

2020

Trends in HERS® Rated Homes



Prepared for RESNET's Suppliers
Advisory Board



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Executive Summary

Each year more than one-fifth of all new homes built in the U.S. are rated for their energy efficiency using the Residential Energy Services Network's (RESNET) Home Energy Rating System (HERS) Index. The HERS Index is miles-per-gallon rating for homes where a lower score means less energy use. A score of 100 on the index represents a home built using standard construction practices from 2006, while a score of zero represents a home that produces as much energy as it uses on an annual basis. This report is the first of its kind to look at the trends across all homes receiving a HERS rating in 2019. The report was completed on behalf of RESNET's Suppliers Advisory Board.

The report first looks at broad national level trends in the number of HERS ratings and average index scores. Next, the report covers state level trends, including the total number of HERS ratings in each state and the percent of new homes that received a HERS Rating. After the state level data, the report looks into trends of HERS ratings in cities, including the top 25 cities for single family and multi-family ratings.

The remainder of the report focuses on individual trends across HERS ratings, including a breakdown of the basic characteristics of rated homes and individual building components. As a national aggregate, the average single family HERS Rated home had the following basic characteristics in 2019:

- HERS Index Score: **59**
- Number of bedrooms: **3.7**
- Conditioned floor area: **2,775 ft²**
- Number of floors: **1.6**
- Annual energy cost: **\$1,707**
- Annual energy cost savings: **\$789**
- Annual CO₂ savings: **2.6 tons**

A variety of building envelope components are covered as well as air leakage rates, equipment efficiencies and the use of solar on HERS rated homes.

The report concludes with a first-of-its-kind look at the demographics of buyers of HERS rated homes. This information is based on a 2019 study conducted by mortgage industry giant Freddie Mac. The Freddie Mac report concluded:

- HERS rated homes are sold for, on average, 2.7% more than comparable unrated homes
- Homes with lower HERS Index Scores are sold for 3-5% more than homes with higher HERS Index Scores.
- From an underwriting perspective, there are notable differences between HERS rated and unrated homes.
- HERS rated homes have lower delinquency rates than unrated homes
- Homes with lower HERS Index Scores had even lower delinquency rates.

Another Record Year

In 2019, HERS Raters rated just shy of 242,000 homes. This represents nearly 100,000 more ratings than were completed in 2013 and marks the eighth straight year-over-year increase in HERS ratings. In addition to the record number of HERS ratings, the efficiency of HERS rated homes also improved. The average HERS Index in 2019 was a 59, representing a 41 percent improvement in efficiency over a home built in 2006. Since 2013, the average HERS index score has decreased by four points. Seventy-seven percent of all homes rated last year were one- and two-family dwellings and 23 percent were multi-family units.

HERS Ratings by State

RESNET conducted an analysis of the percentage¹ of new one- and two-family dwellings compared to the number of HERS ratings in each state in 2019. The clear stand-out for the highest percentage of new homes receiving a HERS Rating is Massachusetts. The commonwealth saw 85 percent of all new homes receive a HERS Rating. Three states had more than half of all new homes HERS Rated last year. Those states include Arizona, Nevada and Indiana. A dozen more states had between 25 and 49 percent of all new homes HERS Rated in 2019. Those states are Colorado, Minnesota, Ohio, Oklahoma, Texas, Iowa, New Mexico, Maryland, South Carolina, Delaware, North Carolina and Kansas. Figure 1 shows the percent of homes HERS rated by state.

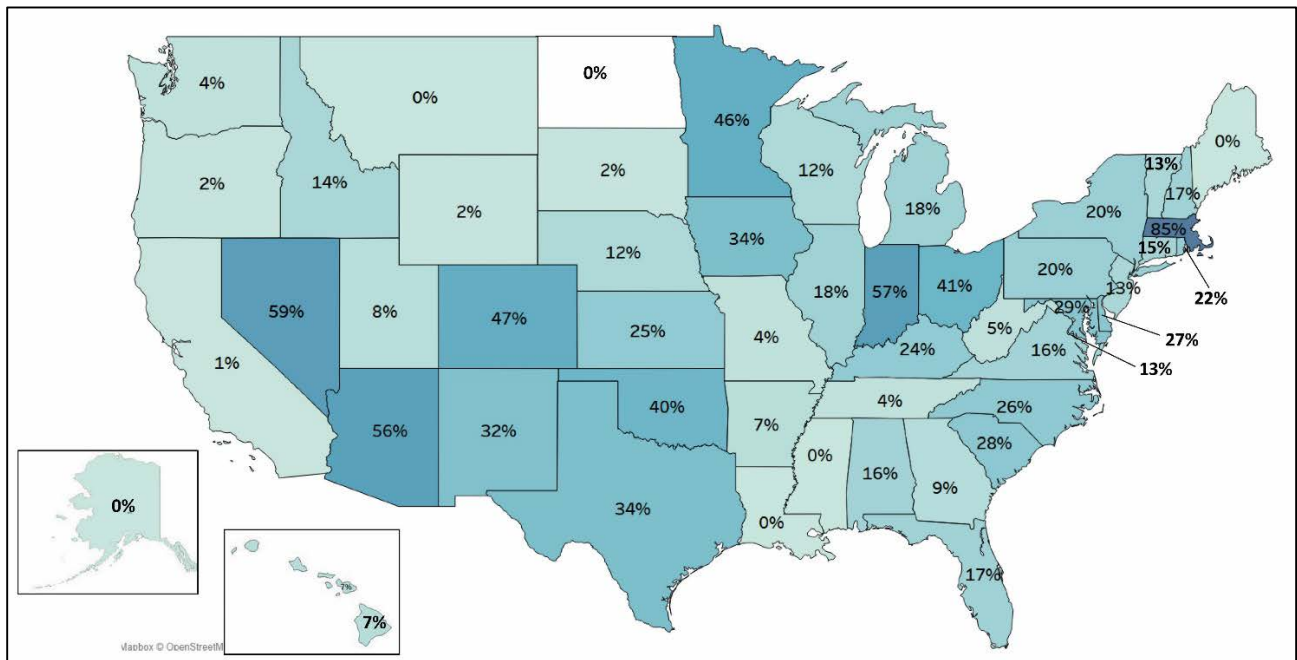


Figure 1. Percent of HERS Ratings by State

When looking at the total number of ratings, for all home types, by state, Texas comes out on top with more than 45,000 homes HERS rated. Six states recorded more than 10,000 ratings last year. Those

¹ Based on the number of HERS Ratings on one- and two-family dwellings in RESNET's National Buildings Registry and permit data from the U.S. Census Bureau

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states are Texas, Florida, Arizona, North Carolina, Colorado and Indiana. Figure 2 shows the total number of HERS Ratings for all home types by state in 2019.

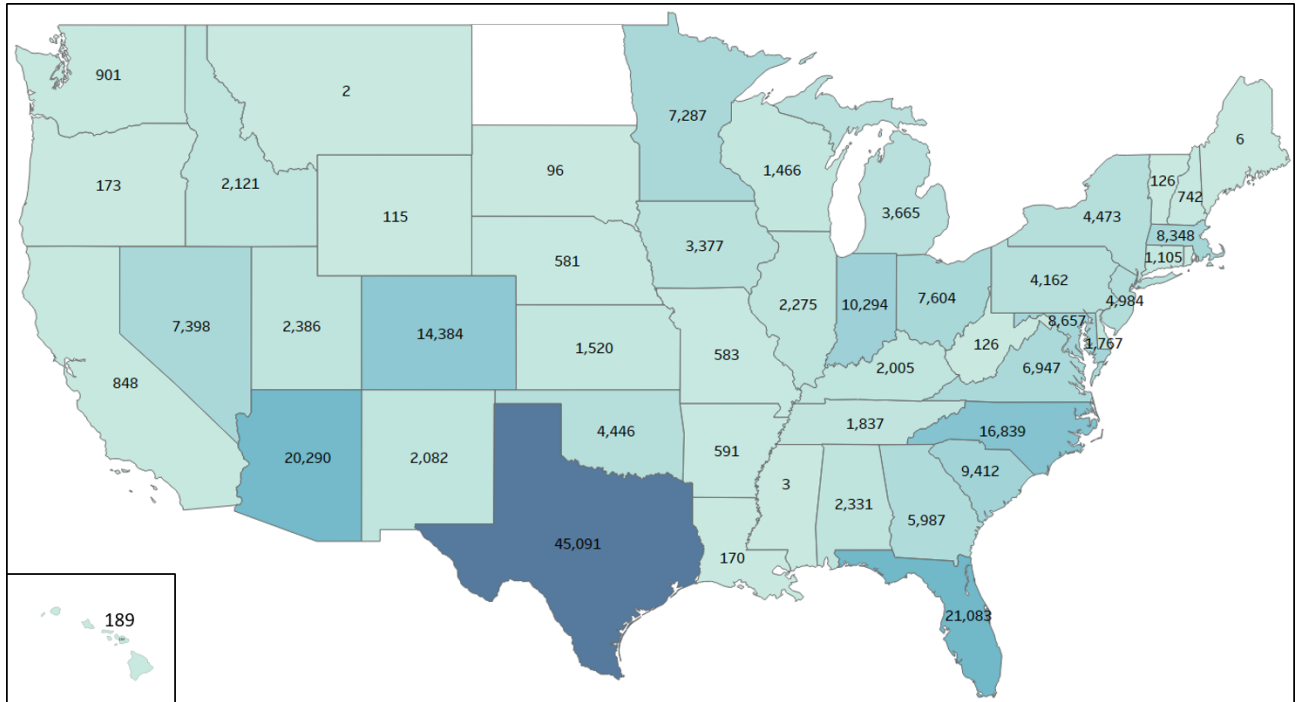


Figure 2. Number of HERS Ratings by State, 2019

HERS Ratings by City

In 2019 there were HERS Ratings completed in more than 4,000 individual municipalities. San Antonio, Texas tops the list of municipalities with the highest number of HERS Ratings at more than 4,200 homes. The top 25 municipalities are located across seven states and are responsible for nearly one-fifth of HERS Ratings last year. Figure 3 shows the top 25 municipalities for HERS Ratings in 2019.

State	City	Number of Ratings
Texas	San Antonio	4,294
Nevada	Las Vegas	3,782
Texas	Katy	2,741
Arizona	Phoenix	2,531
Texas	Houston	2,074
Texas	Richmond	1,997
Nevada	Henderson	1,906
Florida	Orlando	1,869
Arizona	Mesa	1,605

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Colorado	Colorado Springs	1,603
Arizona	Buckeye	1,594
Colorado	Aurora	1,432
Colorado	Denver	1,406
Arizona	Queen Creek	1,389
North Carolina	Charlotte	1,348
Florida	Riverview	1,313
Texas	Cypress	1,298
Texas	Spring	1,289
Arizona	Surprise	1,213
Florida	Winter Garden	1,205
Arizona	Tucson	1,188
Arizona	Peoria	1,179
Indiana	Indianapolis	1,164
Florida	Kissimmee	1,121
North Carolina	Raleigh	1,107

Figure 3. Top 25 Municipalities for HERS Ratings, 2019

When considering only multi-family ratings, there were HERS rated dwelling units in just over 800 municipalities, with Orlando, Florida topping the list at 793 units rated. The top 25 municipalities for multi-family ratings are located across 13 states and are responsible for about one-quarter of all multi-family HERS Ratings last year. Figure 4 shows the top 25 municipalities for multi-family HERS Ratings last year.

State	City	Number of Ratings
Florida	Orlando	793
Maryland	Frederick	615
Maryland	Baltimore	567
Arizona	Phoenix	552
North Carolina	Raleigh	552
Florida	Kissimmee	515
Georgia	Macon	501
District of Columbia	Washington	494
New Mexico	Albuquerque	409
North Carolina	Charlotte	400
Maryland	Hanover	388
Massachusetts	Boston	384
Virginia	Virginia Beach	383
Colorado	Denver	374
New Jersey	Sewell	370
New Jersey	Piscataway	359
Texas	San Antonio	355

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New Jersey	Boonton	348
Virginia	Sterling	310
Maryland	Upper Marlboro	299
North Carolina	Wilmington	292
Florida	Panama City Beach	288
Pennsylvania	Mechanicsburg	282
Florida	Riverview	281
Massachusetts	Saugus	280

Figure 4. Top 25 Municipalities for Multi-Family HERS Ratings, 2019

Components of HERS Rated Homes

This section will address various national construction trends across HERS Rated homes last year. Note that this section will only cover trends across single family homes. RESNET intends to cover trends in multi-family HERS Ratings in the next annual data report.

As a national aggregate, the average single family HERS Rated home had the following basic characteristics in 2019:

- HERS Index Score: **59**
- Number of bedrooms: **3.7**
- Conditioned floor area: **2,775 ft²**
- Number of floors: **1.6**
- Annual energy cost: **\$1,707**
- Annual energy cost savings: **\$789**
- Annual CO₂ savings: **2.6 tons**

The average multi-family dwelling unit had these basic characteristics in 2019:

- HERS Index Score: **59**
- Number of bedrooms: **2.2**
- Conditioned floor area: **1,384 ft²**
- Annual energy cost: **\$1,118**
- Annual energy cost savings: **\$504**
- Annual CO₂ savings: **2.5 ton**

In understanding the data presented in this section, it will be helpful to provide some context for the number of homes rated in each climate zone². This context is useful when considering the insulation R-values and other construction practices characterized below. Climate zones 2 (a & b) and 3 (a & b) cover most of the southern states from Texas and Oklahoma, east to the southern half of North Carolina and south to Florida and the Gulf Coast. They also cover the southern portions of Arizona and New Mexico. These states are primarily in warmer climates and make up roughly 60 percent of single family ratings in

² Climate zone as defined in the 2018 International Energy Conservation Code

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2019. Most of the rest of the ratings were in climate zones 4a and 5 (a & b). These climate zones run roughly from the mid-Atlantic and southern northeast states, west to Nevada and north to Oregon and Washington.

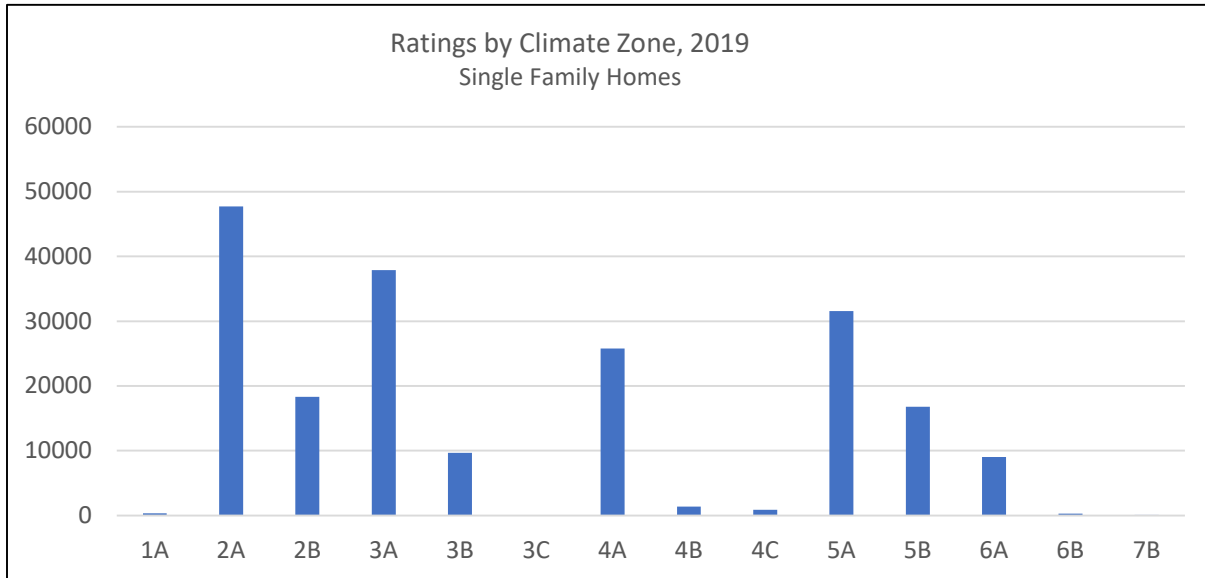


Figure 5. Single Family Ratings by Climate Zone, 2019

Foundation Types and Foundation Insulation

Figure 5 displays the foundation types for HERS Rated homes last year. Nearly two-thirds of single family rated homes were built with a slab-on-grade last year while one-fifth had a conditioned basement. Figure 6 shows the R-values for batt and rigid insulation installed on foundations. In homes that used rigid foundation insulation, two-thirds installed an R-10 or higher.

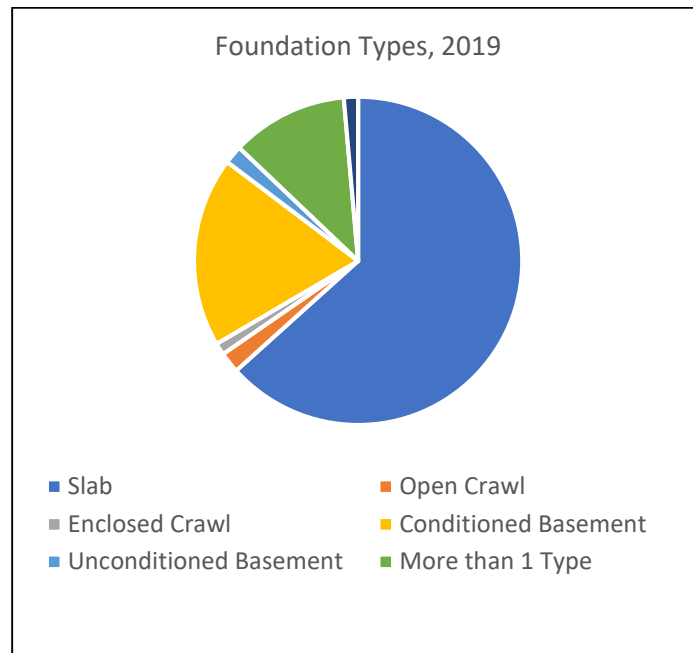


Figure 6. Foundation Types for HERS Rated Homes, 2019

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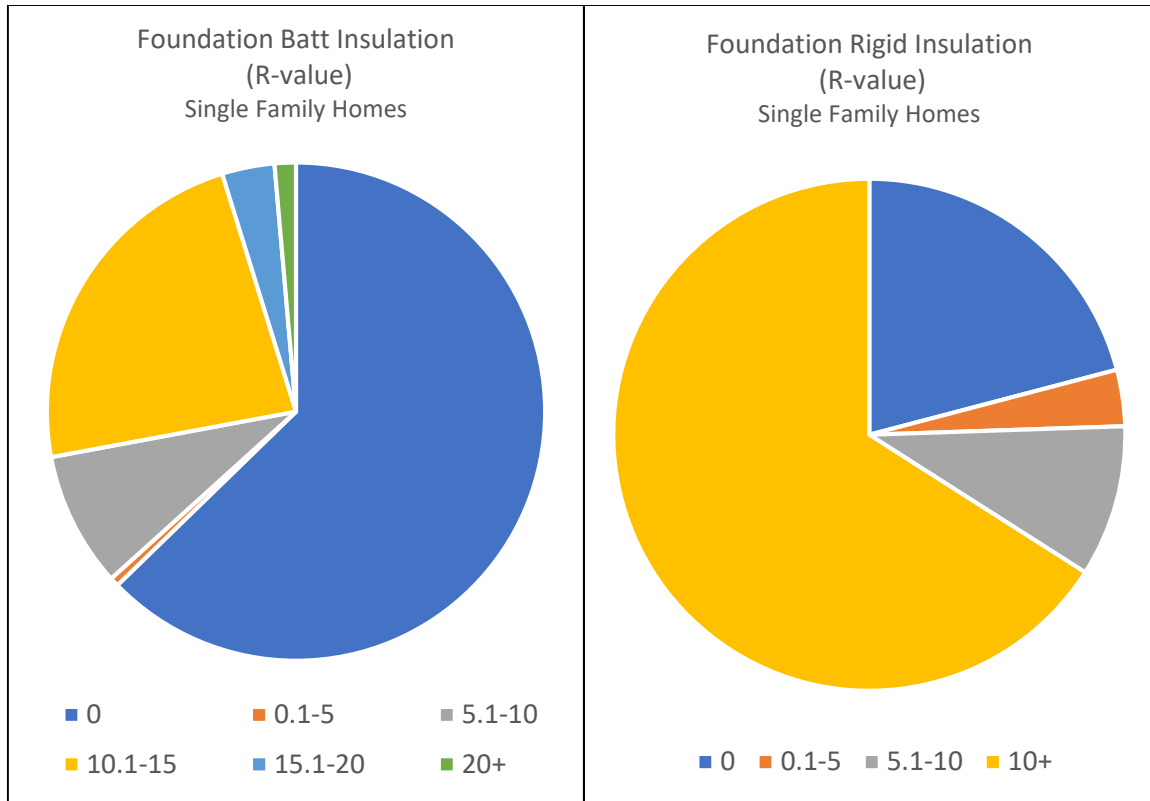


Figure 7. Foundation Batt and Rigid Insulation (R-value)

Above Grade Wall Insulation

Insulation for above grade walls looks at both continuous and cavity insulation. More than two-thirds of ratings indicated that the home had some level up continuous insulation, up to a level of R-5, while a little over one-quarter of homes had no continuous insulation. Figure 8 shows the use of continuous insulation in HERS Rated homes and Figure 9 shows the R-values of cavity insulation.

Since climate zone has a big impact on insulation values, a further breakdown of average insulation values by state can be seen in Figure 10. This figure depicts the clear difference in average insulation wall R-values between northern and southern climates

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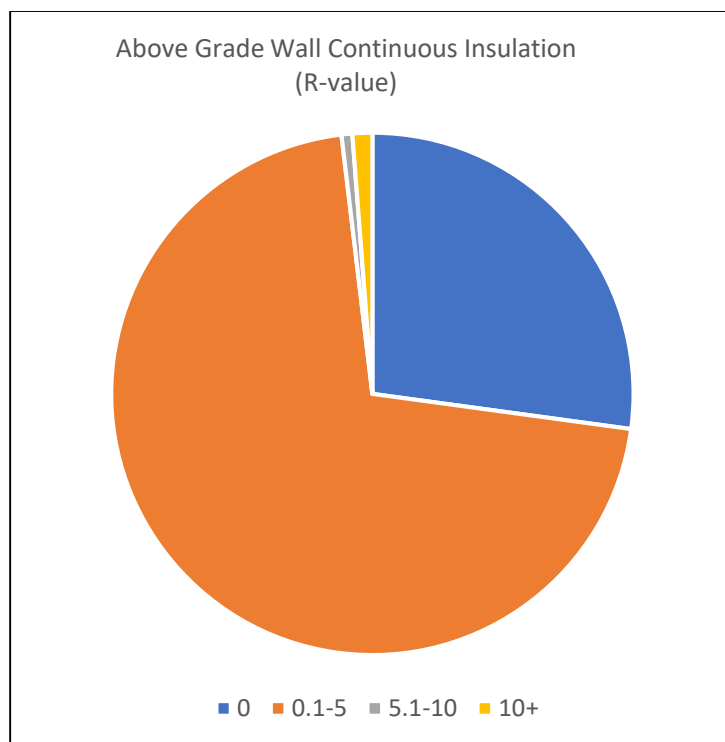


Figure 8. HERS Rated Homes with Continuous Insulation, 2019

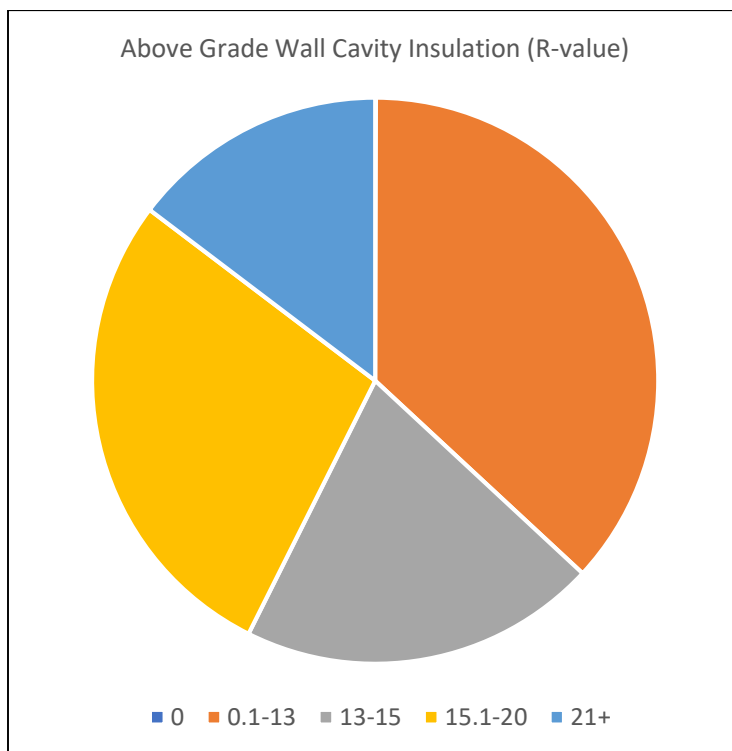


Figure 9. HERS Rated Homes with Cavity Insulation, 2019

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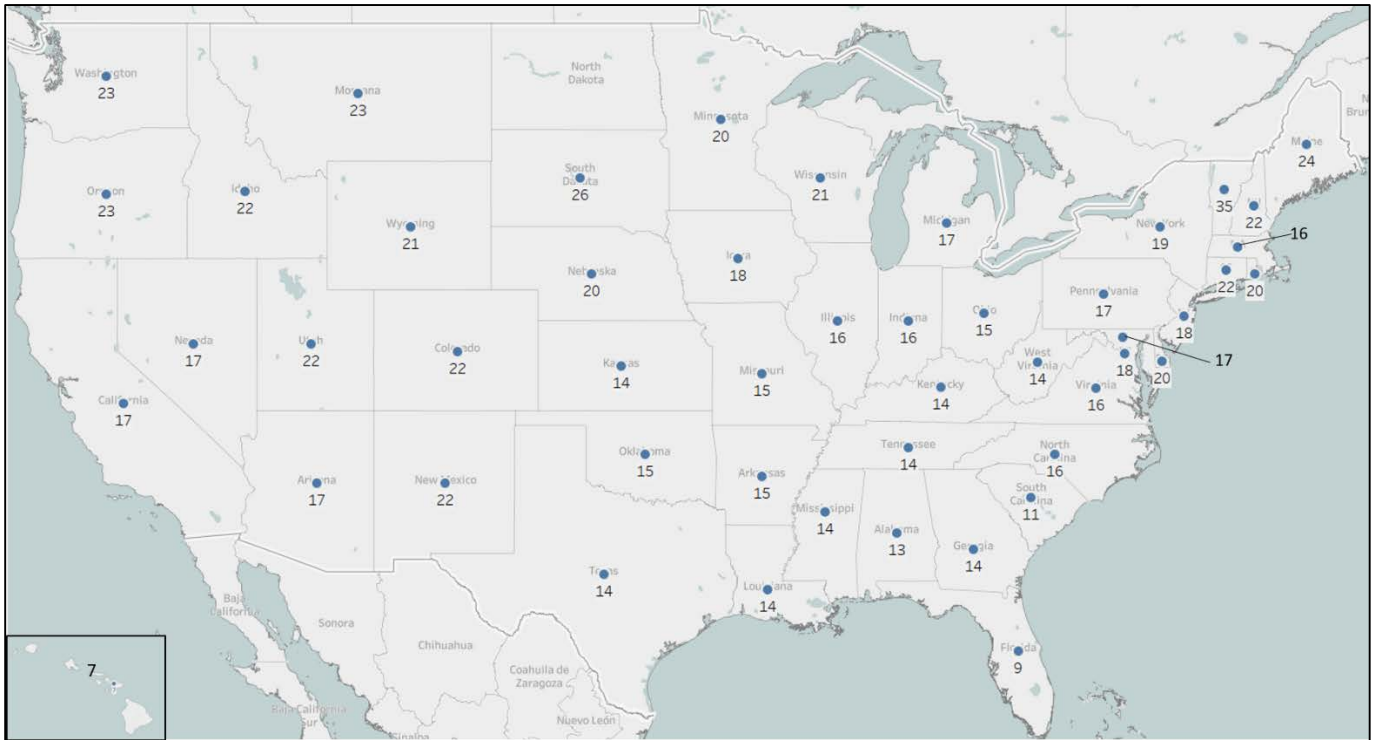


Figure 10. Avg. Wall R-Value by State, 2019

Ceiling Insulation and Radiant Barriers

In 2019, 85 percent of single family HERS Rated homes used blow-in insulation in ceilings, while 15 percent of homes used batt insulation. When it comes to the use of radiant barriers, more than 40 percent of rated homes indicated having a radiant barrier, as shown in Figure 11.

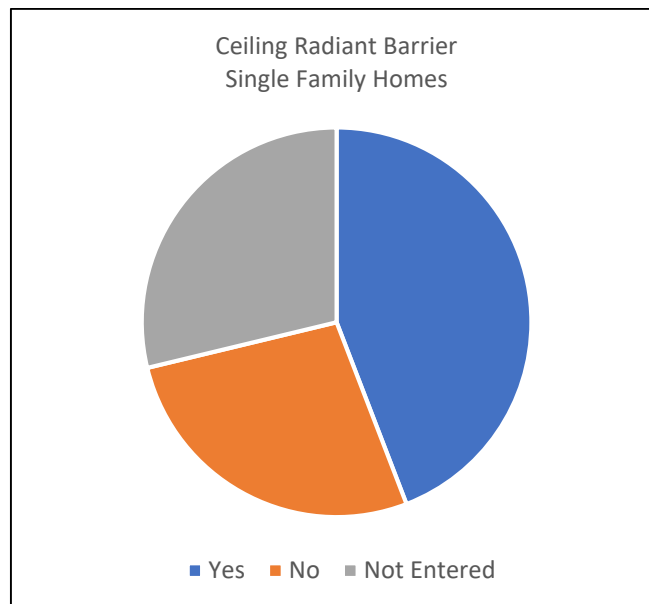


Figure 11. HERS Rated Homes with Radiant Barriers, 2019

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The average ceiling insulation R-value, by state, is shown in Figure 12.

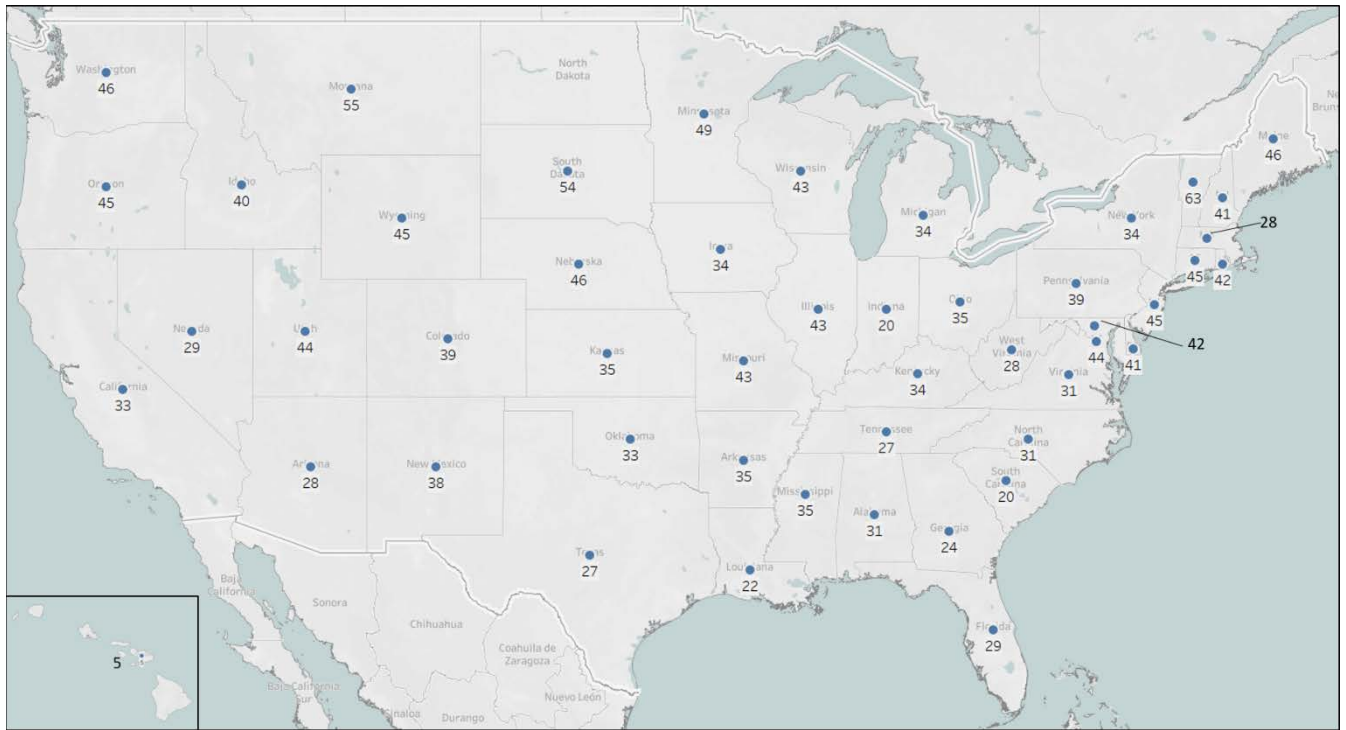


Figure 12. Average Ceiling Insulation R-Value of HERS Rated Homes by State, 2019

Window U-Factor and SHGC

Data on window U-factors shows that two-thirds of windows have a U-factor between 0.31-0.35.

Window solar heat gain coefficient (SHGC) shows a similar trend with about two-thirds of windows having an SHGC of 0.2-0.25. Figure 13 shows the breakdown of window U-factors and Figure 14 shows the breakdown of SHGC.

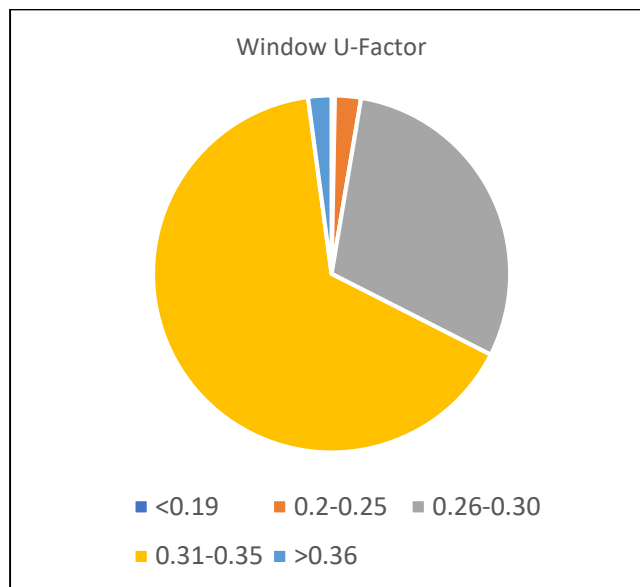


Figure 13. Window U-Factors of HERS Rated Homes, 2019

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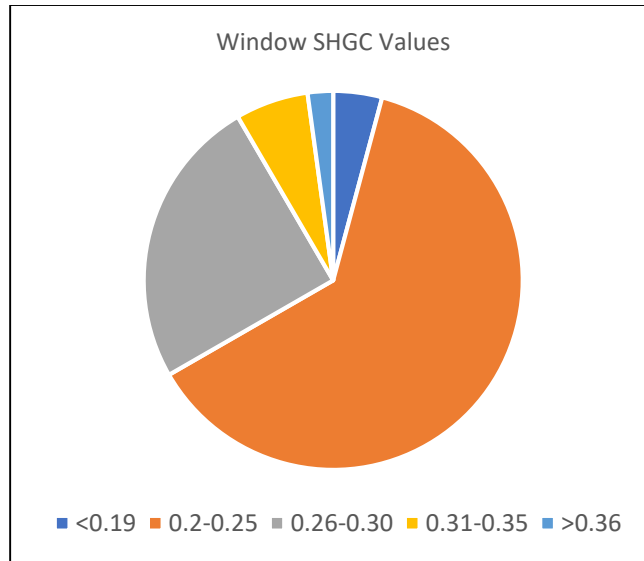


Figure 14. Window SHGC of HERS Rated Homes, 2019

Envelope Air Leakage Rates

In 2019, nearly 80 percent of all HERS Rated homes had an envelope leakage rate of between 2 and 5 air changer per hour at 50 Pascals. Impressively, more than 3,000 homes had an air leakage rate of less than 1 ACH50. Figure 15 shows the breakdown of air leakage rates for rated homes last year.

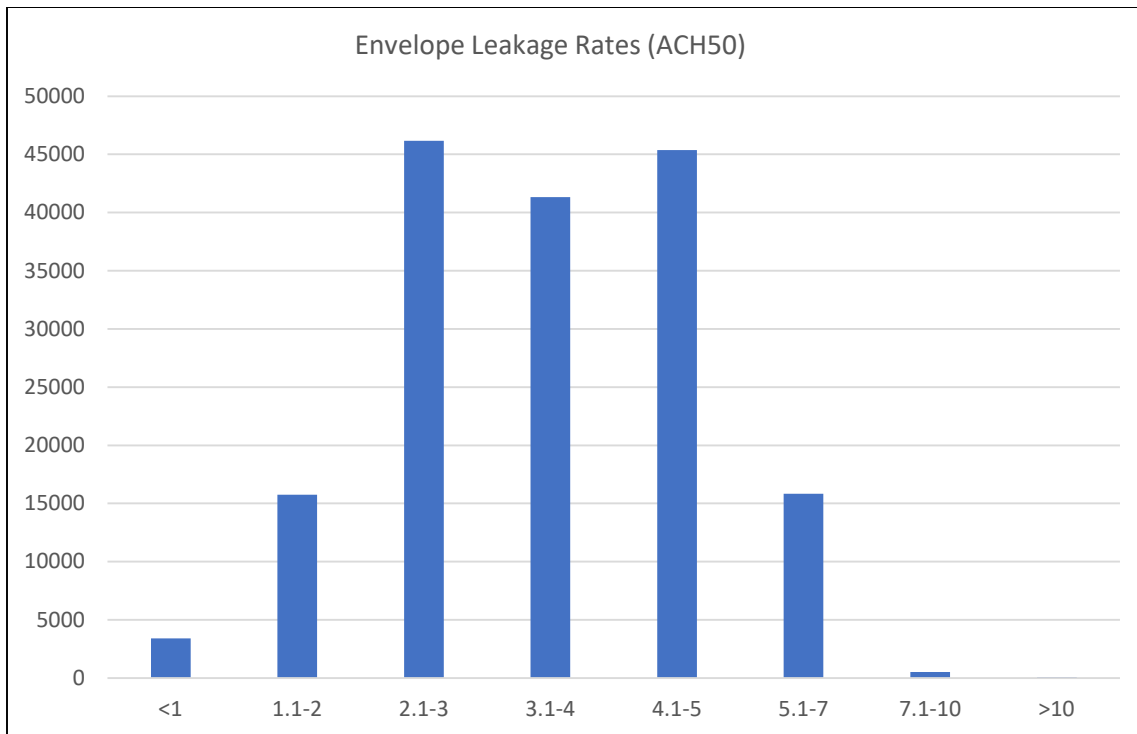


Figure 15. Air Leakage Rates of HERS Rated Homes, 2019

Ventilation Types

Data on mechanical ventilation types shows that exhaust only ventilation strategies are still the most common for HERS Rated homes but using the air handler to introduce ventilation air is a close second in popularity. Figure 16 shows the breakdown of ventilation types for HERS Rated homes last year.

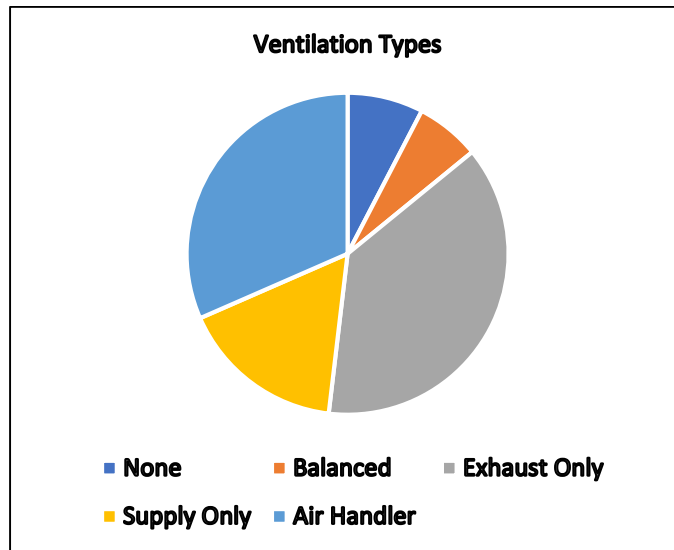


Figure 16. Ventilation Types in HERS Rated Homes, 2019

Heating, Cooling and Water Heating Equipment

RESNET looked at data trends for furnace and air conditioner efficiencies as well as types of water heaters and the fuel sources for water heaters and furnaces. Looking at furnace efficiencies, just under half of all HERS Rated homes used a standard efficiency furnace (less than 90 AFUE), while 53 percent used a high efficient furnace as shown in Figure 17. For air conditioner efficiency, there is nearly a three-way tie among SEER 13, 14 and 16 with each having around a 30 percent share. As you might expect, when looking at air conditioner and furnace efficiency across warm versus cold climates, the northern half of the U.S. uses high efficient furnaces while the southern half tends to use standard efficiency furnaces with higher efficiency air conditioners.

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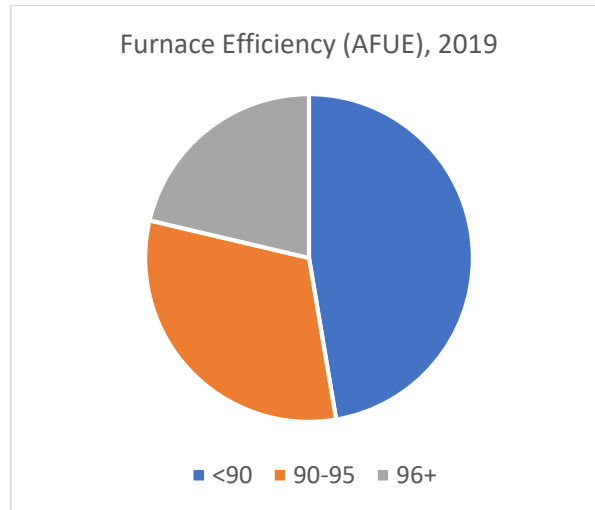


Figure 17. Furnace Efficiency in HERS Rated Homes, 2019

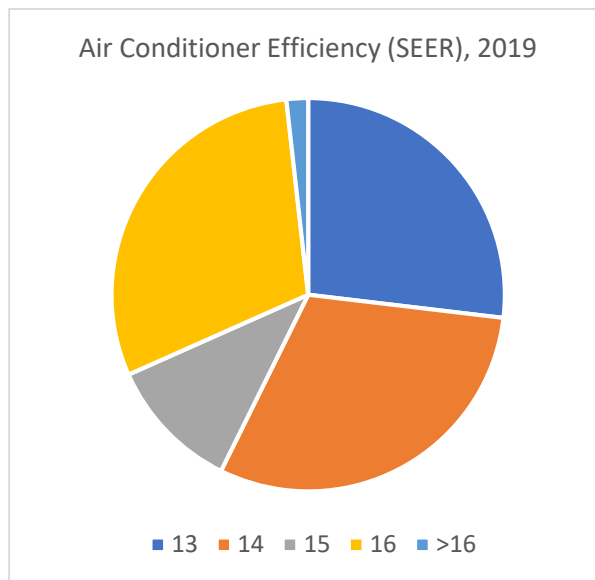


Figure 18. Air Conditioner Efficiency in HERS Rated Homes, 2019

When looking at the fuel type for furnaces, it's clear that natural gas has the largest share of HERS Rated homes with nearly 90 percent, as shown in Figure 19. Figure 20 looks at water heater fuel types and shows that natural gas is still the most popular, but electric water heaters take a bigger chunk with nearly one-third of rated homes.

Finally, data on hot water heater types shows that conventional, storage-type water heaters are the most used, but instant water heaters are in about one-third of rated homes and heat pump water heaters are beginning to gain traction. Figure 21 shows the breakdown of water heater types.

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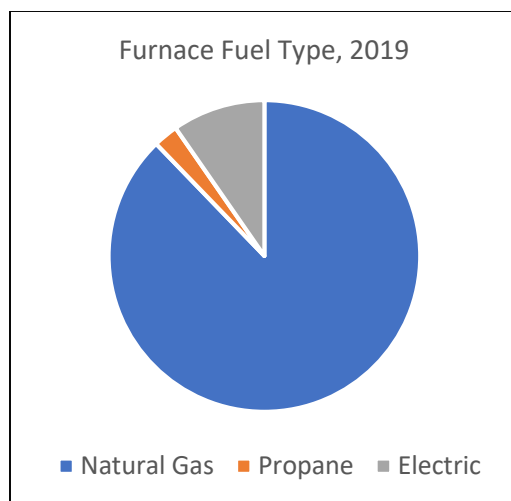


Figure 19. Furnace Fuel Type for HERS Rated Homes, 2019

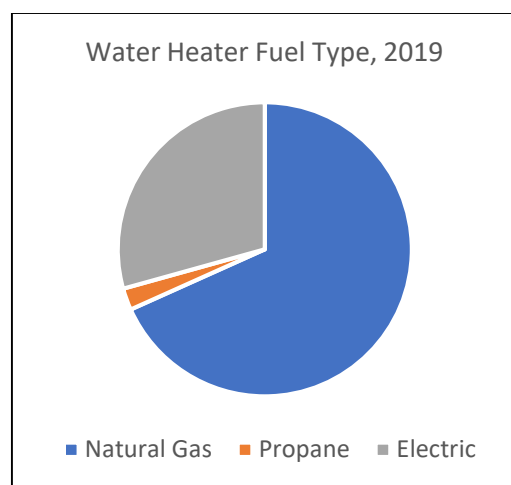


Figure 20. Water Heater Fuel Type for HERS Rated Homes, 2019

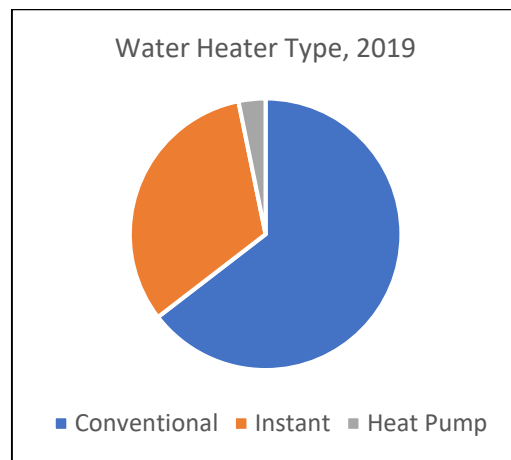


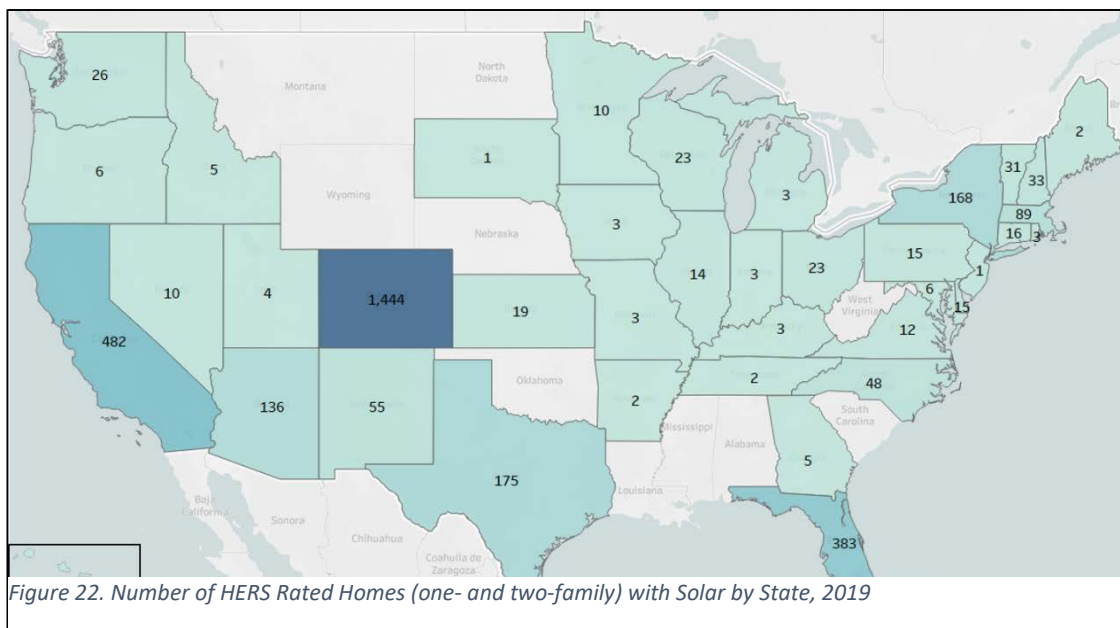
Figure 21. Water Heater Types for HERS Rated Homes, 2019

The Use of Solar PV on HERS Rated Homes

In 2019 there were a total 4,172 HERS Rated homes that installed solar PV. A total of 3,282 were installed on one- and two-family homes and the remainder were on low-rise multifamily. The following are some statistics for HERS Rated homes using solar:

- The average cost savings from solar is \$768
- Average HERS Index before accounting for solar is a 47
- Average HERS Index for homes with solar is a 35
- Average monthly energy production of solar is 37 Mbtu

Figure 22 shows the number of HERS Rated homes (one- and two-family) that installed solar in each state, last year.



2019 Freddie Mac Study on HERS Rated Home Data

Freddie Mac used data provided by RESNET on HERS rated homes from 2013 to 2017 to select a random sampling of about 70,000 HERS rated homes. Working with a major credit bureau, Freddie Mac obtained data on each of these homes plus five comparable unrated homes for each rated home for a total of about 450,000 properties.

The analysis of this data concluded:

- HERS rated homes are sold for, on average, 2.7% more than comparable unrated homes
- Homes with lower HERS Index Scores are sold for 3-5% more than homes with higher HERS Index Scores.
- From an underwriting perspective, there are notable differences between HERS rated and unrated homes.
- HERS rated homes have lower delinquency rates than unrated homes

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- Homes with lower HERS Index Scores had even lower delinquency rates.

Homes with lower HERS Index Scores also had better mortgage profiles in general: owners with higher average credit scores (FICO), lower Loan to Values (LTV) ratios at origination, higher origination unpaid principal balances (UPB), higher owner incomes, and higher neighborhood incomes at the census tract level.

The lower delinquency rates remain for HERS rated versus unrated homes even for homeowners with higher debt-to-income ratios of 45% or more.

Income of Buyers of HERS Rated Homes

One of the data points that Freddie Mac evaluated was homeowner income. When homeowner income was converted to Area Median Income (AMI) at the county level, it showed that about 45% of HERS rated home buyers made more than 120% of the AMI. Using 2016 Home Mortgage Disclosure Act (HMDA) data, the income distributions for HERS rated homes showed fewer high-income households (>120% AMI) and more very low-income households (≤50% AMI) compared to the general mortgage origination market. Figure 23 shows the relative income of HERS Rated homeowners' compared to the general mortgage market.

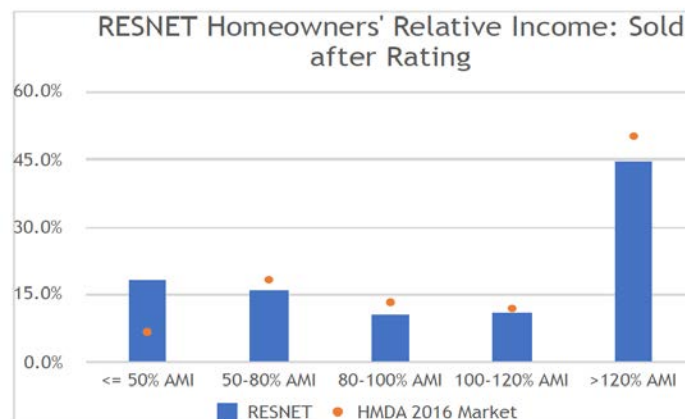


Figure 23. Courtesy of Freddie Mac

Generational Demographics of Buyers of HERS Rated Homes

The Freddie Mac analysis also considered the age and education levels of HERS rated homeowners. The chart below shows that Generation X (those ages 36-54 as of 2016) were more likely than the benchmark population to purchase a HERS rated home. This generation of buyers purchased a little less than half of all HERS rated homes in the sample, while Millennials (ages 16-35 as of 2016) purchased nearly one-third of rated homes and seniors (ages 55+) purchased about one-fifth.

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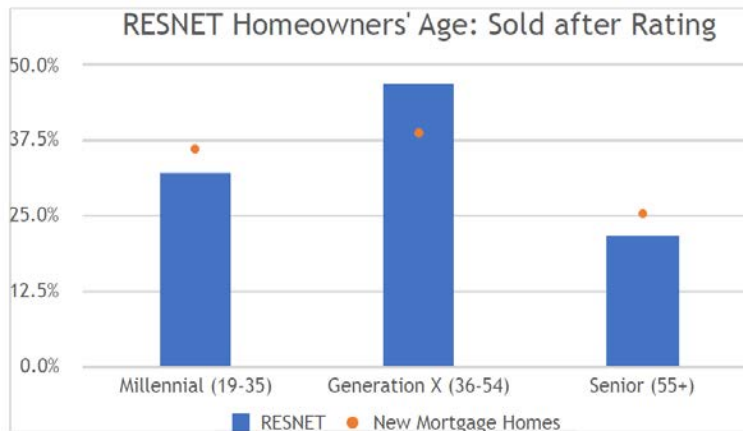


Figure 24. Courtesy of Freddie Mac

Good News for Builders of HERS Rated Homes!

The conclusion of Freddie Mac's analysis is good news for builders, buyers and sellers of energy efficient HERS rated homes. Not only did HERS rated homes sell for an average of 2.7% more than comparable unrated homes, but better-rated homes sold for more than lesser-rated homes—meaning homes with greater energy efficiency are being valued more.

In addition, borrowers with higher debt in comparison to their income have lower delinquency rates for rated homes, compared to unrated homes. The loan performance statistics for HERS rated homes indicate that purchasers of these homes should be a desirable demographic for builders and lenders.

About RESNET's Suppliers Advisory Board

The purpose of the RESNET Suppliers Advisory Board is to provide an opportunity for suppliers to better understand RESNET; network with other suppliers, customers and HERS raters; and to provide supplier input to the RESNET Board of Directors. Membership is open to all suppliers of good and services to the homebuilding market. Visit <https://www.resnet.us/about/sab/> for more information about becoming a member of the SAB.