

2016 Ohio Homeowner Energy Survey

Community and Energy Series Technical Report 16-02



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

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Acknowledgments

A team of Ohio State University faculty and staff from the Ohio State University's College of Food Agricultural and Environmental Sciences and the College of Engineering conducted the 2016 "Ohio Residential Energy Survey" project. The OSU Office of Outreach and Engagement Impact Grant program funded this research. The program provides funds to support diverse interdisciplinary university teams working together with public/private sector partners in mutually beneficial exchanges of knowledge to create impact leading to sustainable, lasting change.

We greatly appreciate the time and efforts of the project stakeholders advisory group in reviewing and providing feedback to the survey project objectives, methods, and instruments. The project stakeholders advisory group consists of New Albany High Schools, New Albany-Plain Local School District, U.S. Green Building Council of Central Ohio, Efficiency Smart – American Municipal Power, Buckeye Power, The Ohio Energy Office, and Habitat for Humanity MidOhio.

The project team approaches each research opportunity with the intention of leveraging knowledge and resources to identify and fill critical knowledge gaps through applied research that will ultimately enhance educational programs to strengthen lives and communities. To the extent possible, this project was approached from a neutral position to ensure the outcomes are evidence based and not influenced by funding sources and other support.

Study Highlights

This report examines the views and opinions of Ohio residential homeowners utilizing data from the 2016 Ohio Homeowner Energy Survey.

- Over 52 percent of respondents have lived in their current residence for more than 10 years, while only 27 percent indicated they have plans to purchase another home in the future.
- More than 64 percent of respondents have taken steps to reduce their energy bill in the past year, while an additional 29 percent indicated they are very likely to take steps to reduce their energy bill this year.
- Nearly 65 percent of respondents said they would consider investing in energy efficiency projects as long as the target payback period was less than 5 years.
- The “cost of energy efficiency improvements” was the greatest potential barrier that kept respondents from improving the energy efficiency of their home, while “lower energy bills” was listed as the top potential benefit that influenced the upgrade in home energy efficiency.
- More than 62 percent of respondents indicated they already have energy efficient lighting in their home, while 50 percent have programmable thermostats.
- Only 4 percent of respondents have installed a renewable energy system in their home.



Methodology



Study Background and Purpose

Through research, outreach, and education the central goal in this effort was to generate research-based data regarding Ohioan's perceptions, knowledge, attitudes, needs, and barriers related to energy trends, home energy consumption, cost, and adoption of healthy green homes and renewable energy systems. More specifically, survey data collected will serve three distinct purposes:

1. The primary purpose of this study was to generate empirical measures of the current energy use, energy cost, energy efficiency, and the integration of renewable energy generation in Ohio households. In addition, the study assessed the current knowledge, attitudes, and opinions of homeowners on energy trends and challenges.
2. The second objective of the survey was to assess homeowners' interest in becoming more energy efficient and in using renewable energy sources by:
 - Defining the existing energy use and costs in relation to household demographics
 - Quantifying to what extent homeowners have implemented energy related cost saving projects
 - Understanding current challenges that prevent homeowners from implementing energy cost saving measures.
3. The final objective was to assist in the development and delivery of relevant Extension programs aimed at addressing emerging energy trends. Results from this study were shared during energy workshops through the broader efforts of the OSU Outreach and Engagement Grant project titled "Establishing a Green Home Technology Center: An OSU and Community Partnership for Research, Education, and Demonstration of Green Building Technologies to Support Healthy, Energy Efficient, and Sustainable Housing in Ohio."

The Questionnaire

Questionnaire construction began in December 2015. The final research protocol, a 32-item questionnaire and informed consent correspondence was submitted to The Ohio State University Office of Responsible Research Practices in January 2016 for review. It received approval on March 2, 2016.

Table 1: Ohio Homeowner Survey Responses	
Total Qualtrics survey responses	944
Removed due to attention filters	260
Not an Ohio resident	44
Renters (non-homeowners)	57
Declined to participate	64
Completed surveys included in the study	519

Data Collection

A modified version of the Dillman Tailored Design Method guided the internet and email data collection methodology.¹ The target population for this study included Ohio households and the sample frame was purchased from a private vendor, Qualtrics LLC., who was responsible for distributing the survey and managing the data on the Qualtrics server.

The Qualtrics sampling frame for the project included 20,000 homeowners age 18+ living in Ohio. A Qualtrics panel project manager randomly selected respondents for the survey from their sampling frame of Ohio homeowners. Each sample from the panel base was proportioned to the general population and then randomized before the survey was deployed. The Qualtrics project manager sent an email invitation to potential respondents inviting them to participate in the survey, informing them that the survey is for research purposes only, how long the survey was expected to take, and that they may unsubscribe at any time.

Data was collected during summer 2016 using an email survey yielding a total of 944 panel responses for the study. To ensure quality data, Qualtrics verified the respondents' computer's IP address, incorporated attention screeners, and time quotas on the surveys. Based on the average completion time, the Qualtrics project manager screened out any respondents who finished the survey too quickly, or took too long to complete the survey. Respondents that did not answer the attention screener question correctly were also dismissed from the survey and their survey results were not considered. In addition, because the study was focused on Ohio homeowners, participants that were not residents of Ohio and/or not homeowners were removed from the study. Table 1 presents the number of total surveys received and outlines the number of surveys removed from the study due to attention filters, non-Ohio residence, renters, and those refusing to participate.

¹Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method, 4th edition. Hoboken, N.J: Wiley & Sons.

Data Management and Analysis

Tracking and coding of surveys was conducted by the Qualtrics project manager. Personal identifiers were permanently removed from the dataset so respondents cannot be reasonably identified. In addition, all data is reported in aggregate. The panel sample and response data are both housed and managed on Qualtrics systems.

Descriptive statistics were used to provide simple observations and summary about the energy use, cost, attitudes and opinions of Ohio homeowners regarding energy efficiency and renewable energy development. Basic statistical analysis including frequencies, percentages, means, modes, medians, ranges, standard deviations, and variance were utilized to analyze and summarize the data using a combination of Excel and Qualtrics Data Reporting software.

Characteristics of Respondents

The 519 survey respondents in the study were geographically diverse, representing 72 of Ohio's 88 counties (Image 1). Combined, 65 percent of the respondents identified their home as located in a city or suburb, while 35 percent of the respondents owned homes in small towns, countryside, or on farms (Chart 1).

Chart 1: Please describe the kind of place in which you currently live. (N=519)

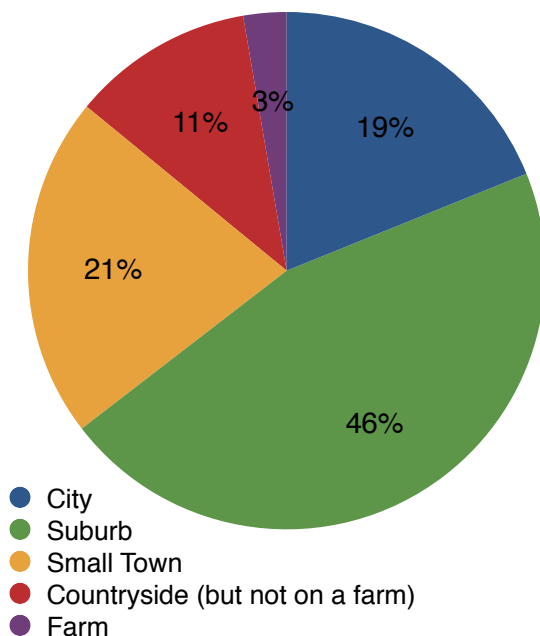
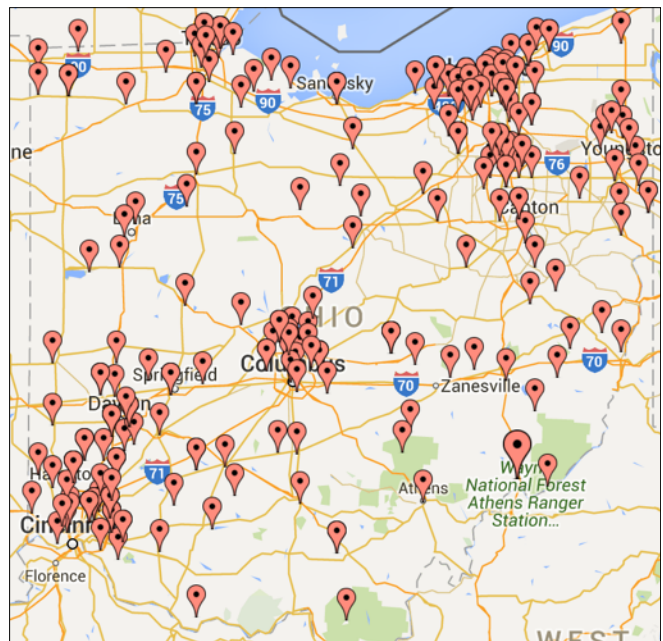


Image 1: Survey Respondents by Zip Code



Results

Housing Characteristics

Most respondents (89 percent) owned a detached home, while 4 percent owned condominiums, 2 percent owned a semidetached home or apartment, and 4 percent had some other arrangement. Combined, 67 percent of the homes had an estimated value of less than \$150,000 (Chart 2).

The average home size was 1,760 square feet, supporting an average of 2.86 occupants. When asked to estimate what year their home was built, 84.6 percent of the respondents indicated their homes were built before

Chart 3: Please estimate which year your home was built? (N=519)

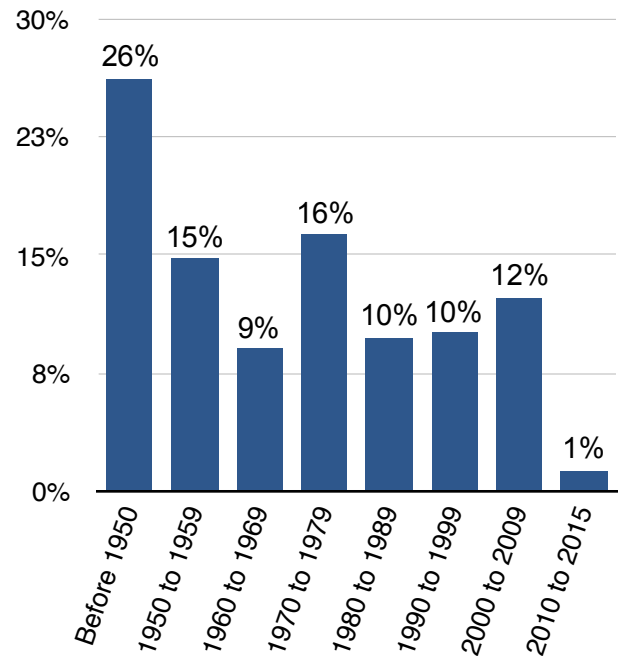


Chart 2: What is the current estimated market value of your home? (N=519)

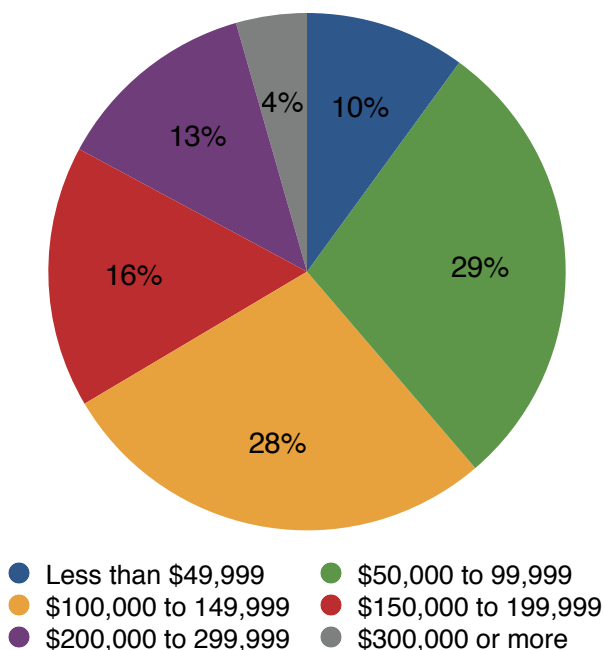


Chart 4: How long have you lived in your current home? (N=519)

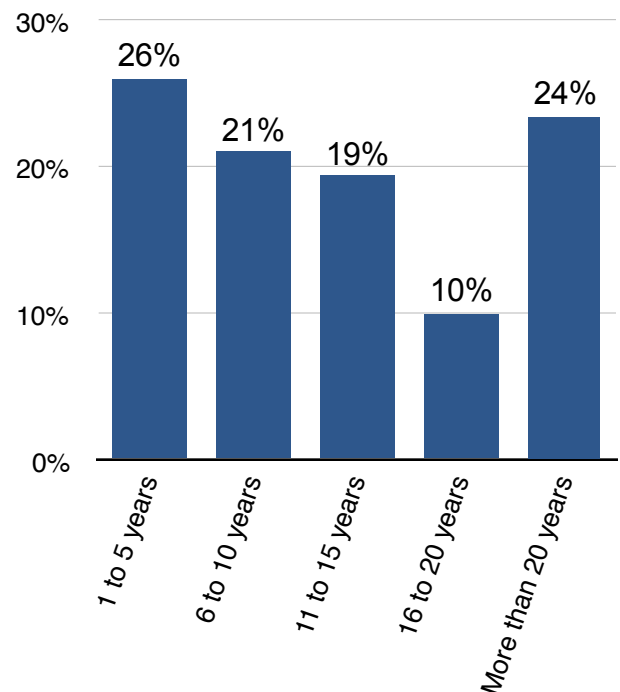
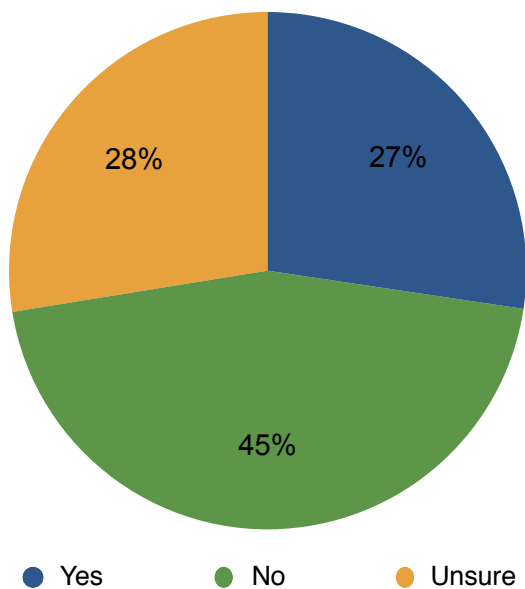


Chart 5: Do you have any plans to purchase another home in the future? (N=519)

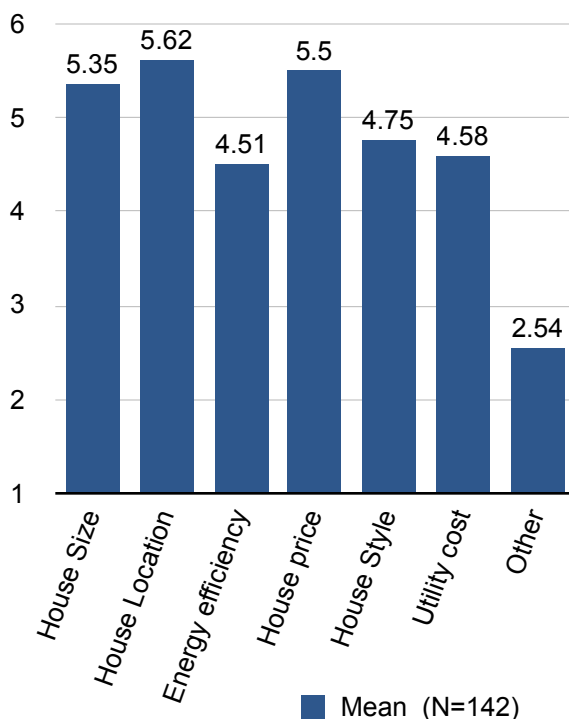


the year 2000 (Chart 3) and roughly a third of the respondents indicated they have lived in their homes for more than 15 years (Chart 4).

When the respondents were asked if they have any plans to purchase another home in the future, only 27 percent indicated “yes”, while an additional 28 percent were “unsure” about their future plans to purchase a new home. Most respondents (45 percent) did not plan on buying another home in the future (Chart 5).

The 142 respondents that indicated they had plans to purchase another house in the future were asked to rank various factors that influence their purchasing decisions. The factor that ranked with the highest influence was location, followed by price. Home energy efficiency and utility cost ranked among the lowest of the options (Chart 6). The most common answers submitted in the “other” category were lot size followed by school district.

Chart 6: Please indicate how much will the below factors influence your purchasing decision? (1=no influence / 6=highest influence)





Energy Efficiency

Respondents were asked to estimate their typical summer and winter utility bill for various energy sources (Table 2). When asked if in the past year they had taken any steps to reduce their energy bill, most respondents (65 percent) indicated “yes” while about one third (32 percent) said “no” they did not take steps to reduce their energy bill. Three percent indicated they were “unsure” (Chart 7).

Furthermore, 29 percent of the respondents indicated they were “very likely” to take steps to reduce their household energy bill this year, while 39 percent indicated they were likely to take steps to reduce their household energy bill within the next 5 years (Chart 8).

Table 2: Please estimate your typical summer and winter energy bills.

	Sample	Average summer bill (August)	Average winter bill (January)
Electric	518	\$140.77	\$150.56
Natural Gas	367	\$60.90	\$101.03
Propane	54	\$129.76	\$248.98
Fuel Oil	39	\$113.77	\$235.85

Chart 7: In the past year, have you taken any steps to reduce your energy bill? (N=519)

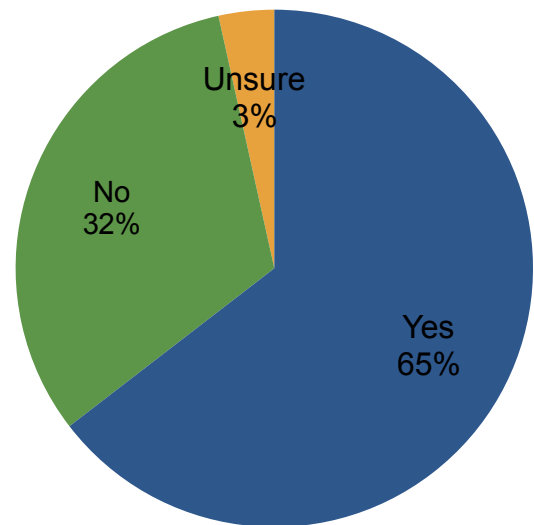
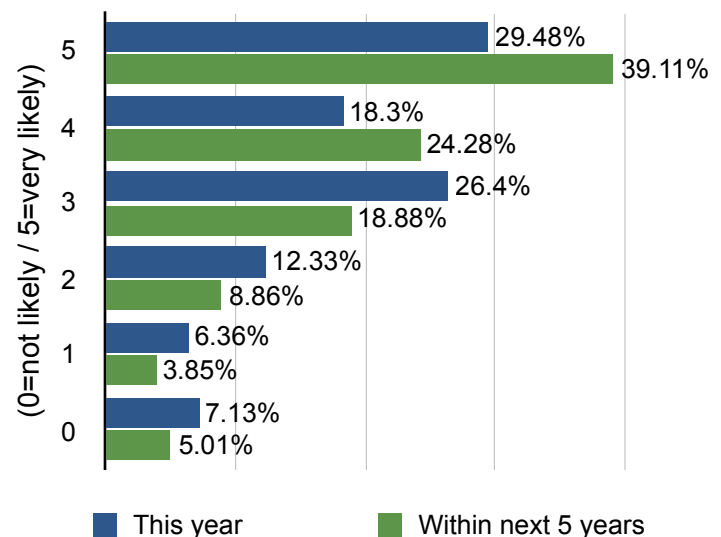
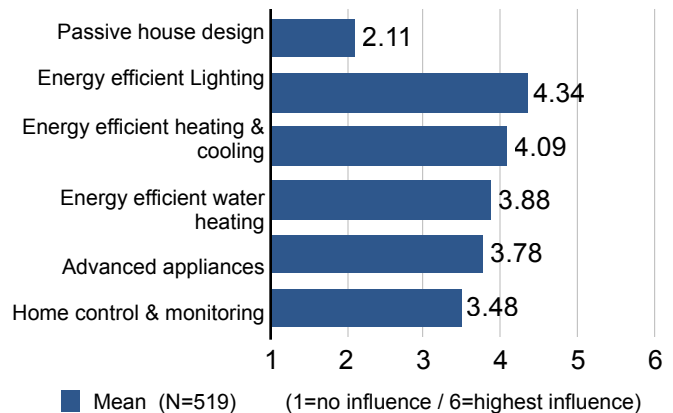


Chart 8: Please indicate how likely you are to take steps to reduce your household's energy bill.



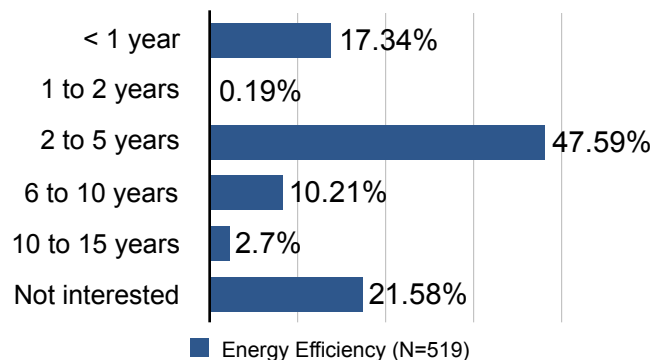
To assess the current level of awareness and understanding of various energy efficiency technologies, respondents were asked to rank their level of knowledge for different energy efficiency technologies. Respondents indicated they were the most knowledgeable about energy efficient lighting, and least knowledgeable about passive house design (Chart 9).

Chart 9: Please indicate your level of knowledge on the energy efficiency technologies listed below.



Respondents were asked how much the potential barriers keep them from upgrading the energy efficiency of their home. The most significant potential barrier they identified was the cost of energy efficiency improvements, followed by other projects with a higher priority (Chart 11). When asked what the target payback period was they would consider investing in an energy efficiency project, 47 percent of respondents selected 2 to 5 years, while 21 percent were not interested regardless of the payback (Chart 10). When asked to consider potential benefits that influence homeowners to upgrade the energy efficiency of their home, respondents were motivated by lower energy bills followed by improving the comfort of their home (Chart 12).

Chart 10: What is the target payback period you will consider investing in an energy efficiency?



Respondents were asked which energy efficient features were already installed in their homes. High efficiency lights were the most common energy efficient feature, with 63 percent of respondents having them installed already. Programmable thermostats were installed in 51 percent of homes. High performance windows, energy efficient heating and cooling systems, and additional insulating materials were present in a little over one third of all homes surveyed. Almost a quarter of respondents had low flow water fixtures in their homes. The least common energy efficient features were: radiant floor heating, tankless water heater, zoned heating and cooling, and automatic lighting controls which were reported by fewer than 10 percent of the respondents. In addition, 8.93 percent of respondents reported having additional features in their homes that were not mentioned in the survey. (Chart 13).

Chart 11: On the scale below, please indicate how much the following potential barriers keep you from upgrading the energy efficiency of your home? (1= this is not a barrier/ 6= this is a very significant barrier)

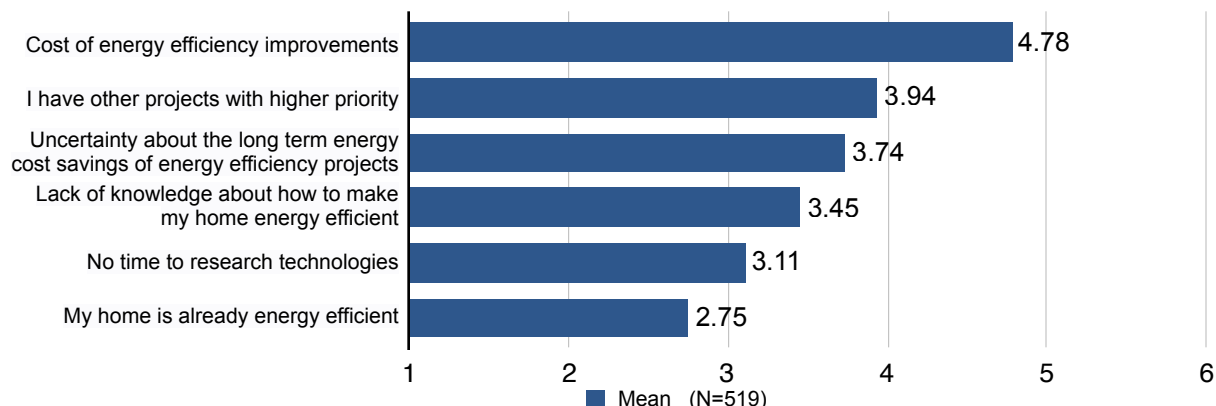


Chart 12: On the scale below, please indicate how much the following potential benefits influence you to upgrade the energy efficiency in your home? (1=no influence / 6=highest influence)

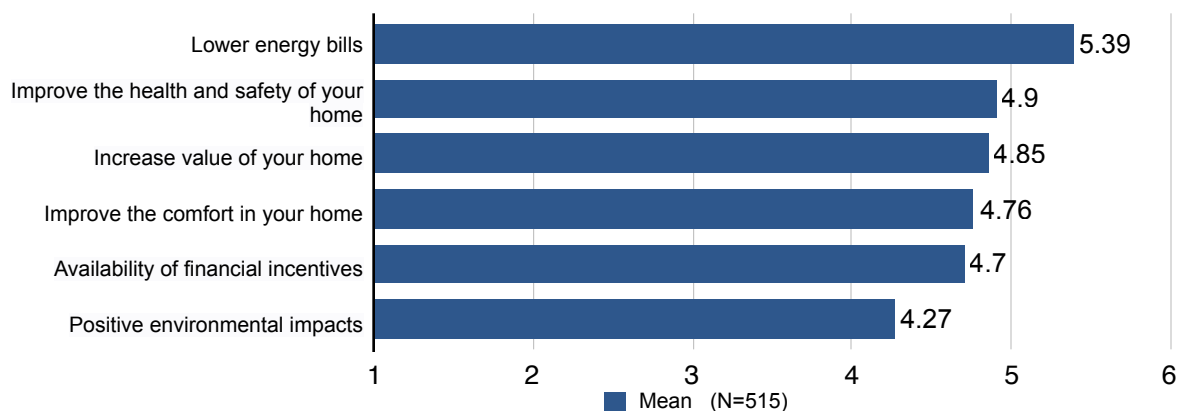
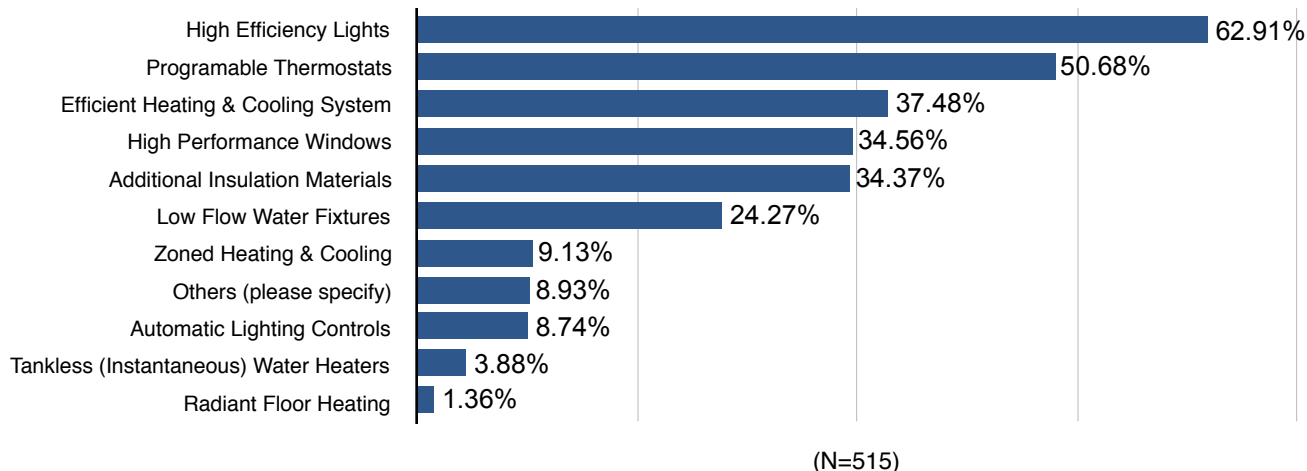


Chart 13: Please select the energy efficiency features installed in your home. Check all that apply.



Renewable Energy

When asked to indicate the level of knowledge about renewable energy systems on a scale from 1 (no knowledge) to 6 (highest level of knowledge), respondents indicated that they had the most knowledge about wind turbines (3.19), followed by geothermal (2.74) and solar hot water (2.54). As illustrated in Chart 14, respondents had the least knowledge of photovoltaic solar (1.93) and biomass boiler systems (1.71).

When asked to assess what payback periods were considered acceptable, 41 percent of respondents indicated that two to five years was acceptable. Eleven percent found less than one year acceptable, and 16 percent of respondents expect a payback period of 6 to 10 years. Fewer than five percent of respondents are willing to wait for 10 to 15 years. Over 26 percent were not interested in installing renewable energy systems (Chart 15).

When asked how much certain barriers influenced their decision to install renewable energy systems, respondents rated their barriers on a scale from 1 (no influence) to 6 (highest influence). As shown in chart 16, the biggest barriers were financial. These include initial cost as the strongest, followed by return on investment, not having reliable information to make an informed decision and uncertainty of future energy costs.

Chart 14: On the scale below, please indicate your level of knowledge on the renewable energy systems listed below. (1=no knowledge / 6=highest knowledge)

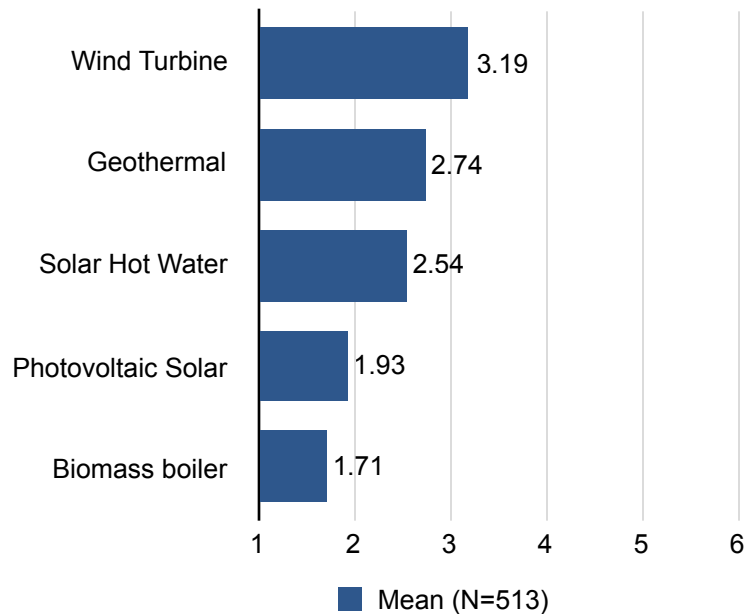


Chart 15: What is the target payback period you will consider investing in a renewable energy system (e.g. solar electric, hot water solar, or wind generator)?

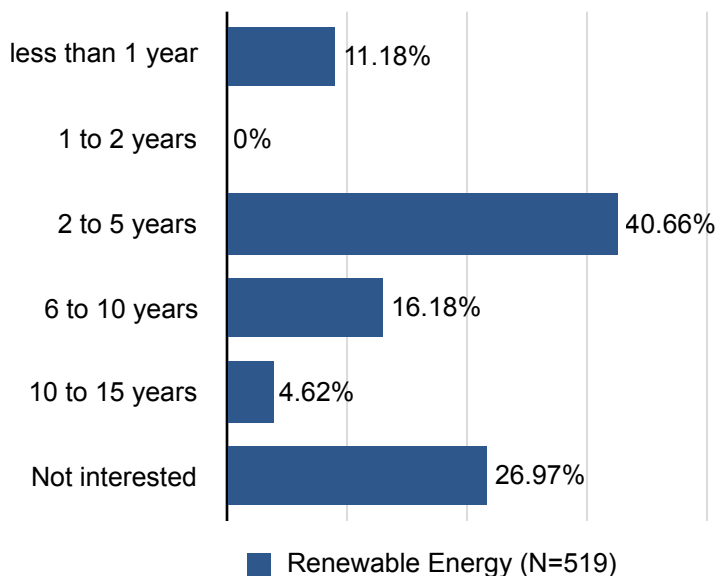
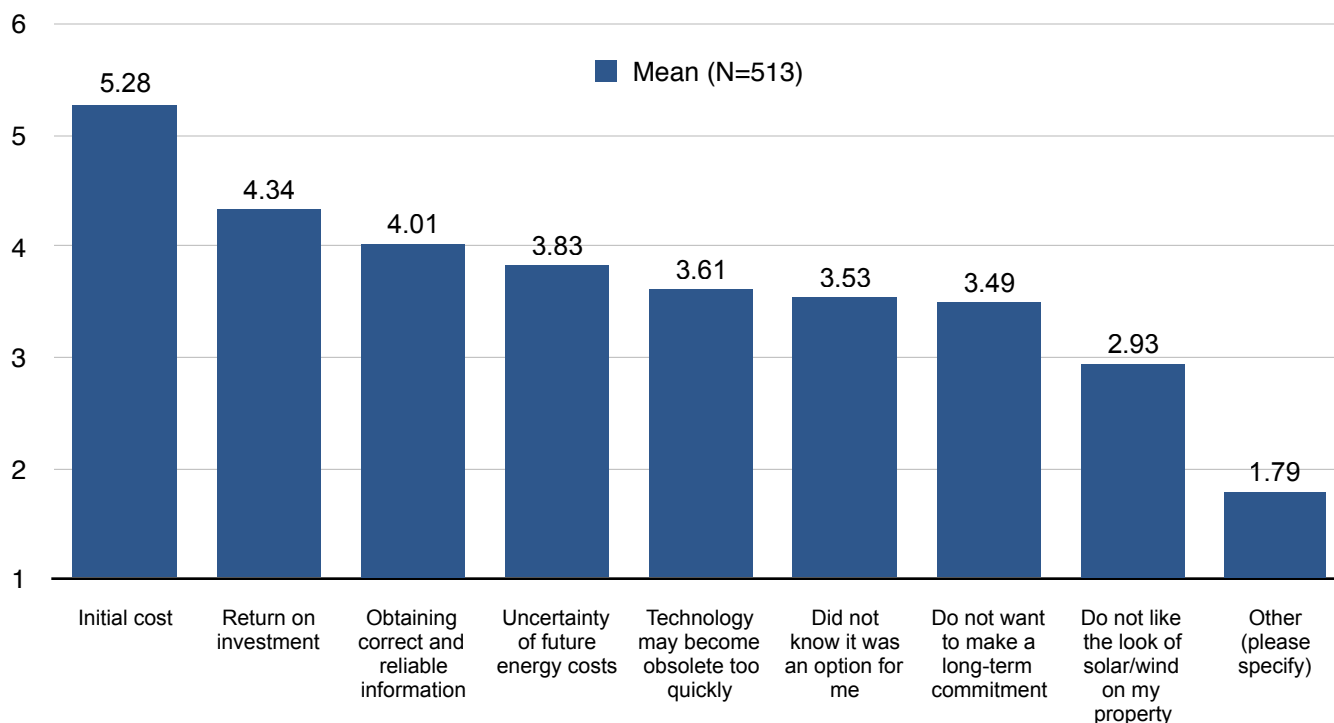


Chart 16: On the scale below, please indicate how much the following potential barriers influence your decision to install a renewable energy system. (1=no influence / 6=highest influence)



Other factors fell into a mid-range, including a concern the technology may become obsolete too quickly, not knowing renewable energy was an option for them, not wanting to make a long-term commitment and not liking the look of solar/wind on their property.

When asked if they had a renewable energy system installed on their home, 95 percent of respondents answered 'no,' while only five percent answered 'yes' (Chart 17).

Of the 25 respondents who answered 'yes,' they had installed a renewable energy system, 28 percent of them had geothermal system while 24 percent had solar thermal (Chart 18).

Chart 17: Have you installed a renewable energy system on your home? (N=513)

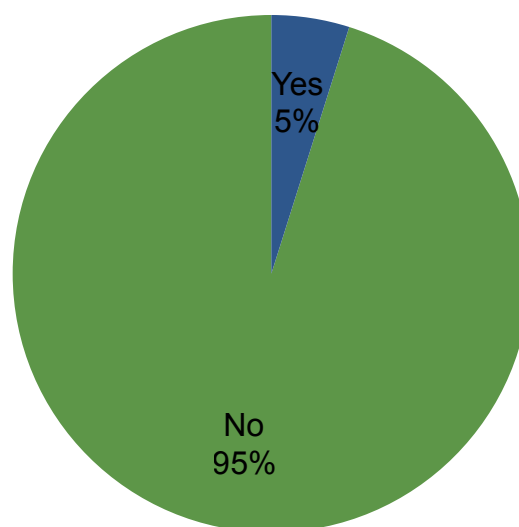
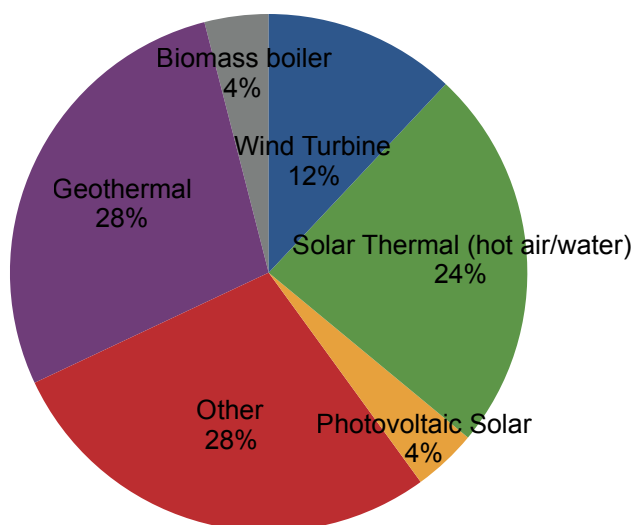


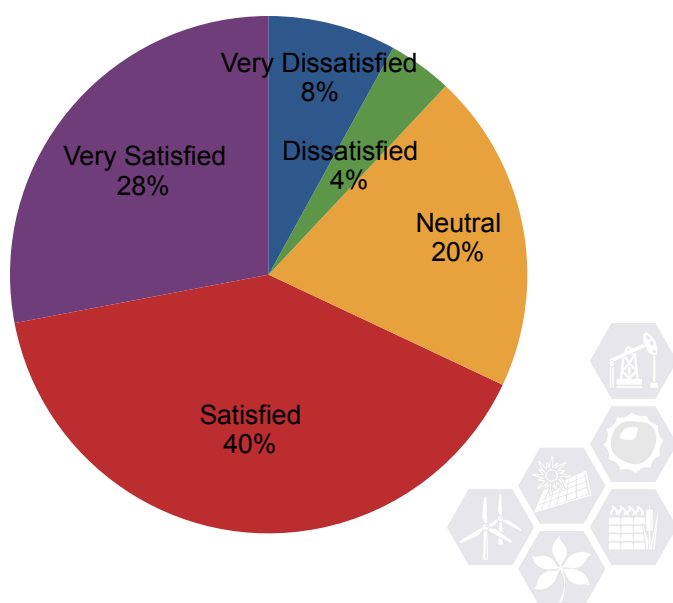
Chart 18: Which renewable energy technology did you install on your home? (N=25)



Of the same respondents who had installed a renewable energy system, 68 percent of them were either “satisfied” (40 percent) or “very satisfied” (28 percent). Twenty percent of respondents were “neutral.” The remaining 12 percent were “dissatisfied” or “very dissatisfied” with their investment decision (Chart 19).

Again, of this same group who had installed a renewable energy system, when asked whether they are saving money on their energy bill as a result of renewable energy installation, 84 percent of the respondents answered “yes” while 16 percent said “no” (Chart 20).

Chart 19: How satisfied are you with the decision to invest in a renewable energy system? (N=25)



When asked whether they are more conscious of their energy use after installing a renewable energy system, 80 percent of them said “yes” while 20 percent said “no” (Chart 22).

The respondents were asked to identify any barriers they encountered when installing a renewable energy system. About two-thirds of respondents (64 percent) said they faced one or more barriers. The barriers include Home Owners’ Association (28 percent), problems with installation (24 percent), availability of solar panels (24 percent), inspections and permitting (4 percent), and other (4 percent). Thirty-six percent answered that they did not encounter any barriers (Chart 22).

Chart 20: Are you saving money on your energy bill as a result of your renewable energy installation?
(N=25)

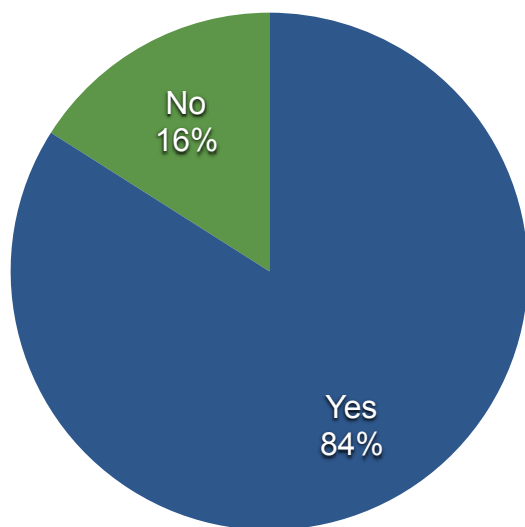


Chart 21: Are you more conscious of your energy use after installing your renewable energy system?
(N=25)

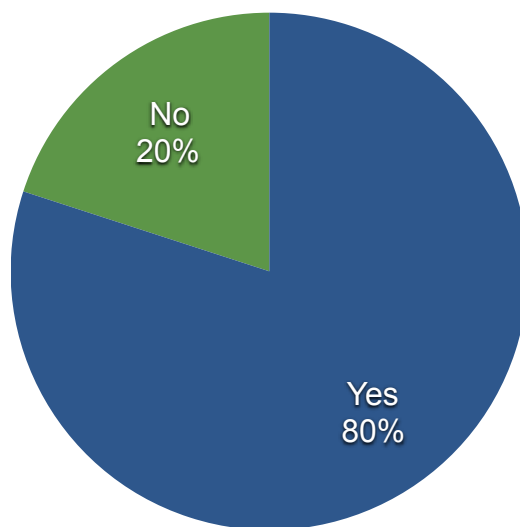
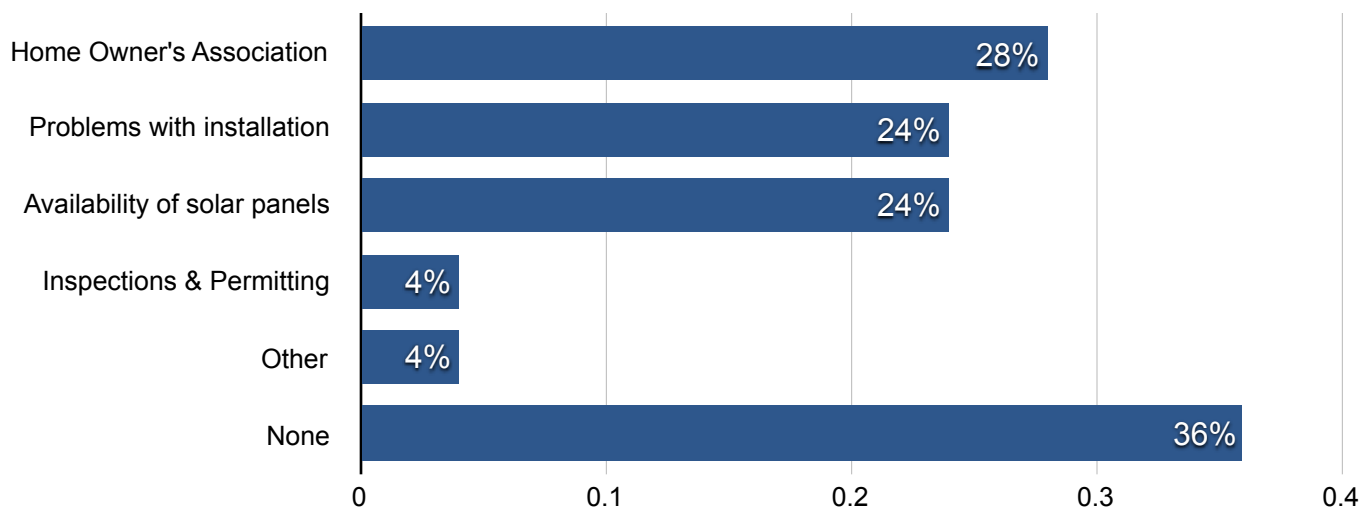


Chart 22: What, if any, were some of the barriers you encountered when installing a renewable energy system? (multiple responses possible) (N=25)



Slightly over half of respondents (58 percent) indicated interested in participating in a community solar project. Thirty percent said “yes”, they would be interested, and twelve percent said “no”, they would not be interested. The question explained that a community solar farm lets participants buy a share of solar electricity without installing their own panels (Chart 23).

Of the 30 percent of respondents who were interested in a community solar farm, slightly less than half (43 percent) said they would be interested in one panel and a similar number (46 percent) said they would be interested in two to five panels. The remainder of respondents were interested in six panels or more.

Most respondents (77 percent) indicated that they were willing to pay less than \$500 for a 250 watt panel from a community solar project. Fourteen percent said they were willing to pay \$500, four percent said they would pay \$750, four percent said they would pay \$1,000, and two percent said they would pay \$1,250 (Chart 24).

The question indicated that depending on current cost of electricity and future escalation rates a 250-watt panel could generate an approximate average annual energy savings of \$38 in for a typical Ohio household, meaning that the majority of respondents were interested in a payback time of less than 13 years.

Chart 23: A community solar farm lets you buy a share of solar electricity without installing solar panels on your roof. Your utility continues delivering your electricity and you simply receive a solar credit on your utility bill. If it were available to you as an option from your utility provider, would you be interested in purchasing a solar panel(s) from a community solar farm to provide electric for your home? (N=511)

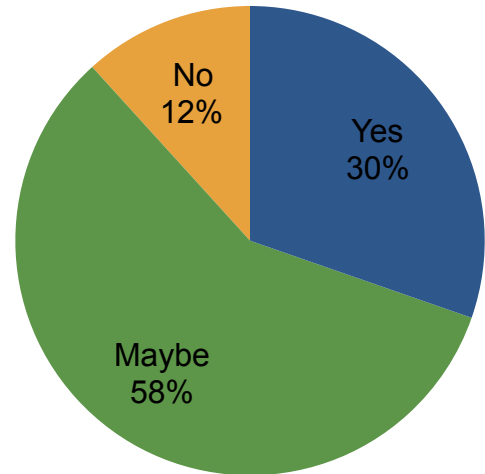
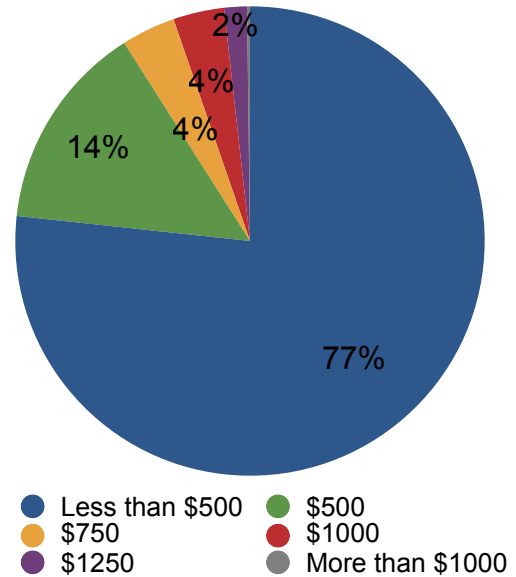


Chart 24: How much would you be willing to pay for a 250 watt panel from a community solar project? (Note: The average per household electricity consumption in Ohio is around 10,812 kWh annually. A standard 250 watt panel in Columbus, OH will generate roughly 308 kWh per year representing roughly \$38 in annual energy savings.) (N=511)



Summary

This report was developed to provide empirical measures of the current home energy use, energy cost, energy efficiency, and the integration of renewable energy generation in Ohio households. The second objective of the survey was to assess homeowners' interest in becoming more energy efficient and in using renewable energy. Results indicated that 65 percent of the respondents had taken steps to reduce their energy bill in the past year, while 29 percent of the respondents were very likely to take steps to reduce their household energy bill in the current year, and 39 percent were likely to take steps to reduce their household energy bill within the next 5 years. Meanwhile, just over 26 percent of respondents were not interested in a renewable energy system, while 40 percent would consider a renewable energy project with a payback of two to five years. Most of the respondents were interested in energy savings projects that provide a payback period in the range of two to five years. In general, the respondents were more knowledgeable of wind, lighting, and geothermal energy efficiency technologies and are still seeking information about PV solar and solar thermal renewable energy technologies. In addition, the respondents are lacking knowledge of passive home design.





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