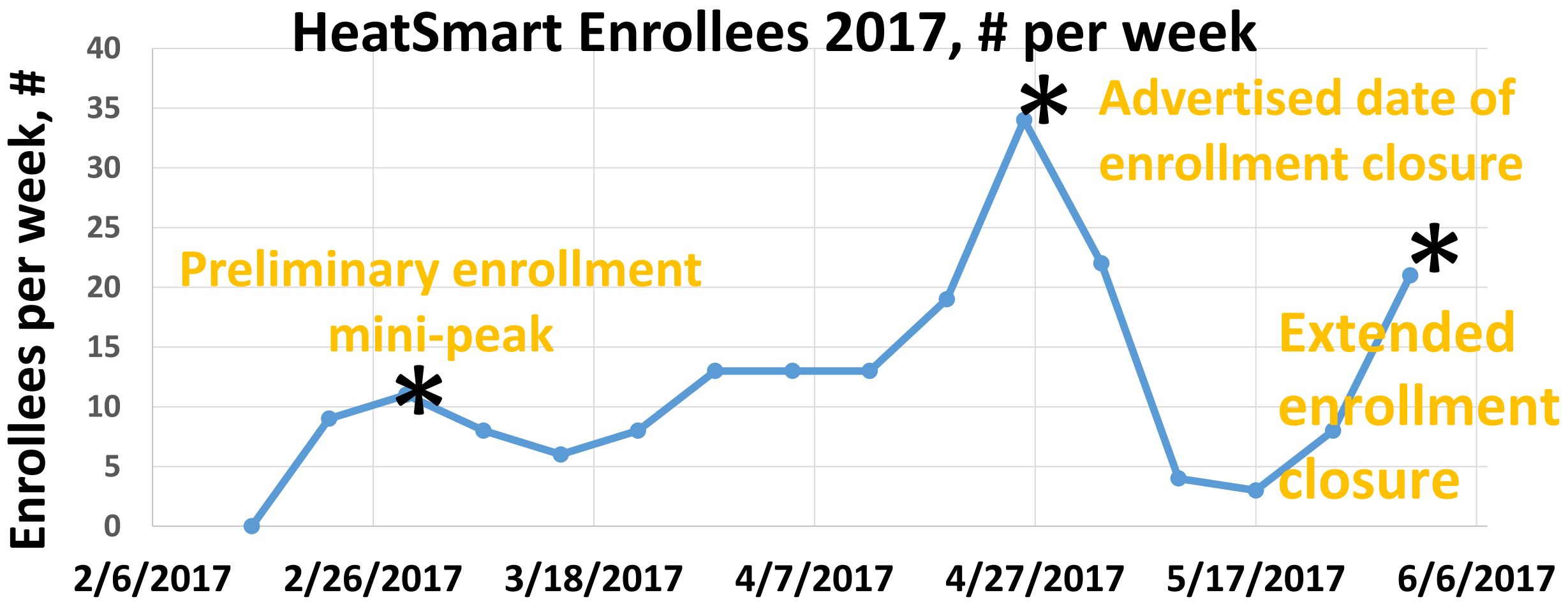
Enrollment is done online at www.SolarTompkins.org
(paper enrollment forms also available here at meetings)

HeatSmart asks that enrollees initially pick ONE Installer Partner

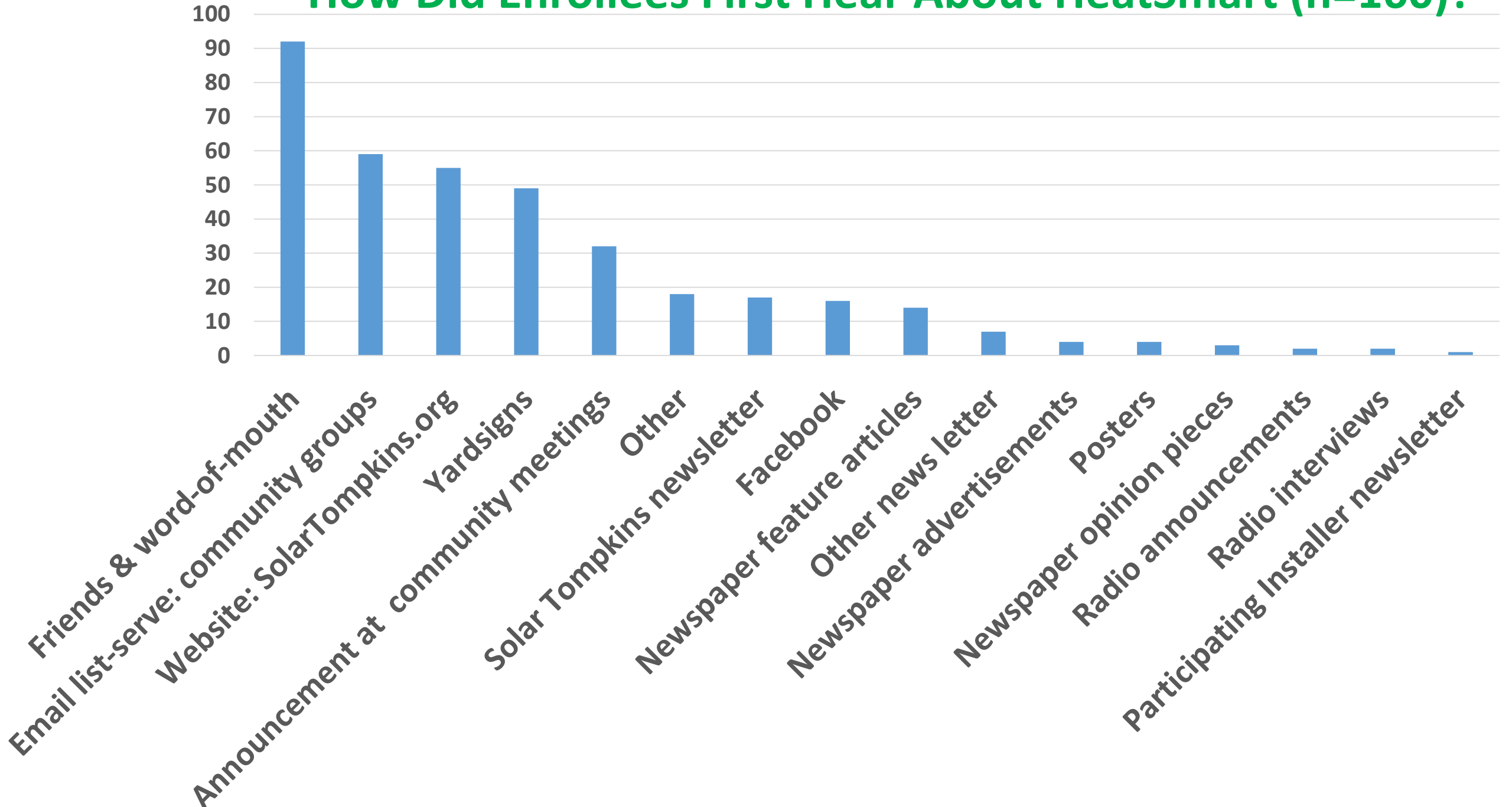
- **Pricing is already negotiated and public**
- **A majority of enrollees pick and contract with their first choice installer**

If, after the first assessment, an enrollee desires a second evaluation, they can ask the HeatSmart Program Director (that's me) and I then open a parallel lead

HeatSmart enrollment, rates through time



How Did Enrollees First Hear About HeatSmart (n=160)?

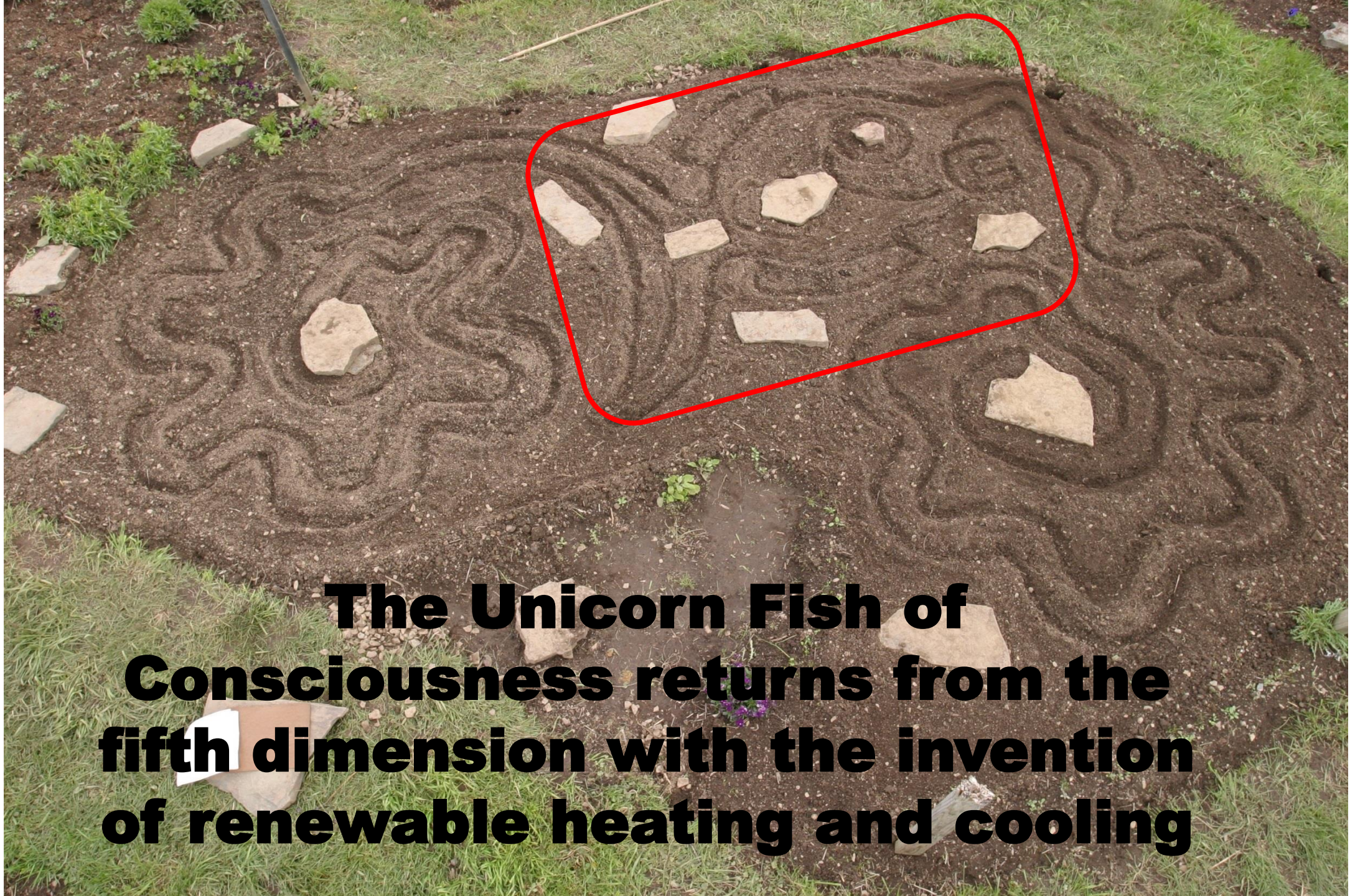


Comparing HeatSmart with a utility-run program

- NYSEG ran the ‘Yes Community Solutions’ program concurrently with HeatSmart.
  - HeatSmart is powered by word-of-mouth and local list-serves
  - NYSEG’s Yes Home Solutions is all web-based interactions promoted by large customer mailings. Relatively little educational content.
- 2 of our 3 installer partners also participated with NYSEG
- Similar numbers of leads were generated by each program—no overlap at all!
- The installers expect a much higher conversion rate from HeatSmart leads
- The NYSEG leads are buying no heat pumps but are nonetheless resulting in some building shell work and other household efficiency measures

Heatpump Theory

Origins of the Heat Pump Concept


The Unicorn Fish of
Consciousness returns from the
fifth dimension with the invention
of renewable heating and cooling

UF of C has adapted the traditional concept of duality in Yin-Yang energy centers to the cause of RH&C. The Yin&Yang spirals become wavy heat-exchanger coils!

This is a great opportunity to study the phase changes of the refrigerant. It flows from the tail as a liquid (yellow) into the outside heat exchanger where it gradually evaporates to gas (red) thus storing the potential energy of latent heat. UF of C is the compressor. The hot gas leaves through his horn into the inside heat exchanger where it condenses back to liquid releasing its stored energy as heat.

Pros and Cons of Heating with ASHPs

ASHP Pros

- Minimal Infrastructure:
  - ✓ Ductless versions have no extra ‘heat distribution’ costs
  - ✓ Multiple inside units are all individually controlled
  - ✓ Very small ‘footprint’ for equipment and no digging
  - ✓ Always provide heating and air-conditioning as well

ASHP Cons

- Heat distribution can be limited by number of inside units
- Outdoor compressors exposed to the elements
- Max BTU output declines at very low temperatures
- Seasonal energy Efficiency only 250%, lower than for GSHP

Pros and Cons of Heating with GSHPs

GSHP Pros

- Highest seasonally-averaged energy efficiency (350 to 400%)
- Takes advantage of existing heat distribution systems
- NYSERDA incentive of $1,500 / ton (now has official approval)
- Heating capacity not affected by outside air temperature
- Ground-loop system lasts 50 years or more, pumps/compressors indoors

GSHP Cons

- Substantial adder costs can arise:
  - ✓Vertical loop field drilling, property remediation
  - ✓Heat distribution upgrades (e.g. adapting hydronic systems)
- Land area requirements greater, more ground disturbance

HeatSmart Timeline

2016 2017 2018

Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sept Oct Nov Dec Jan

HeatSmart is Here

Installer Selection

Public Meetings **Ext.**

Enrollment **Ext.**

HeatSmart Tour

Assessment and Contract

Installations

(get oriented, meet the installers)

(enroll online at SolarTompkins.org)

(see equipment in action & learn about installation experiences)

Heat Pumps have the LOWEST OPERATING COSTS!

This analysis assumes a 3-ton design temperature heating need:

heating mode	annual cost
• Gas ($0.96/Mcuft)	$ 888
• Heating Oil ($2.59/gallon)	$ 1800
• Propane ($2.23/gallon)	$ 2676
• electric resistance heater ($0.088/kWh)	$ 1981
• ASHP ($0.088/kWh)	$ 760 *** runner up ***
• GSHP ($0.088/kWh)	$ 565 *** the winner ***

Heat Pumps have the Smallest Carbon Footprints!

This analysis assumes the same 3-ton design temperature heating need:

old heating mode	metric tons CO2 (per year)	% of footprint left after switch to: ASHP	GSHP
• Gas	5.08	46%	33%
• Heating Oil	7.11	33%	24%
• Propane	5.93	40%	28%

- These large reductions in carbon footprint going from fossil fuel to a heat pump, even when just buying electricity from NYSEG, are due to both the super-high efficiency of the heat pumps and the fact that in our region the grid electricity is over half from low-carbon sources like hydro-electric.

Get electricity from solar or wind and you approach 

carbon!

Cost of conversion to ASHP payback times

Considering the same 3-ton heating need of the previous examples, what is the full cost of switching heating modes compared to costs of continuing to heat with the furnace? Heat pump system cost $12,550.

Original Fuel	Old Furnace Monthly cost	New Heatpump Monthly Cost (operation)	Heatpump Total Costs (operation & payments)	Change in year1 Monthly Budget	Savings over 15 years
heating oil	$ 150	$ 66	$ 196	$ (46)	$ 240
propane	$ 224	$ 66	$ 196	$ 28	$ 13,919

	cost of replacement furnace			
heating oil	$ 7,500	$ 117	$ 33	$ 9,830
propane	$ 3,600	$ 148	$ 76	$ 19,812

This example assumes the use of single-zone ASHP (best ton/$) and a 10 year loan at 4.5% interest.

Cost of conversion to GSHP and payback times

Considering the same 3-ton heating need of the previous examples, what is the full cost of switching heating modes compared to costs of continuing to heat with the furnace? GSHP system costs $21,300, but we expect a NYSERDA incentive of $4,500 ($1500/ton) bringing it down to $16,800.

Original Fuel	Old Furnace Monthly cost	New Heatpump Monthly Cost (operation)	Heatpump Total Costs (operation & payments)	Change in year1 Monthly Budget	Savings over 15 years	Savings over 25 years
heating oil	$ 150	$ 47	$ 221	$ (71)	$ (1,488)	$ 10,886
propane	$ 224	$ 47	$ 221	$ 3	$ 12,192	$ 33,422
	cost of replacement furnace					
heating oil	$ 7,500		$ 117	$ 7	$ 7,756	$ 20,131
propane	$ 3,600		$ 148	$ 50	$ 17,738	$ 38,969

This example assumes the use of single-zone ASHP (best ton/$) and a 10 year loan at 4.5% interest.

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Acknowledgements

HeatSmart Board Members (all volunteer)

Current Board

- Brian Eden
- Martin Hatch
- Matthew Johnston
- Melissa Kemp
- Roxanne Marino
- Gay Nicholson
- Julie Schroeder
- Tom Seaney
- Mark Witmer
- Charles Woodcock

Past Board

- Karim Beers
- Linda Mizer
- Leslie Schill
- Marie McRae

County

- Katie Borgella

Social Ventures

- Sara Hess

Many Volunteers who help our programs succeed!

The Park Foundation and all our Individual Sponsors

Questions?

HEATSMART TOMPKINS

HeatSmart Installers

SOLAR TOMPKINS

snugplanet

NP environmental™
Sustainable Technologies

Upstate
Spray Foam Insulation

HALCO

Everything

Has a Footprint

ASHP Components

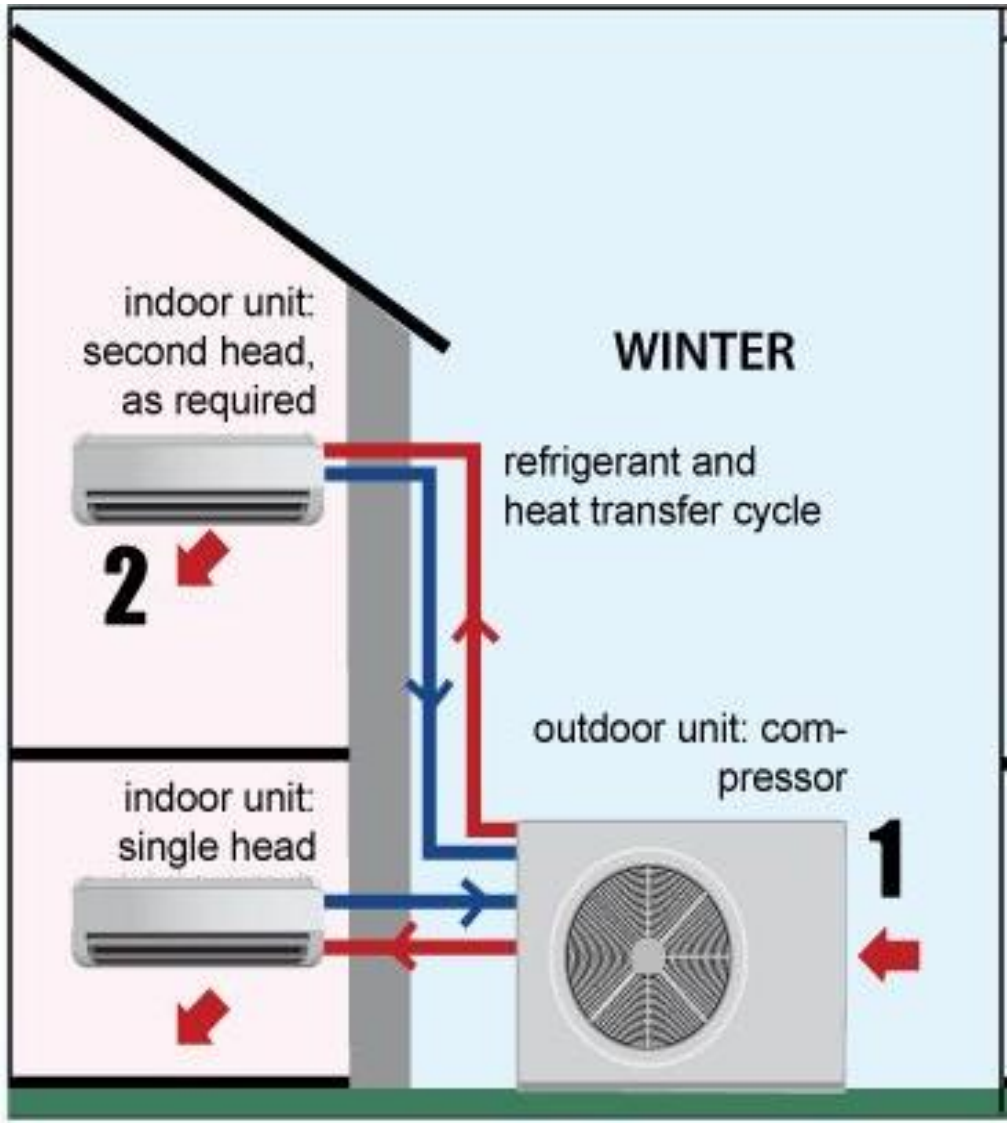
Graphic shows a ‘ductless minisplit’

- Compressor unit facilitates transfer of heat from the air outside to the indoors using recirculating refrigerants

- Seasonal Efficiencies to 250+%

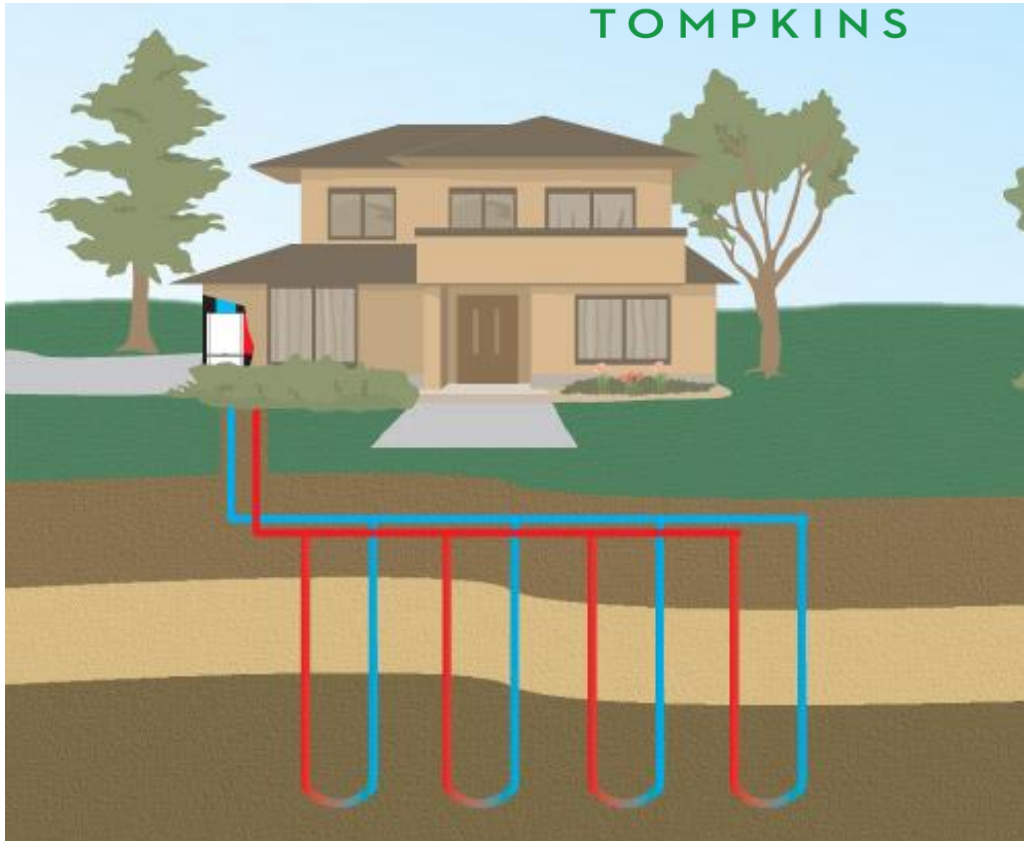
- ASHP offered through HeatSmart guaranteed operating range down to -13ºF and function down to -19ºF.

This capacity is a modern development of cutting edge ASHP technology.



GSHP Components

The compressor and hot and cold heat exchangers are all in one casing that goes in the basement



Water mixed with 5% safe, food-grade glycol circulates between the basement and the buried loopfield capturing heat (in winter) or depositing heat (summer air conditioning) in the ground

Size of an Average GSHP Loopfield

Vertical 4-ton System Ground Disturbance Roughly 20’ x 20’

Horizontal 4-ton System Ground Disturbance: Roughly 33’ x 250’