Pioneer Valley Habitat for Humanity®

# All-Electric Homes Initial Affiliate Survey

MASSCEC EmPower Innovation Grant
May 2023

## Introduction

The goal of this project is to realize the potential of all-electric homes for low-income first-time homebuyers who are working with Habitat for Humanity affiliates across the state of Massachusetts. Habitat for Humanity affiliates build dozens of new homes each year and building practices vary from affiliate to affiliate. This survey provides a look at current practices as we convene affiliates to share best practices for building simple, durable, energy efficient homes.

Of the 16 Habitat for Humanity affiliates in Massachusetts, 14 were able to fully complete this survey, and all were able to partially complete this survey.

## Current Builds, Goals, and Barriers

Across the state, affiliates are **currently building a total of 61 homes** (as of May 1, 2023). Of these homes, **44 are all-electric.** Current affiliate practices also range from those who already build all-electric, zero-net-energy homes to those just beginning research into transitioning away from fossil fuels.

Affiliates already building all-electric homes express goals of continuing on their current trajectories, aiming to build similarly energy-efficient homes over the next five years. Goals include:

- Consistently meeting ENERGY STAR standards and improving HERS ratings, with stretch goals of meeting standards for passive or LEED-certified homes
- Introducing more sustainable landscaping techniques, including permaculture landscaping
- Researching ICF builds and other new technologies as they become more widely available

For affiliates not currently building all-electric homes, goals include transitioning away from fossil fuels, ensuring future homes are zero-energy-ready, and balancing broad goals of energy efficiency with construction costs.

Many affiliates, regardless of the energy efficiency of their current builds, share challenges when it comes to building future all-electric homes.

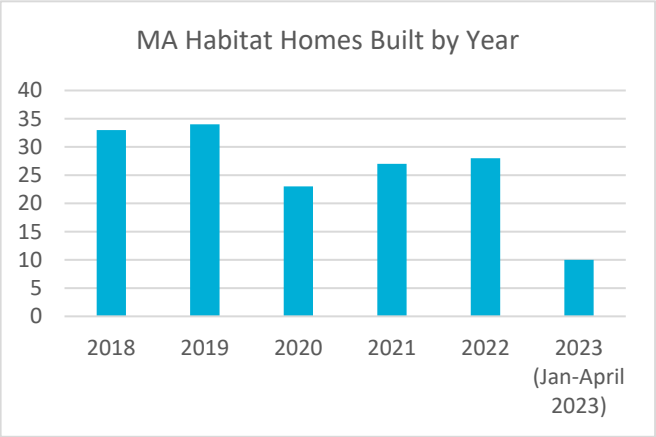
- Some are already building zero-energy-ready homes or homes designed for solar, but **securing reliable sources of funding for solar** is a challenge
    - Funding is the main concern; obtaining available incentives can be confusing or not possible
    - Staff or volunteers don't have the capacity to navigate research or acquisition of solar
- **Homeowner and volunteer education** is challenging around potentially complex new systems
    - With typical volunteer turnover, there is a continuous process of **re-training volunteers** in different building techniques for energy-efficient homes
    - There is also concern for the **cost of future maintenance** of new technologies for homeowners
- Current expertise or already-owned donated product may not translate to all-electric builds

By participating in this project, affiliates hope to:

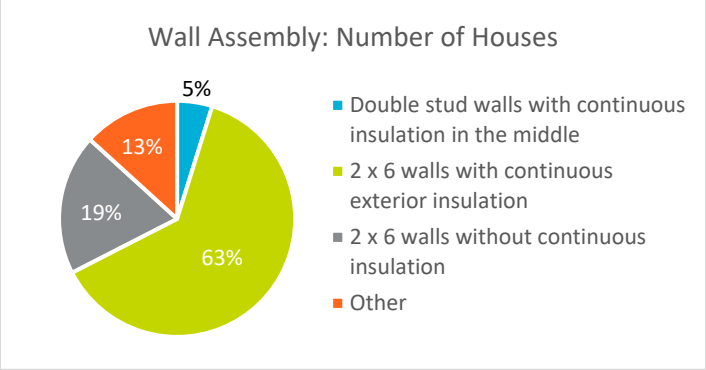
- Learn about best practices across the state for increasing sustainability and decreasing energy costs, while still building cost-effective homes
- Learn practical approaches to transitioning away from fossil fuels from those who have already done so
- Compare experiences in building energy-efficient affordable homes in different areas
- Create messaging and educational materials for future homeowners around energy efficiency
- Explore additional funding sources, rebates, or incentives
- Find new resources for design and energy-efficient technology

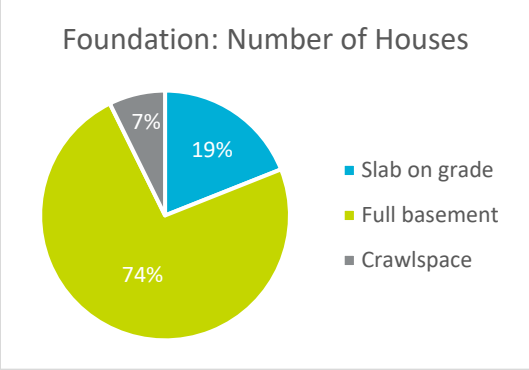
## Builds in the Last Five Years

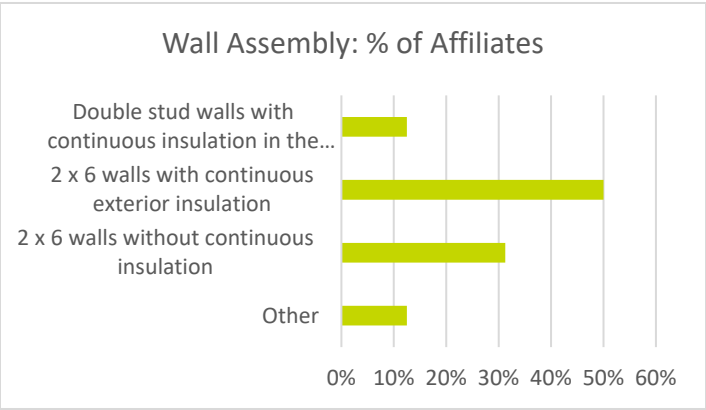
Massachusetts affiliates have built **155 new homes** in the last five years. Of those, **85** are all-electric, and **58** homes were self-reported as having participated in the Mass Save new construction program.

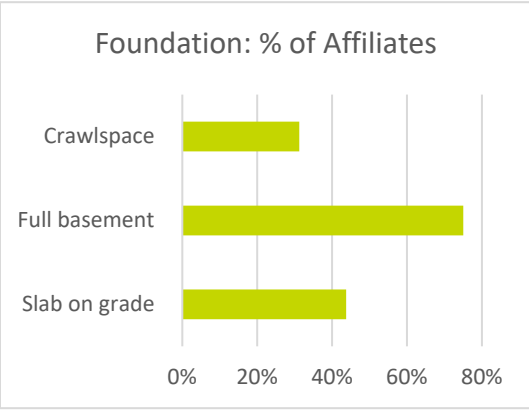



Assemblies for reported homes vary, but there are clear leaders in each area: 63% use 2x6 walls with continuous exterior insulation, and 74% are built with a full basement. Some affiliates have built using multiple different wall assemblies and foundations during the last five years, but the most common assemblies by build are also the most widely used among affiliates: 50% of affiliates have used 2x6 walls with continuous exterior insulation, and 75% have built with full basements.

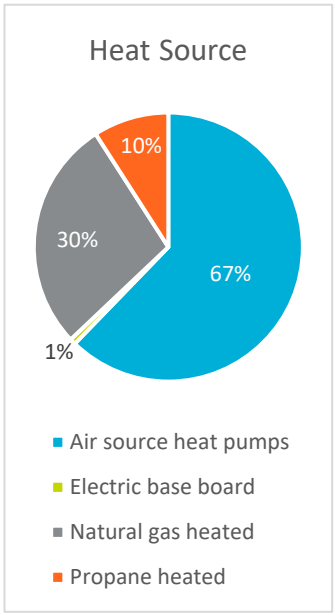


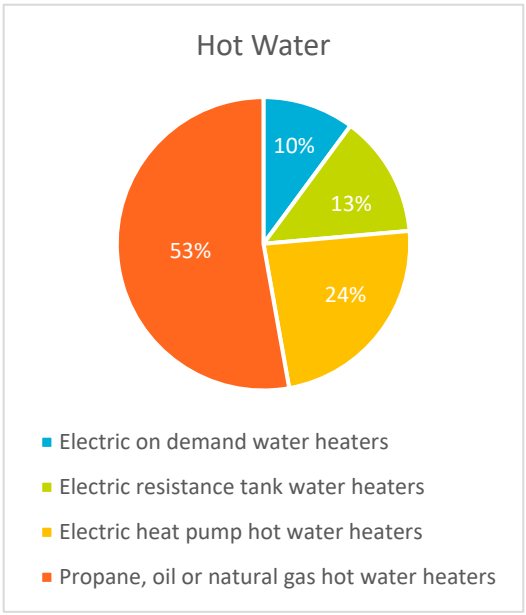



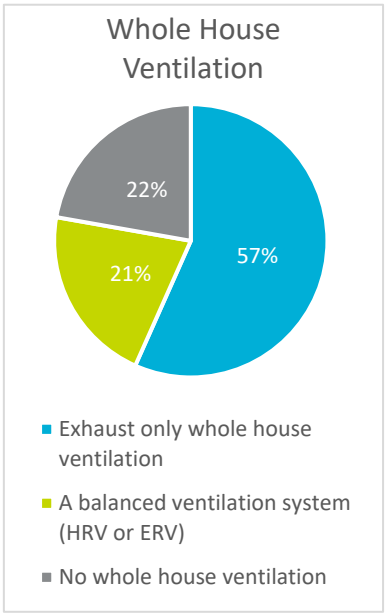



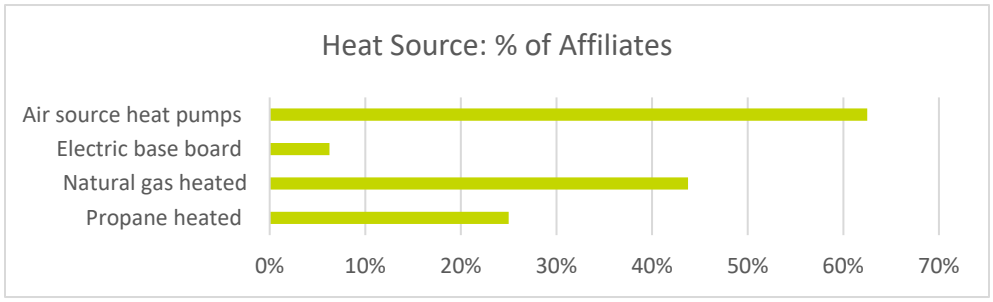



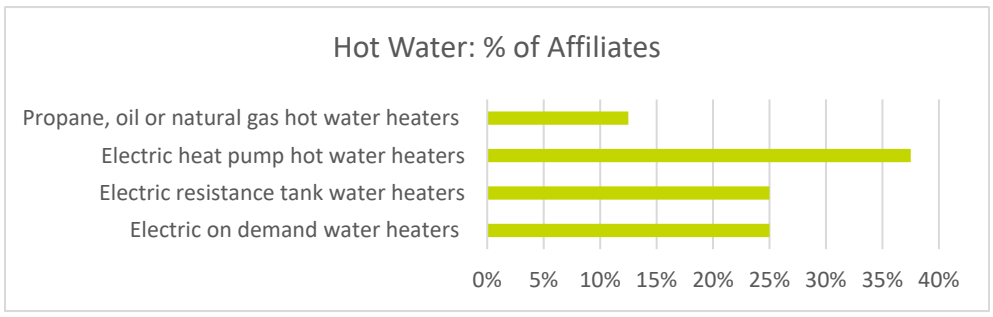
The trends for heat, hot water, and ventilation are more mixed, though there are still clear leaders in each area: 67% use air source heat pumps (ducted or ductless mini splits), 53% use propane, oil, or natural gas water heaters, and 57% use exhaust-only ventilation (such as a bath fan). Most homes did not have backup heat sources. Those that did most commonly had electric resistance heaters in smaller spaces, such as bathrooms or hallways.

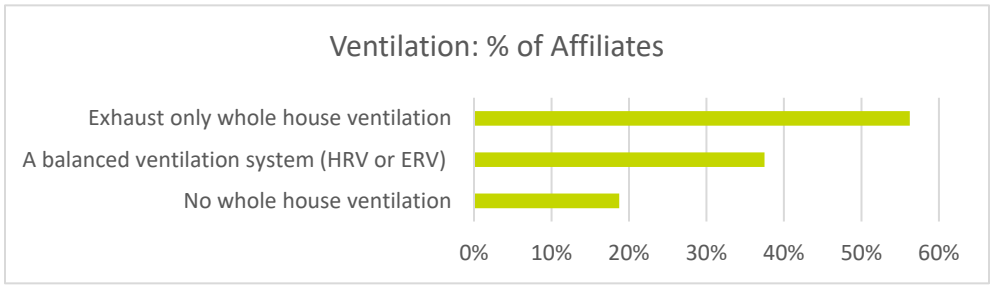


## HERS Ratings

The Home Energy Rating System (HERS) is the industry standard by which a home's energy efficiency is rated; the lower the rating, the more efficient the home. Massachusetts affiliate homes have a wide range of best scores achieved, but are largely already efficient. All of affiliates' most energy-efficient homes scored below a 50; a score of 50 indicates that a home is 50% more energy-efficient than a home built to the reference home (2006 IECC code).

Looking at just the last five years, the average HERS ratings across affiliates are more closely clustered around the 40s, varying less than affiliates' best ratings of all time.

| Best HERS ratings (all time) | With solar | Without solar |
|---|---|---|
| Best rating | -20 | 35 |
| Average rating | 14 | 45 |
| Median rating | 11 | 46 |

| Avg. HERS ratings (last 5 years) | With solar | Without solar |
|---|---|---|
| Best avg. rating | 11 | 44 |
| Average rating | 35 | 49 |
| Median rating | 38 | 49 |

## Education

Massachusetts affiliates seek advice on building science from a variety of sources for their builds. The most common source of information for affiliates is HERS raters, but others ask local professionals (including consultants, vendors, and trade organizations) or seek in-house expertise from staff and volunteers.

When it comes to educating Habitat homebuyers about the construction and systems within their new homes, all affiliates that responded rely on the education received through participation in construction via sweat equity. Many will also conduct in-person trainings on site with future homeowners, or prepare a written manual.

Only one affiliate currently has written case studies about their builds for the purpose of public education, though many have informal or anecdotal information about their projects.