Pacific Northwest
NATIONAL LABORATORY

PNNL-31429

American Homeowner Perceptions and Choices for Energy Efficiency

Summary of Technology Adoption – Census Division Level

May 2021

Abe Tidwell

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Abstract

In 2020 a nationwide survey of homeowners was conducted to determine what energy efficiency upgrades homeowners had made to their homes and which ones they would make in the near future. The survey also included results on respondent financials about energy efficiency home upgrades/retrofits and perceptions of the value of energy efficiency/who should support improving the energy efficiency of the residential sector. The Department of Energy's goal for this survey is to inform ongoing work in the residential energy efficiency research portfolio on the human dimensions of residential energy systems transformation. In addition, DOE envisions this work supports efforts by industry, non-profits, and other government partners in informing programming, customer discovery, and policy writ large. This report provides a general summary of the nationwide results as they pertain to the following three issues: (1) how much did respondents indicate spending on energy efficiency-related home upgrades, (2) what upgrades/improvements had they made to their homes, and (3) which upgrades/improvements do they believe have the most significant impact on energy efficiency. The results provided are segmented by census division as specific regions demonstrated unique preferences for energy efficiency and willingness to expend family resources to achieve those goals. As such, the goal of this report is not to analyze the data nor draw cross-cutting conclusions but to serve as a resource for any groups interested in reviewing national trends about residential energy efficiency.

Summary

Today, most American homeowners have changed their homes and energy use to reduce their energy consumption. During a survey (discussed further here) of American homeowners conducted in late 2020 jointly by Pacific Northwest National Laboratory and the Shelton Group, 93% indicated they had made some change to their home life to reduce energy consumption. While this number is encouraging in general, a deeper exploration of Americans' choices to reduce energy consumption shows there remains a grand challenge ahead. Few Americans choose to adopt technologies or life choices that will deeply impact home energy consumption, such as installing high-performance windows, replacing existing water heating sources with heat pump water heaters, or integrating renewable energy, amongst other choices. Even more challenging, the importance of each of these energy-saving measures varies significantly on a regional basis, both due to climate differences and tendencies in residential construction.

This report provides a broad overview of the trends identified in that survey, focusing on census division level differences in energy efficiency technologies and practices adopted, perceptions of what home upgrades save the most energy, and willingness to invest in energy-saving measures. Some key insights from the cross-national summary are the following:

- American homeowners surveyed believe in the importance of saving energy for their homes, and a sizable portion thinks that upgrading HVAC or replacing windows and doors have the largest impact. However, compared to other upgrades such as weatherization, unplugging appliances, or changing habits at home, respondents chose to upgrade HVAC or windows at lower rates.

- 62% of all New England respondents indicated they had replaced between 90-100% of their old light bulbs with LEDs – almost 10% higher than any other census division in the country.

- HVAC replacement ranked as the top way to save energy in all census divisions except the Pacific and Middle Atlantic. In both of these, window replacement ranked top.

- Renewable adoption ranked low across all parts of the United States, with only the Mountain census division indicating greater than 10% adoption of photovoltaic solar (10.6%).

- Nationwide spending on energy efficiency-related upgrades to the home exhibits a bimodal character – the two largest groups of respondents (each comprising ~12% of the total population) spent between $5,000 and $9,999 or $100 $499.

- East South Central census division respondents (KY, TN, MS, AL) demonstrated the greatest disparity in spending on energy efficiency – with the two largest groups spending between $100 and $499 (18.5%) or $10,000 to $19,999 (15.4%).

- Americans were not strongly motivated by access to financing as a mechanism to do energy efficiency-related upgrades across the board.

Acknowledgments

The author would like to acknowledge the timely feedback and input on the data analysis and synthesis included in this report from Chrissi Antonopoulos and Cheryn Metzger, Joan Glickman, and Amy Jiron.

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1.0 Overview

In 2020, Pacific Northwest National Laboratory, in collaboration with the Shelton Group, launched a survey of homeowners across the United States to determine what opportunities and barriers existed to enhancing energy efficiency in the residential sector. This survey integrated questions on the following topics:

1. The adoption of specific technologies and practices (e.g., heat pump water heaters, employing a home energy rater);

2. How much and to what extent respondents were willing to expend resources to make energy efficiency related upgrades; and

3. Homeowner perceptions of the value of energy efficiency for their families, community, and the planet writ large, as well as climate change-related social issues.

The following sections outline the methods employed in this survey and a review of the survey instrument and the respondent distribution.

1.1 Methods

An online survey was co-designed by PNNL and the Shelton Group –an energy and environment-focused market research firm—and employed a cross-sectional methodology. A survey instrument was chosen as the study aimed to gather a snapshot of American homeowner behaviors, perceptions, and values about home energy efficiency. Using a combination of multiple-choice, single answer, multiple-answer, Likert scale, and open-ended questions the survey covered topics ranging from previous or current home renovation choices, expenditures and desired return on investment on investments in home energy efficiency, perceptions of the challenges and opportunities of certain investments, and other questions on homeowner values related to energy and the environment. PNNL served as the human subjects review entity, and all consent forms, language, and the survey were reviewed and filed with DOE (#2020-16). The final survey included 54 questions, distributed via a third party contracted by Shelton Group to respondents across the United States to reach an informant audience reflective of the American homeowning population.

1.2 Respondent Demographics

Comprising 2,015 respondents from all 50 states the survey provides a nearly representative sample of the homeowning population against U.S. Census demographics for the American homeowning population. Table 1 below provides summary characteristics of the survey sample. Figure 1 provides a map of the U.S. Census Regions.

Table 1. Respondent demographics (n = 2,015)

Category		Respondents	Percent
Gender			
	Female	990	49.1%
	Male	1023	50.8%
	Prefer Not to Identify	2	0.1%
Race/Ethnicity			
	White/Caucasian	1566	77.7%
	Black/African-American	163	8.1%
	Hispanic or Latino	123	6.1%
	Asian	106	5.3%
	Other	57	2.8%
Age Range			
	18-34 years	164	8.1%
	35-44 years	301	14.9%
	45-54 years	393	19.5%
	55-64 years	502	24.9%
	65-74 years	430	21.3%
	75 years or more	225	11.2%
Gross Household Income (2019)			
	Less than $25,000	129	6.4%
	$25,000–$49,999	307	15.2%
	$50,000–$74,999	382	19.0%
	$75,000–$99,999	357	17.7%
	$100,000–$149,999	463	23.0%
	$150,000–$199,999	213	10.6%
	$200,000 or more	164	8.1%
Highest Level of Education Attained			
	High school graduate or less	167	8.3%
	Some college or associate degree	505	25.1%
	Bachelor's degree	750	37.2%
	Graduate/professional degree	593	29.4%
Employment Type			
	Blue collar (e.g., manual laborer, service or retail worker, etc. – no college degree required)	192	9.5%
	White collar (e.g., office worker, technician, etc. – at least some college required)	731	36.3%
	Professional (e.g., doctor, lawyer, etc. – advanced degree required)	355	17.6%
	Student	6	0.3%
	Retired	436	21.6%
	Homemaker	132	6.6%
	Part-time	62	3.1%
	Unemployed	101	5.0%

Figure 1. U.S. map by Census Divisions (U.S. Census 1994)

This report summarizes three key areas of the survey, broken down by census division level to provide a regional snapshot of energy trends. The remaining parts of Section 1 outline nationwide trends of energy-efficient technology adoption practices, perceptions of what technologies may provide the most significant impact on energy efficiency at the home level, and other financial considerations of investing in energy-efficient upgrades.

1.3 Nationwide – Energy Efficiency Adoption Trends

Overall, 93% of respondents indicated they had undertaken some energy efficiency-related behavior change or upgraded to their homes. The most common upgrade or change was the replacement of 90-100% of bulbs with LED lighting (50%) followed by changing habits to save energy (47%) and unplugging small appliances and power strips when not in use (31%). Table 2 outlines results from all the various energy efficiency changes respondents answered in the survey. Most respondents indicate that, in general, they are not installing measures that achieve deep energy savings in residential buildings, such as installing high-performance windows, water heating, or renewables.

Table 2. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – nationwide sample (n = 2,015)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	50.7%
Changed habits at home to save energy	47.8%
Unplug small appliances and power strips when not in use	31.4%
Added caulking or weather stripping around windows and doors	29.7%
Purchased a high-efficiency furnace, heat pump, or boiler	25.6%
Purchased an ENERGY STAR® certified air conditioning system	24.0%
Installed extra attic insulation	23.5%
Installed high efficiency/ENERGY STAR® certified windows	20.1%
Purchased a smart thermostat	16.6%
Purchased a tankless water heater or heat pump water heater	11.1%
Had a home energy inspection	10.0%
Had a professional come into the home to seal air leaks	8.0%
Added photovoltaic solar to home or property	5.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	3.1%

Respondents showed a general motivation to be more energy efficient when it came to their home lives; only 16% of respondents felt there was no need to conserve energy. Similarly, when asked about the importance of individual effort to saving energy writ large, only 22% indicated they did not believe individual actions would make a difference. Furthermore, most respondents (67.5%) believe government intervention to increase energy efficiency is warranted. Table 3 summarizes these results and those about other questions about personal actions and motivations for saving energy.

Table 3. Perceptions of why individuals may not adopt more energy-efficient ways of living – nationwide sample (n = 2,015)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	15.7%	71.8%	12.5%
It's easier to pay more for energy than make the effort to save energy	31.6%	44.2%	17.2%
My energy bills are too low for me to care about energy efficiency	20.6%	62.1%	17.3%
Individual efforts won't make much of a difference	22.9%	60.4%	17.7%
The government should do more to increase energy efficiency	67.5%	11.0%	21.5%

When asked to identify a specific technology, service, or behavioral modification that they believed would have the most impact on household energy efficiency, 26% specified upgrading older inefficient HVAC with more efficient models, while another 21% selected replacing older, inefficient windows with more efficient ones. Table 4 includes all choices ranked by the percentage of respondents who selected the option; Table 5 includes a separate set of options where respondents identified those choices they believe would be the hardest to make as a homeowner.

Table 4. Respondent beliefs about the most impactful upgrade on home energy efficiency – nationwide sample (n = 2,015)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	25.9%
Replacing older, inefficient windows with more efficient ones	21.0%
Adding or replacing attic insulation	14.7%
Replacing all bulbs with LEDs	11.1%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	9.1%
Replacing an older, inefficient water heater with a more efficient model	7.0%
Replacing an old thermostat with a "smart" thermostat	5.9%
Replacing the siding or exterior cladding	3.1%
Adding an automated lighting control system	2.3%

With, *at a minimum* 74% of respondents having not made any upgrades to their HVAC systems (heating or cooling), and less than 40% having made changes to their HVAC, significant opportunities exist to expand adoption of new systems purely in terms of market opportunity. Similarly, only 27% of those who indicated windows have made said upgrade amongst those indicating such an upgrade would have the largest impact on household energy efficiency.

However, as explored in the following subsection, limitations on spending at the household level and willingness to finance upgrades impact this maximum adoption potential amongst respondents.

Table 5. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – nationwide sample (n = 2,015)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	34.4%
Install solar panels or wind turbines	18.5%
Install energy-efficient windows	10.4%
Install extra insulation	10.0%
Don't know	7.1%
Install a higher efficiency heating or cooling system	6.7%
Get a professional home energy audit	6.6%
Switch to LED light bulbs	2.2%
Purchase an ENERGY STAR® appliance	1.8%
Install a higher efficiency hot water heater	1.5%
Install a programmable thermostat	0.8%

1.4 Nationwide – Financial Dimensions

Respondents were asked to provide information on recent spending on energy-efficient home upgrades, the origins of these funds, how much elasticity there was in spending for energy-efficient upgrades, and interest in using financing to support these home transformations. In the last five years, respondents demonstrated a very bimodal level of spending on energy efficiency upgrades; over the last five years, the largest group of respondents (12.8%) indicated they had spent between $5,000 and $9,999 while the second largest group (12.6%) had only spent between $100 and $500. Figure 2 shows all responses ranked by the total percentage of the sample.

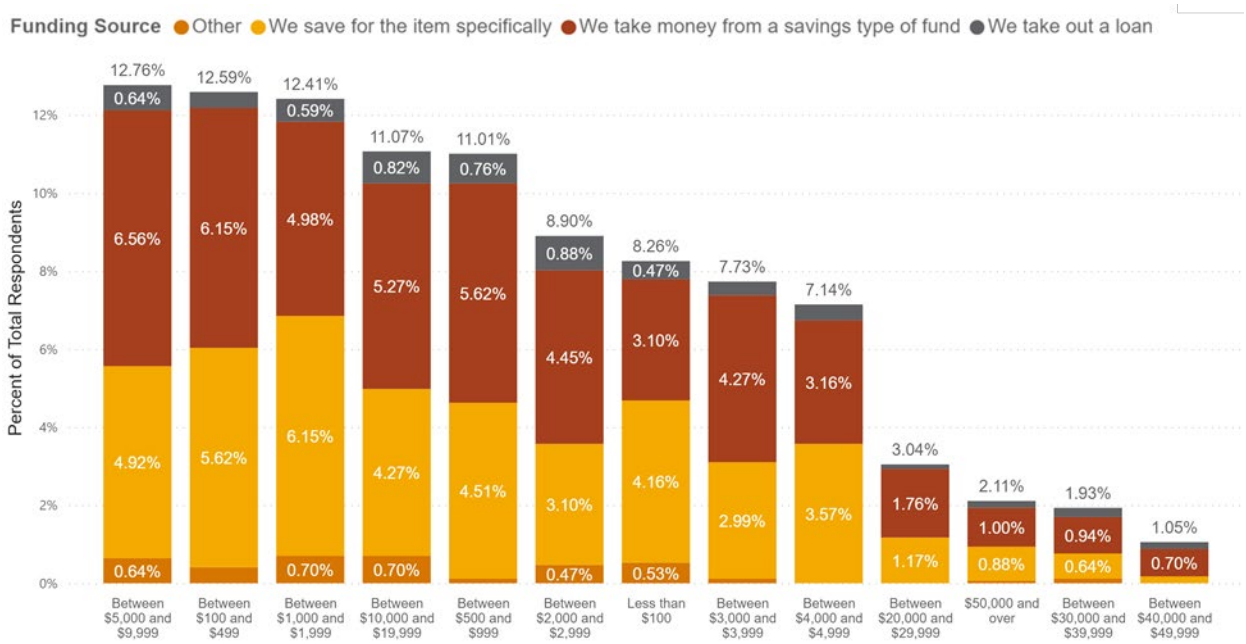

Figure 2. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020).

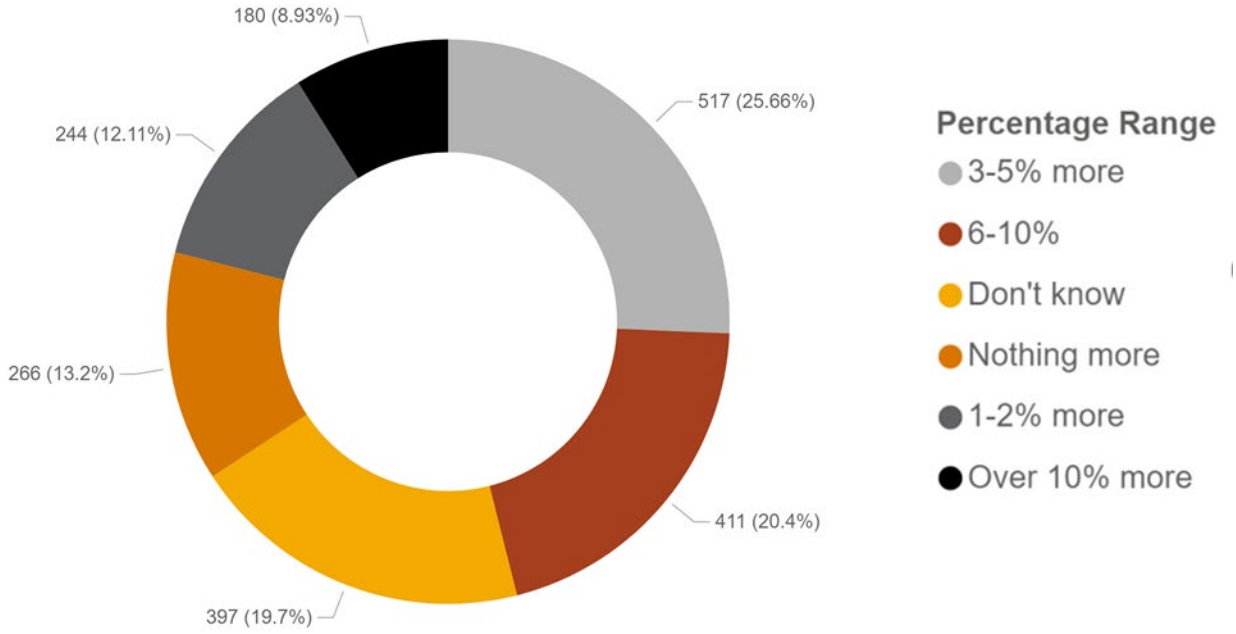

Figure 3. Percentage respondents are willing to pay more for an energy-efficient upgrade/retrofit to their homes

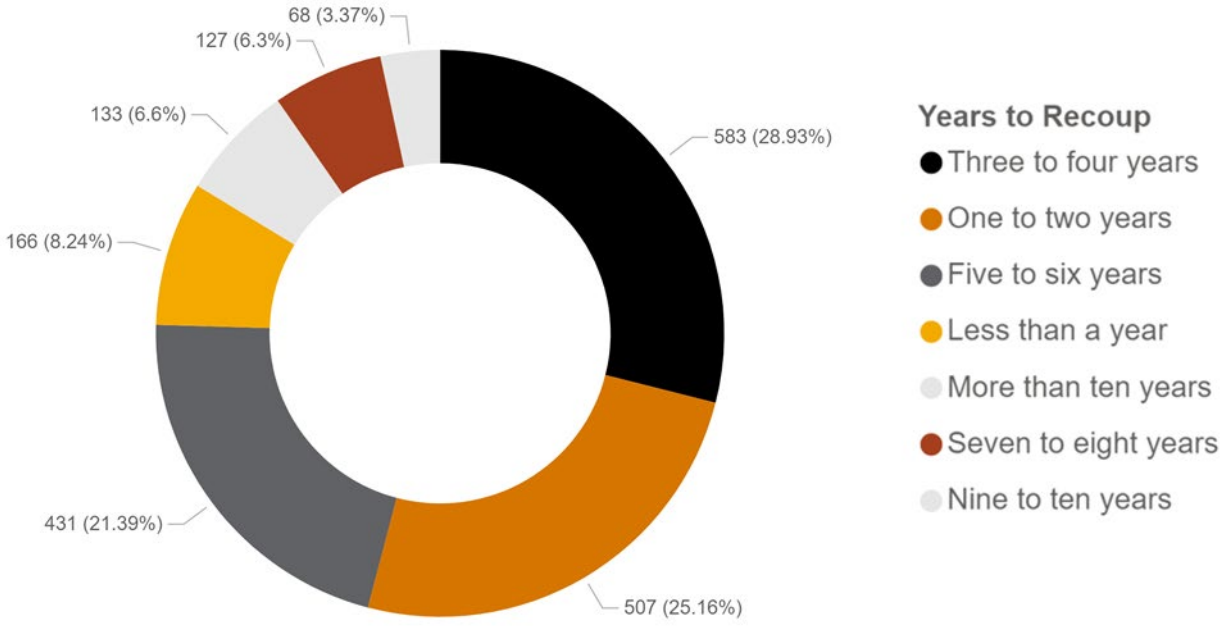

Figure 4. The desired window to recoup the cost of an energy-efficient home retrofit.

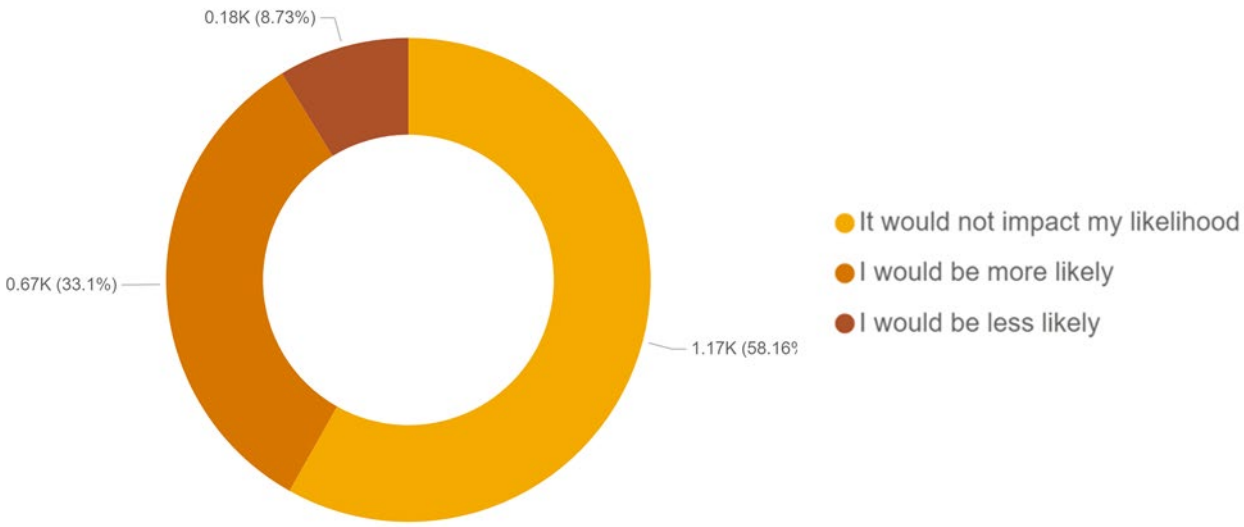

Figure 5. Influence of financing on choosing to make an energy efficiency-related home upgrade

2.0 Regional Analysis: New England Census Division (n = 100)

Compared to national adoption trends, New England respondents had a higher prevalence of completed energy efficiency upgrades in their homes across all categories and was the only region where more than 60% of respondents had replaced 90-100% of incandescent lighting with LED bulbs (Table 6).

Table 6. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – New England Census Division (n = 100)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	62.0%
Changed habits at home to save energy	50.0%
Installed extra attic insulation	35.0%
Unplug small appliances and power strips when not in use	34.0%
Added caulking or weather stripping around windows and doors	34.0%
Purchased a high-efficiency furnace, heat pump, or boiler	29.0%
Installed high efficiency/ENERGY STAR® certified windows	29.0%
Had a home energy inspection	21.0%
Purchased an ENERGY STAR® certified air conditioning system	18.0%
Purchased a tankless water heater or heat pump water heater	18.0%
Had a professional come into the home to seal air leaks	15.0%
Purchased a smart thermostat	14.0%
Added photovoltaic solar to home or property	6.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	5.0%

New England respondents believe that energy efficiency is a personal matter that directly impacts their homes and families. Table 7 outlines the views of this sub-sample as it pertains to the importance of conservation and the role of government in facilitating greater energy efficiency.

Table 7. Perceptions of why individuals may not adopt more energy-efficient ways of living – New England Census Division (n = 100)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	17.0%	73.0%	10%
It's easier to pay more for energy than make the effort to save energy	34.0%	41.0%	25.0%
My energy bills are too low for me to care about energy efficiency	20.0%	60.0%	20.0%
Individual efforts won't make much of a difference	20.0%	60.0%	20.0%
The government should do more to increase energy efficiency	71.0%	22.0%	7.0%

New England respondents track with the national sample in terms of the top three perceived home improvements for improving energy efficiency (Table 8). However, unlike the national sample, LED bulb replacement ranks below the replacement of appliances and water heaters, with 13% and 11% of the sub-sample electing for this option. New England tracked with national trends regarding the most challenging changes for homeowners to make to save energy, with 33% indicating habit changes (versus 34.4% nationally). Table 9 summarizes these results.

Table 8. Respondent beliefs about the most impactful upgrade on home energy efficiency – New England Census Division (n = 100)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	23.0%
Replacing older, inefficient windows with more efficient ones	17.0%
Adding or replacing attic insulation	14.0 %
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	13.0%
Replacing an older, inefficient water heater with a more efficient model	11.0%
Replacing all bulbs with LEDs	8.0%
Replacing an old thermostat with a "smart" thermostat	7.0%
Replacing the siding or exterior cladding	5.0%
Adding an automated lighting control system	2.0%

Table 9. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – New England Census Division (n = 100)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	33.0%
Install solar panels or wind turbines	15.0%
Install extra insulation	11.0%
Install energy-efficient windows	9.0%
Install a higher efficiency heating or cooling system	9.0%
Don't know	6.0%
Get a professional home energy audit	6.0%
Switch to LED light bulbs	5.0%
Install a higher efficiency hot water heater	4.0%
Install a programmable thermostat	1.0%

2.1 New England – Financial Dimensions

On average, New England respondents spent less on home renovations over the previous five years than the national sample (Figure 6). The largest single group of respondents spent between $2,000 and $2,999, followed by the $100 to $499 band.

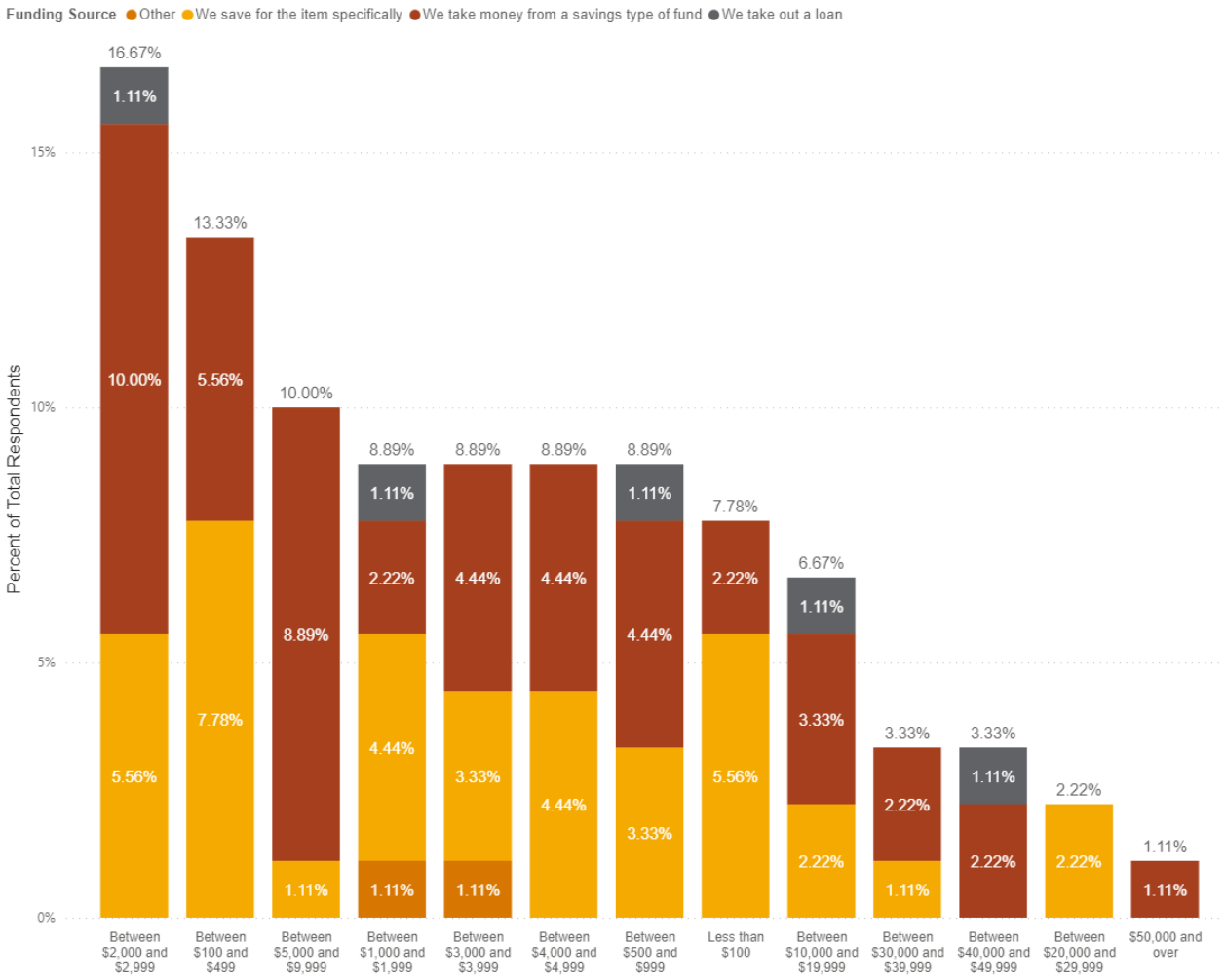

Figure 6. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – New England Census Division (n = 100)

New England respondents were more likely to pay more for an energy-efficient home upgrade (Figure 6), with nearly half (49%) willing to pay between three and ten percent more (compared to 46% nationally). Compared to the national sample, however, New Englanders were willing to wait significantly longer periods to recoup investments in energy efficiency, with 58% willing to wait between three and six years compared to 50.32% nationally (Figure 7).

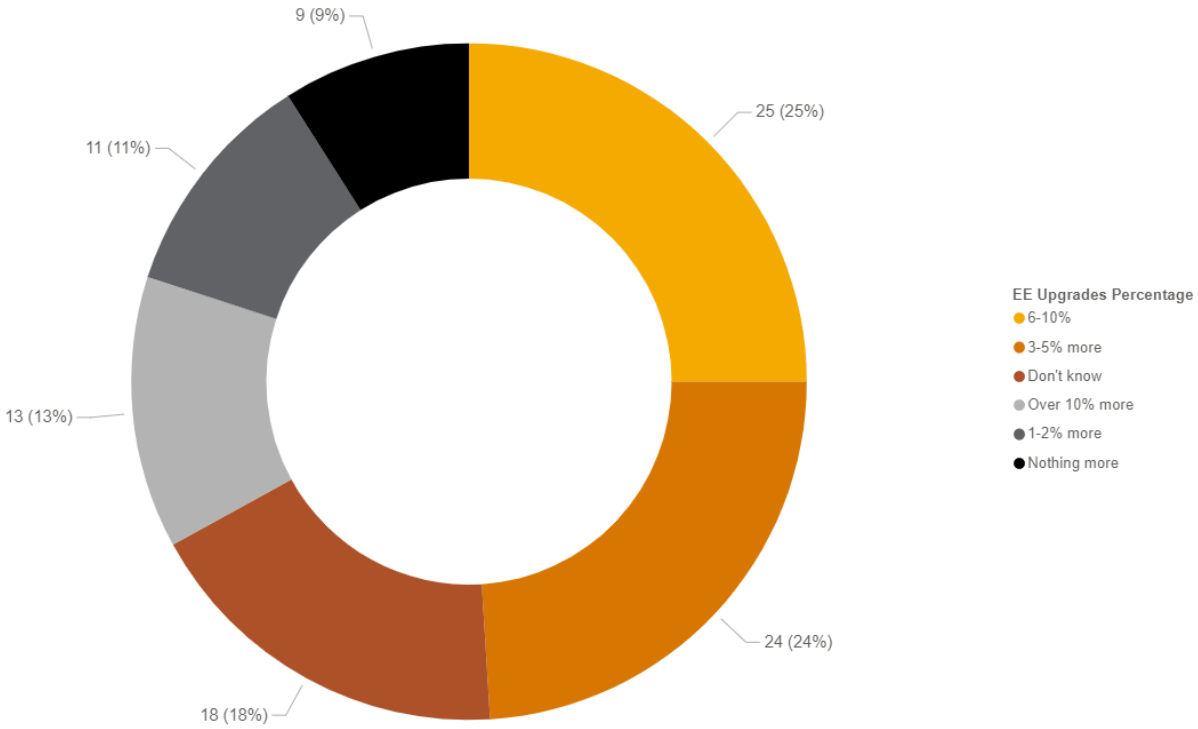

Figure 7. Percentage respondents are willing to pay more for an energy-efficient upgrade/retrofit to their homes – New England Census Division (n = 100)

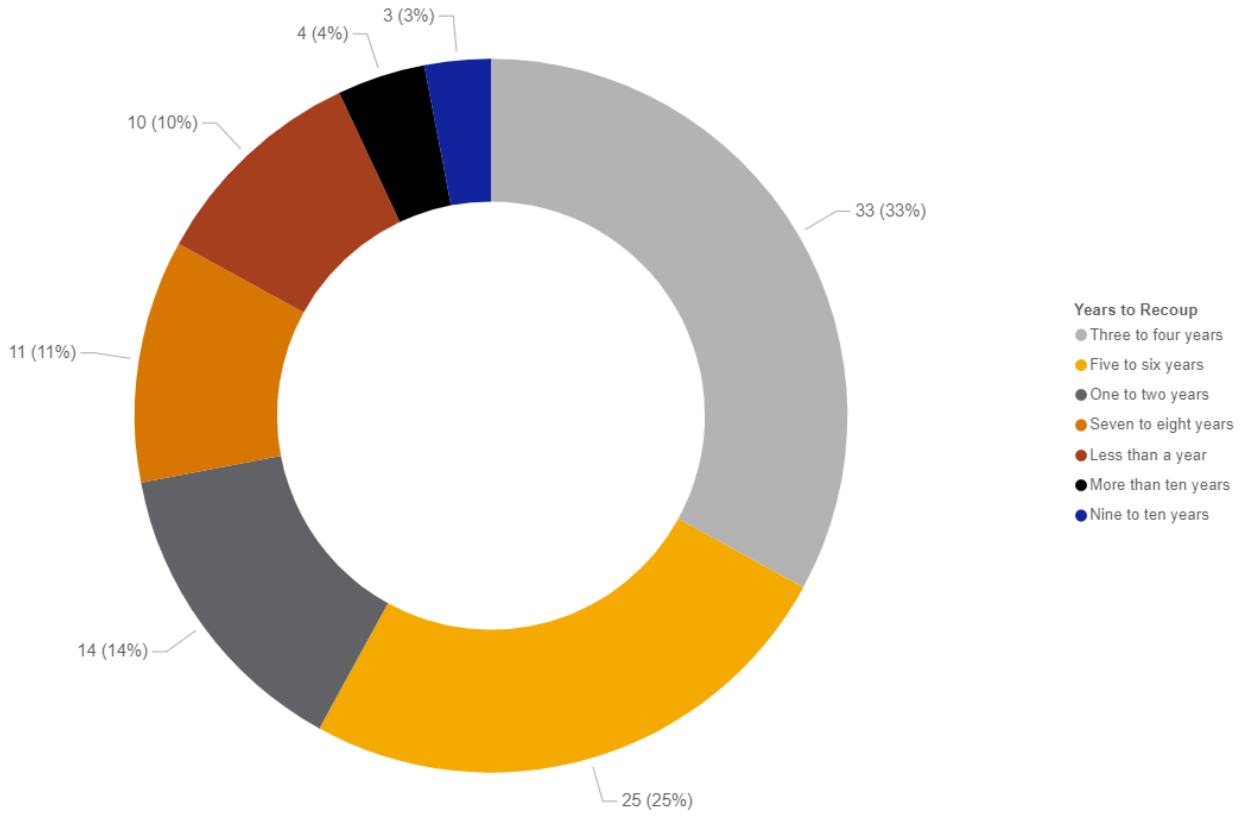

Figure 8. Desired window to recoup the cost of an energy-efficient home retrofit – New England Census Division (n = 100)

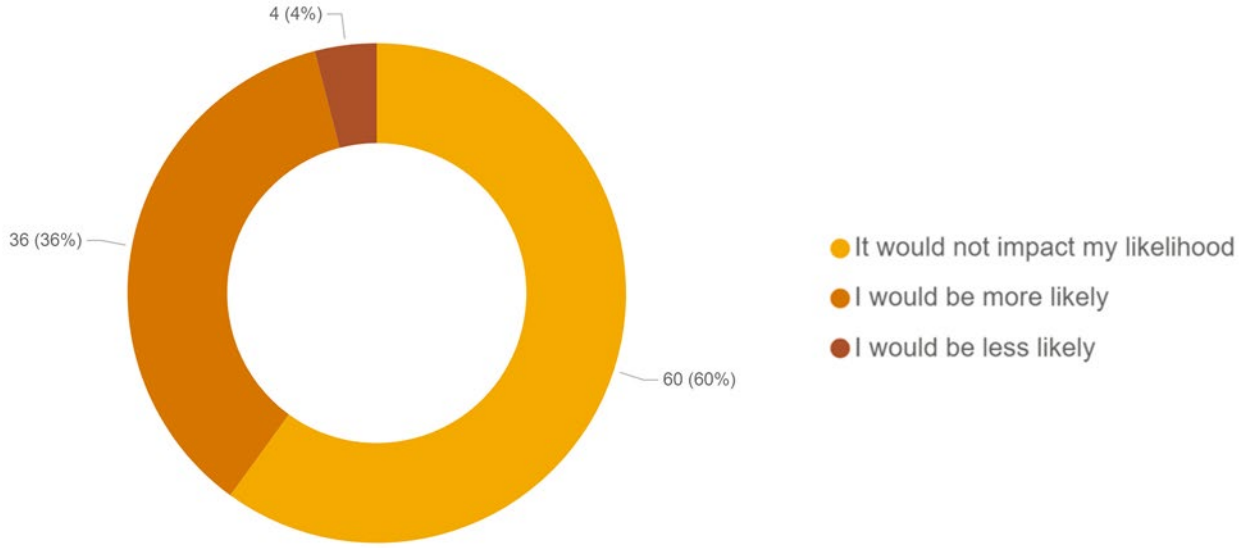

Figure 9. Influence of financing on choosing to make an energy efficiency-related home upgrade – New England Census Division (n = 100)

In keeping with national trends, 60% of New England respondents (compared to 58% nationally) indicated that financing for renovations was not a motivator to pursue energy-efficient home improvements.

3.0 Regional Analysis: Middle Atlantic Census Division (n = 298)

Middle Atlantic respondents carried out the same home improvements at relatively the same rates as the national sample (Table 10). The one significant exception is tankless or heat pump water heaters; in the Middle Atlantic region, respondents adopted these at over twice the national sample rate (26.2% versus 11.1%). Conversely, Middle Atlantic residents adopted high-efficiency furnaces, heat pumps, or boilers (13.1%) at half the rate of the national sample (25.6%).

Table 10. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – Middle Atlantic Census Division (n = 298)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	50.7%
Changed habits at home to save energy	43.0%
Added caulking or weather stripping around windows and doors	31.9%
Unplug small appliances and power strips when not in use	31.5%
Purchased a tankless water heater or heat pump water heater	26.2%
Installed extra attic insulation	20.5%
Purchased an ENERGY STAR® certified air conditioning system	17.8%
Installed high efficiency/ENERGY STAR® certified windows	17.5%
Purchased a smart thermostat	16.8%
Purchased a high-efficiency furnace, heat pump, or boiler	13.1%
Had a home energy inspection	10.1%
Had a professional come into the home to seal air leaks	5.7%
Added photovoltaic solar to home or property	5.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	2.4%

Middle Atlantic respondents demonstrated a lower overall proclivity towards individual action to change energy consumption behaviors and reduce spending compared to the national sample across all categories (Table 11). However, compared to the national sample, Middle Atlantic

residents showed a stronger belief in the importance of government to drive energy efficiency (70.8% agree vs. 67.5% nationally).

Table 11. Perceptions of why individuals may not adopt more energy-efficient ways of living – Middle Atlantic Census Division (n = 298)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	18.8%	70.1%	11.1%
It's easier to pay more for energy than make the effort to save energy	33.2%	43.0%	23.8%
My energy bills are too low for me to care about energy efficiency	22.8%	60.4%	16.8%
Individual efforts won't make much of a difference	24.8%	55.7%	19.5%
The government should do more to increase energy efficiency	70.8%	19.1%	10.1%

In the Middle Atlantic, respondents believe that replacing windows will have the greatest impact on energy efficiency in the home (23.2% of the regional sample), followed by HVAC (20.8%), attic insulation (14.4%), and appliance replacement (13.1%) (Table 12).

Table 12. Respondent beliefs about the most impactful upgrade on home energy efficiency – Middle Atlantic Census Division (n = 298)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing older, inefficient windows with more efficient ones	23.2%
Replacing an older, inefficient HVAC with a more efficient model	20.8%
Adding or replacing attic insulation	14.4%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	13.1%
Replacing all bulbs with LEDs	10.4%
Replacing an old thermostat with a "smart" thermostat	6.7%
Replacing an older, inefficient water heater with a more efficient model	5.4%
Replacing the siding or exterior cladding	3.7%
Adding an automated lighting control system	2.3%

Tracking with the national sample, Middle Atlantic residents also believe changing habits is the hardest change for homeowners to make to save energy, with installing programmable thermostats (1.0%), LED bulbs (1.3%), and higher efficiency water heaters (1.3%) ranking among the least difficult changes (Table 13).

Table 13. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – Middle Atlantic Census Division (n = 298)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	31.5%
Install solar panels or wind turbines	16.8%
Install energy-efficient windows	11.1%
Install extra insulation	11.1%
Don't know	9.4%
Get a professional home energy audit	7.0%
Install a higher efficiency heating or cooling system	7.0%
Purchase an ENERGY STAR® appliance	2.3%
Install a higher efficiency hot water heater	1.3%
Switch to LED light bulbs	1.3%
Install a programmable thermostat	1.0%

3.1 Middle Atlantic – Financial Dimensions

Middle Atlantic respondents as a whole spent much less than the national sample on home renovations related to energy efficiency in the last five years (Figure 10). Over half (51.5%) of Middle Atlantic respondents spent less than $2,000 over the past five years on energy-efficient home renovations, compared to 44.3% nationally.

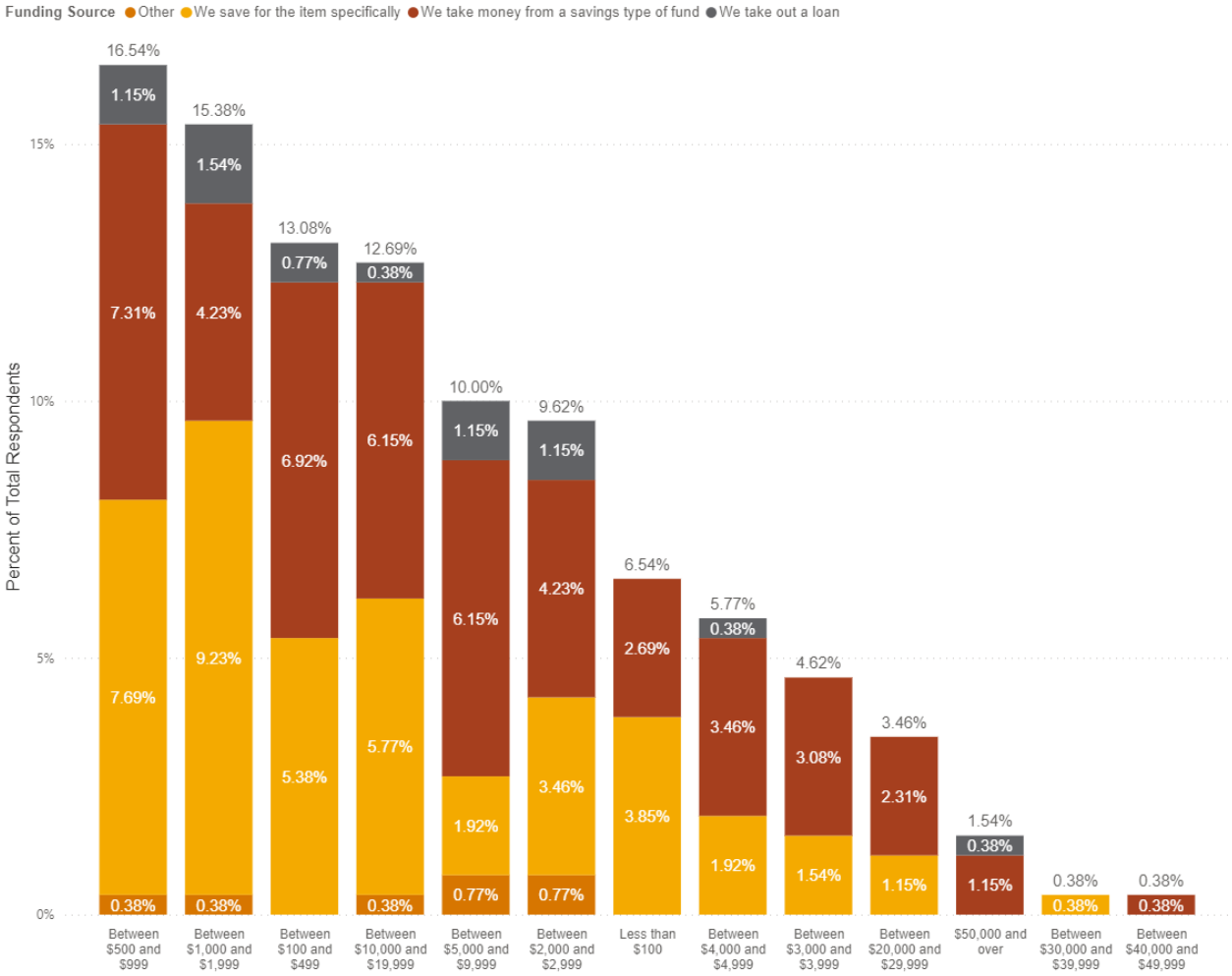

Figure 10. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – Middle Atlantic Census Division (n = 298).

Over 30% of respondents in the Middle Atlantic indicated they would be willing to pay 3-5% more for energy-efficient home improvements (upgrades or retrofits) compared to 25.7% nationally (Figure 11). A total of 56% of respondents in the Middle Atlantic indicated they desired to recoup any of their investments in energy efficiency upgrades between one to four years, similar to the national sample (54.1%) (Figure 12). The same trend held for interest in financing to support energy efficiency improvements, with the Middle Atlantic tracking with the large sample trends (Figure 13).

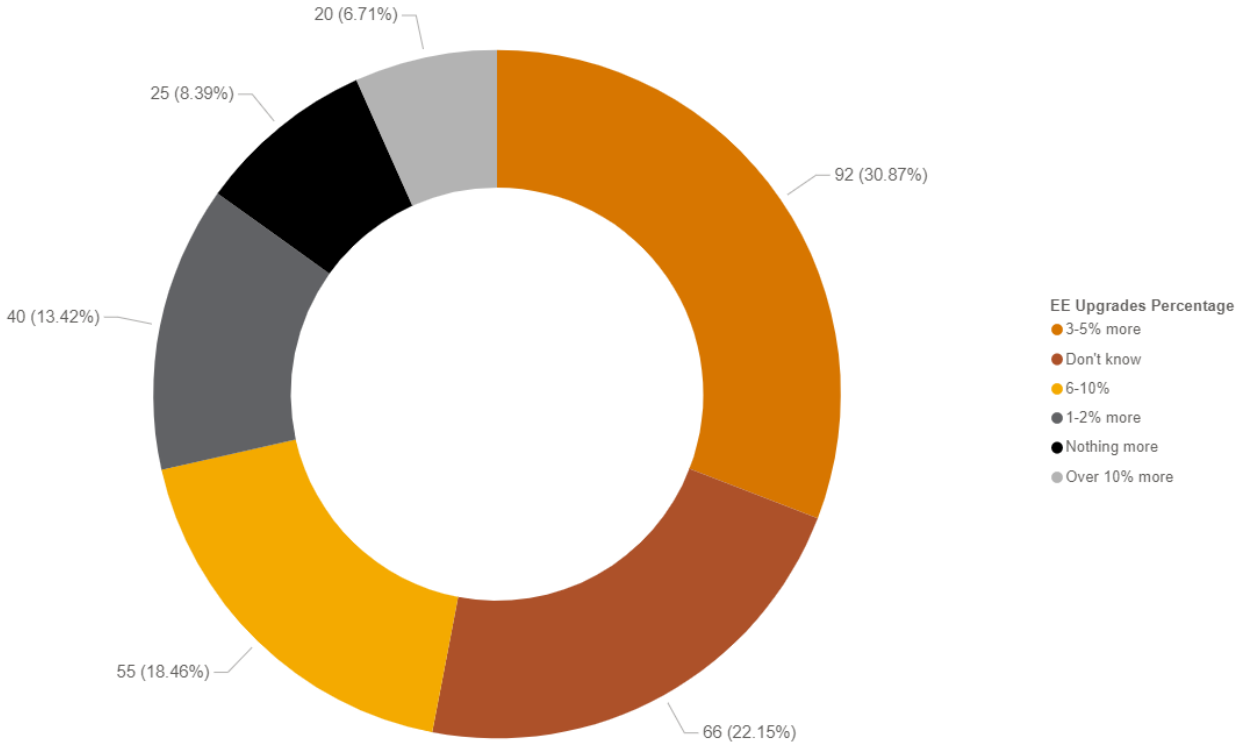

Figure 11. Percentage respondents are willing to pay more for an energy-efficient upgrade/retrofit to their homes – Middle Atlantic Census Division (n = 298)

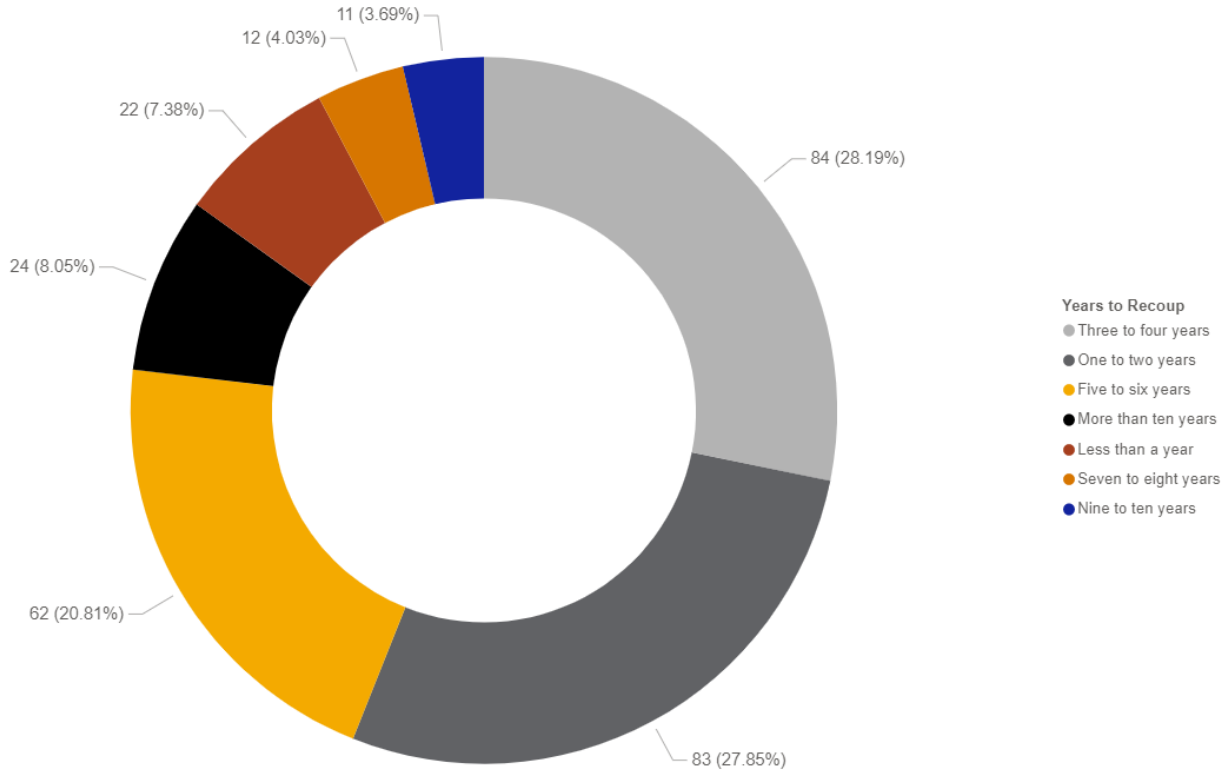

Figure 12. Desired window to recoup the cost of an energy-efficient home retrofit – Middle Atlantic Census Division (n = 298)

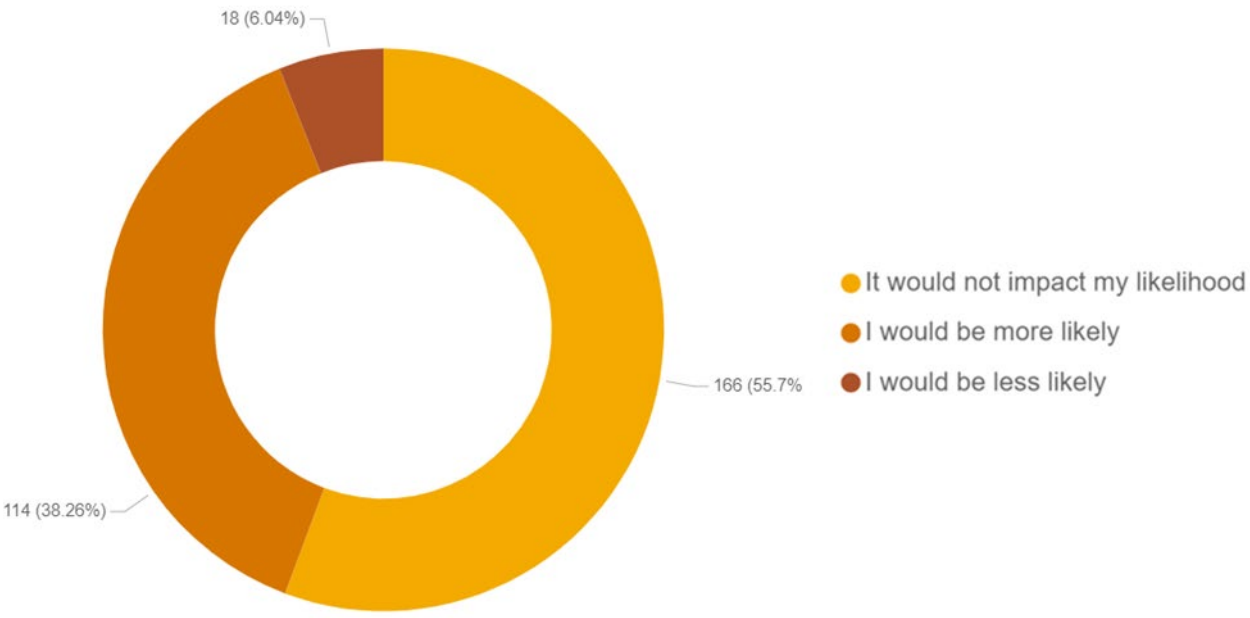

Figure 13. Influence of financing on choosing to make an energy efficiency-related home upgrade – Middle Atlantic Census Division (n = 298)

4.0 Regional Analysis: South Atlantic Census Division (n = 470)

South Atlantic respondents trended similarly in terms of energy-efficient home improvements and changes with the national sample, except in the case of adopting energy-efficient air conditioning systems (Table 14). Only 24% of national respondents had purchased an ENERGY STAR® certified air conditioning system, while 28.7% of South Atlantic respondents indicated making this change.

Table 14. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – South Atlantic Census Division (n = 470)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	51.5%
Changed habits at home to save energy	48.1%
Purchased an ENERGY STAR® certified air conditioning system	28.7%
Unplug small appliances and power strips when not in use	27.9%
Added caulking or weather stripping around windows and doors	24.3%
Purchased a high-efficiency furnace, heat pump, or boiler	23.6%
Installed extra attic insulation	20.2%
Installed high efficiency/ENERGY STAR® certified windows	16.8%
Purchased a smart thermostat	14.0%
Purchased a tankless water heater or heat pump water heater	11.5%
Had a professional come into the home to seal air leaks	9.6%
Had a home energy inspection	8.1%
Added photovoltaic solar to home or property	3.8%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	3.0%

South Atlantic respondents were split on their perceptions of their ability to and interest in conserving energy. While the sample tracked with national trends on the importance of conserving energy (Table 15, first row), South Atlantic respondents indicated they believed it was easier to spend more on energy and that energy was too cheap to incentivize energy

efficiency at home. In terms of the role of government in increasing energy efficiency, South Atlantic respondents tracked with the national sample (Agree: 68.5% vs. 67.5% nationally).

Table 15. Perceptions of why individuals may not adopt more energy-efficient ways of living – South Atlantic Census Division (n = 470)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	15.3%	71.3%	13.4%
It's easier to pay more for energy than make the effort to save energy	34.0%	42.3%	23.6%
My energy bills are too low for me to care about energy efficiency	22.8%	59.8%	17.4%
Individual efforts won't make much of a difference	23.0%	60.2%	16.8%
The government should do more to increase energy efficiency	68.5%	21.5%	10.0%

A much larger proportion of South Atlantic respondents (31.3% vs. 25.9% nationally) indicated that replacing HVAC was the most impactful home improvement to increasing home energy efficiency (Table 16). The predominant tradeoff in choice for this difference came from window upgrades, where only 18.3% (versus 21% nationally) indicated window upgrades were the top method for increasing energy efficiency.

Table 16. Respondent beliefs about the most impactful upgrade on home energy efficiency – South Atlantic Census Division (n = 470)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	31.3%
Replacing older, inefficient windows with more efficient ones	18.3%
Adding or replacing attic insulation	13.8%
Replacing all bulbs with LEDs	10.9%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	7.9%
Replacing an old thermostat with a "smart" thermostat	6.6%
Replacing an older, inefficient water heater with a more efficient model	6.2%
Replacing the siding or exterior cladding	3.0%
Adding an automated lighting control system	2.1%

Changing habits ranked as the hardest change for homeowners to make to save energy in the South Atlantic (35.3%), tracking with national trends (Table 17).

Table 17. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – South Atlantic Census Division (n = 470)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	35.3%
Install solar panels or wind turbines	18.9%
Install extra insulation	9.1%
Get a professional home energy audit	8.3%
Install energy-efficient windows	8.1%
Don't know	7.2%
Install a higher efficiency heating or cooling system	5.5%
Switch to LED light bulbs	2.3%
Install a higher efficiency hot water heater	2.1%
Purchase an ENERGY STAR® appliance	1.9%
Install a programmable thermostat	1.1%

4.1 South Atlantic – Financial Dimensions

South Atlantic respondents indicated a willingness to spend slightly more than the national sample, with 16.3% of respondents indicating they spent between $5,000 and $9,999 over the past five years on energy-efficient upgrades (compared to 12.8% nationally) (Figure 14). Beyond this category, the region trended similarly to the national trend across all other spending bands.

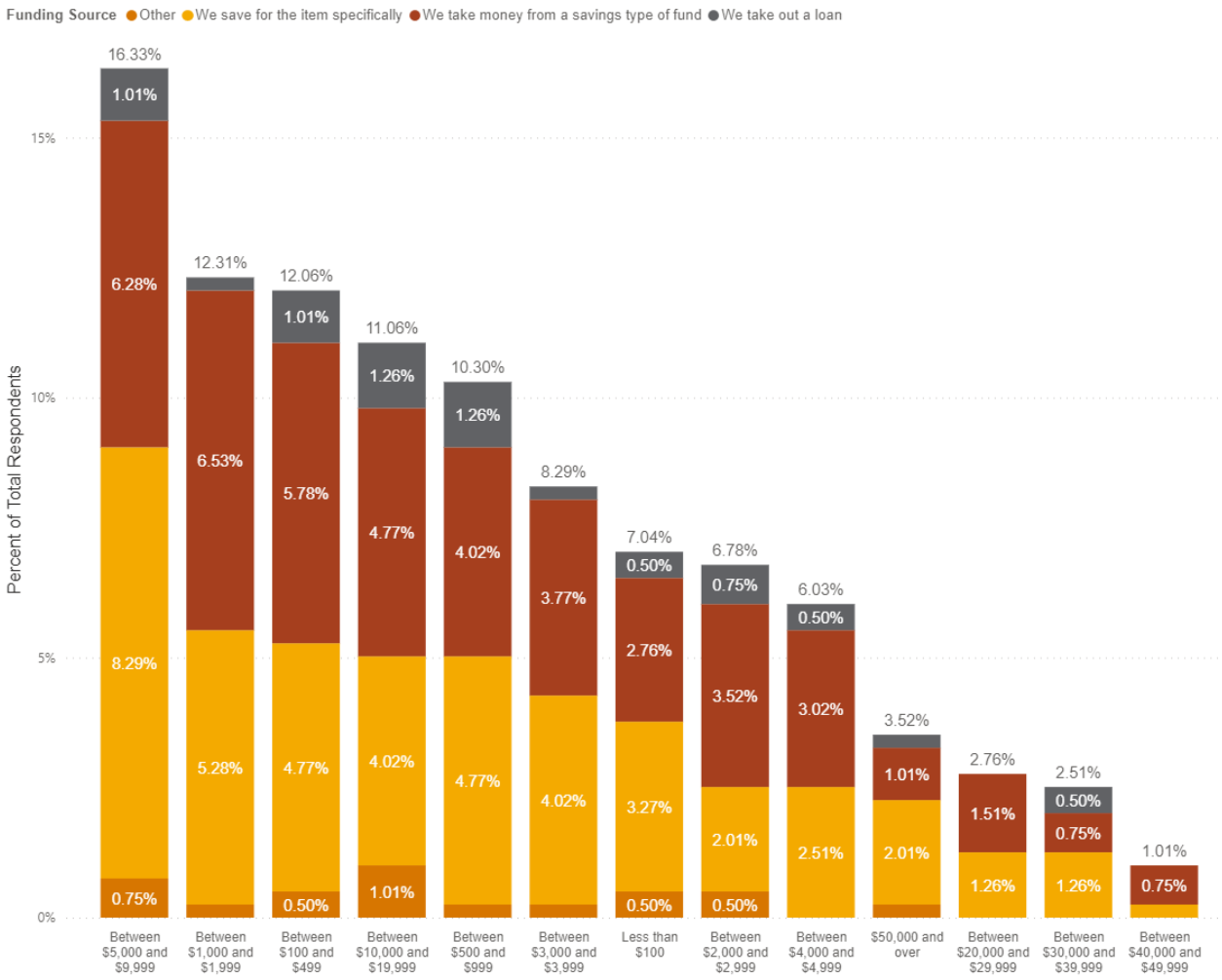

Figure 14. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – South Atlantic Census Division (n = 470).

Unlike the national sample, South Atlantic respondents indicated a greater willingness to spend more on a given upgrade if it included more energy-efficient features/capabilities, with 11.7% (Figure 15) willing to spend 10% or more over the base price of an improvement (versus 8.9% nationally). Other bands trended alongside the national sample.

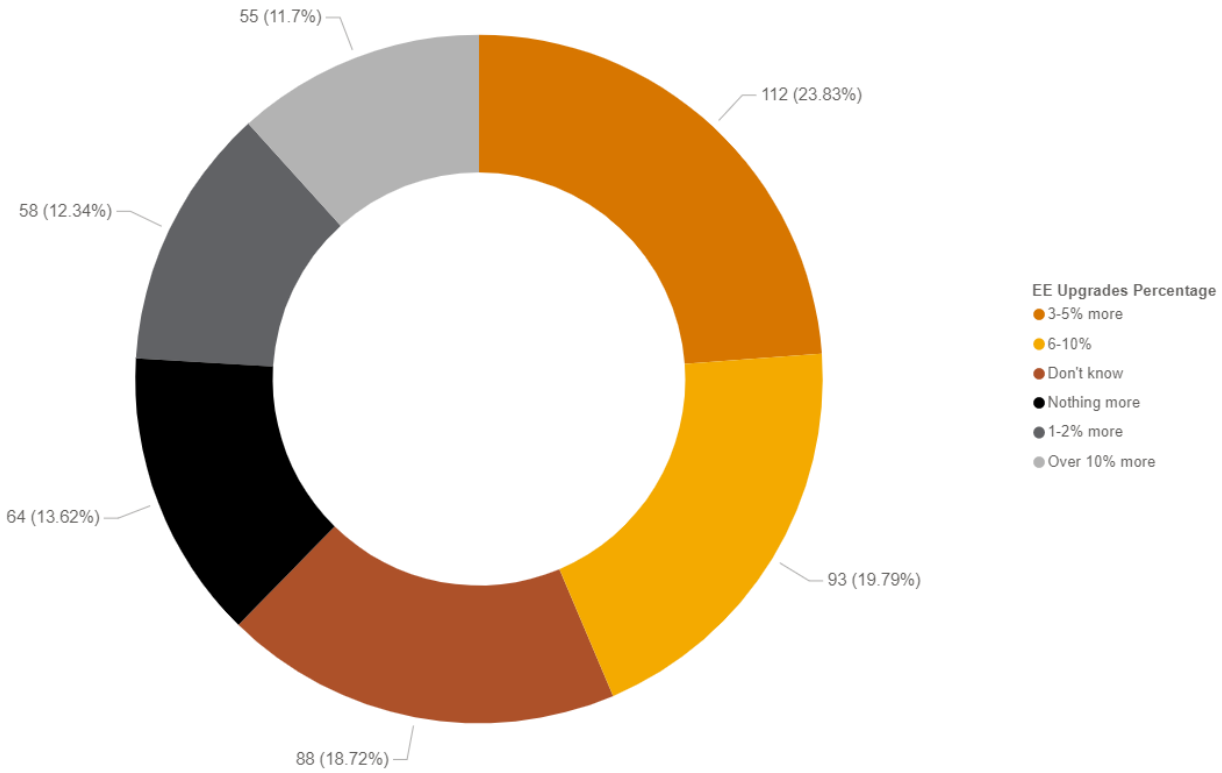

Figure 15. Percentage respondents are willing to pay more for an energy-efficient upgrade/retrofit to their homes – South Atlantic Census Division (n = 470)

Time to recover costs are like those of the national sample, with 55.5% indicating between one and four years (Figure 16). All other bands tracked with national trends as well as did interest in financing as an incentive to carry out a home improvement (Figure 17).

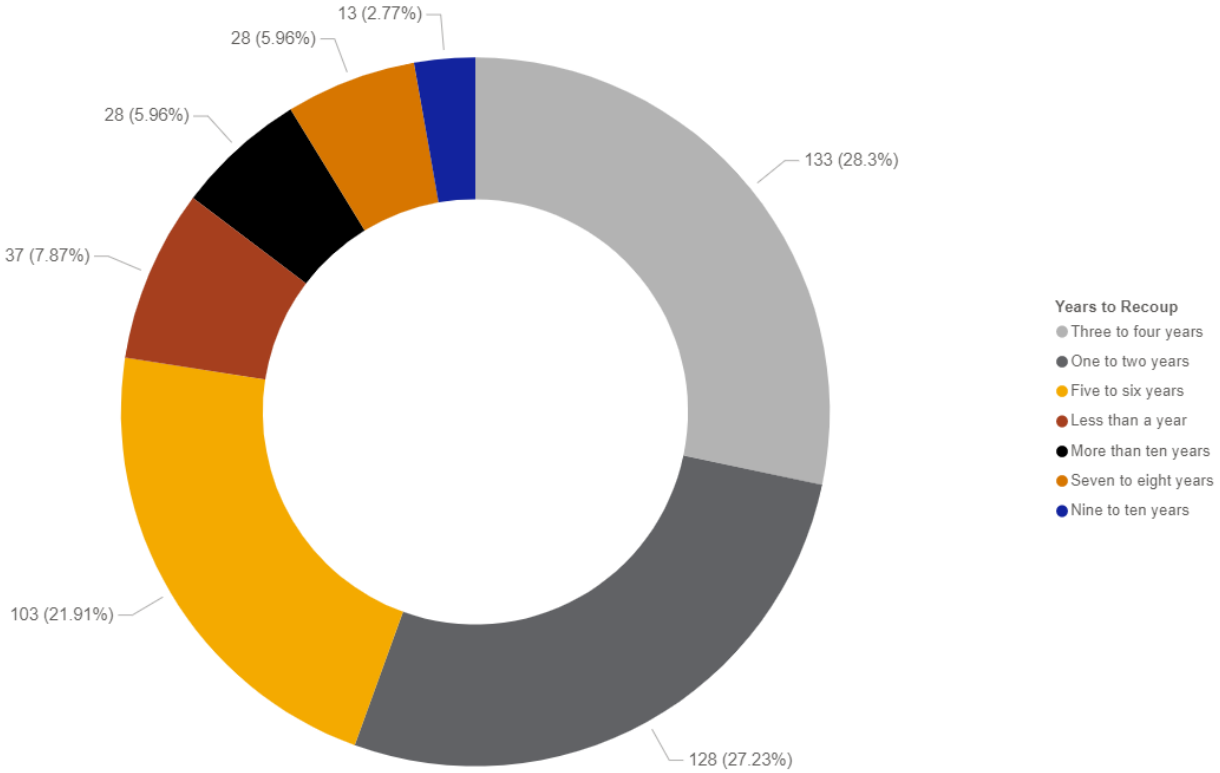

Figure 16. Desired window to recoup the cost of an energy efficient home retrofit – South Atlantic Census Division (n = 470)

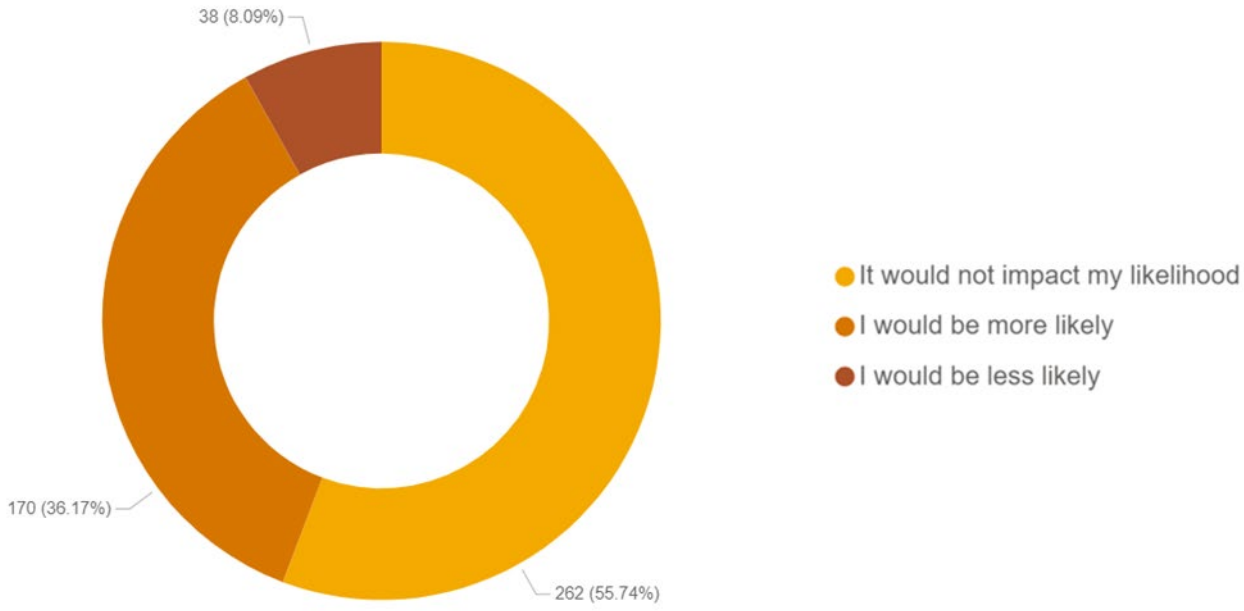

Figure 17. Influence of financing on choosing to make an energy efficiency-related home upgrade – South Atlantic Census Division (n = 470)

5.0 Regional Analysis: East North Central Census Division (n = 314)

East North Central respondents demonstrated the highest percentage of investing in LED bulb replacement and habit change (both categories above 50% per Table 18). Across all options surveyed, East North Central respondents indicated higher rates of adoption/change than the national sample for almost every category except for the following four: unplugging small appliances and power strips when not in use (30.6% versus 31.4% nationally), adding tankless or heat pump water heaters (6.4% versus 11.1% nationally) and renewable energy sources (solar, geothermal, or otherwise) which were both at less than 3% adoption. The largest difference in adoption rates between East North Central respondents and the national sample was in adopting high-efficiency furnaces, heat pumps, or boilers (34.1% versus 25.6% nationally).

Table 18. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – East North Central Census Division (n = 314)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	54.1%
Changed habits at home to save energy	51.9%
Purchased a high-efficiency furnace, heat pump, or boiler	34.1%
Added caulking or weather stripping around windows and doors	32.8%
Unplug small appliances and power strips when not in use	30.6%
Installed extra attic insulation	29.6%
Purchased an ENERGY STAR® certified air conditioning system	24.8%
Installed high efficiency/ENERGY STAR® certified windows	23.6%
Purchased a smart thermostat	20.1%
Had a home energy inspection	10.8%
Had a professional come into the home to seal air leaks	6.7%
Purchased a tankless water heater or heat pump water heater	6.4%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	2.2%
Added photovoltaic solar to home or property	1.0%

Across the board, East North Central respondents were less likely to agree that conserving energy was not important (Table 19). However, compared to the national sample, East North Central respondents were less likely to believe the government should do more to increase energy efficiency (64% versus 67.5% nationally).

Table 19. Perceptions of why individuals may not adopt more energy-efficient ways of living – East North Central Census Division (n = 314)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	14.7%	74.8%	10.5%
It's easier to pay more for energy than make the effort to save energy	28.6%	44.0%	27.4%
My energy bills are too low for me to care about energy efficiency	12.4%	70.7%	16.9%
Individual efforts won't make much of a difference	19.4%	61.5%	19.1%
The government should do more to increase energy efficiency	64.0%	12.1%	23.9%

Tracking with the national sample, East North Central respondents were most likely to indicate HVAC replacement as the most impactful home improvement to increase energy efficiency (27.1%), followed by window replacement (20.4%) and replacing attic insulation (17.5%) (Table 20). Less than 5% of respondents thought replacing exterior siding/cladding (1.3%), adding automated lighting control systems (2.2%), or installing a smart thermostat (4.8%) would have the most impact on energy efficiency.

Table 20. Respondent beliefs about the most impactful upgrade on home energy efficiency – East North Central Census Division (n = 314)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	27.1%
Replacing older, inefficient windows with more efficient ones	20.4%
Adding or replacing attic insulation	17.5%
Replacing all bulbs with LEDs	11.8%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	8.6%
Replacing an older, inefficient water heater with a more efficient model	6.4%
Replacing an old thermostat with a "smart" thermostat	4.8%
Adding an automated lighting control system	2.2%
Replacing the siding or exterior cladding	1.3%

A total of 35% of respondents in the East North Central division believe changing habits is the most challenging activity for individuals to undertake to save energy. At a distant second and third, the same group indicated that adding renewable energy (20.4%) and extra insulation (10.8%) were the subsequent two most challenging improvements for homeowners (Table 21). Less than a percent of respondents in the East North Central division saw programmable thermostats as a complex upgrade (0.3%).

Table 21. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – East North Central Census Division (n = 314)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	35.0%
Install solar panels or wind turbines	20.4%
Install extra insulation	10.8%
Install energy-efficient windows	9.9%
Don't know	8.9%
Install a higher efficiency heating or cooling system	4.8%
Get a professional home energy audit	3.8%
Switch to LED light bulbs	2.9%
Purchase an ENERGY STAR® appliance	2.2%
Install a higher efficiency hot water heater	1.0%
Install a programmable thermostat	0.3%

5.1 East North Central – Financial Dimensions

Over the past five years, East North Central respondents spent, on average, similar amounts as the national sample, with the largest group (16.3%) spending between $5,000 and $9,999 (Figure 18). Whereas the national sample had 5.1% of respondents spending $30,000 or more, only 2.3% of East North Central respondents were in the same category.

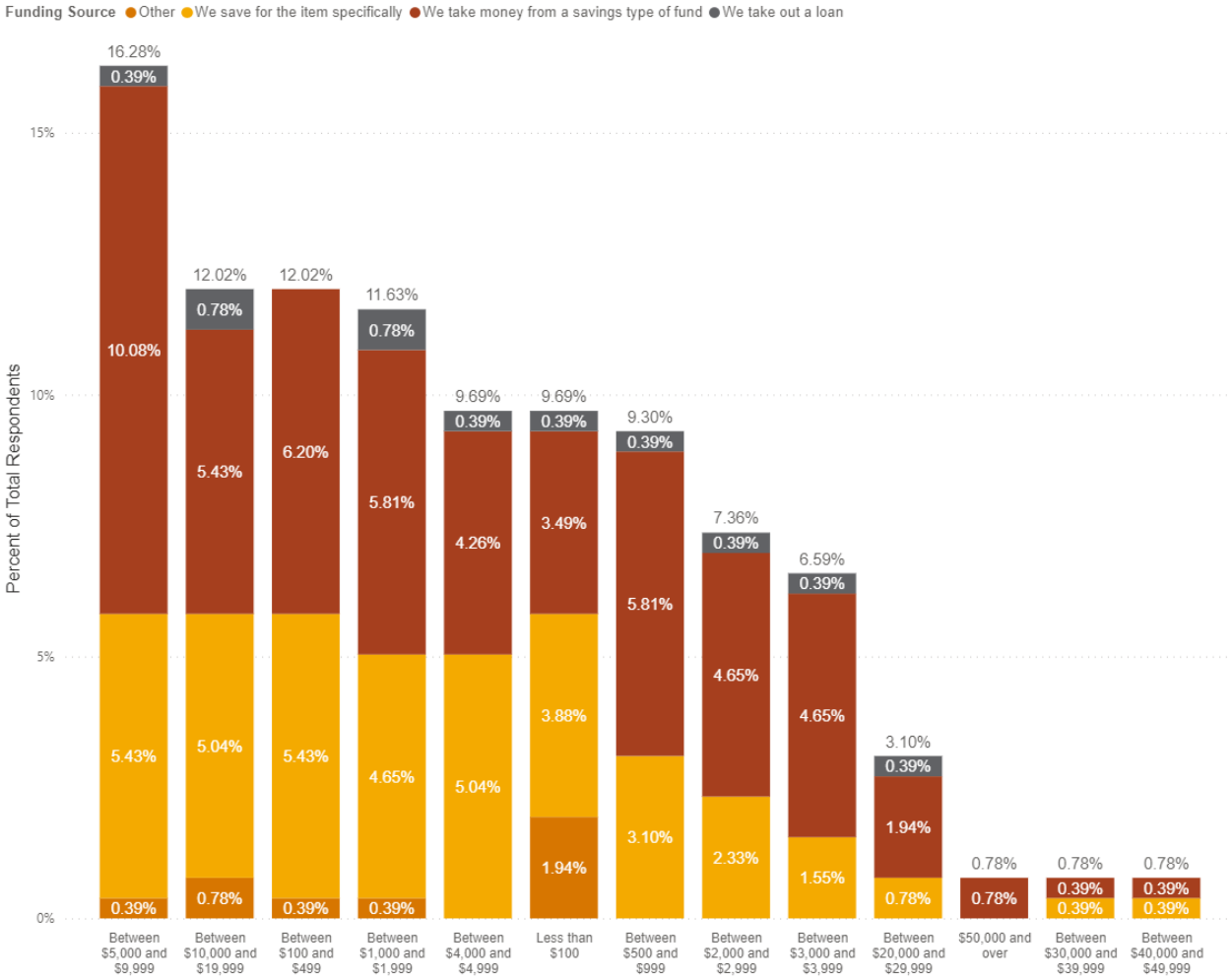

Figure 18. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – East North Central Census Division (n = 314)

Distribution of willingness to spend more for an energy-efficient home upgrade in the East North Central division tracked national trends (Figure 19). The largest group of respondents were those willing to spend 3-5% more (26.8%), followed by 6-10% (20.4%). East North Central respondents leaned towards shorter timelines in terms of payback time, with 27.4% preferring to see a return on their investment in one to two years, followed by the three to four-year group (26.4%) (Figure 20). A slightly larger amount of East North Central respondents (in comparison to the national sample) indicated financing would have no impact on their willingness to pursue an energy-efficient home improvement (Figure 21).

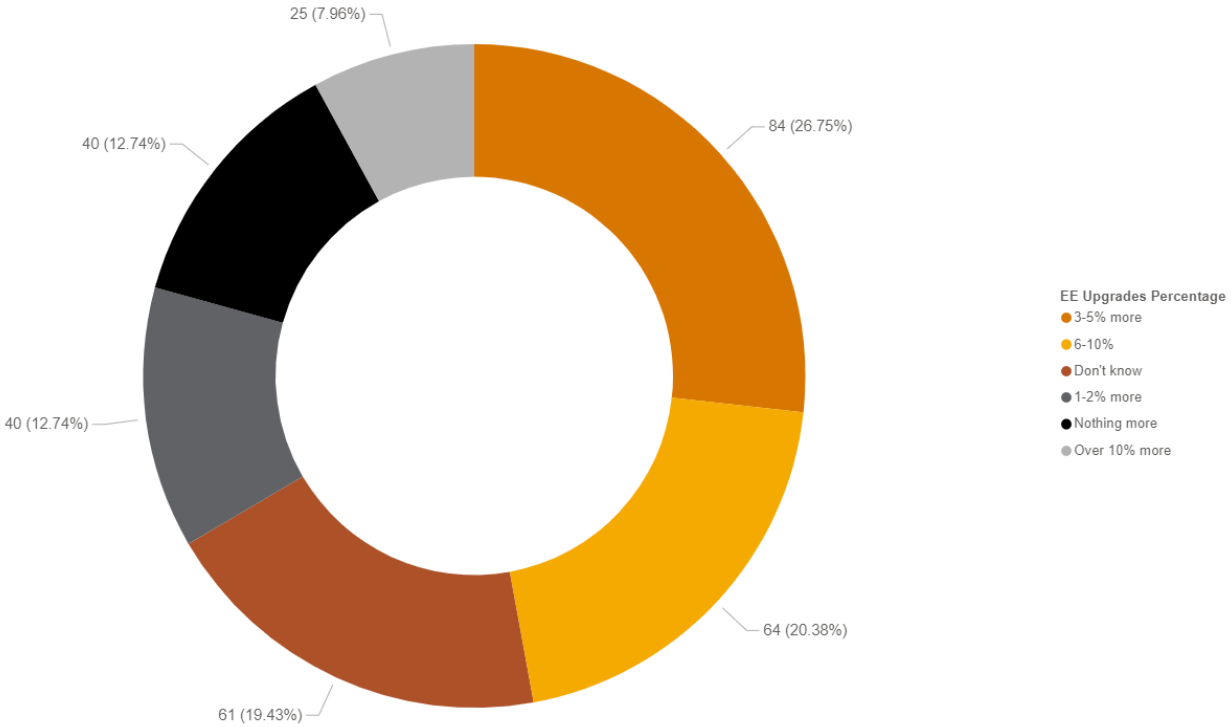

Figure 19. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – East North Central Census Division (n = 314)

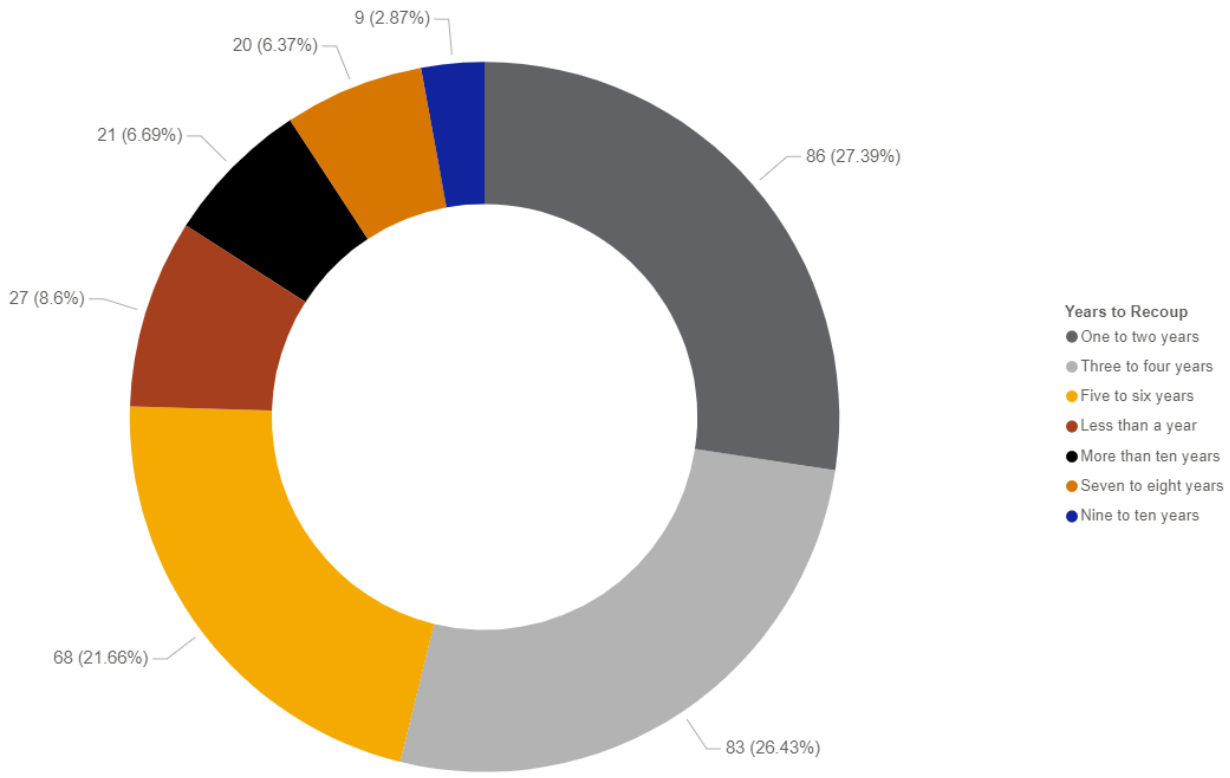

Figure 20. Desired window to recoup the cost of an energy efficient home retrofit – East North Central Census Division (n = 314)

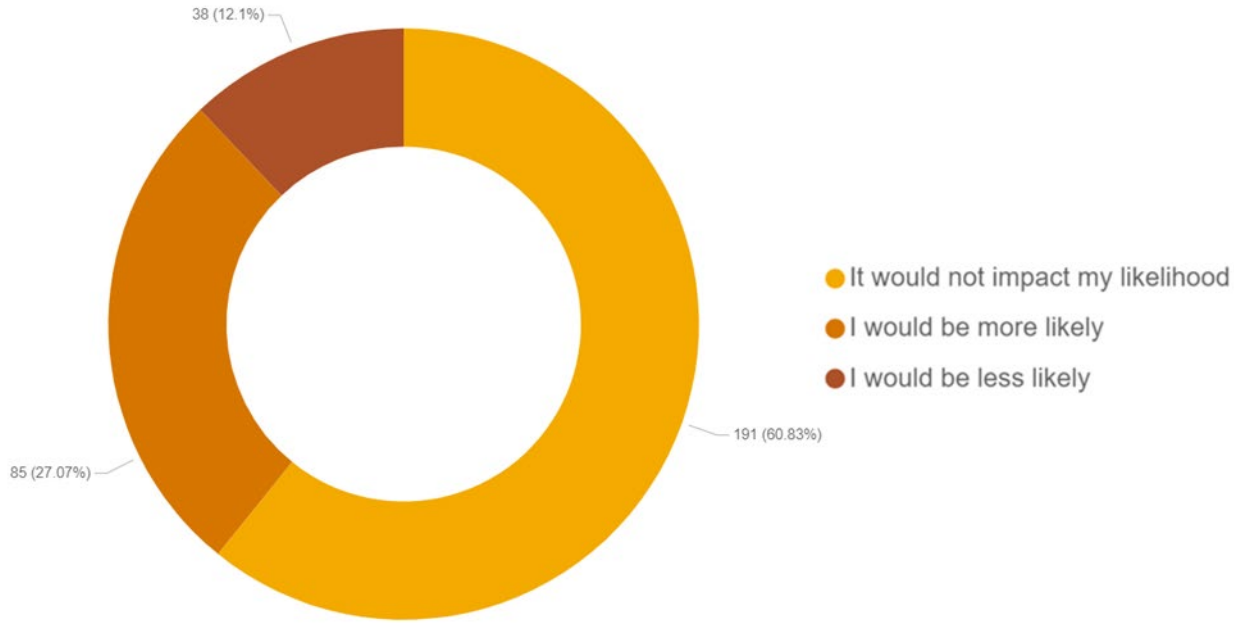

Figure 21. Influence of financing on choosing to make an energy efficiency-related home upgrade – East North Central Census Division (n = 314)

6.0 Regional Analysis: East South Central Census Division (n = 80)

East South Central respondents' top three changes for energy efficiency improvement to the home track with the national sample, with LED replacement (53.8%) and changing habits (40%) being the top two changes (Table 22). A more significant percentage of East South Central respondents indicated they had carried out some type of weatherization to their windows and doors (36.2%) versus the national sample (29.7%). Notably, only 10% of East South Central respondents indicated they had purchased a smart thermostat (compared to 16.6% nationwide).

Table 22. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – East South Central Census Division (n = 80)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	53.8%
Changed habits at home to save energy	40.0%
Added caulking or weather stripping around windows and doors	36.2%
Unplug small appliances and power strips when not in use	35.0%
Purchased an ENERGY STAR® certified air conditioning system	21.2%
Installed extra attic insulation	21.2%
Purchased a high-efficiency furnace, heat pump, or boiler	17.5%
Installed high efficiency/ENERGY STAR® certified windows	11.2%
Purchased a smart thermostat	10.0%
Purchased a tankless water heater or heat pump water heater	10.0%
Had a home energy inspection	5.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	3.7%
Had a professional come into the home to seal air leaks	2.5%
Added photovoltaic solar to home or property	2.5%

Across the board, East South Central respondents indicated they did not believe individual action on energy efficiency and energy conservation were as important when compared to the national sample. A total of 35% of all respondents from the East South Central division agreed it was easier to pay for more energy than making an effort to change habits, compared to 31.6%

nationally. Despite signs that East South Central respondents value energy efficiency less, over 70% indicated they believed the government should play a larger role in increasing energy efficiency (71.3%).

Table 23. Perceptions of why individuals may not adopt more energy efficient ways of living – East South Central Census Division (n = 80)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	20.0%	67.5%	12.5%
It's easier to pay more for energy than make the effort to save energy	35.0%	40.0%	25.0%
My energy bills are too low for me to care about energy efficiency	22.5%	63.8%	13.7%
Individual efforts won't make much of a difference	22.5%	62.5%	15.0%
The government should do more to increase energy efficiency	71.3%	13.7%	15.0%

East South Central respondents indicated they believed replacing existing windows with more efficient ones would create the greatest energy savings (26.3%), followed by replacing older HVAC (23.8%) and adding or replacing attic insulation (15%) (Table 24). As a tradeoff, fewer East South Central respondents believed that either older appliances or automated lighting systems would provide the greatest impact on home energy usage.

Table 24. Respondent beliefs about the most impactful upgrade on home energy efficiency – East South Central Census Division (n = 80)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing older, inefficient windows with more efficient ones	26.3%
Replacing an older, inefficient HVAC with a more efficient model	23.8%
Adding or replacing attic insulation	15.0%
Replacing all bulbs with LEDs	13.8%
Replacing an older, inefficient water heater with a more efficient model	7.5%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	5.0%
Replacing an old thermostat with a "smart" thermostat	3.8%
Replacing the siding or exterior cladding	3.8%
Adding an automated lighting control system	1.3%

Compared to the national sample, East South Central respondents (Table 25) demonstrated a strong preference for personal habits as the most difficult change for homeowners to make to save energy (43.8%), followed at a distant second by installing renewable energy sources

(15%). Like the national sample, few East South Central respondents thought programmable thermostats, ENERGY STAR® appliances, or LED light bulbs were a problematic change for homeowners to make that would save energy.

Table 25. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – East South Central Census Division (n = 80)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	43.8%
Install solar panels or wind turbines	15.0%
Don't know	8.8%
Install energy-efficient windows	8.8%
Get a professional home energy audit	6.3%
Install a higher efficiency heating or cooling system	6.3%
Install extra insulation	5.0%
Install a higher efficiency hot water heater	2.5%
Install a programmable thermostat	1.3%
Purchase an ENERGY STAR® appliance	1.3%
Switch to LED light bulbs	1.3%

6.1 East South Central – Financial Dimensions

East South Central respondents demonstrated a bimodal preference for spending on energy-efficient home upgrades in the last five years, with the two largest groups spending between $100 and $499 (18.5%) or $10,000 and $19,999 (15.38%) (Figure 22). On the whole, 41.6% of the sample had spent less than $1,000 over the previous five years on energy efficiency-related home upgrades.

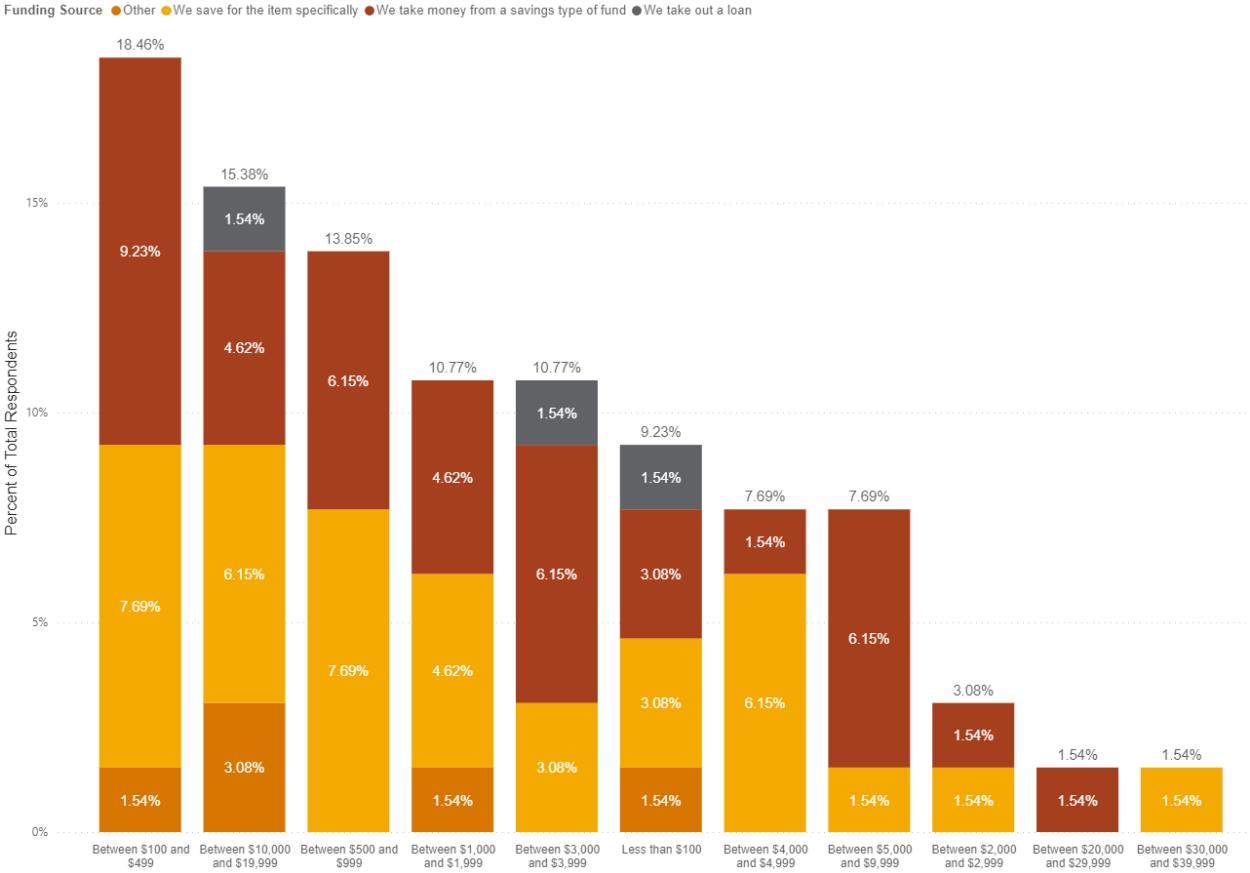

Figure 22. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – East South Central Census Division (n = 80)

When asked to respond how much they would spend for a more energy-efficient home upgrade or retrofit, 25% of East South Central respondents did not know how much they would spend, and another 20% indicated they would not spend any more money for a more energy-efficient alternative (Figure 23). In terms of time to recuperate money expended in an improvement, 51.3% of East South Central respondents would wait between one and four years (Figure 24), but much like the national sample, the majority did not state that financing would motivate them to pursue any energy-efficient upgrades more (Figure 25).

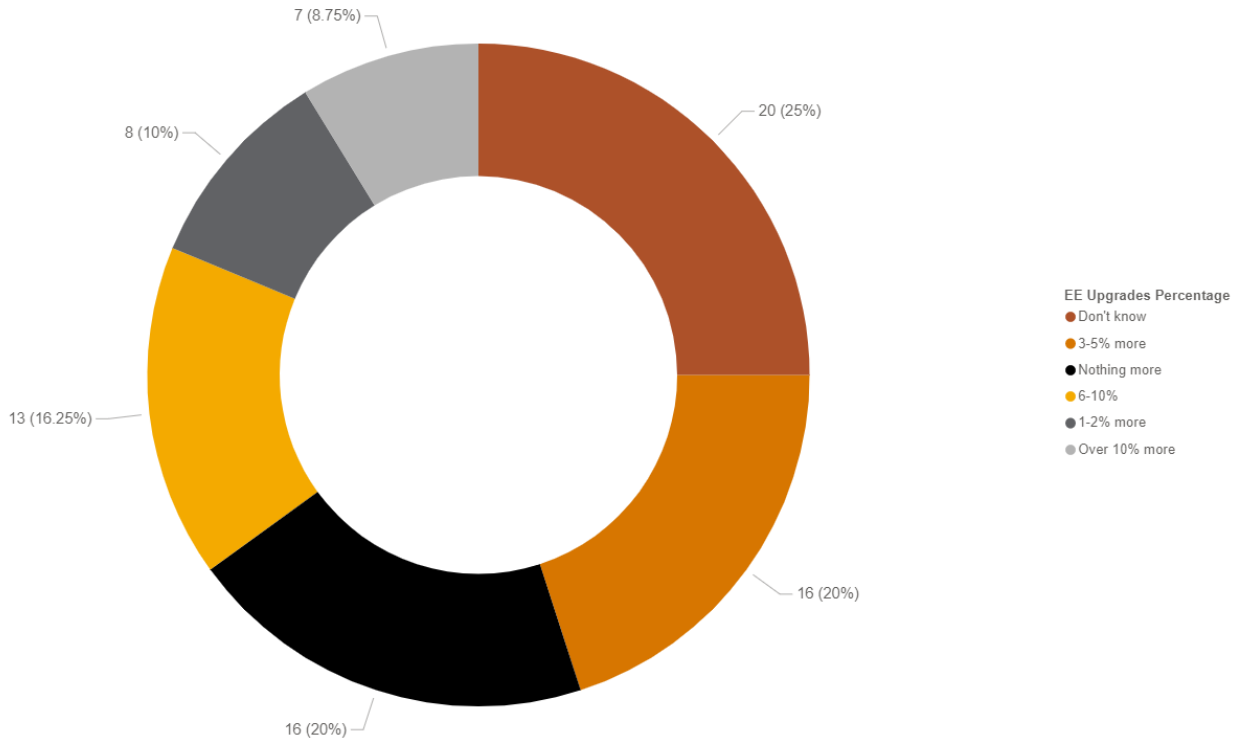

Figure 23. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – East South Central Census Division (n = 80)

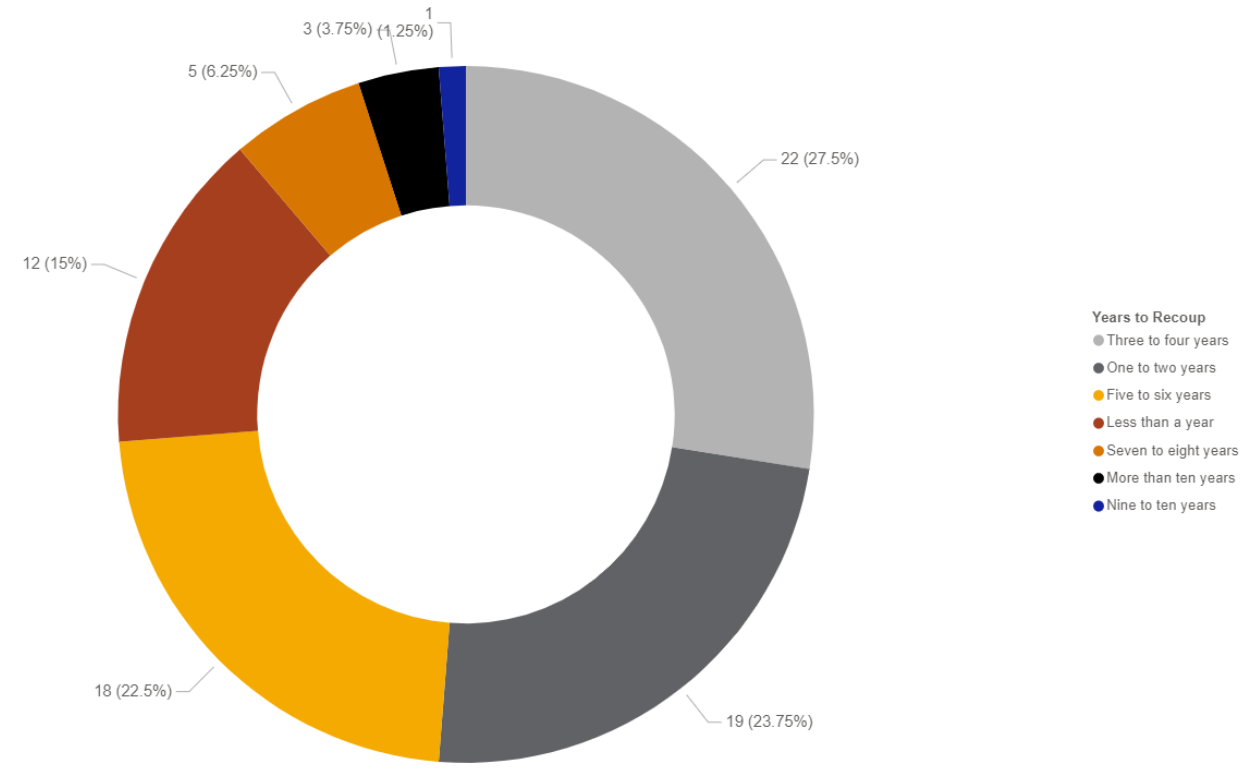

Figure 24. Desired window to recoup the cost of an energy efficient home retrofit – East South Central Census Division

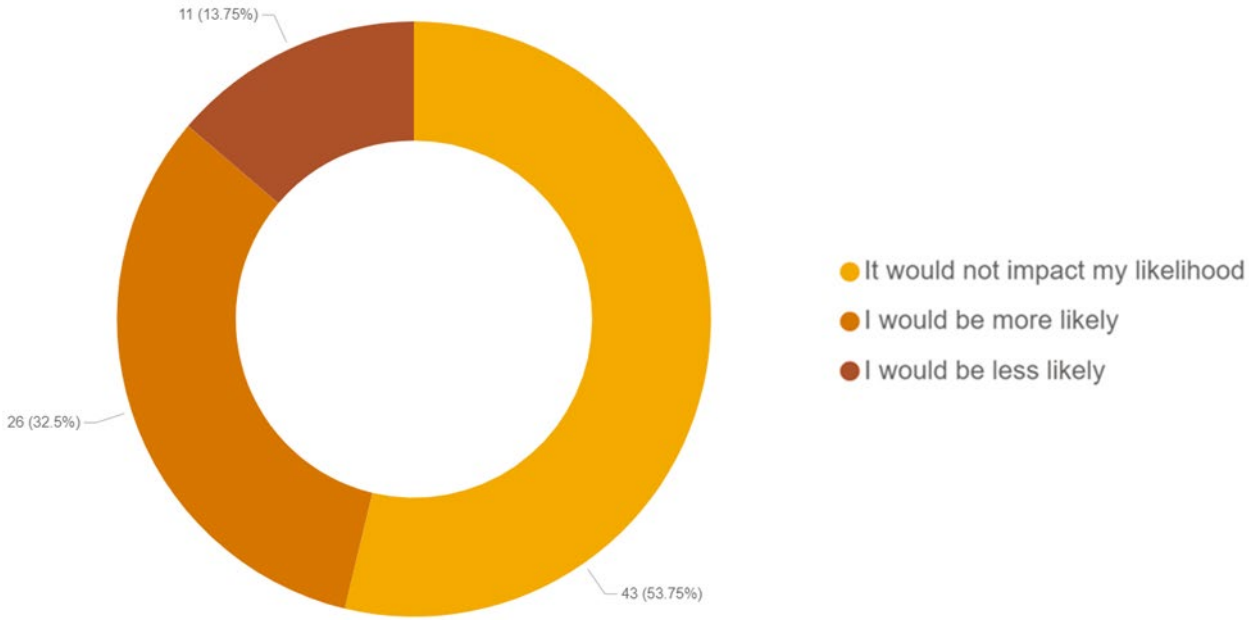

Figure 25. Influence of financing on choosing to make an energy efficiency-related home upgrade – East South Central Census Division

7.0 Regional Analysis: West North Central Census Division (n = 120)

Diverging from the national sample, West North Central respondents were most likely to have changed their personal habits to save energy (47.5%), followed then by replacing most bulbs with LEDs (45.8%) (Table 26). West North Central respondents also showed significantly higher rates of adopting other energy-efficient technologies, such as high-efficiency furnaces, heat pumps, or boilers (37.5%), unplugging small appliances (35.8%), weather stripping (34.2%), and ENERGY STAR® windows (25%).

Table 26. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – West North Central Census Division (n = 120)

Upgrade/Service/Change	Yes, I have done this
Changed habits at home to save energy	47.5%
Replaced 90-100% of incandescent lighting with LED bulbs	45.8%
Purchased a high-efficiency furnace, heat pump, or boiler	37.5%
Unplug small appliances and power strips when not in use	35.8%
Added caulking or weather stripping around windows and doors	34.2%
Installed high efficiency/ENERGY STAR® certified windows	25.0%
Purchased an ENERGY STAR® certified air conditioning system	24.2%
Installed extra attic insulation	20.0%
Purchased a smart thermostat	15.0%
Had a home energy inspection	11.7%
Purchased a tankless water heater or heat pump water heater	9.2%
Had a professional come into the home to seal air leaks	9.2%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	5.0%
Added photovoltaic solar to home or property	4.2%

West North Central respondents demonstrated a higher than average predilection to indicate they believed that there was a motivation to increase energy efficiency and a willingness to make the changes necessary to save energy (Table 27). Furthermore, unlike the other regions

surveyed, West North Central respondents were less likely to indicate they believe government should play a greater role in increasing energy efficiency (66.7% versus 67.5% nationally).

Table 27. Perceptions of why individuals may not adopt more energy efficient ways of living – West North Central Census Division (n = 120)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	12.5%	76.7%	10.8%
It's easier to pay more for energy than make the effort to save energy	29.2%	48.3%	22.5%
My energy bills are too low for me to care about energy efficiency	14.2%	68.3%	17.5%
Individual efforts won't make much of a difference	15.8%	63.3%	20.8%
The government should do more to increase energy efficiency	66.7%	10.8%	22.5%

West North Central beliefs about the top ways to impact home energy efficiency tracked with the national sample (Table 28). Replacing HVAC ranked top (31.7%) – a higher rate than the national sample significantly. Window (22.5%) and attic insulation (12.5%) followed, with the latter being a lower percent of the West North Central sample than was observed in the national sample.

Table 28. Respondent beliefs about the most impactful upgrade on home energy efficiency – West North Central Census Division (n = 120)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	31.7%
Replacing older, inefficient windows with more efficient ones	22.5%
Adding or replacing attic insulation	12.5%
Replacing all bulbs with LEDs	7.5%
Replacing an older, inefficient water heater with a more efficient model	7.5%
Replacing an old thermostat with a "smart" thermostat	5.0%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	5.0%
Adding an automated lighting control system	4.2%
Replacing the siding or exterior cladding	4.2%

West North Central respondents also ranked habit changes to be the hardest thing for homeowners to do for saving energy (26.7%), followed by renewable energy (20.8%, and energy-efficient windows (15%) (Table 29). West North Central respondents also believed that

installing more efficient heating or cooling systems was the most difficult at higher rates than the national sample (10% versus 6.7% nationally).

Table 29. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – West North Central Census Division (n = 120)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	26.7%
Install solar panels or wind turbines	20.8%
Install energy-efficient windows	15.0%
Install extra insulation	11.7%
Install a higher efficiency heating or cooling system	10.0%
Don't know	7.5%
Get a professional home energy audit	5.0%
Install a higher efficiency hot water heater	1.7%
Install a programmable thermostat	0.8%
Purchase an ENERGY STAR® appliance	0.8%

7.1 West North Central – Financial Dimensions

Over the past five years, 16.7% of West North Central respondents spent between $5,000 and $9,999 on energy efficiency-related home upgrades (Figure 26). However, 39.8% had only spent up to $1,000 over the same interval.

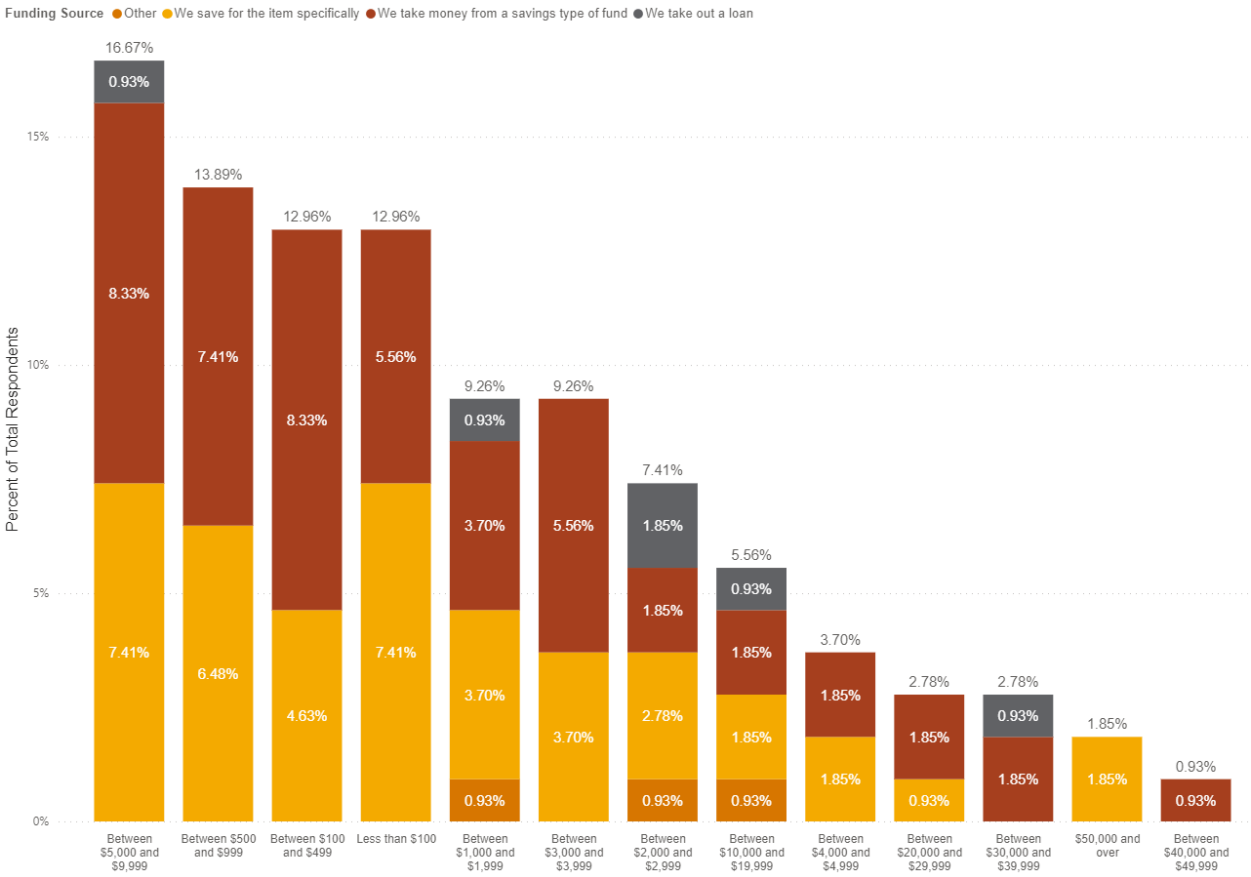

Figure 26. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – West North Central Census Division (n = 120)

Willingness to spend more for energy-efficient home upgrades trended with the national sample, with most West North Central respondents indicating they would either spend 3-5% more (25%), 6-10% (22.5%), or being unsure (18.3%). Regarding time to recuperate the cost of an energy efficiency improvement or change, West North Central respondents preferred shorter timelines, with 30.8% indicating they would only wait for one to two years (compared to 25.2% nationally). Financing was not a solid factor to motivate making any energy efficiency-related changes.

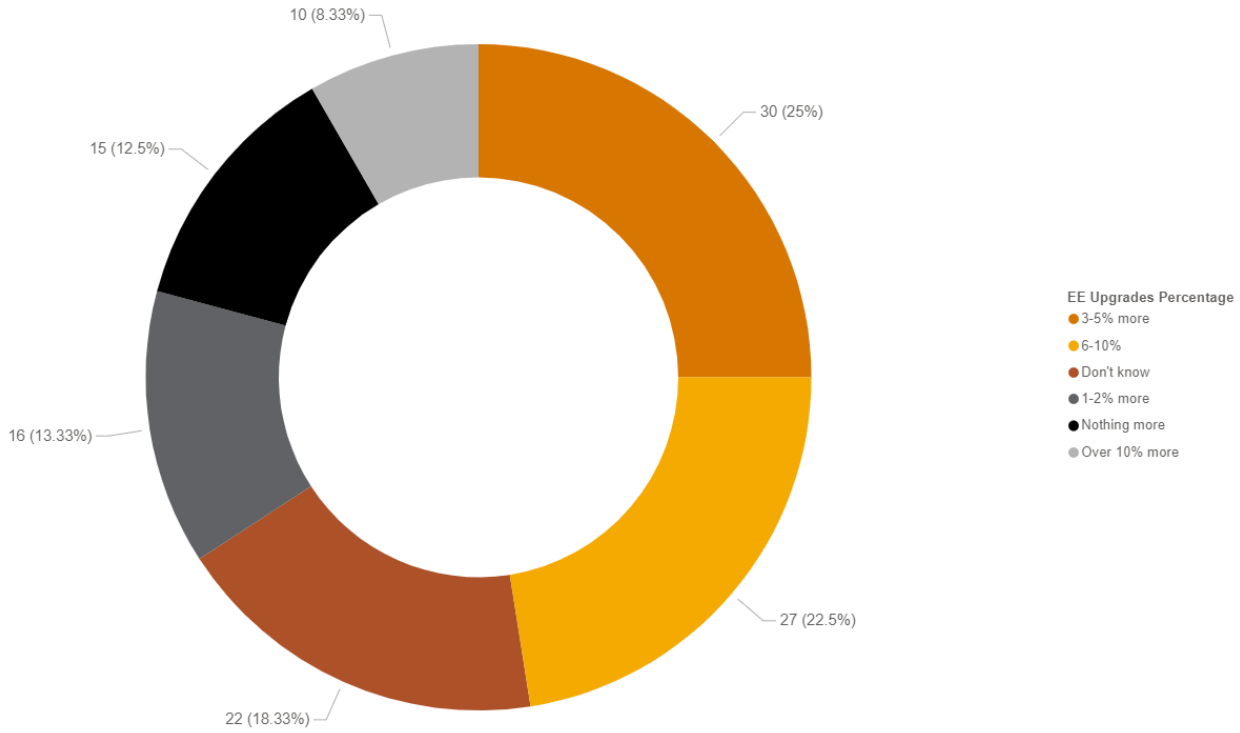

Figure 27. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – West North Central Census Division (n = 120)

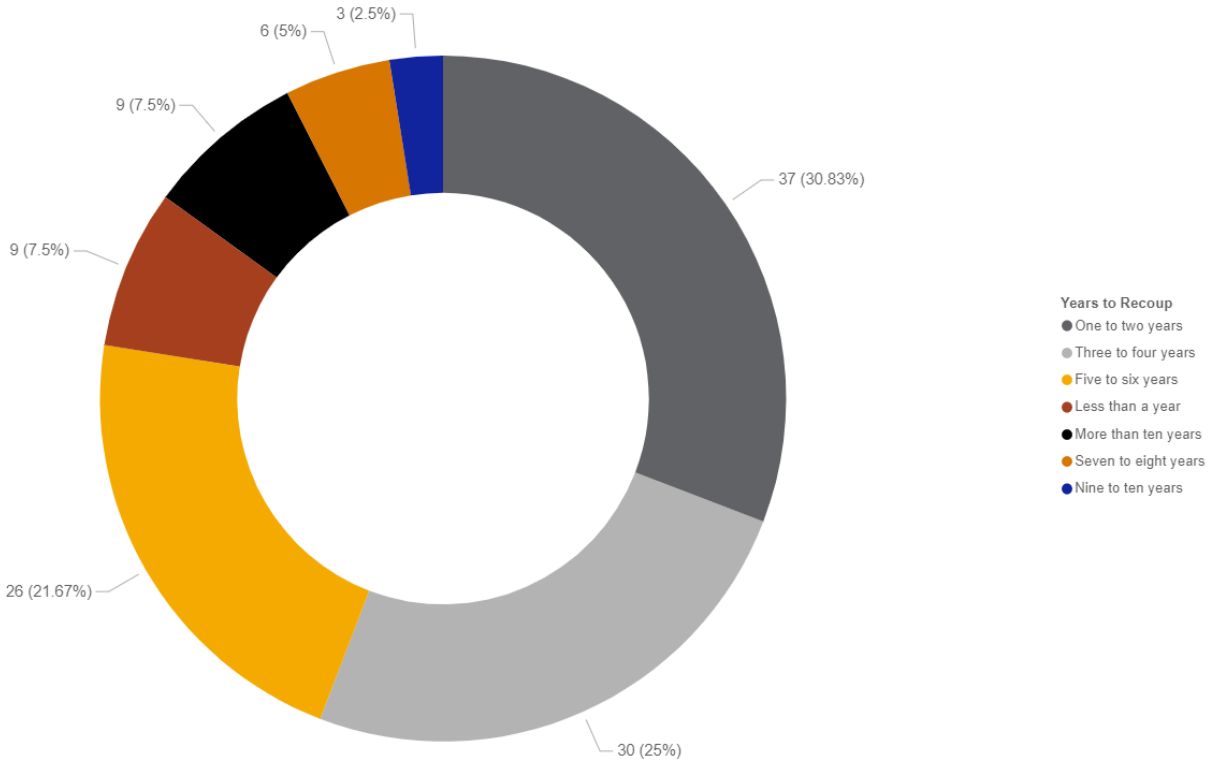

Figure 28. Desired window to recoup the cost of an energy efficient home retrofit – West North Central Census Division (n = 120)

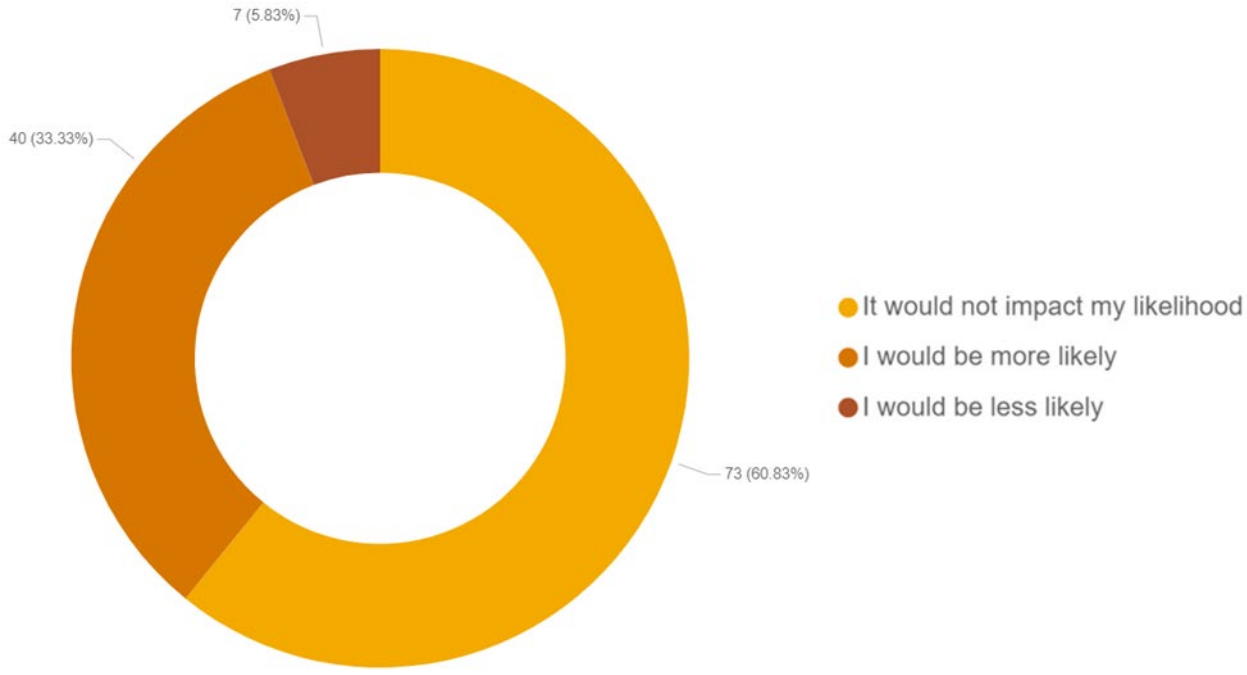

Figure 29. Influence of financing on choosing to make an energy efficiency-related home upgrade – West North Central Census Division (n = 120)

8.0 Regional Analysis: West South Central Census Division (n = 200)

Unlike the national sample, West South Central division respondents were most likely to have changed their habits to save energy (51%), followed by LED bulbs (44.5%) and weatherization (35%) (Table 30). West South Central respondents showed consistently higher levels of adoption concerning weatherization, unplugging power strips and appliances (33.5%), extra attic insulation (28.5%), and purchasing ENERGY STAR© air conditioning systems (26.5%).

Table 30. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – West South Central Census Division (n = 200)

Upgrade/Service/Change	Yes, I have done this
Changed habits at home to save energy	51.0%
Replaced 90-100% of incandescent lighting with LED bulbs	44.5%
Added caulking or weather stripping around windows and doors	35.0%
Unplug small appliances and power strips when not in use	33.5%
Installed extra attic insulation	28.5%
Purchased an ENERGY STAR® certified air conditioning system	26.5%
Purchased a high-efficiency furnace, heat pump, or boiler	21.5%
Installed high efficiency/ENERGY STAR® certified windows	19.5%
Purchased a smart thermostat	16.0%
Purchased a tankless water heater or heat pump water heater	10.5%
Had a professional come into the home to seal air leaks	8.5%
Had a home energy inspection	8.5%
Added photovoltaic solar to home or property	4.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	2.5%

West South Central respondents believe conserving energy is essential; however, compared to the national sample, they were more likely to indicate they do not think individual action makes a difference (Agree: 24% versus 22.9% nationally) (Table 31). Interestingly, West South Central respondents also do not believe the government should do more to increase energy efficiency

(Agree: 61.5% versus 67.5% nationally) which presents an unexpected quandary as to who these respondents think should make the changes necessary to save energy.

Table 31. Perceptions of why individuals may not adopt more energy-efficient ways of living – West South Central Census Division (n = 200)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	14.5%	71.0%	14.5%
It's easier to pay more for energy than make the effort to save energy	27.5%	46.0%	26.5%
My energy bills are too low for me to care about energy efficiency	16.5%	68.5%	15.0%
Individual efforts won't make much of a difference	24.0%	62.0%	14.0%
The government should do more to increase energy efficiency	61.5%	15.0%	23.5%

Top home improvements to enhance home energy efficiency in the West South Central division tracked with national trends, with the top four (Table 32) being replacing HVAC (27.5%), window replacement (22.5%), attic insulation (18.0%), and LED bulb replacement (8.5%). West South Central respondents indicated personal behavior change to be the most difficult change to make (37.5%), followed by renewable energy (17.5%) and windows (12%) (Table 33).

Table 32. Respondent beliefs about the most impactful upgrade on home energy efficiency – West South Central Census Division (n = 200)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	27.5%
Replacing older, inefficient windows with more efficient ones	22.5%
Adding or replacing attic insulation	18.0%
Replacing all bulbs with LEDs	8.5%
Replacing an old thermostat with a "smart" thermostat	7.0%
Replacing an older, inefficient water heater with a more efficient model	7.0%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	5.5%
Adding an automated lighting control system	2.5%
Replacing the siding or exterior cladding	1.5%

Table 33. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – West South Central Census Division (n = 200)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	37.5%
Install solar panels or wind turbines	17.5%
Install energy-efficient windows	12.0%
Install a higher efficiency heating or cooling system	9.5%
Install extra insulation	9.5%
Get a professional home energy audit	5.0%
Don't know	4.0%
Purchase an ENERGY STAR® appliance	2.0%
Switch to LED light bulbs	1.5%
Install a programmable thermostat	1.0%
Install a higher efficiency hot water heater	0.5%

8.1 West South Central – Financial Dimensions

West South Central respondents spending on home energy efficiency-related upgrades tracks with national trends, with 32.2% spending less than $1,000 over the past five years (Figure 30). However, West South Central respondents indicated a willingness to pay more for an energy efficiency upgrade, with 23.5% willing to pay 6-10% more (versus 20.4% nationally) (Figure 31). Only 9% would wait less than a year to recoup an energy efficiency-related upgrade expense, with the largest group (33%) willing to wait between three and four years (Figure 32). A slightly larger group of respondents (35.5% versus 33.1% nationally) indicated financing would motivate them to engage in an energy efficiency-related home improvement; however, more West South Central respondents also indicated financing would reduce their willingness to carry out a home improvement (Figure 33).

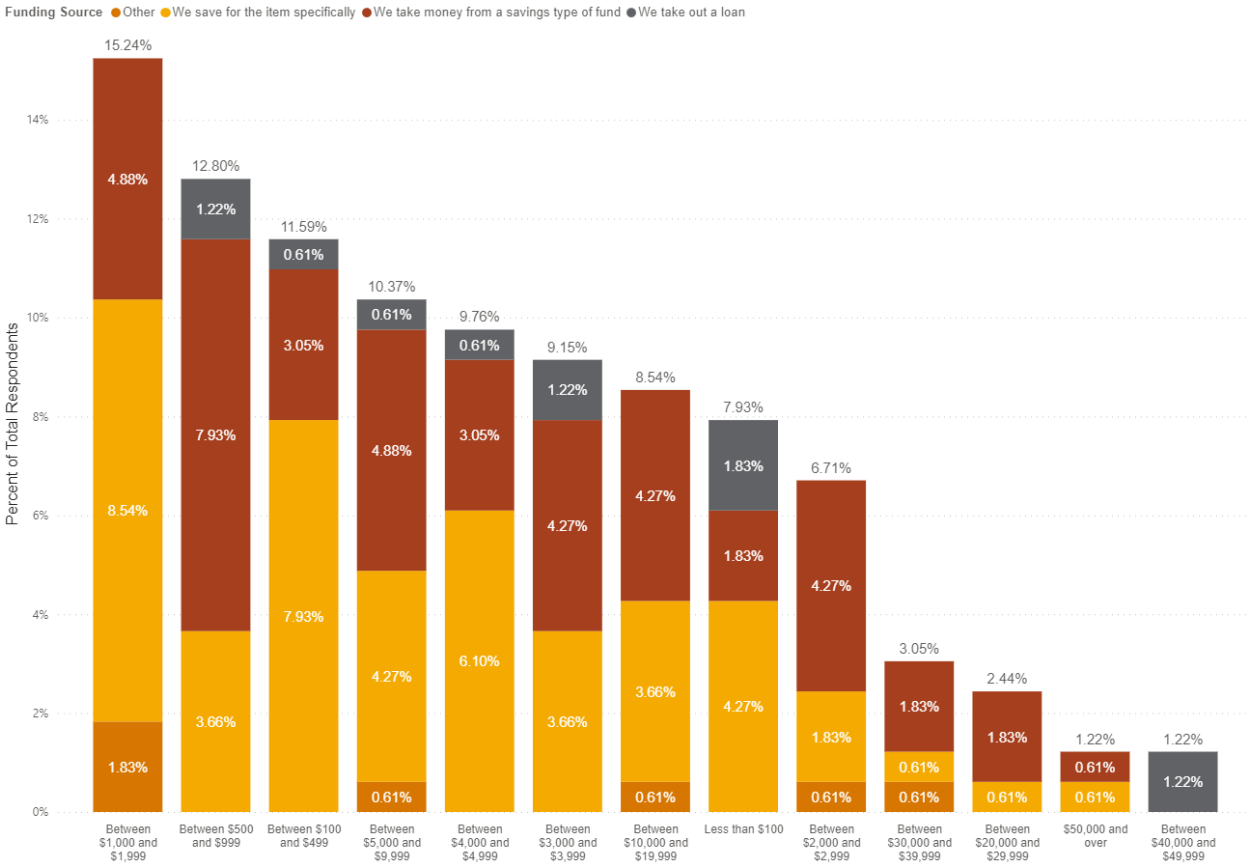

Figure 30. Total funds spent by respondents on energy efficiency related home modifications in the last five years (2020) – West South Central Census Division (n = 200)

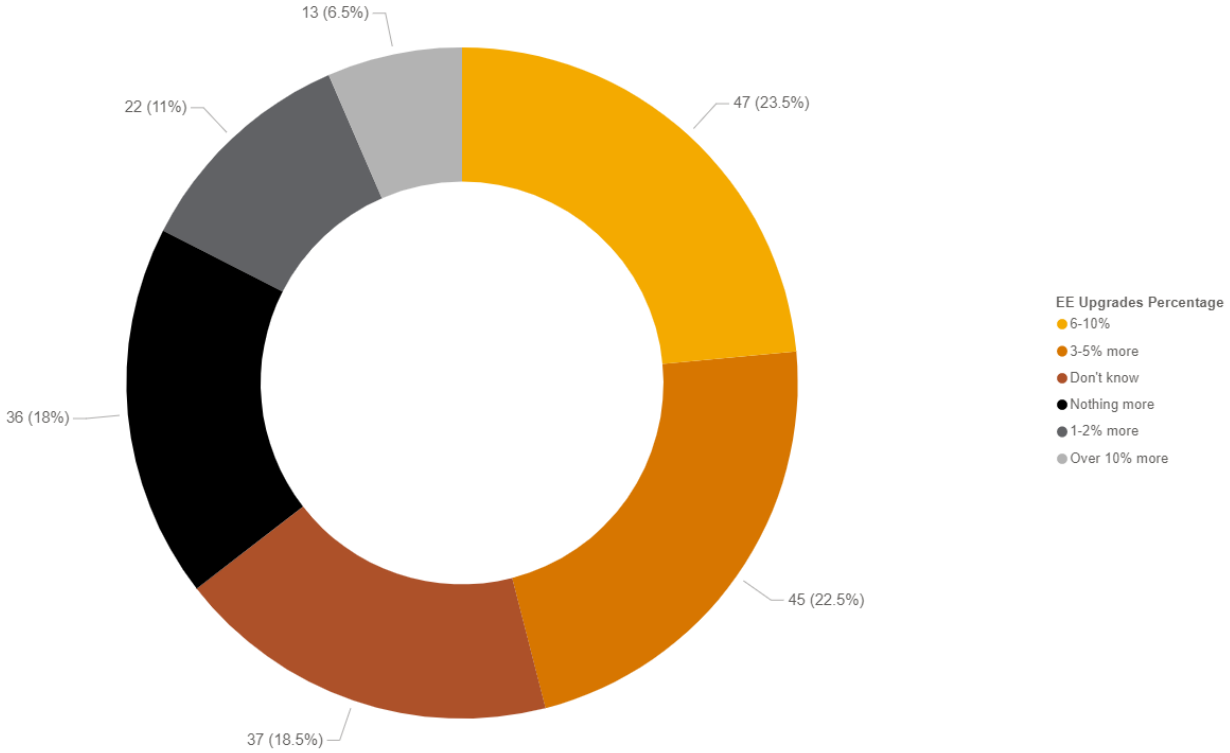

Figure 31. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – West South Central Census Division (n = 200)

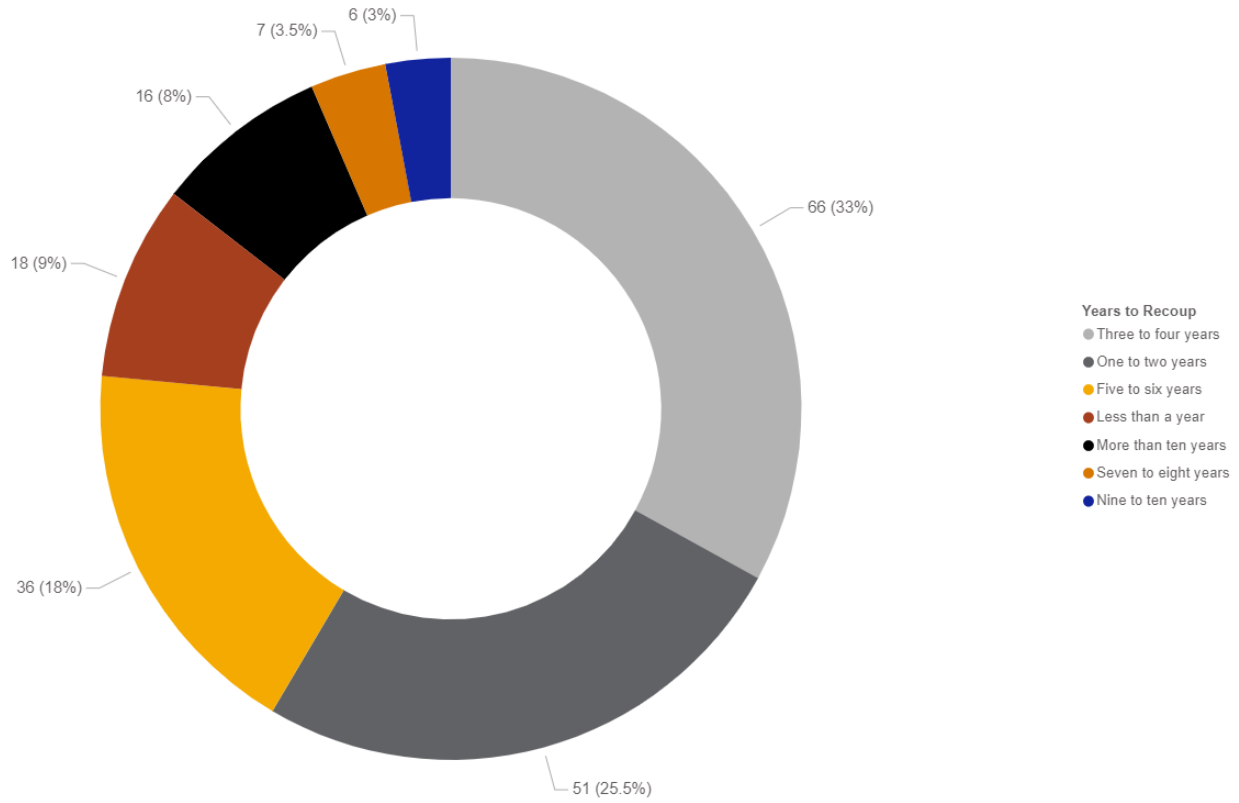

Figure 32. Desired window to recoup the cost of an energy efficient home retrofit – West South Central Census Division (n = 200)

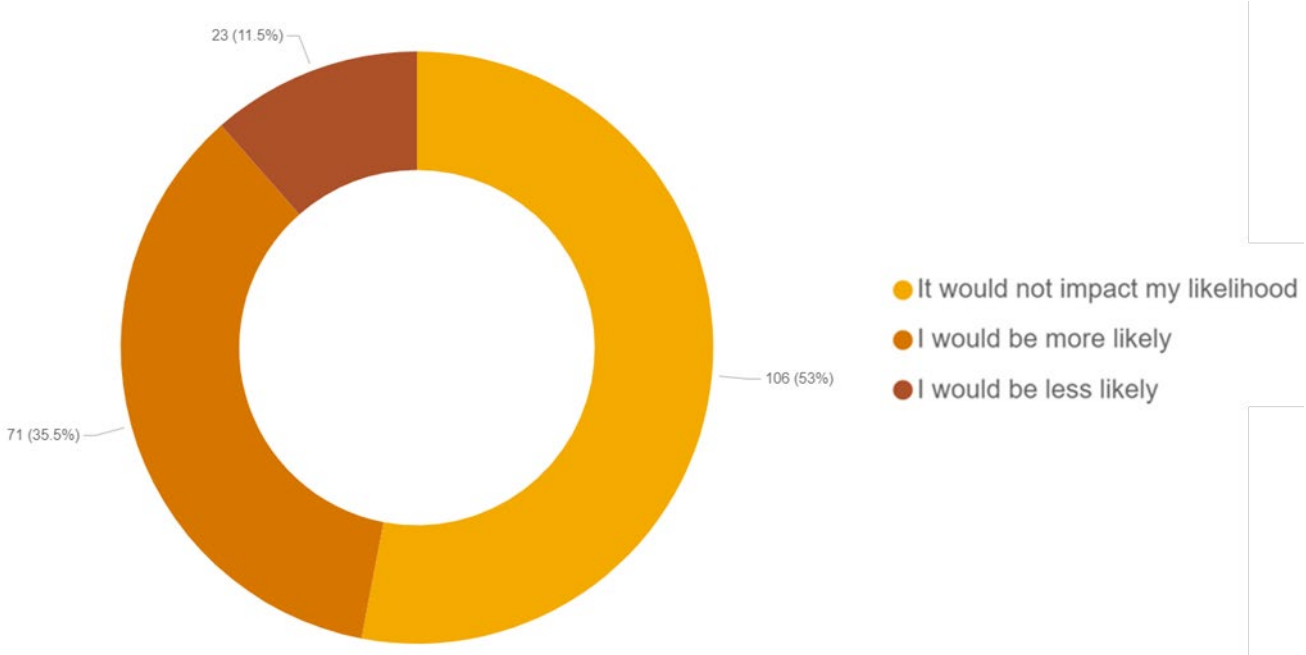

Figure 33. Influence of financing on choosing to make an energy efficiency-related home upgrade – West South Central Census Division (n = 200)

9.0 Regional Analysis: Mountain Census Division (n = 161)

Mountain division respondents share the same top two changes with the national sample – installing LED bulbs (51.5%) and changing habits at home to save energy (48.5%) (Table 34). Beyond these two changes, Mountain respondents indicated they replaced both air conditioning systems (26.7%) and windows (26.7%) with ENERGY STAR© certified products – both at higher rates than the national sample. Similarly, Mountain respondents also, on average, installed smart thermostats (21.7%) and replaced existing heating systems with more efficient models (18.6%) than the overall national sample.

Table 34. Which of these energy-saving actions and home improvements have you completed in the past 5 years? – Mountain Census Division (n = 161)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	51.5%
Changed habits at home to save energy	48.5%
Purchased an ENERGY STAR® certified air conditioning system	26.7%
Installed high efficiency/ENERGY STAR® certified windows	26.7%
Added caulking or weather stripping around windows and doors	25.5%
Unplug small appliances and power strips when not in use	24.2%
Installed extra attic insulation	23.6%
Purchased a smart thermostat	21.7%
Purchased a high-efficiency furnace, heat pump, or boiler	18.6%
Purchased a tankless water heater or heat pump water heater	10.6%
Added photovoltaic solar to home or property	10.6%
Had a home energy inspection	9.9%
Had a professional come into the home to seal air leaks	9.3%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	1.2%

When asked to indicate their views on energy conservation and the cost of energy savings, Mountain respondents were mixed in their views. A larger than national average percentage agreed that there was no need to conserve energy (16.2% versus 15.7% nationally) and similarly more thought their energy bills were too low to care about energy efficiency (27.4%

versus 20.6% nationally) (Table 35). However, a smaller percentage agreed that individual efforts to save energy made no difference (19.2% agree versus 22.9% nationally). Fewer mountain respondents also believe that the government should do more to increase energy efficiency (61.5% versus 67.5% nationally).

Table 35. Perceptions of why individuals may not adopt more energy-efficient ways of living – Mountain Census Division (n = 161)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	16.2%	73.9%	9.9%
It's easier to pay more for energy than make the effort to save energy	29.8%	45.4%	24.8%
My energy bills are too low for me to care about energy efficiency	27.4%	57.1%	15.5%
Individual efforts won't make much of a difference	19.2%	63.4%	17.4%
The government should do more to increase energy efficiency	61.5%	14.9%	23.6%

Mountain respondents track with the national sample in terms of the top four upgrades they believe will most impact energy efficiency (Table 36). Similarly, Mountain respondents also believe that personal behavior change, renewable energy installation, and energy-efficient window installation are the hardest changes for homeowners to make to save energy (Table 37).

Table 36. Respondent beliefs about the most impactful upgrade on home energy efficiency – Mountain Census Division (n = 161)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing an older, inefficient HVAC with a more efficient model	26.7%
Replacing older, inefficient windows with more efficient ones	24.8%
Adding or replacing attic insulation	14.3%
Replacing all bulbs with LEDs	10.6%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	8.7%
Replacing an old thermostat with a "smart" thermostat	5.0%
Replacing an older, inefficient water heater with a more efficient model	5.0%
Replacing the siding or exterior cladding	4.3%
Adding an automated lighting control system	0.6%

Table 37. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – Mountain Census Division (n = 161)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	29.2%
Install solar panels or wind turbines	21.1%
Install energy-efficient windows	13.0%
Install extra insulation	11.2%
Install a higher efficiency heating or cooling system	8.7%
Get a professional home energy audit	6.8%
Switch to LED light bulbs	5.0%
Don't know	2.5%
Purchase an ENERGY STAR® appliance	1.9%
Install a programmable thermostat	0.6%

9.1 Mountain – Financial Dimensions

Compared to the national sample, mountain respondents have spent significantly more on home energy efficiency-related upgrades than other regions over the past five years (Figure 34). 16.9% of all Mountain respondents indicated they spent between $10,000 and $19,999 in the past five years, compared to only 11.1% nationally. In total, 27.2% of respondents spent at least $10,000 over the past five years on energy efficiency renovations, compared to 17.1% nationally.

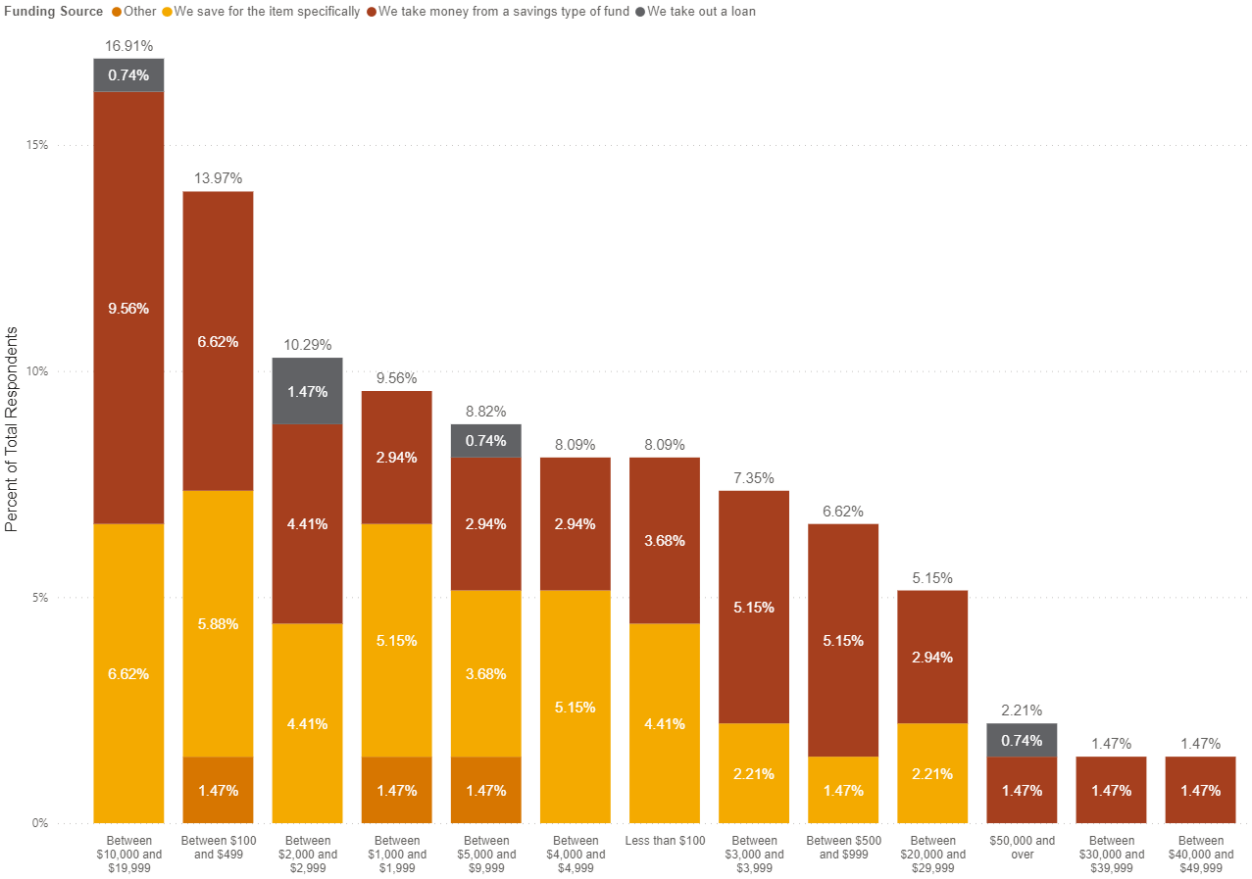

Figure 34. Total funds spent by respondents on energy efficiency-related home modifications in the last five years (2020) – Mountain Census Division (n = 161)

Despite these trends towards spending more on energy efficiency upgrades, Mountain respondents indicated they were less willing to spend more on an energy-efficient alternative to home improvements than the national sample (Figure 35). Though Mountain respondents indicated a willingness to pay 3-5% more frequently than the national sample (28% versus 25.7%), only 16.8% (compared to 20.4%) would pay 6-10% more for such a home improvement (Figure 36). However, Mountain respondents indicated a willingness to wait longer to recoup costs, with only 22.4% willing to wait two years or less (versus 33.4% nationally). Financing was not a strong motivator to undertake an energy efficiency improvement – 67.7% indicated that access to financing would not impact their decision to take on a home improvement (versus 58.2% nationally) (Figure 37).

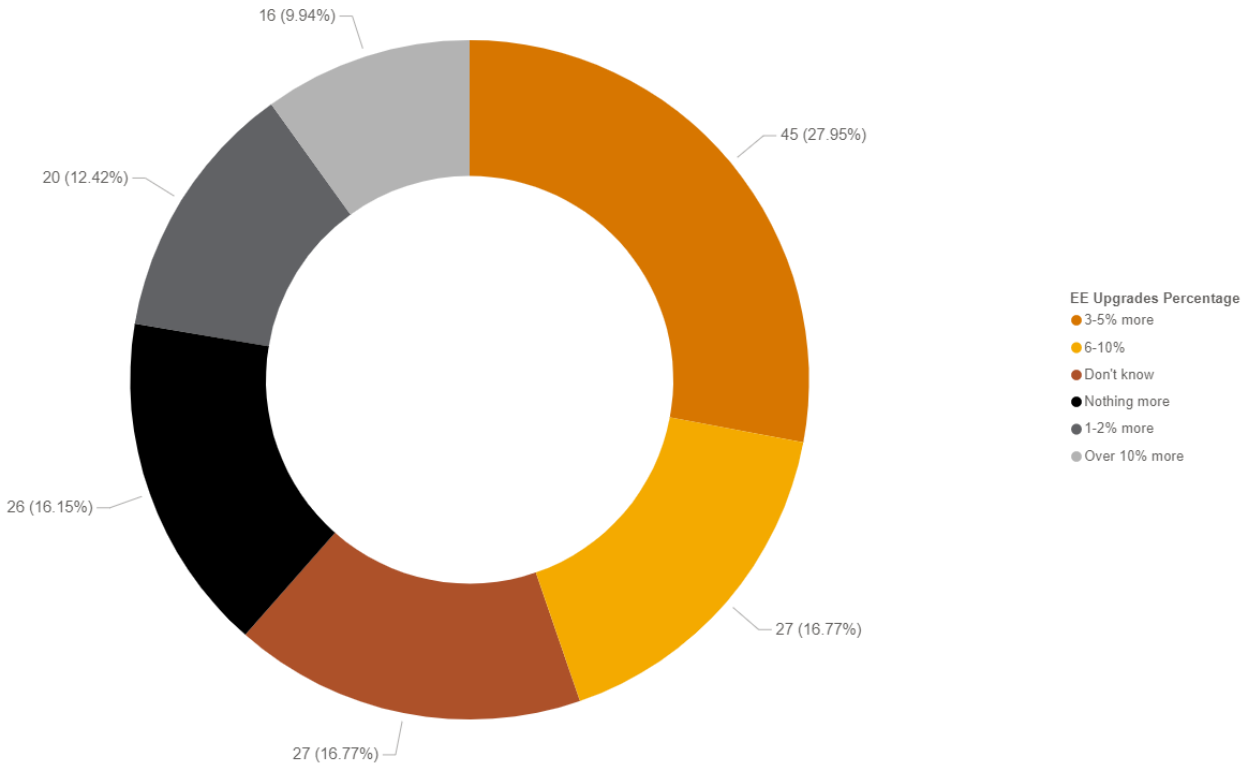

Figure 35. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – Mountain Census Division (n = 161)

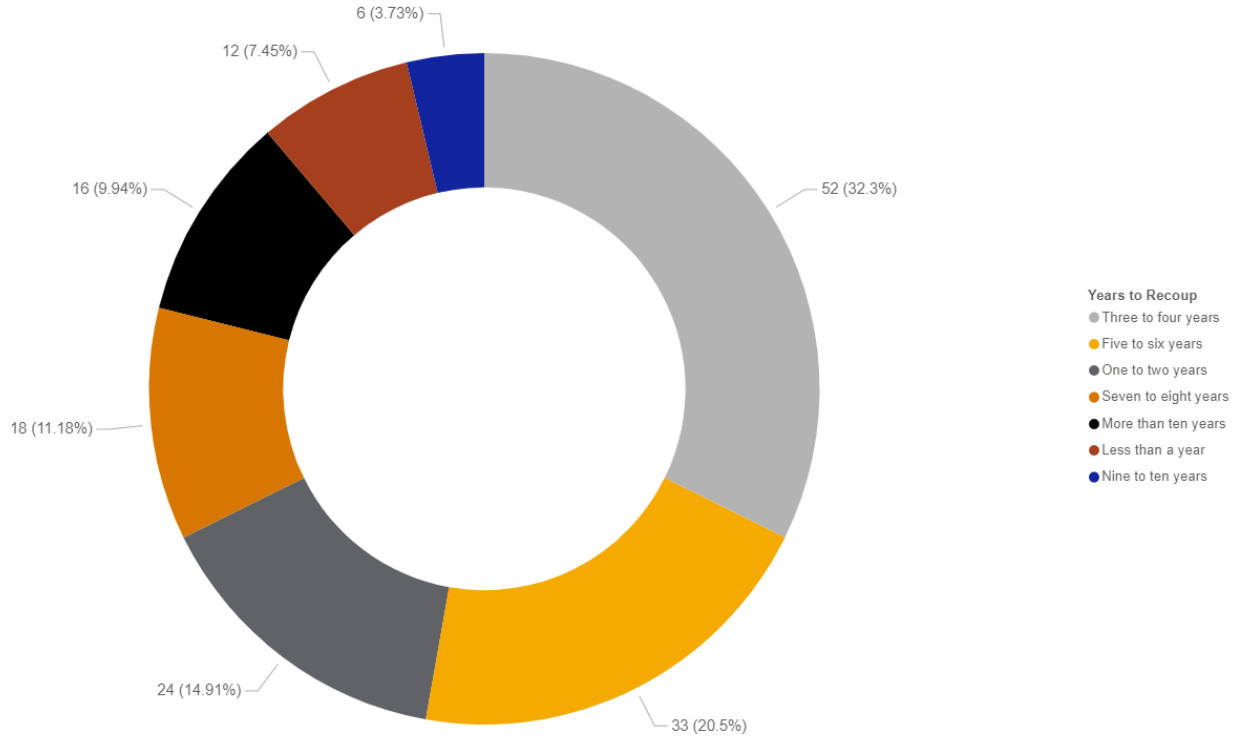

Figure 36. Desired window to recoup the cost of an energy efficient home retrofit – Mountain Census Division (n = 161)

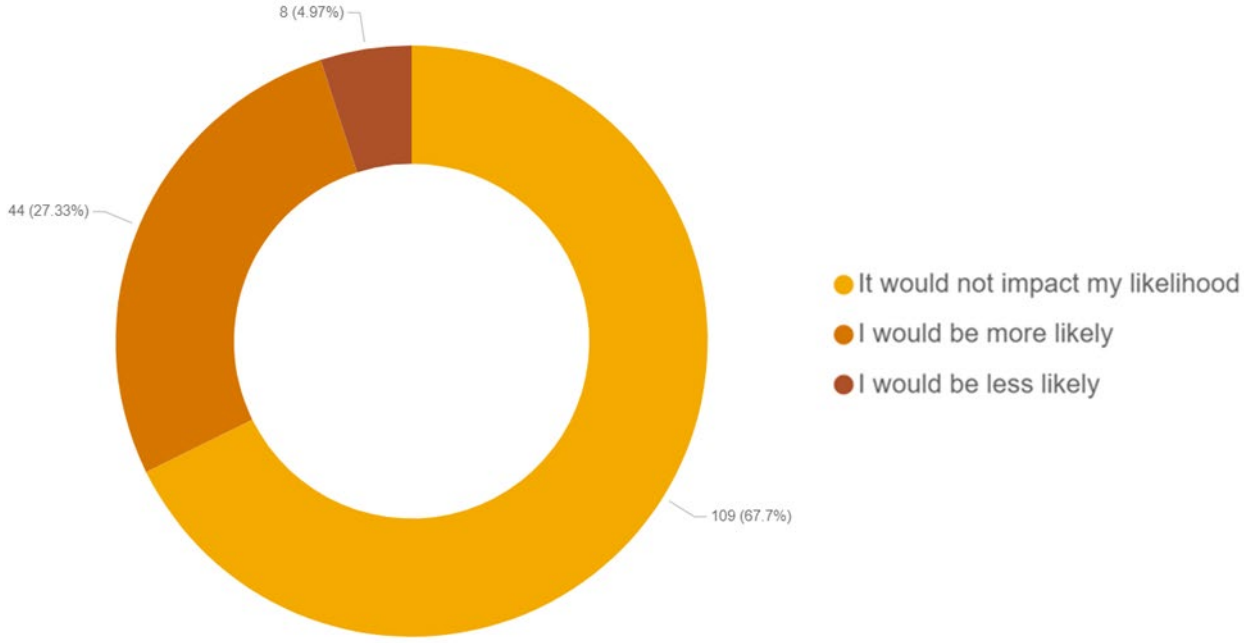

Figure 37. Influence of financing on choosing to make an energy efficiency-related home upgrade – Mountain Census Division (n = 161)

10.0 Regional Analysis: Pacific Census Division (n = 272)

Pacific region respondents indicated changing out lighting for LEDs at higher percentages than the national sample; however, perhaps the largest difference in this region is adopting high-efficiency furnaces, heat pumps, or boilers at nearly twice the rate of the national sample (Table 38). Compared to the nation, 21.3% of Pacific respondents (versus 11.1% nationally) had adopted high-efficiency home heating technologies. Similarly, more Pacific respondents had adopted some form of renewable energy (9.6%) than the overall national trends.

Table 38.
Which of these energy-saving actions and home improvements have you completed in the past 5 years? – Pacific Census Division (n = 272)

Upgrade/Service/Change	Yes, I have done this
Replaced 90-100% of incandescent lighting with LED bulbs	54.0%
Changed habits at home to save energy	47.1%
Unplug small appliances and power strips when not in use	36.8%
Added caulking or weather stripping around windows and doors	26.5%
Purchased an ENERGY STAR® certified air conditioning system	21.7%
Purchased a high-efficiency furnace, heat pump, or boiler	21.3%
Installed extra attic insulation	20.2%
Installed high efficiency/ENERGY STAR® certified windows	18.8%
Purchased a smart thermostat	17.7%
Purchased a tankless water heater or heat pump water heater	13.2%
Had a home energy inspection	9.9%
Added photovoltaic solar to home or property	9.6%
Had a professional come into the home to seal air leaks	7.0%
Added another form of renewable energy (e.g., geothermal, wind, etc.) to home or property.	5.5%

Pacific respondents were more likely than the national sample to indicate that energy-saving and conservation were unimportant at the household level (Table 39). 19.1% (versus 15.7% nationally) agree they see no need to conserve energy; in addition, 23.4% agree their energy bills are too low to care about energy efficiency. Rather than personal action, Pacific

respondents indicated a strong preference for government action on energy efficiency, with 72.1% agreeing the government should do more in this arena.

Table 39. Perceptions of why individuals may not adopt more energy-efficient ways of living – Pacific Census Division (n = 272)

Statement	Agree	Disagree	Neither Agree nor Disagree
No need to conserve energy	19.1%	69.1%	11.8%
It's easier to pay more for energy than make the effort to save energy	32.4%	47.8%	19.8%
My energy bills are too low for me to care about energy efficiency	23.4%	59.6%	21.0%
Individual efforts won't make much of a difference	23.2%	59.5%	17.3%
The government should do more to increase energy efficiency	72.1%	8.1%	19.8%

Pacific respondents demonstrated less consensus on what would impact home energy efficiency the most when compared to the national sample (Table 40). Windows came out as the most common choice for what upgrade would have the greatest impact on home energy efficiency – though it is worth noting that only 20.2% (versus 21% nationally) agreed on this point. Instead, a larger percentage of respondents than in the national sample indicated appliance replacement (11.8% versus 9.1% nationally) and water heater upgrades (10.3% versus 7.0% nationally) would have the greatest impact. Despite the lack of consensus on technologies, when it came to the hardest change for homeowners to make to save energy 37.1% (versus 34.4% nationally) agreed human behavior was the most difficult step (Table 41).

Table 40. Respondent beliefs about the most impactful upgrade on home energy efficiency – Pacific Census Division (n = 272)

Most Impactful Home Improvement	Percentage of Total Respondents
Replacing older, inefficient windows with more efficient ones	20.2%
Replacing an older, inefficient HVAC with a more efficient model	18.0%
Replacing all bulbs with LEDs	15.4%
Adding or replacing attic insulation	12.1%
Replacing older appliances (refrigerator, dishwasher, washer/dryer) with new, more efficient ones	11.8%
Replacing an older, inefficient water heater with a more efficient model	10.3%
Replacing an old thermostat with a “smart” thermostat	5.5%
Replacing the siding or exterior cladding	3.7%
Adding an automated lighting control system	2.9%

Table 41. Respondent beliefs about the hardest upgrades for homeowners to make to save energy – Pacific Census Division (n = 272)

Hardest change for homeowners to save energy	Percentage of Total Respondents
Change habits at home to save energy	37.1%
Install solar panels or wind turbines	18.0%
Install energy-efficient windows	10.3%
Install extra insulation	9.2%
Get a professional home energy audit	8.1%
Don't know	6.6%
Install a higher efficiency heating or cooling system	5.1%
Install a higher efficiency hot water heater	1.8%
Purchase an ENERGY STAR® appliance	1.8%
Switch to LED light bulbs	1.1%
Install a programmable thermostat	0.7%

10.1 Pacific – Financial Dimensions

Respondents in the Pacific region spent similar amounts on energy efficiency-related upgrades in the last five years as the national sample (Figure 38). A total of 26.6% spent between $1,000 and $3,000 over the past five years (versus 21.3% nationally), but only 27.9% spent less than $1,000 over the same window (versus 31.9% nationally). Pacific respondents were less sure than the national sample on how much more they would spend for an energy-efficient version of the desired home upgrade, with 21.3% indicating they did not have a range in mind (Figure 39). Time to payback tracked alongside the national sample, with a slightly larger percentage of respondents willing to only wait three to four years (29.41% versus 28.9% nationally) (Figure

40). Impact of financing access on willingness to make a home upgrade tracked with the national sample (Figure 41).

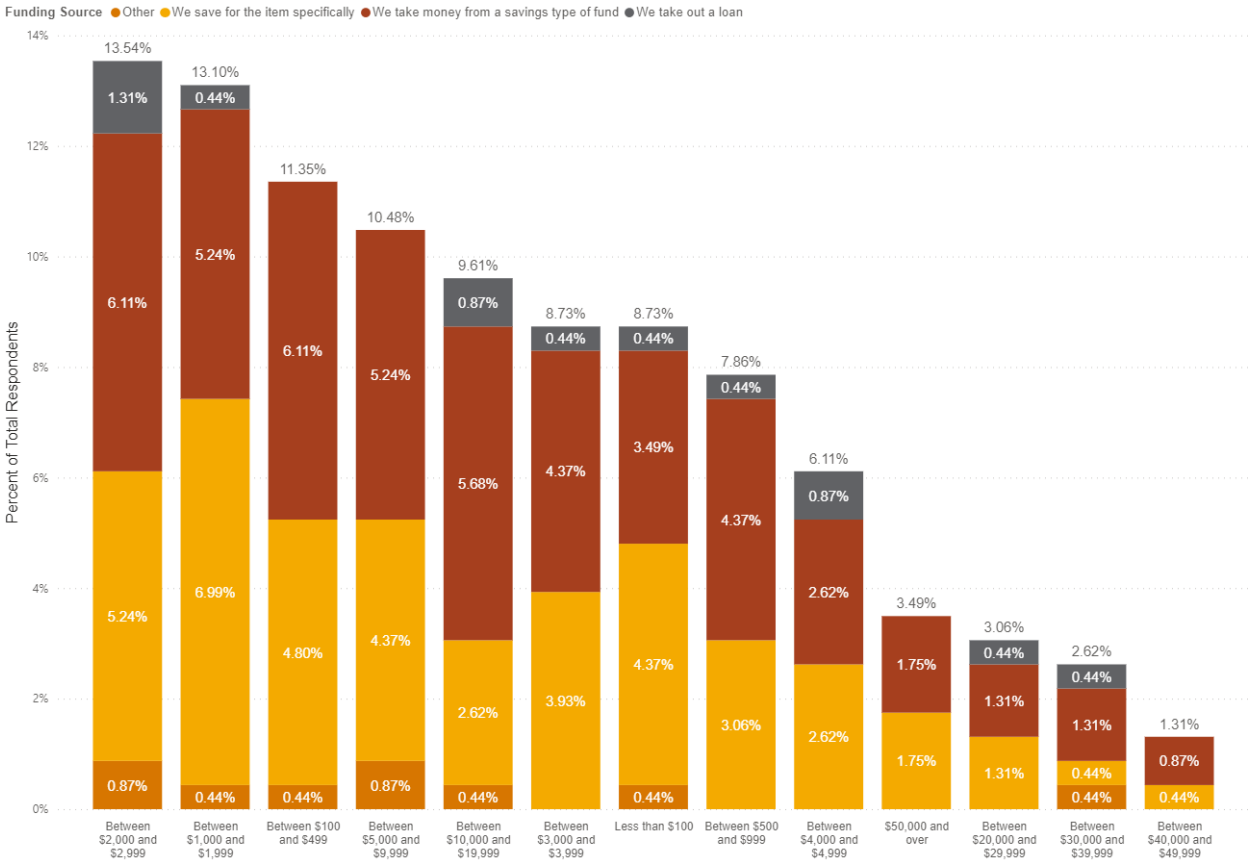

Figure 38. Total funds spent by respondents on energy efficiency related home modifications in the last five years (2020) – Pacific Census Division (n = 272)

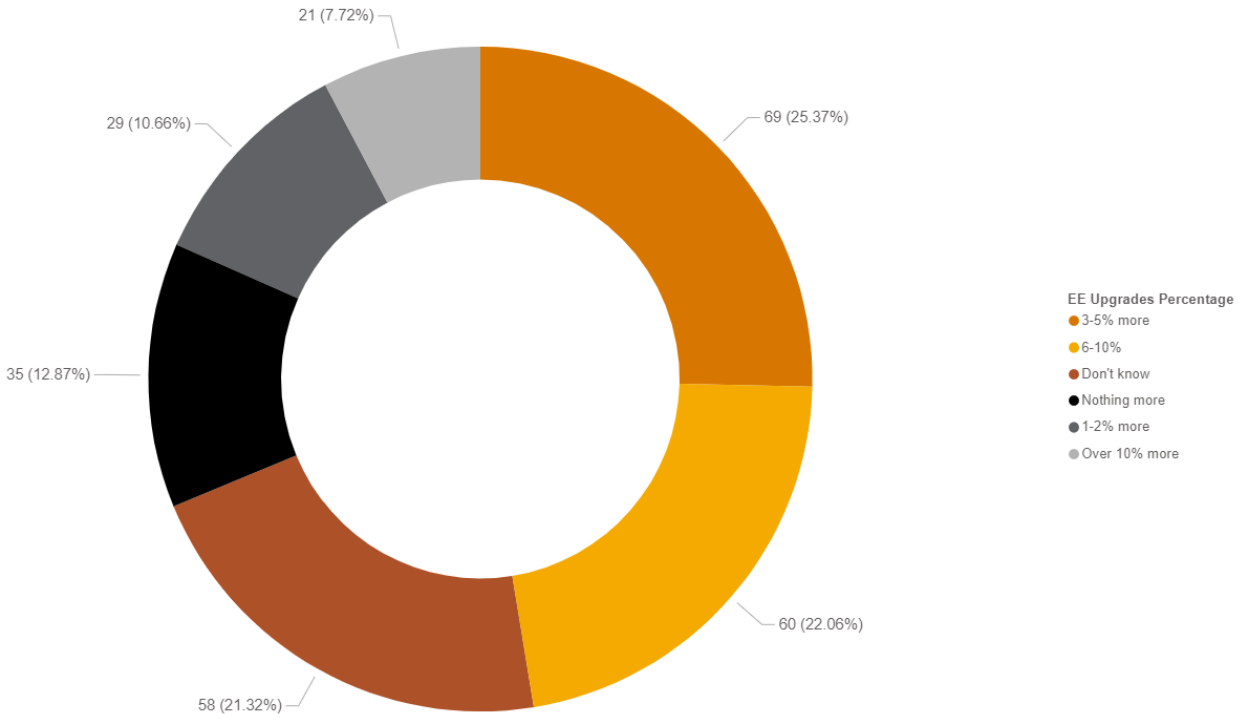

Figure 39. Percentage respondents are willing to pay more for an energy efficient upgrade/retrofit to their homes – Pacific Census Division (n = 272)

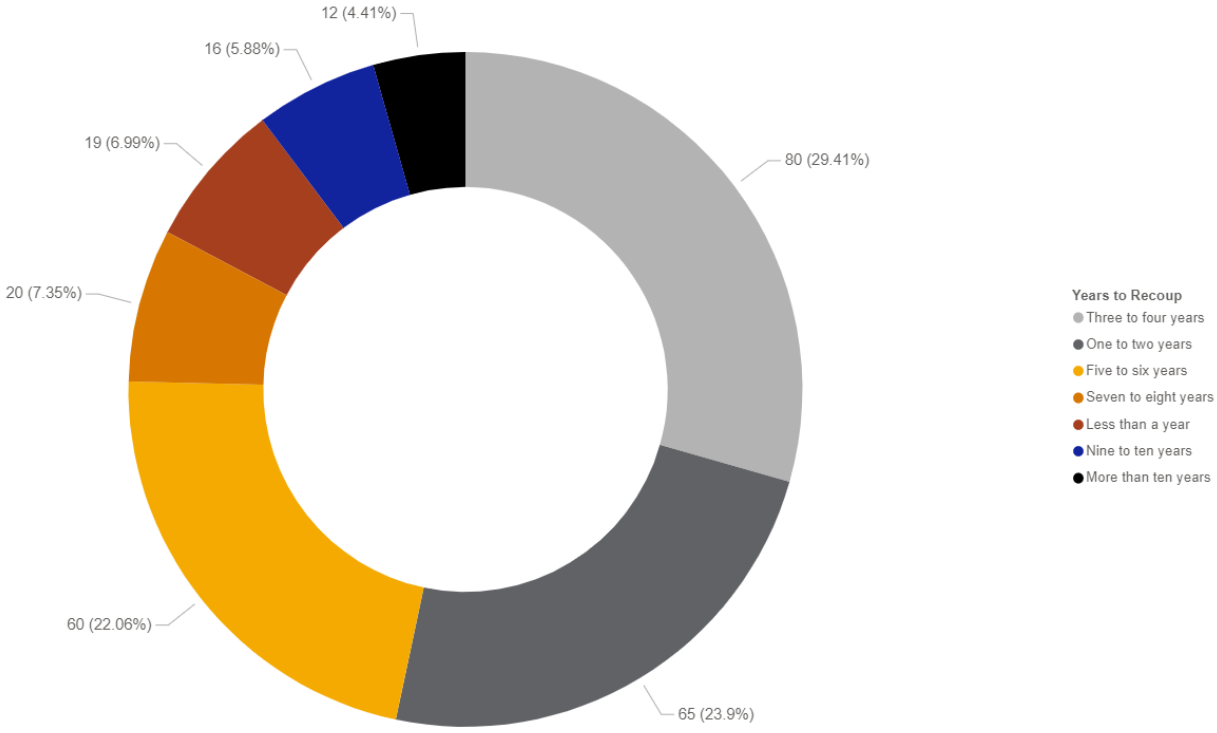

Figure 40. Desired window to recoup the cost of an energy efficient home retrofit – Pacific Census Division (n = 272)

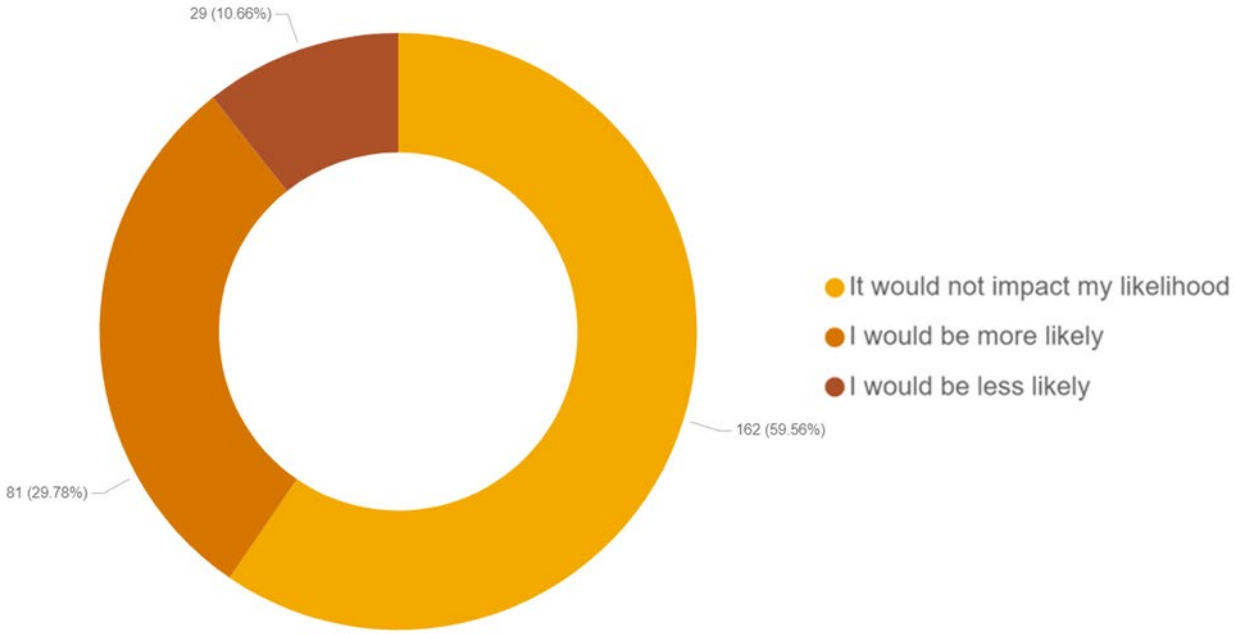

Figure 41. Influence of financing on choosing to make an energy efficiency-related home upgrade – Pacific Census Division (n =272)

11.0 References

U.S. Census Bureau. “Statistical Groupings of States and Counties,” in *Geographic Areas Reference Manual*, 6-1 – 6-25, U.S. Department of Commerce: Washington, DC, 1994.

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