2022 Energy Efficiency Forum

October 31st & November 1st

VIRGINIA ENERGY EFFICIENCY COUNCIL

A Tale of Two Heat Pumps

October 31, 2022

ENERGY EFFICIENCY FORUM

A Tale of Two Heat Pumps

Dave Lis, *Northeast Energy Efficiency Partnerships (NEEP)*

Maggie Kelley Riggins, *Southeast Energy Efficiency Alliance (SEEA)*

Louis O'Berry, *Rappahannock Electric Co-op*

Dan York, *American Council for an Energy Efficient Economy (ACEEE)*

Cleaner Home Heating: the Rapid Rise of Heat Pumps Across the US

Dan York, Senior Fellow, ACEEE

2022 Energy Efficiency Forum

Virginia Energy Efficiency Council

Oct 31, 2022

ACEEE
American Council for an Energy-Efficient Economy

A quiet, clean revolution underway

A sampling of titles from papers (dozens of them) presented at ACEEE's 2022 Summer Study

- *Cold-Climate Packaged Heat Pumps: Resistance is Futile*
- *Why We Should Never Install Another Air Conditioner*
- *High Efficiency Heat Pumps Can Pave the Path for Building Decarbonization in Cold Climates*
- *The Present and Future of Decarbonizing through Electrification in Commercial Buildings in the Midwest*

Why now? Drivers of change

- Decarbonization policies: local, state, and national
- Greening of the grid
- Improved heat pump performance (esp. for cold climates)
- Increased need and desire for greater demand flexibility

Barriers for switching to heat pumps for space heating/cooling

- High first costs (even if lower life cycle costs)
- Home readiness: electrical and other system upgrades typically needed
- Customer preferences/unfamiliarity
- Perceived risks by customers (esp. in cold climates)
- Contractor/supplier inexperience, resistance, and unfamiliarity

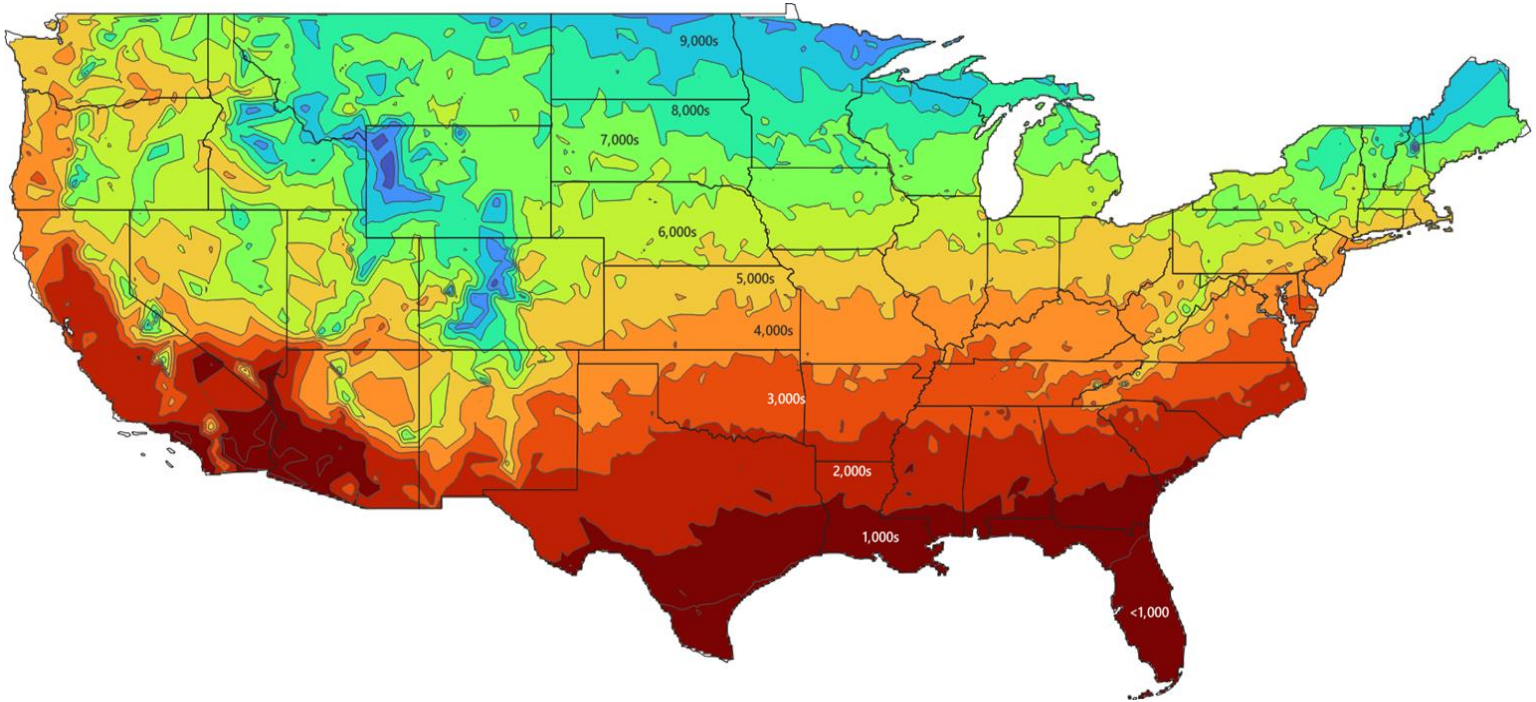
Benefits of heat pumps and electrification for residents

- Improved health and safety within the home – possibly improved comfort
- Can generally reduce energy costs (depends on climate, local energy costs, condition of home)
- May provide air conditioning where none was in place; increasingly important due to extreme, life-threatening heat waves

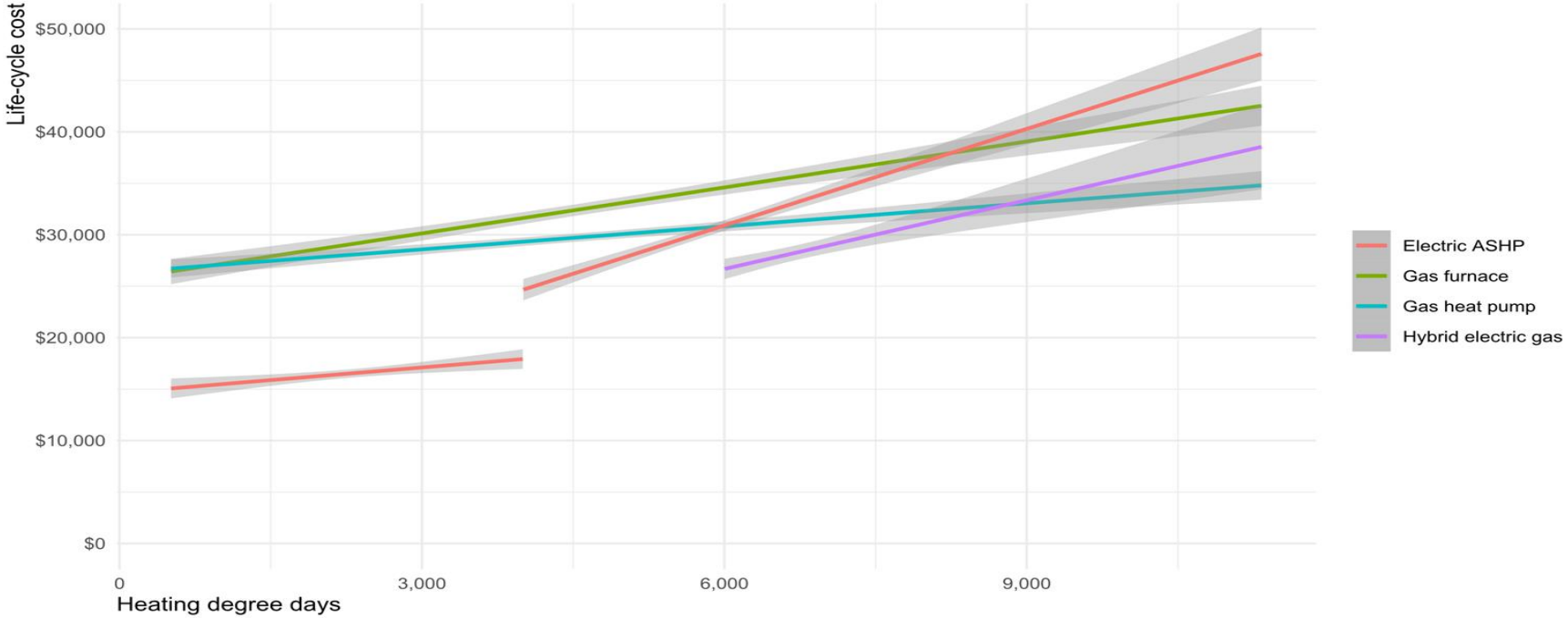
ACEEE Study

- 2015 Residential Energy Consumption Survey (RECS) data
- Home-by-home analysis (1000s of homes modeled)
- Equipment installed in 2030 at end of life of AC (or heater if no AC)
- Life-cycle cost
  - 18-year equipment life (13 for water heaters)
  - 5% real discount rate
  - Equipment costs mostly from DOE Technical Support Documents

U.S. Average Heating Degree Days (2006-2020)

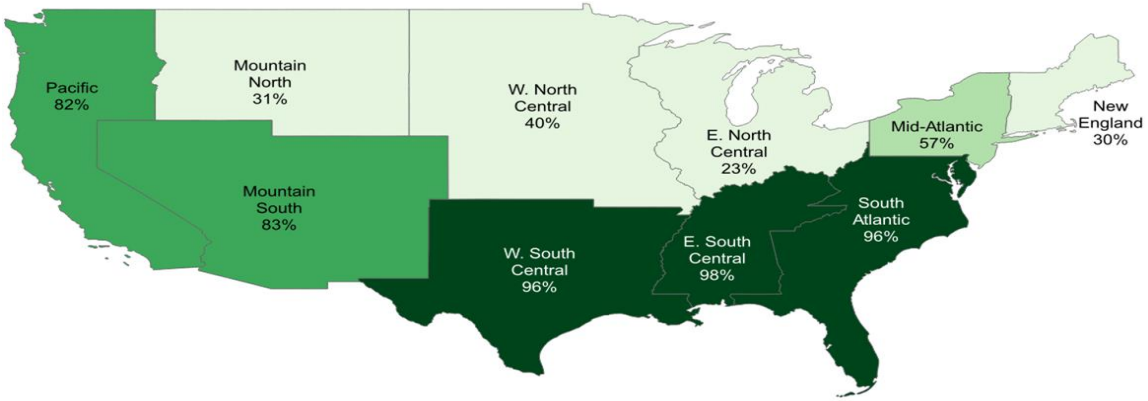


Cost effectiveness for heating a single-family home in the United States (best fit lines)

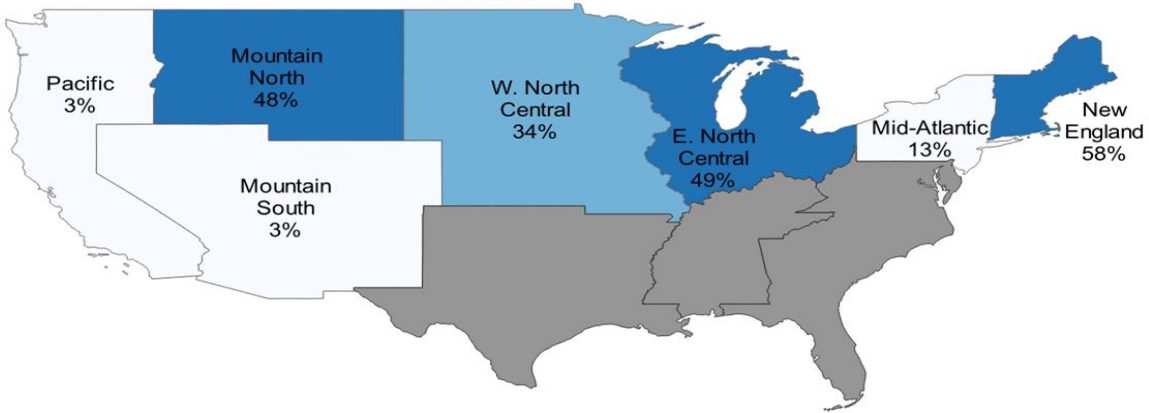


All-electric heat pump or heat pump with fuel backup is most cost-effective in **81% of U.S. homes**

% of homes where all-electric heat pump is lowest life-cycle cost



% of homes where heat pump w/fuel backup is lowest life-cycle cost



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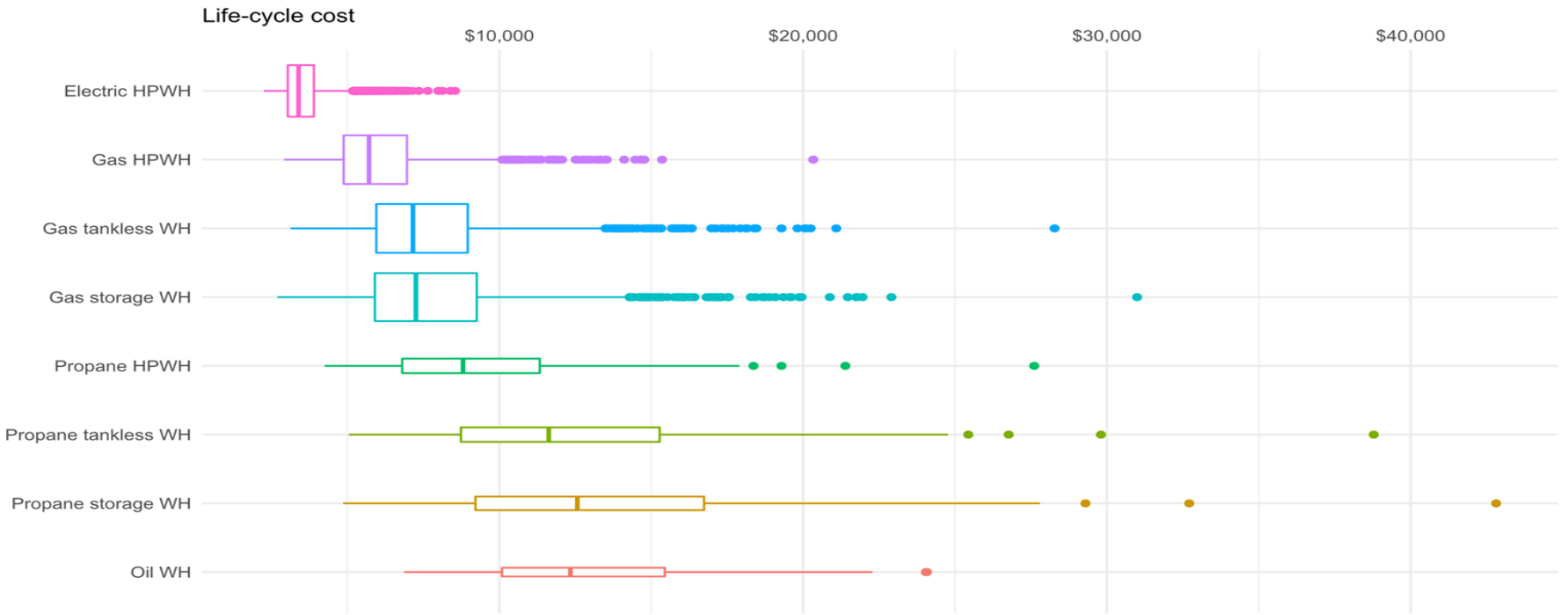
Heat pump water heaters are most cost-effective in every home

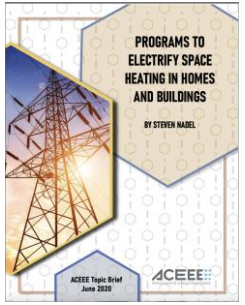


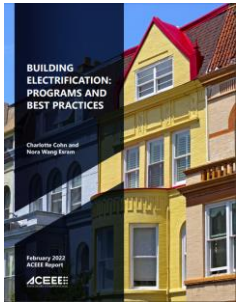
Energy efficiency should be packaged with heat pump conversions

- For many homes, moderate EE package has lowest life-cycle costs
- For some system types, deep retrofit at time of building renovation often reduces life-cycle costs further, particularly homes (a) heated with oil or propane, (b) with above-average energy use or (c) in cold climates.
- Energy efficiency could help alternative fuels better compete economically with electric options, also helps electric HP minimize need for fuel backup

States are updating program designs to scale EE + electrification

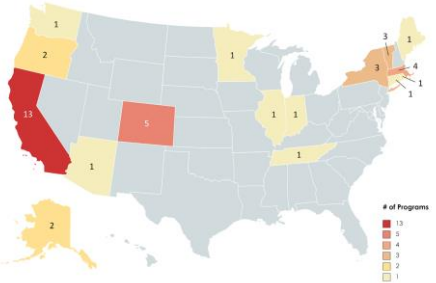
- Electrification in Buildings is growing – programs had a collective annual budget of $166 million
  - Up from $108 million reported in Nadel 2020





Program design trends:

- Encouraging weatherization to reduce loads alongside new heat pumps
  - Offering 'pre-electrification' or 'heat pump ready' programs (e.g, weatherization, envelope programs)
  - 1/3 of programs require weatherization
- Targeting upstream incentives to contractors or distributions
- Updating program materials, incentives to align with reducing total energy use across fuels
  - Contractor training in cold climate heat pump performance, maintenance, etc
  - Offering higher incentives, enabled by all fuel savings and value on GHG reductions



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American Council for an Energy-Efficient Economy

Thank you!

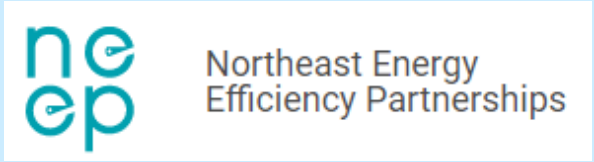
ACEEE research on electrification and heat pumps

Building Electrification: Programs and Best Practices. C. Cohn and N.W. Esram. February 2022. https://www.aceee.org/research-report/b2201

Analysis of Electric and Gas Decarbonization Options for Homes and Apartments. S. Nadel and L. Fadali. July 2022. https://www.aceee.org/research-report/b2205

Building Decarbonization Solutions for the Affordable Housing Sector. D. York, C. Cohn, D. Morales, and C. Tolentino. April 2022. https://www.aceee.org/research-report/u2204

Contact: dwyork@aceee.org



Dave Lis
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SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

Heat Pump Innovation & Application:
Southeastern trends, challenges, and opportunities

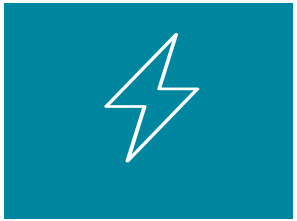
Maggie Kelley Riggins
Senior Program Manager
mkelleyriggins@seealliance.org
October 31, 2022

The Southeast Energy Efficiency Alliance (SEEA) promotes energy efficiency as a catalyst for economic growth, workforce development, and energy security across 11 southeastern states, including Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

Our Values

Take Initiative

We take responsibility for realizing a better quality of life in the Southeast.



Earn Trust

We pursue our work with benevolence, competence, and reliability.

Value Others

We seek, respect, and promote diverse perspectives.

Pursue Equitable Solutions

We recognize, acknowledge, and account for a history of prejudice and inequality in Southeastern communities and the role it plays in the issues we address.

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

Southeast Heat Pump Trends

01

Electrification

SE is highly electrified for space heating and cooling, leading to less barriers for adoption.

02

Affordability

Federal and local efforts to create affordability pathways for heat pump technology

03

Workforce Training Support

Momentum is building to upskill and expand workforce confidence and competency

04

High levels of interest

SE seen as the most ideal place for modern heat pump technology adoption and deployment due to our climate

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

Challenges & Opportunities for Heat Pumps

(In the Southeast)

Regulatory Environment

Regulations can create barriers for incentives and programs from utilities and government entities

Training & Education

Increase training and educational opportunities and resources

Trust & Confidence

Building recognition of the products for consumers, stakeholders, and workforce

Costs

High upfront costs; federal incentives on the way through IRA

Supply

Keeping heat pumps in supply for training and installation on demand for consumers

Equitable Adoption

Ensuring equitable deployment strategies for low-income, rural, and BIPOC communities

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

Thank You

SMART ENERGY. STRONG ECONOMY. FOR ALL.

WWW.SEEALLIANCE.ORG

2022 VAEEC Fall Forum

Louis O'Berry
Energy Solutions and Services Administrator

Tale of Two Heat Pumps-A Utility Perspective
November 2022

SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

CONNECTING OUR
MEMBERS AND COMMUNITIES
WITH SAFE, RELIABLE, AFFORDABLE,
AND SUSTAINABLE ENERGY SOLUTIONS.

REC QUICK FACTS

22 Counties

4,000 sq. mi. Territory

170,000 Services

17,500 Miles of Line

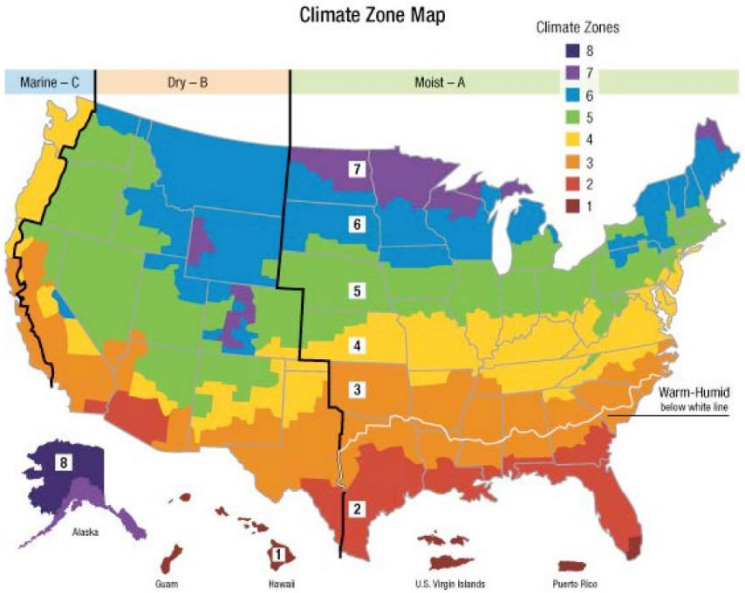
10 Accounts per Mile

$416M Revenue

430 Employees

Heat Pump Solutions- Types

- Ducted Air Source
- Ductless Air Source
- Ground Source (Geo)



All three options are efficient & viable comfort solutions in most applications.

Advantages of Heat Pumps

- Units of heat delivered / unit of energy consumed
- Safe to operate & Simple to maintain
- Tech Advancements (even in subfreezing temps)
  - Warm air delivery
  - Variable speed fans & compressors
  - Improved cooling & dehumidification
- Improved equipment ratings- SEER, EER, HSPF, & COP
- Reduce Green House Gas Potential

Factors combined make heat pumps viable install and retrofit options

HP Adoption Rates- US

Heat pumps in **existing buildings:**

Residential	27% COOLING	16% HEATING
Commercial	8% COOLING	11% HEATING

National sales (2022):

3.9 million
HEAT PUMPS

- 80% Single Speed
- 17% 2-phase
- 3% Variable speed/inverter

Heat pumps in **new construction:**

Residential	39% SINGLE FAMILY	46% MULTIFAMILY

compared to:

6.2 million
AIR CONDITIONERS

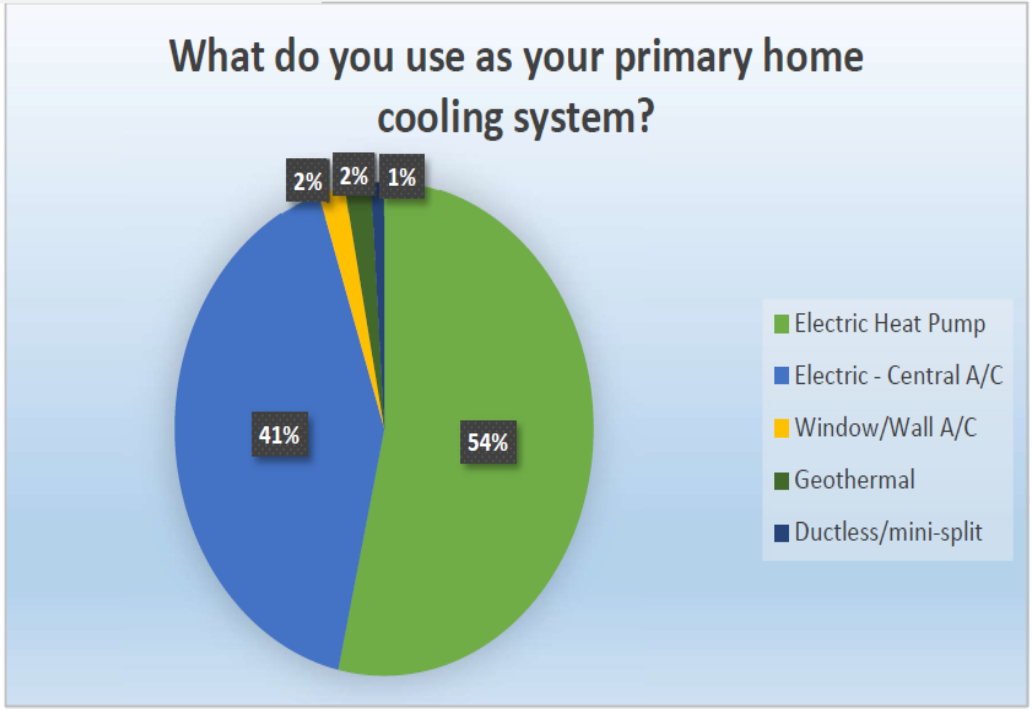
4 million
FURNACES

Figure 1. Current heat pump adoption in the U.S.

Sources: (EIA 2015/2020/2022; AHRI 2021; DOE 2020; NAHB 2020; Industry Interviews 2021)

HP Adoption Rates- REC

Cooling Systems

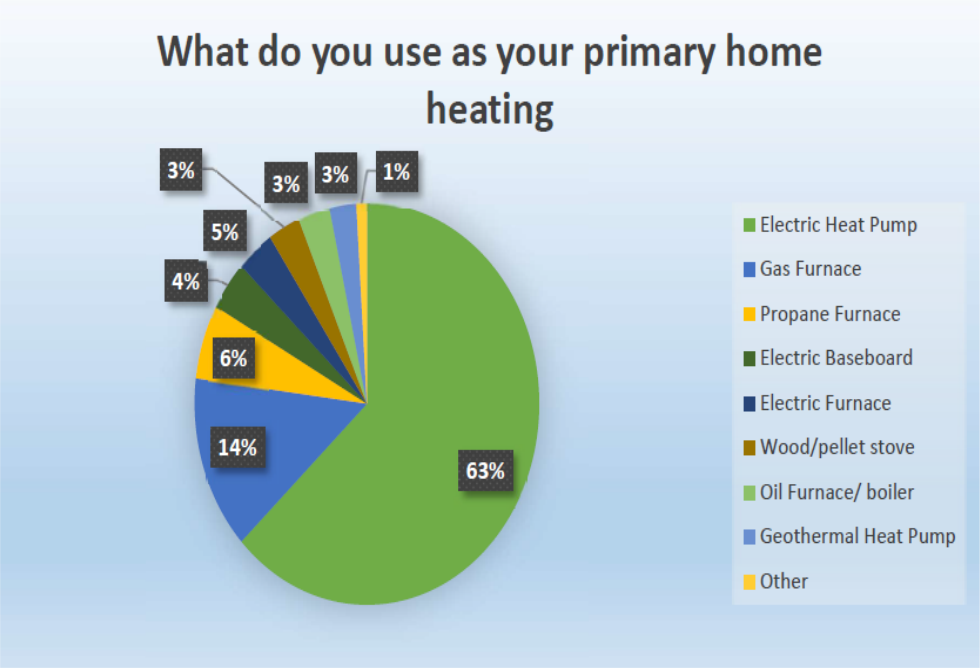


54% of our Members said that they use Electric Heat Pumps as their primary cooling system.

When asked, "What do you use as your *secondary* home cooling system" – **43%** of respondents said "Electric Heat Pump"

HP Adoption Rates- REC

Heating Systems



63% of our Members said that they use Electric Heat Pumps as their primary heating system.

When asked, "What do you use as your *secondary* home heating system" – **29%** of respondents said "Electric Heat Pump"

**Other* consists of Ductless/mini-split and Kerosene stove/heater

Overcome the Barriers-A Glance

Barrier	Solution
Retrofit Costs	Rebates & Incentives
Equip. & Ducts	Sound engineering & Specs.
Weatherization	WX & Utility Programs
Manufacturers	Education/ Re-branding
Environmental	Low/No GWP Refrigerants

Barriers to access include Industry, Technology & Affordability

Vividly Brighter Upgrades

Residential Energy Efficiency Program

Launched August 2022

REC's Vividly Brighter program offers innovative solutions that power an economically and energy efficient future.

Vividly Brighter

BY RAPPAHANNOCK ELECTRIC COOPERATIVE

THANK YOU

REC's Vividly Brighter program offers innovative solutions that power an economically and energy efficient future.

Q&A

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