AMEREN ILLINOIS ENERGY EFFICIENCY MARKET POTENTIAL ASSESSMENT

Report Number 1404

Volume 1: Executive Summary

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EXECUTIVE SUMMARY

Ameren Illinois (AIC) selected EnerNOC to conduct this Energy Efficiency Market Potential Study to assess the various categories of electric and natural gas energy efficiency potential in the residential, commercial, and industrial sectors of the Ameren Illinois service territory. The key objectives of the study were to:

- Satisfy the legislative requirement to provide an electric potential study with the IPA incremental savings filing that is no less than 3 years old (last one completed in 2010). Ameren Illinois chose to include natural gas as well.
- Provide support for the development of an integrated gas and electric Cycle 3 (2014-2017) Plan.
- Conduct comprehensive market research to better represent customers in the AIC service territory.
- Quantify wasted energy due to customer behavior.
- Develop EE potential estimates for 2017-2024 for benchmarking and future analyses.

The study assesses various tiers of energy efficiency potential including technical, economic, achievable, and naturally occurring potential. The study developed updated baseline estimates with the latest information on federal, state, and local codes and standards for improving energy efficiency. The study consisted of three primary components: market research, a full energy efficiency potential analysis, including program design and estimation of supply curves, and quantification of wasted energy due to customer behavior.

As part of the study, the EnerNOC team conducted primary market research to collect data for the Ameren Illinois service territory, including: electric and natural gas end-use data, end-use saturation data, and customer psychographics, demographics, and firmographics. This information enables Ameren Illinois to understand how their customers make decisions related to their energy use and energy efficiency investment decisions.

Ameren Illinois will use the results of this study in its Demand Side Management (DSM) planning process to optimally implement energy efficiency related savings programs.

Report Organization

This report is presented in six volumes as outlined below. This document is **Volume 1: Executive Summary**.

- Volume 1, Executive Summary
- Volume 2, Market Research Report
- Volume 3, Energy Efficiency Potential Analysis
- Volume 4, Program Analysis
- Volume 5, Supply Curves
- Volume 6, EE Potential Analysis Appendices

Definitions

Before launching into the discussion of results, a few key terms are defined:

- **Technical potential** is a theoretical construct that assumes all feasible measures are adopted by customers, regardless of cost or customer preferences.
- **Economic potential** is also a theoretical construct that assumes all ***cost-effective*** measures are adopted by customers, regardless of customer preferences. This is a subset of technical potential.
- **Maximum achievable potential (MAP)** takes into account expected program participation, based on customer preferences resulting from ideal implementation conditions. MAP establishes a maximum target for the EE savings that a utility can hope to achieve through its EE programs and involves incentives that represent a substantial portion of the incremental cost combined with high administrative and marketing costs. It is commonly-accepted in the industry that MAP is considered the hypothetical upper-boundary of achievable savings potential simply because it presumes conditions that are ideal and not typically observed in real-world experience. This is a subset of economic potential.
- **Realistic achievable potential (RAP)** represents what is considered to be realistic estimates of EE potential based on realistic parameters associated with EE program implementation (i.e., limited budgets, customer acceptance barriers, etc.). This is also a subset of economic potential.
- **Baseline projection** is a reference end-use forecast developed specifically for this study. This estimates what would happen in the absence of any DSM programs, and includes naturally occurring energy efficiency and savings from equipment standards and building codes that were active and on the books for future enactment as of January 31, 2013. It is the metric against which savings are measured. The approach used to develop this projection is an end-use forecast approach and it is fundamentally different than the statistically-adjusted end-use approach used by Ameren to develop its official load forecasts. However, as much as possible, the forecast assumptions are the same and the resulting forecasts are close.
- **Net savings** represents the energy efficiency potential savings potential that is after naturally occurring energy efficiency has been taken into consideration. Unless specified, all savings listed in this report represent net savings, as opposed to gross savings.
- **Incremental savings** refers to the amount of potential savings that can be achieved in that one particular year. **Cumulative savings** refers to the sum of the incremental savings. Unless specified, all savings listed in the report are cumulative savings.

Overall Conclusions

This study has enlightened Ameren Illinois about its customer base and the potential for electric and natural gas energy savings that are possible through energy-efficiency (EE) programs. The key highlights are as follows:

- With a thorough review of 699 possible efficiency measures[1], the estimated program potential is somewhat higher than past program achievements.
- In general, however, attaining the maximum achievable program potential in the Cycle 3 plan will not meet the Illinois state savings targets and will cost significantly more than the spending caps, for both electric and natural gas programs.

[1] A list of all the measures and the corresponding costs, savings, and lifetimes can be found in in Volume 6: Appendices.

- The study identifies that a majority of savings are to be had in the commercial and industrial sectors as opposed to the residential sector. This represents a significant change from previous studies and reflects the recent wave of Federal appliance standards

High-level details on savings and costs are provided in the Key Findings sections below.

Key Findings for Electricity

The key findings of the potential analysis are presented first in terms of measure-level results, where program delivery and implementation concerns have not been considered. Subsequently, program-level savings are developed by considering appropriate program delivery mechanisms and measure bundling strategies based on real-world implementation and evaluation experience.

Measure-level Energy Efficiency Potential

Key findings related to measure-level electric potentials are summarized as follows:

- **Realistic achievable potential.** In 2014 realistic achievable savings are 483 GWh which is 1.3% of the baseline projection. By 2016 cumulative realistic achievable savings grow to 1,093 GWh which represents 3.0% of the baseline projection.
- **Maximum achievable potential**. In 2014 savings for this case are 630 GWh or 1.8% of the baseline and by 2016 cumulative savings reach 1,432 GWh or 4.0% of the baseline projection.
- **Economic potential** reflects the savings when all cost-effective measures are taken. The savings for this case in 2014 are 1,149 GWh or 3.2% of the baseline projection and by 2016 the cumulative savings reach 2,650, about 7.4% of the baseline.
- **Technical potential**, which reflects the adoption of all energy efficiency measures regardless of cost-effectiveness, is a theoretical upper bound on savings. Savings in 2014 for the technical case are 1,584 GWh or 4.4% of the baseline and by 2016 these savings reach a cumulative number of 3,516 GWh or about 9.8% of the baseline.

Table 1 and Figure 1 summarize the electric energy-efficiency savings for the different levels of potential relative to the baseline projection.

Table 1 Summary of Cumulative, Net, Measure-Level Electric Energy Efficiency Potential

	2014	2015	2016
Baseline Projection (GWh)	35,865	35,810	35,999
Cumulative Savings (GWh)			
Realistic Achievable Potential	483	803	1,093
Maximum Achievable Potential	630	1,051	1,432
Economic Potential	1,149	1,958	2,650
Technical Potential	1,584	2,604	3,516
Energy Savings (% of Baseline)			
Realistic Achievable Potential	1.3%	2.2%	3.0%
Maximum Achievable Potential	1.8%	2.9%	4.0%
Economic Potential	3.2%	5.5%	7.4%
Technical Potential	4.4%	7.3%	9.8%

Figure 1 Summary of Cumulative, Net, Measure-Level Electric Energy Savings

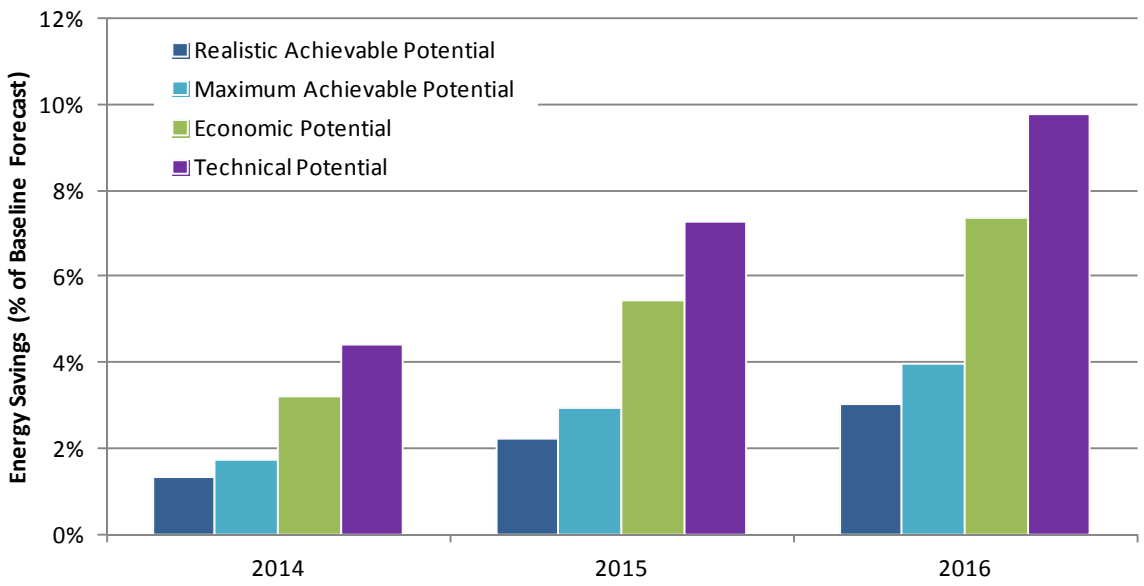
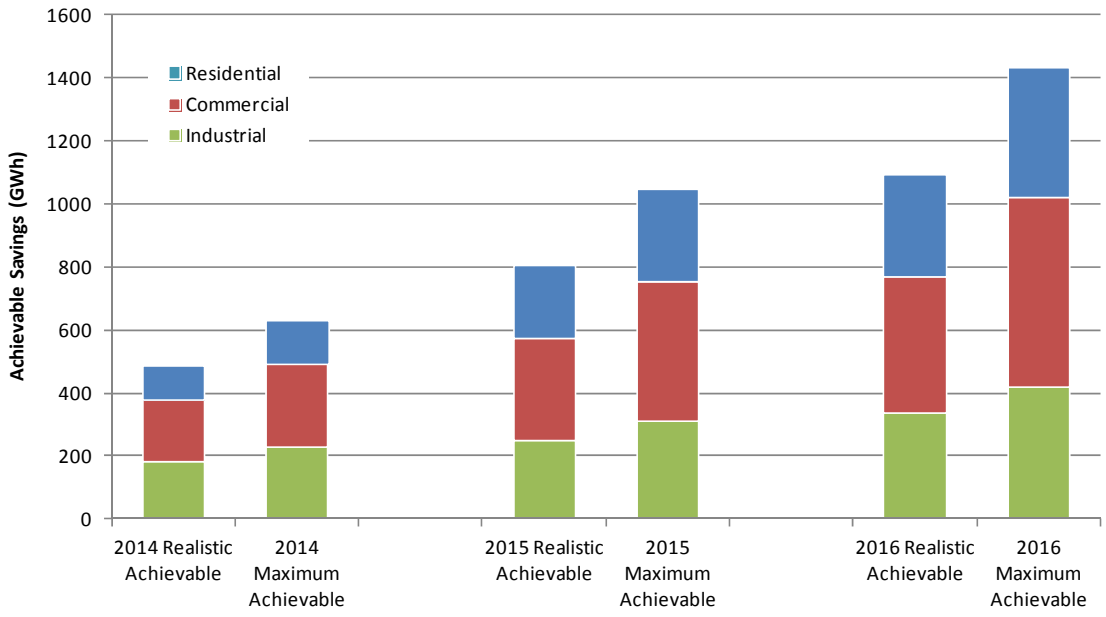


Figure 2 summarizes the range of electric achievable potential by sector. The commercial sector accounts for the largest portion of the savings, followed by residential and industrial.

Figure 2 Cumulative, Net, Measure-Level Potential by Sector (GWh)



Program-level Potential

The program-level results here consider program delivery strategies, real-world limitations, and the associated administrative costs and economics. (Please note that measure-level savings are provided above in cumulative terms, but are translated here to incremental or annual terms to align better with the language and expectations of program implementation and annual targets.)

In order to more accurately assign realistic program costs, measure-level results were synthesized to group measures into programs that can realistically be delivered to Ameren Illinois customers. The key steps and differences between the measure-level analysis and program-level analysis are:

- Installation Smoothing: Measure installations from the program-level analysis were "smoothed" to account for even implementation across three program years.
  - For example, the measure-level analysis estimates the installation of 1,000 units in 2014, 800 units in 2015, and 600 units in 2016 of Measure X. In order to provide consistency for implementers and align with the ramp rate of legislative targets, the program-level analysis would estimate 800 installations of Measure X in 2014, 2015, and 2016.
- Measure Removal/Reduction: Specific measures or measure types were from the program-level analysis due to either the realistic potential installations being too high to implement over the three program years or the measures cannot be delivered through traditional Ameren Illinois programs. There were two main segments where electric measure were removed/reduced:
  - Residential Consumer Electronics: Past program experience and evaluation has shown the consumer electronics market is extremely difficult to reach and has had limited participation in past programs.
  - Business Energy Management Systems: The measure-level model predicts installations of Energy Management Systems for most commercial and industrial buildings in the Ameren Illinois service territory. The levels of installations were reduced to more realistic implementation levels and to control program costs (Energy Management Systems have very high costs with relatively low energy savings).

Key findings related to program-level electric potentials are summarized as follows:

- **Program Low achievable potential.** In 2014 program low achievable savings are 341 GWh which is 0.9% of the baseline projection at a cost of $86.1 million. By 2016 cumulative realistic achievable savings grow to 992 GWh which represents 2.8% of the baseline projection at a cumulative cost of $263.9 million.
- **Program High achievable potential**. In 2014 savings for this case are 449 GWh or 1.3% of the baseline at a cost of $177.7 million. By 2016 cumulative savings reach 1,308 GWh or 3.6% of the baseline projection at a cumulative cost of $542.8.

Table 2summarizes the electric energy-efficiency program savings for the different levels of potential relative to the baseline projection.

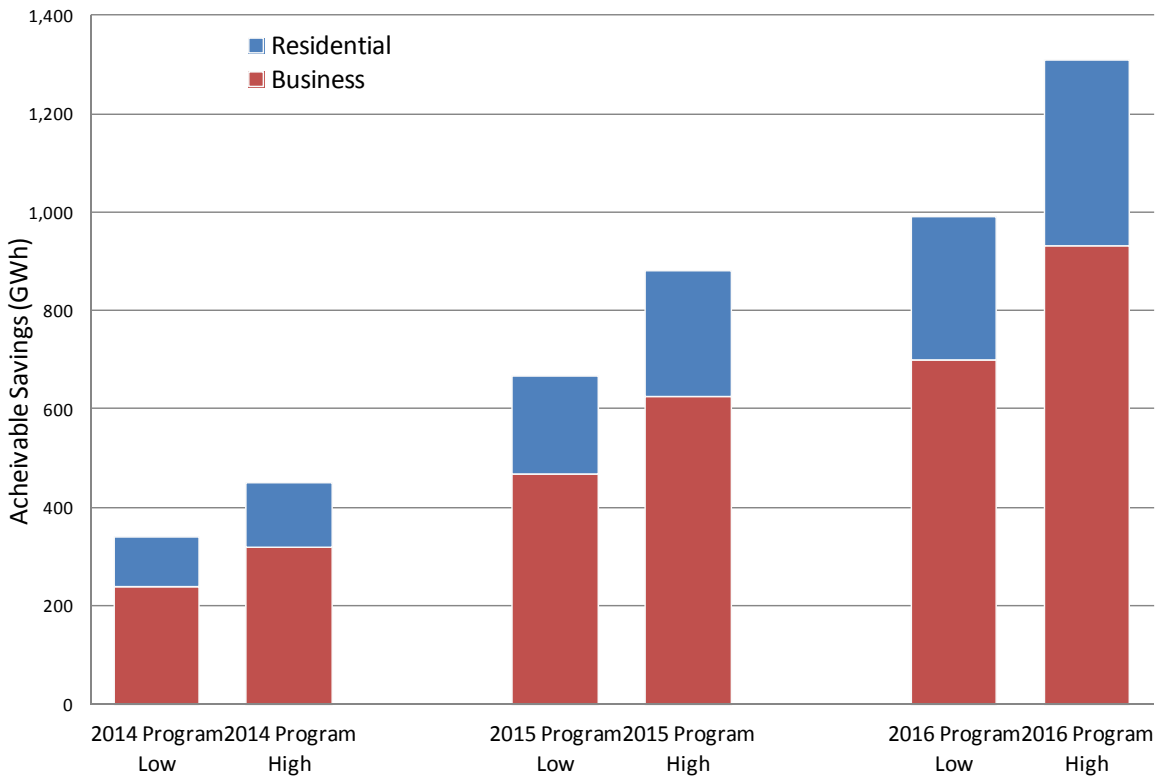
Table 2 Summary of Cumulative, Net, Program-Level Electric Energy Efficiency Potential

	2014	2015	2016
Baseline Projection (GWh)	35,861	35,792	35,973
Annual Savings (GWh)			
Program Low Potential	341	667	992
Program High Potential	449	880	1,308
Energy Savings (% of Baseline)			
Program Low Potential	0.9%	1.9%	2.8%
Program High Potential	1.3%	2.5%	3.6%
Energy Costs (Million $)			
Program Low Potential	$86.1	$171.2	$263.9
Program High Potential	$177.7	$353.0	$542.8

Figure 3 summarizes the range of electric program-level achievable potential by sector. Sectors were adjusted to Residential and Business (which includes both Commercial and Industrial) to

align with Ameren Illinois program sectors. The business sector accounts for the largest portion of the savings, followed by residential.

Figure 3 Cumulative, Net, Program-Level Potential by Sector (GWh)



Supply Curves

The program analysis provided guidelines for creating various portfolio scenarios by interpolating between Program RAP and Program MAP, optimizing to consider a number of other scenarios relevant to planning considerations. These include attainment of the Illinois state goals, spending exactly at the rate caps, and 0.5% increments of spending until the estimated limit of MAP is reached.

Figure 4 shows the resulting Net Incremental MWh savings per year for the various portfolios, along with a line indicating the level of load reduction necessary to meet the Illinois state targets in any year. Figure 5 shows the total program costs to achieve these electricity savings.

Figure 4 Summary of Achievable Electricity Savings (Net, Incremental MWh)

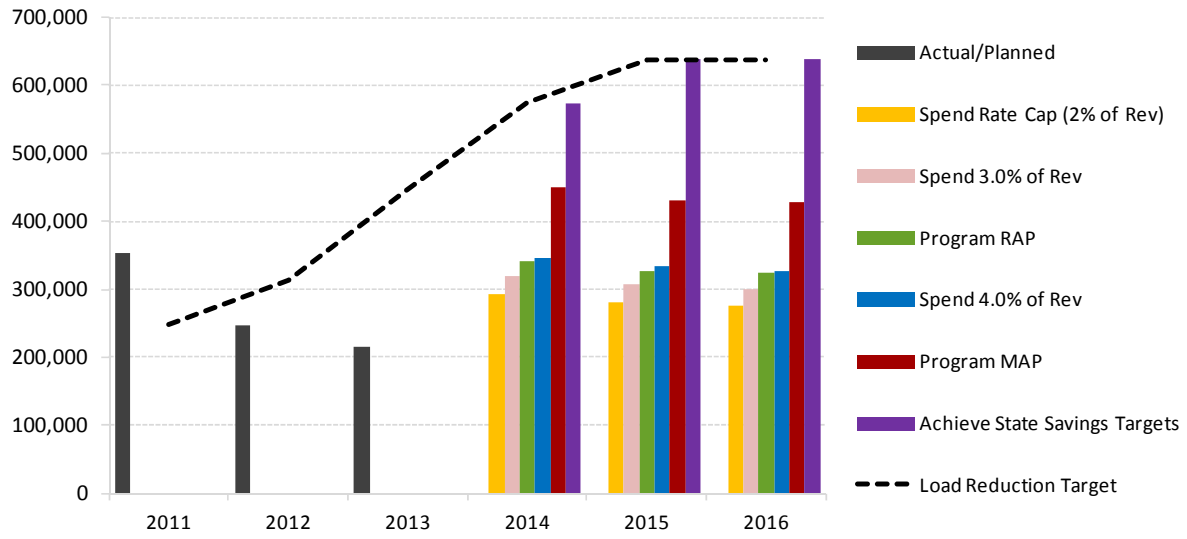


Figure 5 Costs to Achieve Electricity Savings ($000)

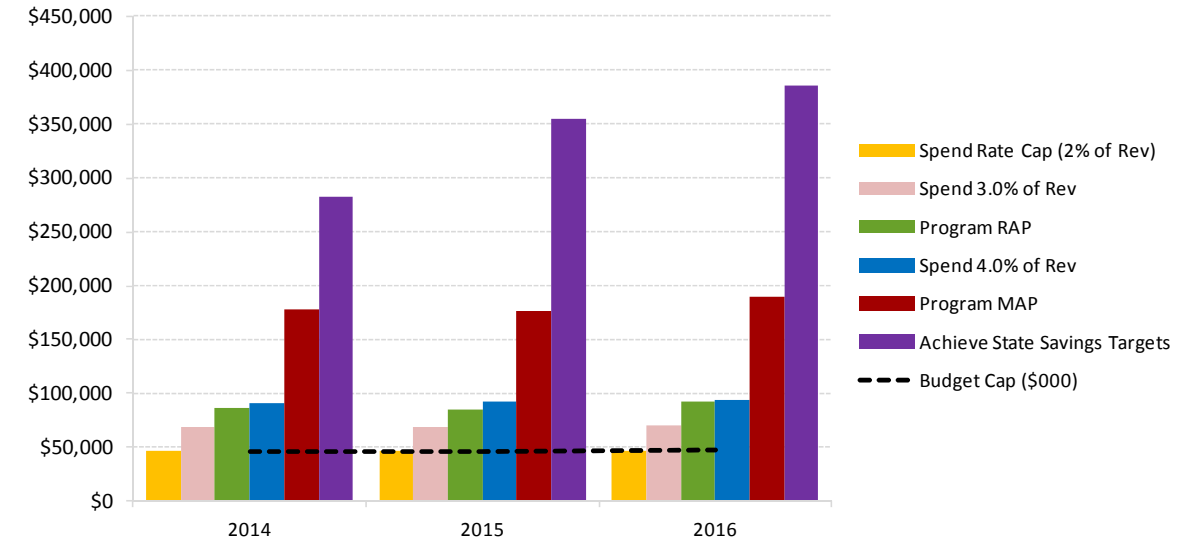


Figure 6 through Figure 8 show the supply curves for electric EE programs at various implementation levels for the program years 2014-2016. Each horizontal line is a discrete program with a bundle of measures and an explicit delivery mechanism and cost structure. Several program levels are shown, as well as the supply curve for achieving the state target.

- Overall, the analysis shows a significant majority of the EE program savings fall under $0.40/kWh, where kWh are given in incremental or first-year terms.
- The portfolio representing spending at the rate cap level of 2% of revenue is significantly lower than the Program Low level from the EE potential analysis.

Overall, any portfolio between the Rate Cap and the Program RAP portfolio will offer the best opportunity for Ameren Illinois to achieve a cost-effective portfolio with levels of electric savings greater than the current Cycle 2 portfolio, while also having less risk and uncertainty than the Program MAP portfolio. As can be seen from the supply curves, the Program RAP would be very

similar to the portfolio that spends 4.0% of Revenue in the three program years. This gives a barometer of the spending level required to achieve the savings in the Program RAP scenario.

Figure 6 Electric Energy Efficiency Program Supply Curves—Potential in 2014

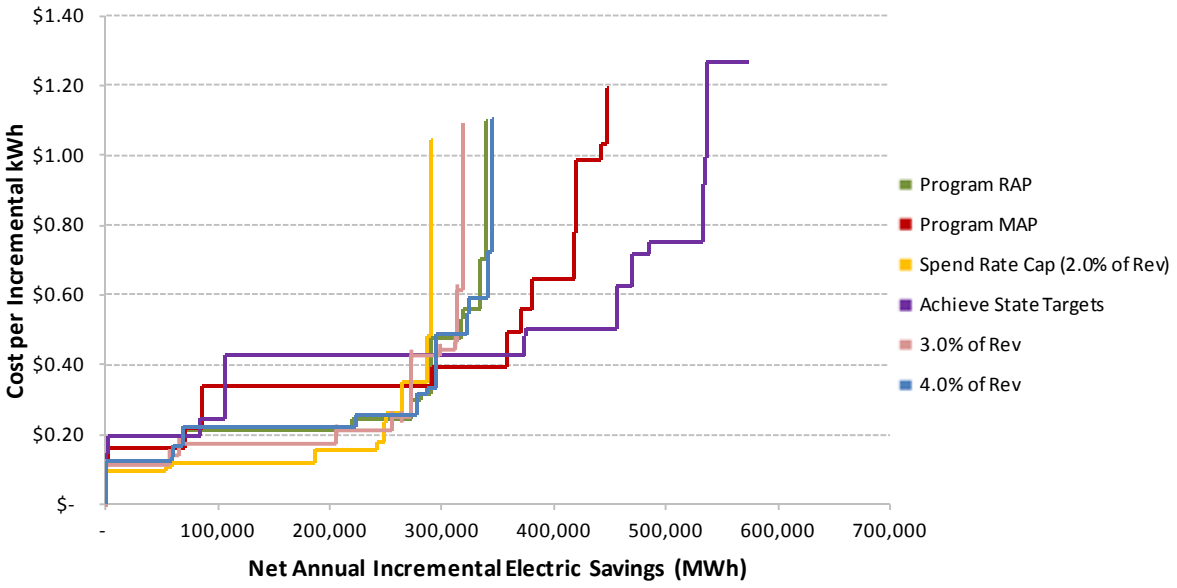


Figure 7 Electric Energy Efficiency Program Supply Curves—Potential in 2015

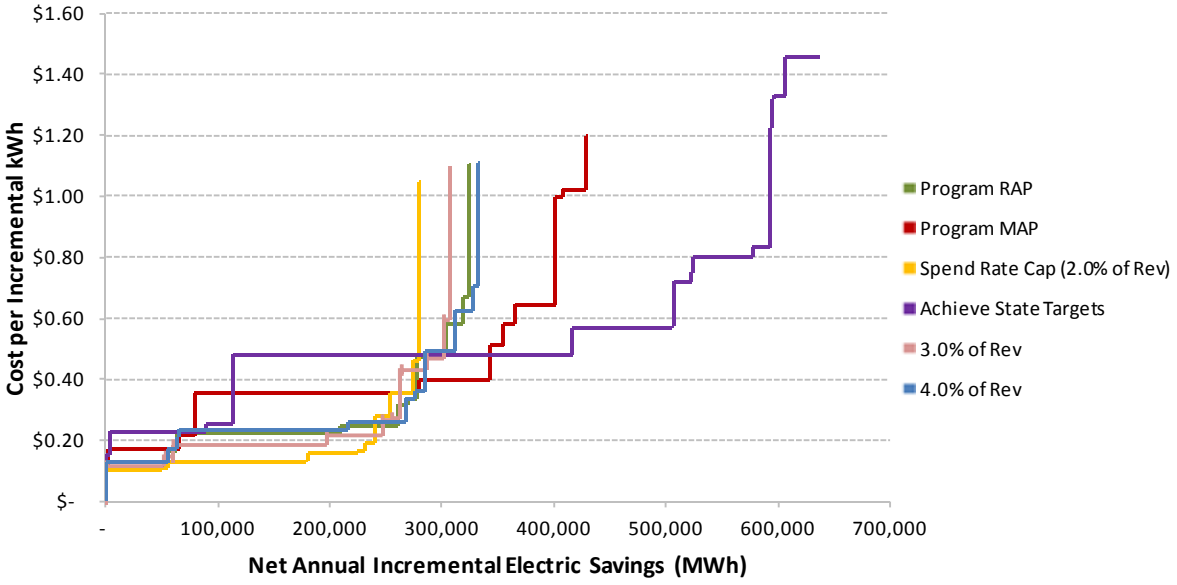
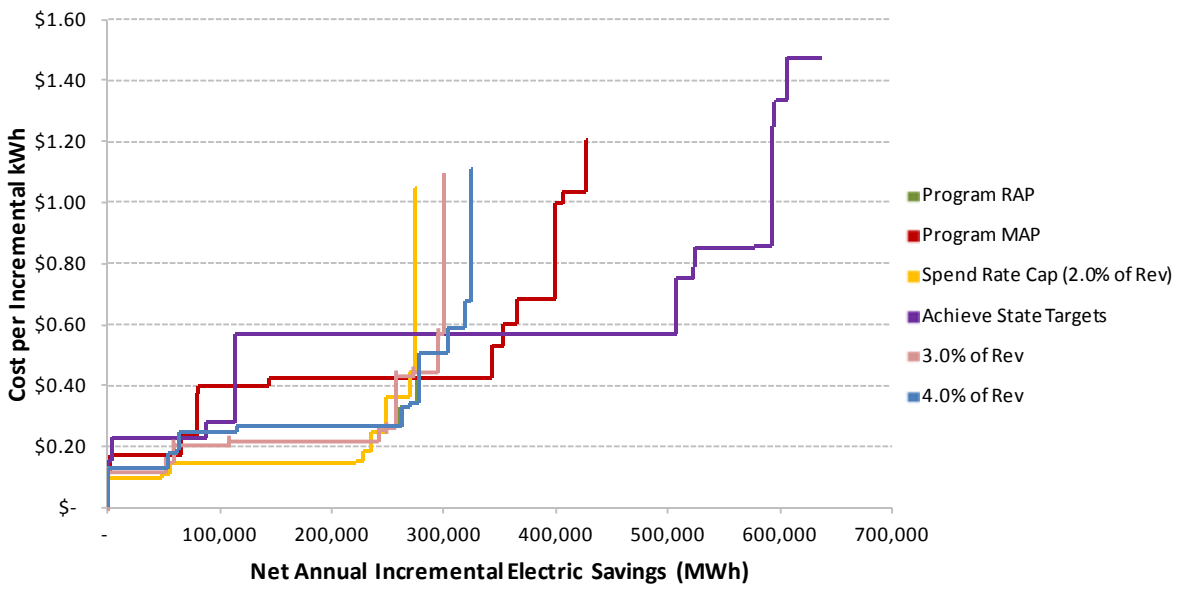


Figure 8 Electric Energy Efficiency Program Supply Curves—Potential in 2016



Key Findings for Natural Gas

Like the electricity findings above, the key findings of the natural gas potential analysis are presented first in terms of measure-level results, where program delivery and implementation concerns have not been considered. Subsequently, the results are refined to the program level by considering appropriate program delivery mechanisms and measure bundling strategies based on real-world implementation and evaluation experience.

Measure-level Energy Efficiency Potential

Key findings related to measure-level natural gas potentials are summarized below.

- **Realistic achievable potential**. In 2014 realistic achievable savings are 6.1 million therms which is 0.5% of the baseline projection. By 2016, cumulative realistic achievable savings grow to 14.1 million therms which represent 1.3% of the baseline projection.
- **Maximum achievable potential**. In 2014 savings for this case are 9.0 million therms or 0.8% of the baseline and by 2016 cumulative savings reach 20.8 million therms or 1.9% of the baseline projection.
- **Economic potential**. The savings for this case in 2014 are 17.4 million therms or 1.6% of the baseline projection and by 2016 the cumulative savings reach 39.6 million therms, about 3.6% of the baseline.
- **Technical potential**. Savings in 2014 for the technical case are 29.1 million therms, 2.6% of the baseline and by 2016 these cumulative savings reach 65.3 million therms, about 5.9% of the baseline.

Table 3 and Figure 9 summarize the natural gas energy-efficiency savings for the different levels of potential relative to the baseline projection.

Table 3 Summary of Cumulative, Net, Measure-Level Natural Gas Energy Efficiency Potential

	2014	2015	2016
Baseline Energy Forecasts (million therms)	**1,102**	**1,109**	**1,109**
Cumulative Energy Savings (million therms)			
Realistic Achievable Potential	6.1	9.5	14.1
Maximum Achievable Potential	9.0	14.1	20.8
Economic Potential	17.4	27.0	39.6
Technical Potential	29.1	45.2	65.3
Energy Savings (% of Baseline)			
Realistic Achievable Potential	0.5%	0.9%	1.3%
Maximum Achievable Potential	0.8%	1.3%	1.9%
Economic Potential	1.6%	2.4%	3.6%
Technical Potential	2.6%	4.1%	5.9%

Figure 9 Summary of Cumulative, Net, Measure-Level Natural Gas Energy Savings

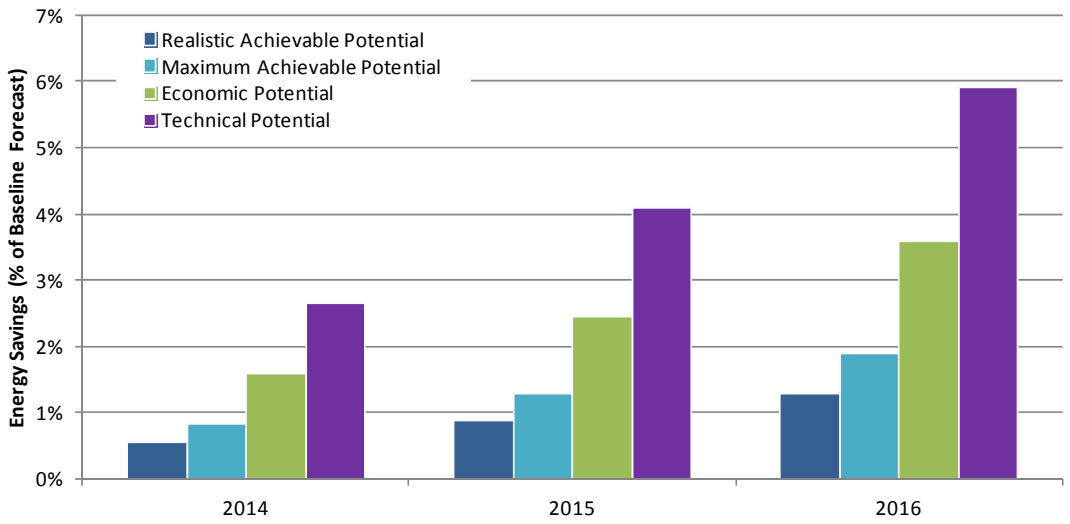
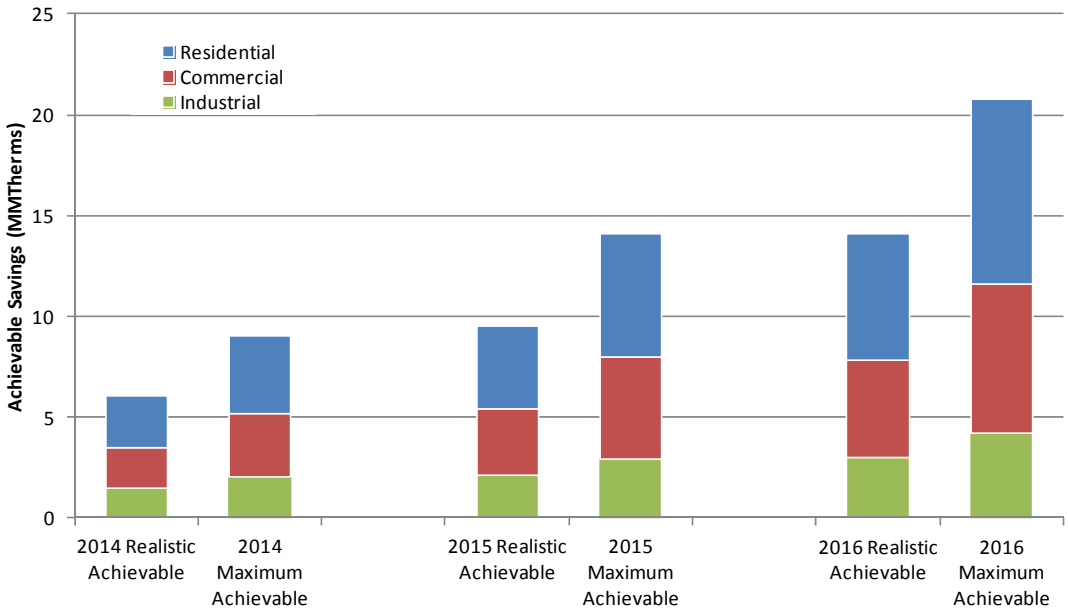


Figure 10 presents the range of natural gas achievable potential by sector. Unlike the electric analysis, the residential sector accounts for the largest portion of the natural gas savings, followed by the commercial and then the industrial sectors.

Figure 10 Cumulative, Net, Measure-Level Natural Gas Potential by Sector (million therms)



Program-level Potential

As with the electricity analysis, the program-level results here consider program delivery strategies, real-world limitations, and the associated administrative costs and economics. Please note that measure-level savings are provided above in cumulative terms, but are translated here to incremental or annual terms to align better with the language and expectations of program implementation and annual targets.

In order to more accurately assign realistic program costs, measure-level results were synthesized to group measures into programs that can realistically be delivered to Ameren Illinois customers. The key steps and differences between the measure-level analysis and program-level analysis are discussed above. Key findings related to program-level natural gas potentials are summarized as follows:

- **Program Low achievable potential.** In 2014 program low achievable savings are 4.2 million therms which is 0.4% of the baseline projection at a cost of $13.3 million. By 2016 cumulative program low achievable savings grow to 12.5 million therms or 1.1% of the baseline projection at a cumulative cost of $40.7 million.
- **Program High achievable potential**. In 2014 savings for this case are 6.3 million therms or 0.6% of the baseline at a cost of $28.9 million. By 2016 cumulative savings reach 18.7 million therms or 1.7% of the baseline projection at a cumulative cost of $89.0 million.

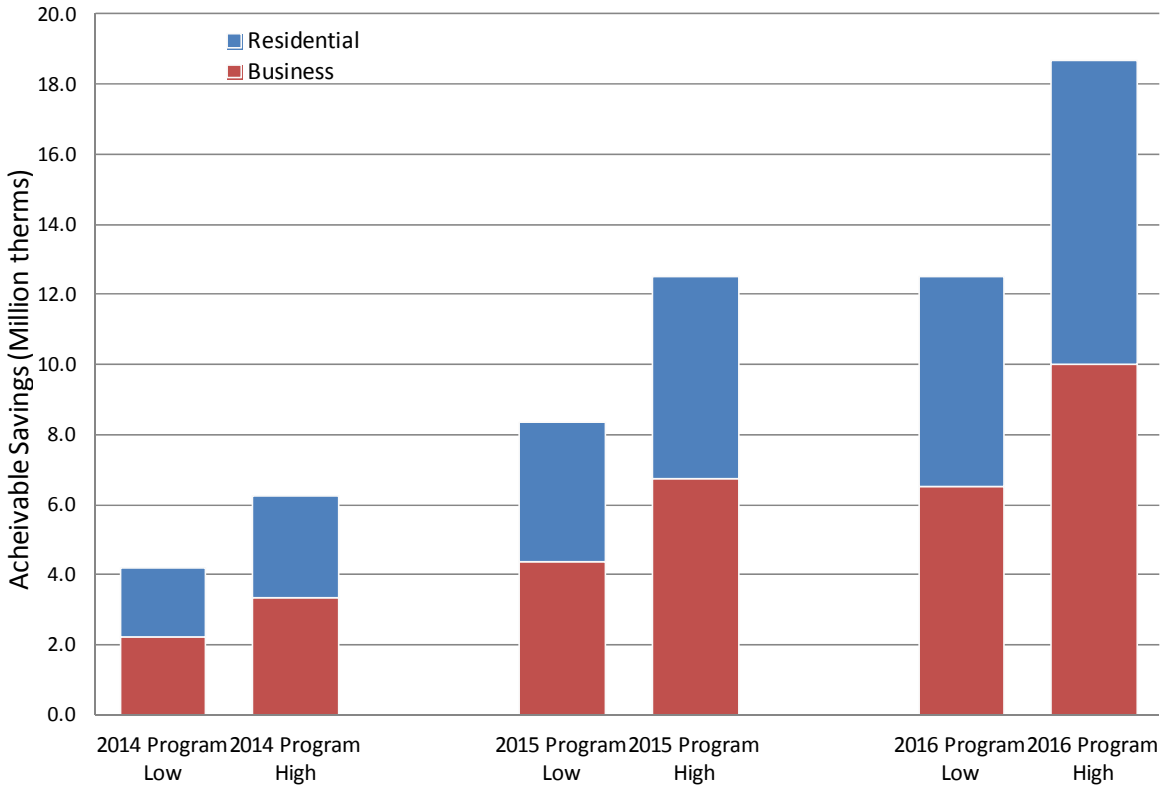
Table 4 summarizes the electric energy-efficiency savings for the different levels of potential relative to the baseline projection.

Table 4 Summary of Cumulative, Net, Program-Level Electric Energy Efficiency Potential

	2014	2015	2016
Baseline Energy Forecasts (million therms)	**1,102**	**1,109**	**1,109**
Annual Savings (million therms)			
Program Low Potential	4.2	8.3	12.5
Program High Potential	6.3	12.5	18.7
Energy Savings (% of Baseline)			
Program Low Potential	0.4%	0.8%	1.1%
Program High Potential	0.6%	1.1%	1.7%
Energy Costs (Million $)			
Program Low Potential	$13.3	$26.6	$40.7
Program High Potential	$28.9	$58.1	$89.0

Figure 11 summarizes the range of natural gas program-level achievable potential by sector. Sectors were adjusted to Residential and Business (which includes both Commercial and Industrial) to align with Ameren Illinois program sectors. The business sector accounts for the largest portion of the savings, followed by residential.

Figure 11 Cumulative, Net, Program-Level Potential by Sector (million therms)



Supply Curves

For the natural gas portfolios, the resulting Net Incremental therm savings per year are shown in Figure 12. The respective costs to achieve the savings are shown in Figure 13.

Figure 12 Summary of Achievable Natural Gas Savings (Net, Incremental 1000 Therms)

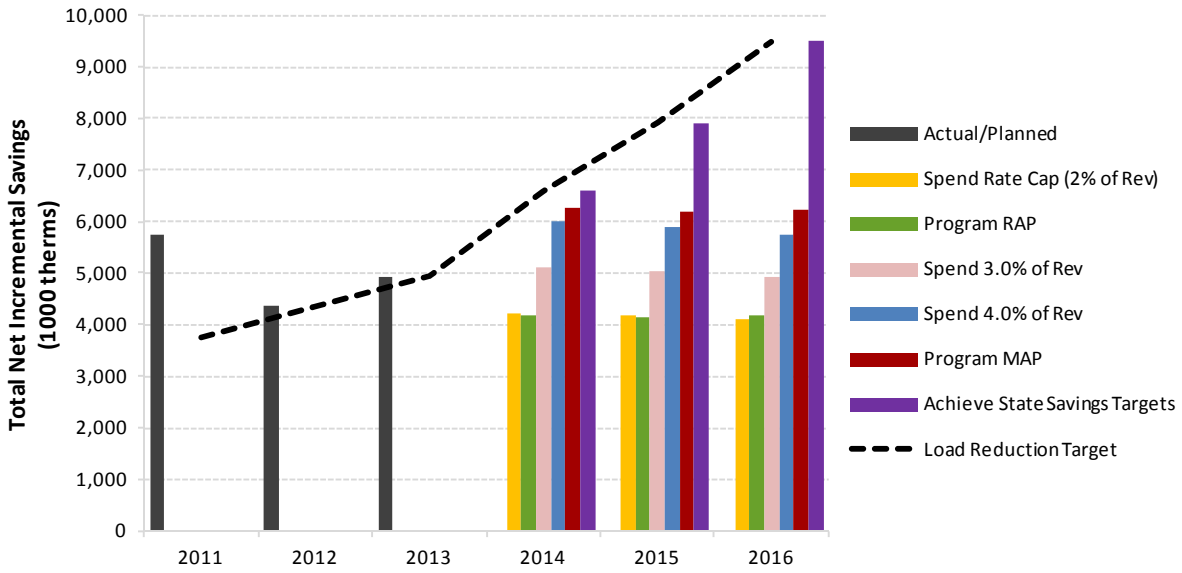
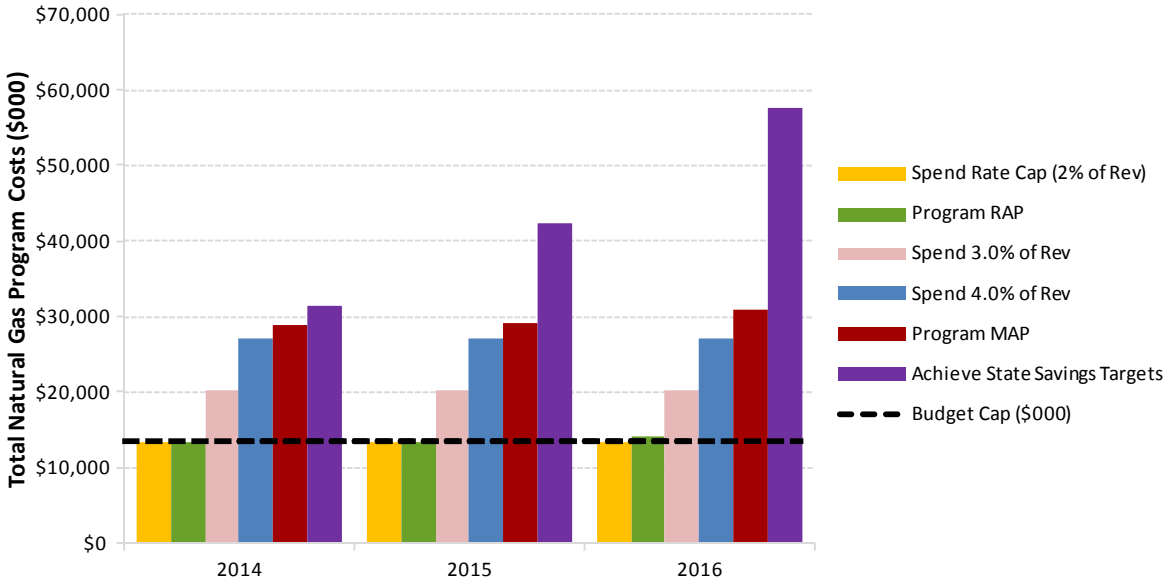


Figure 13 Costs to Achieve Natural Gas Savings ($000)



The supply curves for the various natural gas EE portfolios are presented below in Figure 14 through Figure 16 for the program years 2014-2016.

- A majority of the EE program savings for natural gas are under and around the $5.00/therm level, where therms are given in incremental or first-year terms.
- The portfolio representing spending at the rate cap level of 2% of revenue is closer to the Program RAP scenario for natural gas than it was in the electric analysis.

- There are a few very high cost programs that skew the end of the supply curve with a nearly vertical spike, including: Residential ENERGY STAR Homes, Residential Moderate Income, and Retro Commissioning.

Overall, the Program RAP portfolio offers the most cost-effective natural gas portfolio for Ameren Illinois, maintaining spending levels close to the "Spend Rate Cap" portfolio and providing slightly lower $/therm cost.

Figure 14 Natural Gas Energy Efficiency Program Supply Curves—Potential in 2014

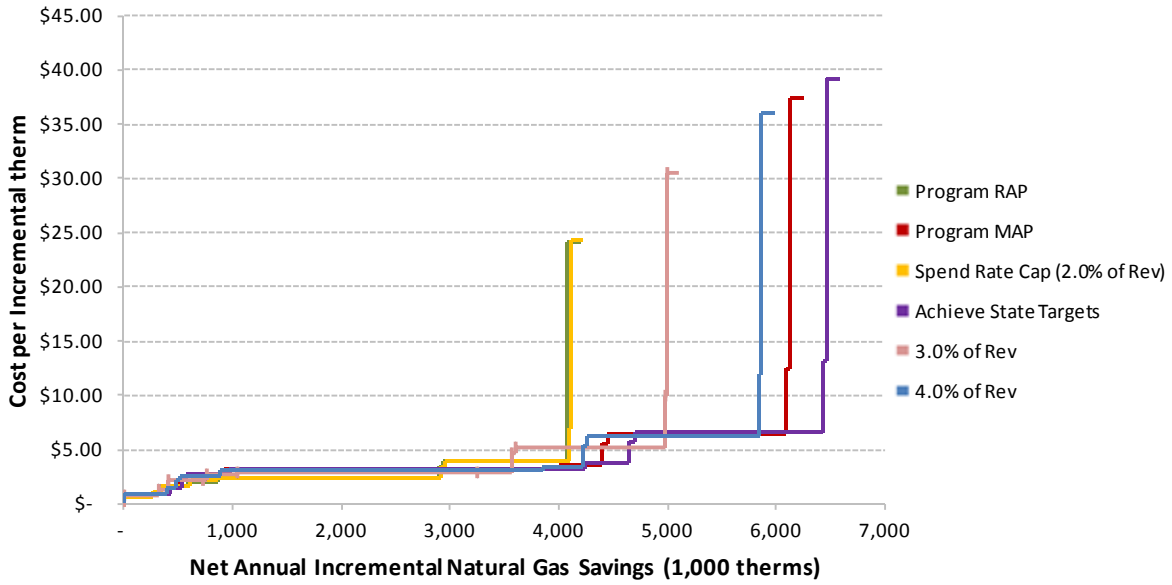


Figure 15 Natural Gas Energy Efficiency Program Supply Curves—Potential in 2015

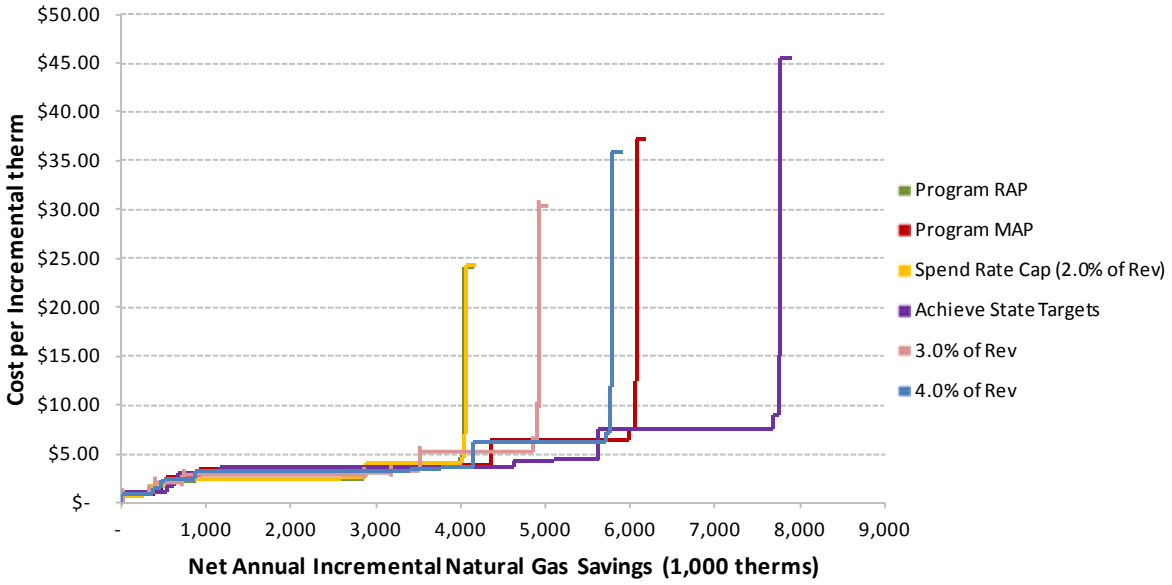
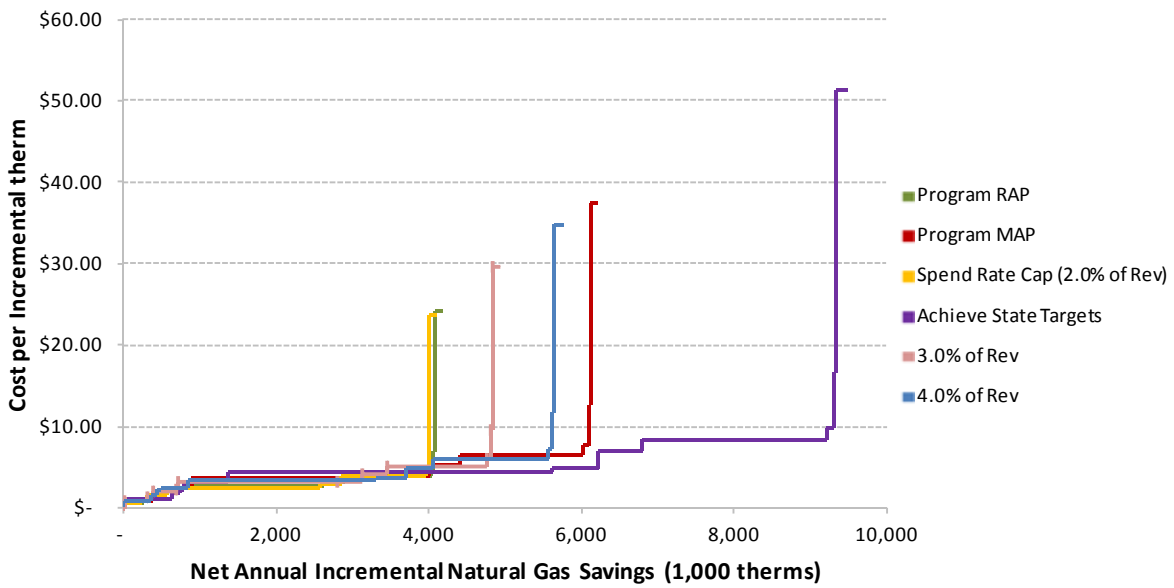


Figure 16 Natural Gas Energy Efficiency Program Supply Curves—Potential in 2016



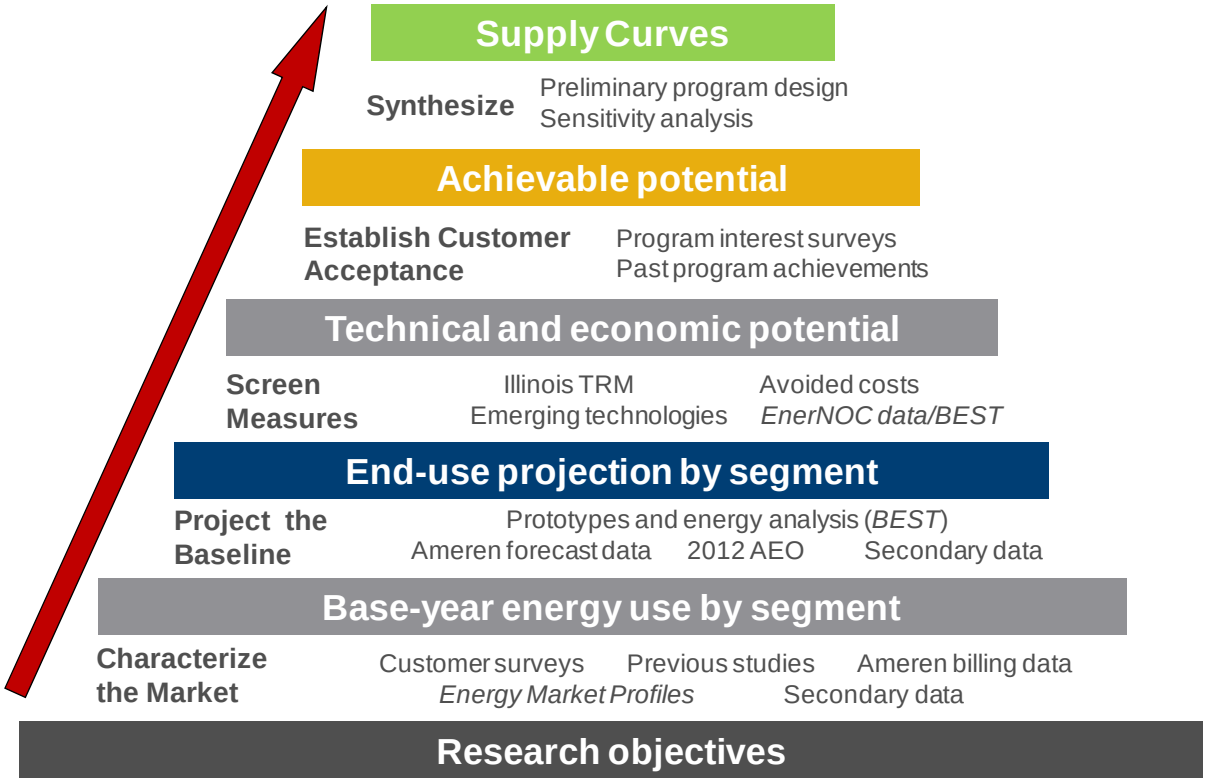
Study Approach

This study followed industry best practices in assessment of EE market potential. An overview of the analysis approach is illustrated in Figure 17 below. Key features of this approach include the following:

1. Conduct primary market research that includes comprehensive saturation and program-interest surveys with residential, commercial and industrial customers. Volume 2 describes the market research in detail.
2. Perform a market characterization to describe sector-level electricity and natural gas use for the residential, commercial and industrial sectors for a recent "base year" (2011). We further segmented by housing type, building type and industry.
3. Utilize a wide variety of data sources to estimate how customers in the region currently use electricity and natural gas. We developed energy market profiles for each segment that describe appliance/equipment saturation and use for new and existing buildings.
4. Develop a baseline end-use projection by sector, segment, end use and technology for electricity and natural gas for a 10-year time horizon. This projection accounts for building codes and appliance standards that are "on the books."
5. Identify and analyze energy efficiency measures appropriate for the Ameren Illinois service area, including measures currently covered by programs offered by Ameren and other entities as well as emerging technologies.
6. Estimate three levels of measure-level energy-efficiency potential, *Technical*, *Economic*, and *Achievable*. We used EnerNOC's analytical model, LoadMAP, to develop the baseline projection and the estimates of EE potential. We delivered LoadMAP to Ameren so staff can continue to use it on their own for additional analyses. Steps 2 through 6 are documented in Volume 3. Detailed appendices are provided in Volume 6.
7. Transfer measure-level results to Applied Energy Group who used this information to develop program designs (documented in Volume 4).
8. Use program-level results from Step 7 to develop supply curves (see Volume 5).

Additional information and results are provided below.

Figure 17 Analysis Approach for Ameren Illinois Market Potential Study



Throughout the project, the Ameren and EnerNOC project teams engaged with Ameren Illinois' stakeholders (the SAG) in meetings and by webinar to review each major step in the study.

Market Research

The market research component collected electricity and natural gas end-use data, end-use saturation data, customer demographics, and psychographic information that provides insight on how Ameren Illinois customers make decisions related to electric and natural gas usage and energy-efficiency investment decisions.

Comprehensive primary market research about Ameren Illinois customers was conducted for this project. This research provides a solid foundation for the analyses performed in this study and it also provides a wealth of information for future analyses across many departments at Ameren. The market research included:

- Residential customers – online saturation surveys with 726 customers
- Residential customers – online program interest surveys with 749 customers
- Small and medium C&I customers – online saturation surveys with 691 customers
- Large C&I customers – 101 site visits distributed strategically among campuses/locations of Ameren Illinois' largest customers
- C&I customers – online program interest surveys with 610 customers

Volume 2 of the report series presents the detailed results of the primary market research.

Energy-use Surveys

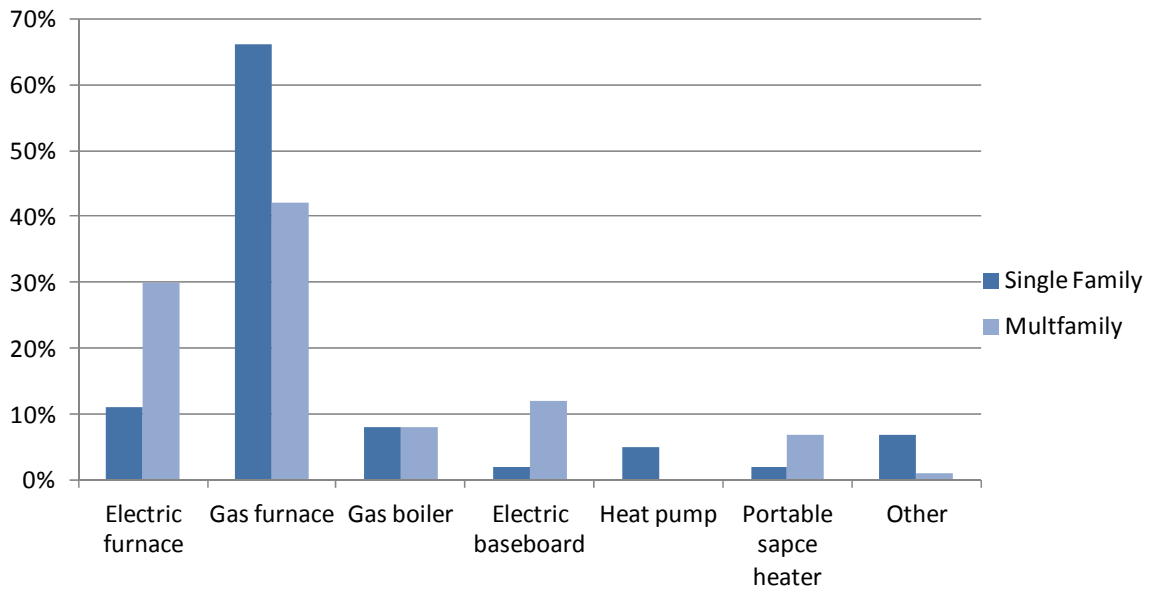
Energy-use (or saturation) surveys were conducted across all customer classes. Topics included:

- Characteristics of households/homes and businesses/buildings and their occupants
- Heating, cooling and water heating equipment
- Lighting, refrigeration and food service equipment
- Office equipment, electronics and miscellaneous plug loads
- Motors and process uses
- Energy-efficiency measures taken and planned

Figure 18 and Figure 19 present two examples of results from the residential saturation survey.

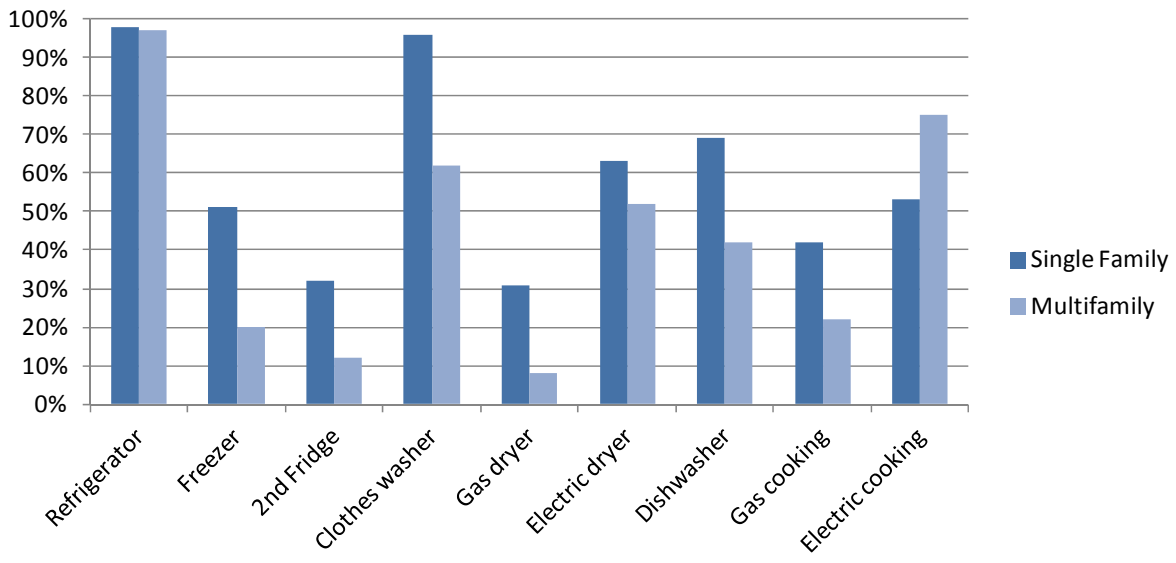
In the residential sector, the majority of respondents in single-family homes have a gas furnace (66%) and eleven percent (11%) have an electric furnace (Figure 18). Most respondents in multi-family homes have either a gas or an electric furnace. Several respondents reported using supplemental heating such as portable space heaters and fireplaces as their main type of space heating; 9% of single-family and 8% of multi-family homes use these other types of space heating.

Figure 18 Type of Space Heating



Almost all respondents living in single-family homes have a refrigerator (Figure 19). In addition, more than half have a stand-alone freezer and 32% have a second refrigerator. In the previous study the saturation of a second refrigerator was 29%. While the difference is not statistically significant, we had expected the percentage to decrease based on the success of the program the past three years. We speculate that the ARRA rebate encouraged more customers to purchase new refrigerators and therefore customers that had already recycled a second refrigerator or never had one in the first place moved the existing refrigerator to the garage after purchasing a new one through the ARRA rebate. Sixty-nine percent of respondents in single-family homes have a dishwasher and 53% use electric for cooking. Ninety-six percent of respondents in single-family homes also have a clothes washer, and 94% have a clothes dryer. Sixty-three percent of respondents have an electric dryer; while 31% have a gas unit.

Figure 19 Appliance Saturation



Program-interest Research

A hallmark of this study is the research of customer attitudes and behaviors toward energy efficiency measures and programs. The objectives of this research were to:

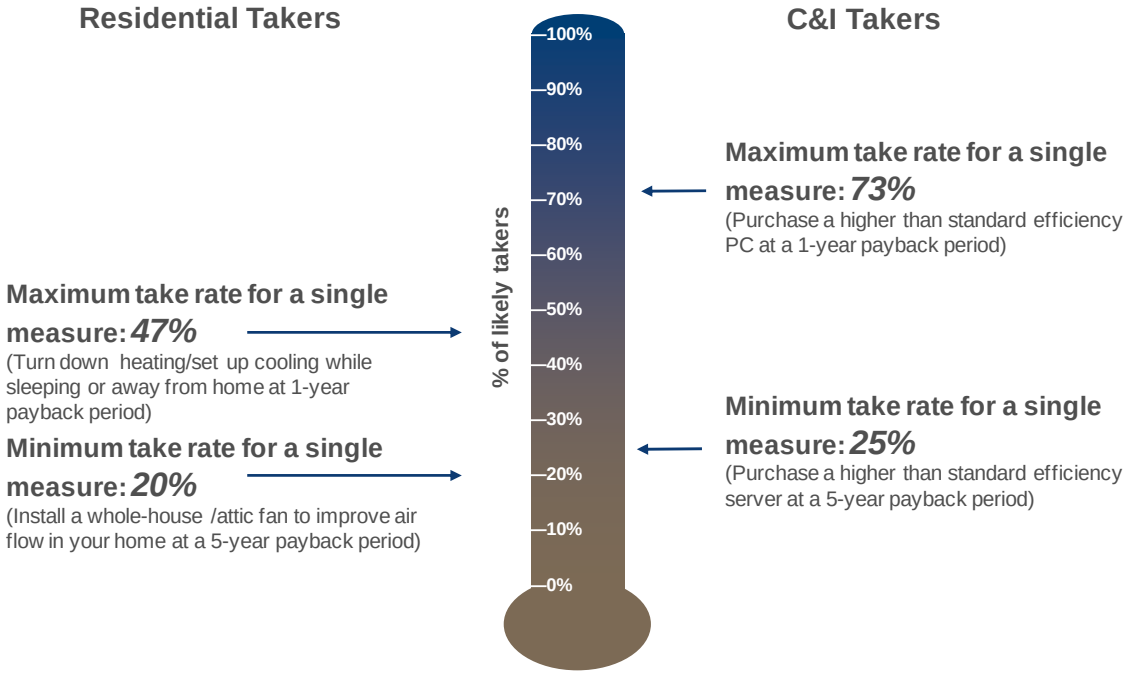
1. Help Ameren estimate achievable potential
   - How likely are customers within each sector to participate in various energy efficiency programs Ameren Illinois is considering offering?
   - Which energy efficiency measures offer the highest likely participation rates?
   - How does likelihood to participate differ by payback period for the customer?
2. Help Ameren Illinois understand unique customer segments to support customer marketing and outreach

Other relevant questions embedded in this phase of the research to help Ameren Illinois better understand achievable potential include:

- What overall demographic and psychographic characteristics correspond to a higher likelihood to participate in energy efficiency programs?
- What attitudinal or market segments can be derived within the residential sector, and how do these segments differ in terms of their impact on the likelihood to participate, as well as on customer demographic and psychographic characteristics?
- Which of these segments represent the best opportunities for Ameren Illinois to focus their marketing on?
- What messaging strategies would likely be useful to help foster participation among these high opportunity segments?

Key results from the program interest research included “take rates” for various program concepts. Take rates represent the likelihood that customers will participate in specific programs and they reflect a snapshot of current behavior and circumstances. They have been adjusted for response bias using industry standard techniques to reflect what customers *actually* do rather than what they *say* they will do. Figure 20 illustrates the range of take rates for the residential and business sectors.

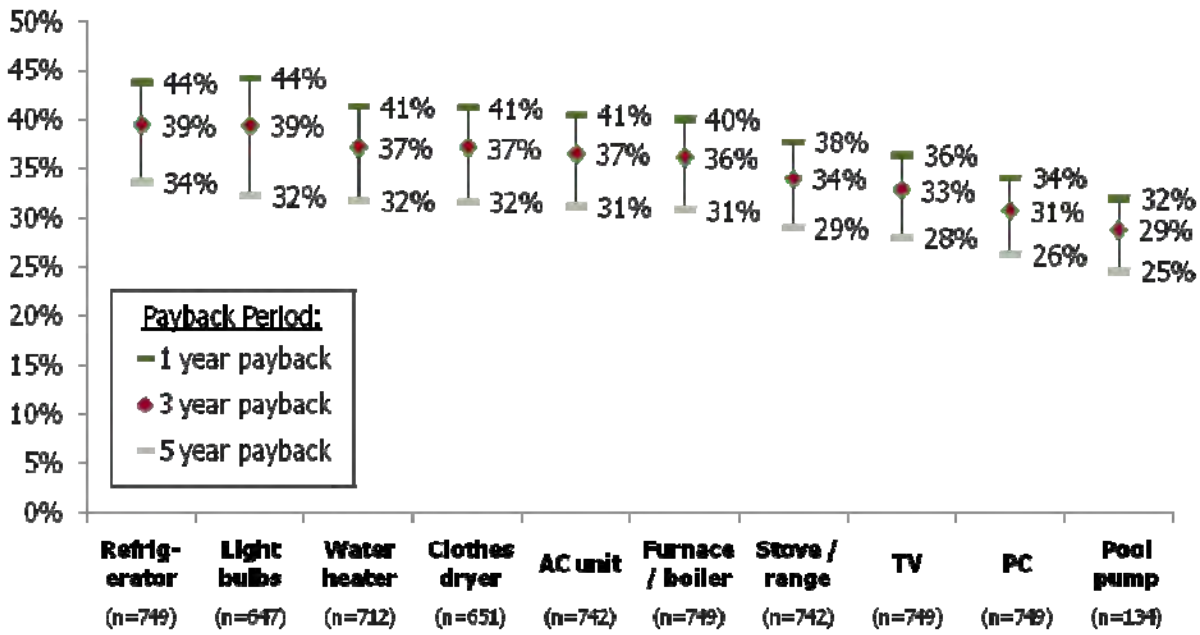
Figure 20 Range of Take Rates



Residential Sector Program Interest Research Results

Figure 21 presents likely take rates for specific appliances or equipment measures in the residential sector. This is a subset of the take rates for the residential sector; additional rates were developed for a second category of non-equipment measures such as insulation or low-flow showerheads.

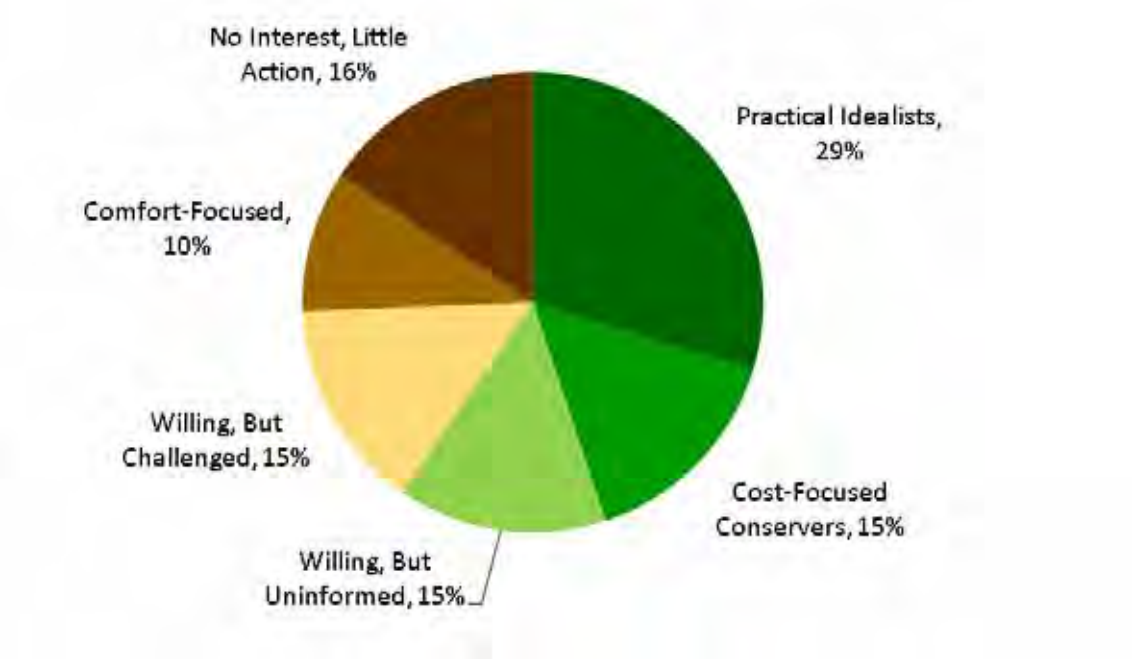
Figure 21 Likely Residential Take Rates for Purchasing High-efficiency Equipment



In addition to estimating take rates, the study also developed an attitudinal segmentation model that disaggregated residential customers into groups that differ in terms of whether, and why, they might be interested in pursuing energy efficiency options. The goal of the segmentation

analysis was to define groups of customers that were different in ways that would allow Ameren Illinois to prioritize customer targets for EE program marketing, and to develop targeted messages for each of those segments. Using a variety of attitudinal and behavioral inputs, six residential customer segments that seemed to best represent the differences in this population on these issues were identified. The segments and relative sizes are outlined in Figure 22 and described in detail in Volume 2.

Figure 22 Residential Attitudinal Segment Distribution



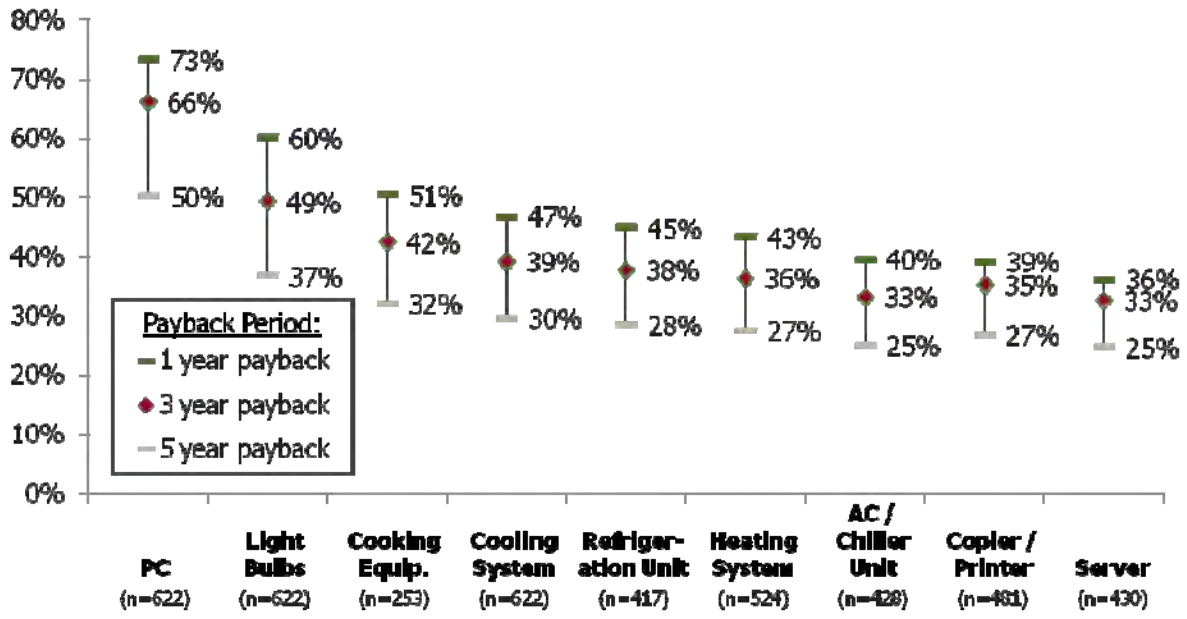
- **Practical Idealists (30%)** are concerned with conserving energy, both from a cost-focus and an environmental perspective (they are the "greenest" segment). They are tech and feature oriented when considering appliances, but they also say they research options and compare prices. Higher education and income, and with the largest homes (though with only average total annual kWh usage), but tend to say their economic situation is worse than it was a year ago. Tend to be high on familiarity, and experience, with EE / conservation measures to date, and are very likely to say that they would adopt new EE / conservation measures.
- **Cost-Focused Conservers (15%)** are informed about, and interested in, conservation / EE measures, but for cost reasons rather than environmental reasons. This group believes in the value of EE as a way to save money, and has taken many prior EE actions. They do not trust Ameren Illinois very highly, however, and do not see it as the job of the company to encourage customers to save energy or money. They would prefer the company reduce rates than spend money on EE or green options. They have higher than average education and income levels, and the second largest homes on average, and the second highest average kWh. They have the second highest program take rate.
- **Willing, But Uninformed (15%).** This group is positive in its assessment of Ameren Illinois, and green in their environmental perspectives (though this is not a daily, top-of-mind issue). They are relatively less experienced with EE / conservation measures to-date, however, and unsure of what they could be doing in this area, or if any of their actions would actually lead them to save money. They prefer simple, functional appliances that are on sale, and which they can purchase locally, rather than online. They have average sized homes and average annual kWh usage, as well as have lower than average income and education levels. They are moderate on take rates across programs, but are the lowest on familiarity / experience with EE conservation measures currently.

- **Willing, But Challenged (15%)**. This group has relatively high opinions of Ameren Illinois and believes that the company should be pursuing EE options for its customers, while also supporting green initiatives. They are relatively low on EE / conservation information currently, however, and have implemented fewer such measures than others to-date. Appliance cost is critical to them and it appears that they do not think that they can afford to purchase higher quality / higher EE appliances. They live in the smallest homes, and have lower than average income and education levels, as well as the lowest annual kWh usage. They are moderate to low in their interest in participating in new EE / conservation options.
- **Comfort Focused (10%)**. This group is quite positive in its overall assessment of Ameren Illinois, but does not see the company as a leader in energy efficiency, nor do they think the company should be a leader in this area (i.e., in encouraging customers to be more efficient), or in green energy. Rather, the company should just focus on keeping costs low. Comfort is important to them, and they just want to be left alone to use energy as they please. They are concerned about appliance cost, but worry more about functionality (particularly as this relates to comfort) than about environmental / energy saving considerations. They tend to live in average sized homes, but have the highest annual kWh levels, along with higher than average incomes and educations. They are moderate on both familiarity with EE programs / options to-date, and their likelihood to participate in new programs.
- **Low Interest, Little Action (16%)**. This group has very little interest in conservation or EE. This group actively dislikes Ameren Illinois, particularly on the dimensions of trust and being a leader in EE. They do not want the company to encourage customers to save energy, nor do they want it to pursue green options. They do want the company to keep costs low as its sole focus. They have smaller than average homes, but average kWh levels, and are more likely to live in multi-family structures and to have somewhat lower levels of education and income. They are the lowest on likelihood to adopt new EE programs and one of the lowest on existing familiarity / experience with EE / conservation options.

Business Sector Program Interest Research Results

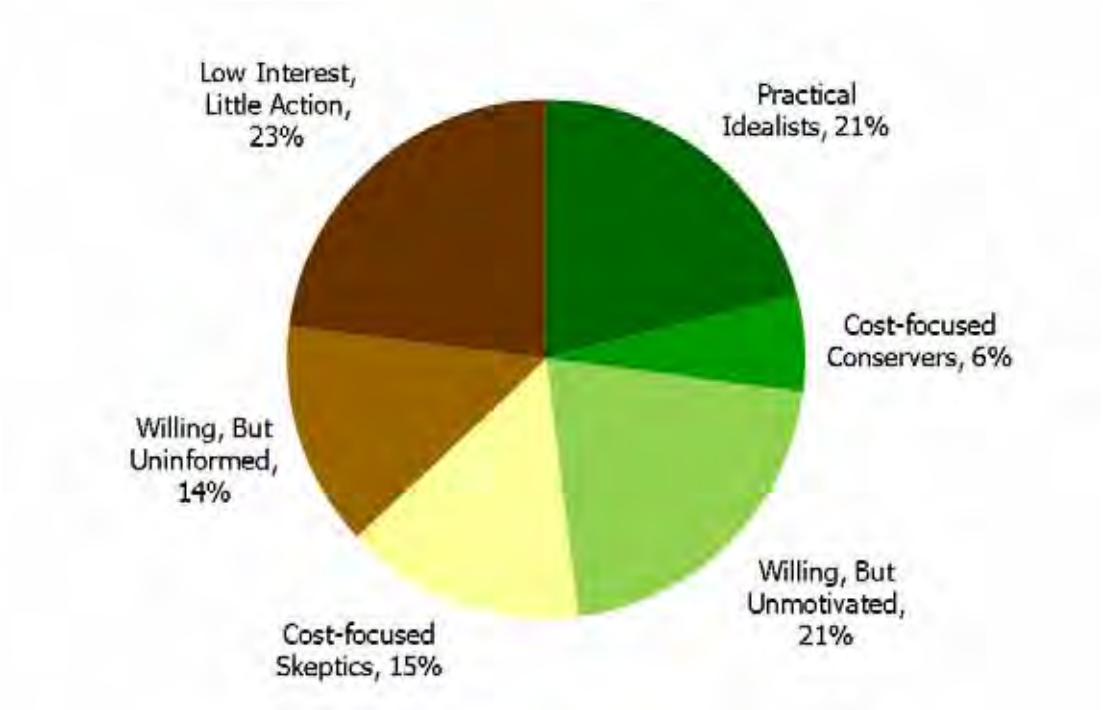
Figure 23 presents likely take rates for high-efficiency equipment in the business sector, a subset of measures considered in the program interest surveys. For the estimation of achievable potential, the take rates at the one-year payback period were used.

Figure 23 Likely C&I Take Rates for Purchasing High-efficiency Equipment



As with the residential sector, the team developed a segmentation model that disaggregated business customers into groups that differ in terms of whether, and why, they might be interested in pursuing energy efficiency options. This segmentation will allow Ameren Illinois to prioritize customer targets for EE program marketing, and to develop targeted messages for each of those segments The segments and relative sizes are outlined in Figure 24 and described in detail in Volume 2.

Figure 24 Business Attitudinal Segment Distribution



- **Practical Idealists (21%)** are concerned with conserving energy, both from a cost-focus and an environmental perspective. They are feature focused when considering equipment, but they also say they research options and compare prices. They have the highest opinion of Ameren Illinois, particularly on the dimensions of trust and being a leader in EE. They tend to be high on familiarity with EE / conservation measures to date, and are most likely to say that they would adopt new EE / conservation measures in the future.
- **Cost-Focused Conservers (6%)** are informed about, and interested in, conservation / EE measures, but for cost reasons rather than environmental reasons. This group believes in the value of EE as a way to save money, and has taken many prior EE actions. They trust Ameren Illinois and believe the company should keep costs low for their customers while also pursuing green options. They have the highest average kWh, higher than average building size and number of employees, and the second highest program take rate.
- **Willing, But Unmotivated (21%)**. This group believes in conserving energy, for both environmental and cost reasons, and has the highest familiarity with EE / conservation measures. Despite this, they aren't as active as you might expect in conserving energy, which could be due to the fact that they already have lower than average kWh. They are, however, likely to say they would adopt new EE programs in the future.
- **Cost-Focused Skeptics (15%)**. Skeptical about global warming and the need for EE, this group is only focused on saving energy if it will in turn save them money. They have a positive opinion of Ameren Illinois, but believe their priority should be keeping costs low for their customers rather than focusing on conservation. While unfamiliar with EE measures, they have higher than average kWh and would be somewhat likely to adopt new EE / conservation measures in the future if they thought it would save them money.

- **Willing, But Uninformed (14%)**. This group is relatively less experienced with EE / conservation measures to-date, and unsure of what they could be doing in this area, but they believe that conservation is important and that Ameren Illinois should be focused on pursuing green options in addition to keeping energy costs low. They have an average building size and number of employees, as well as have lower than average kWh. They are low on take rates across programs, and are the lowest on familiarity / experience with EE conservation measures currently.
- **Low Interest, Little Action (23%)**. This group has very little interest in conservation or EE. This group actively dislikes Ameren Illinois, particularly on the dimensions of trust and being a leader in EE. They do not want the company to encourage customers to save energy, nor do they want it to pursue green options. They do want the company to keep costs low as its sole focus. They operate in smaller than average size buildings, and have smaller than average company size (more than half have less than 10 employees). They are the lowest on likelihood to adopt new EE programs and second lowest on existing familiarity.

Market Characterization and Energy-Use Profiles

The primary market research was a key source of information for the development of energy market profiles, base-year electricity use by end use and the baseline projection. For this study, 2011 was defined as the base-year because it was the most recent year for which complete billing data were available when the study began.

Total electricity use for the residential, commercial and industrial sectors for Illinois in 2011 was 36,571 GWh and 569 (million therms) of natural gas.

Residential Sector

In 2011, there were 1.25 million households in Ameren's service area. They used 11.6 GWh of electricity and 569 million therms of natural gas. For the analysis, this energy consumption was allocated to six residential segments based on the Ameren Illinois customer database and the saturation survey data. Since the Ameren Illinois electric and natural gas service territories overlap in some areas, but not all; the resulting customer segments are characterized by which fuels they receive from Ameren Illinois: electricity only, natural gas only, or both electricity and natural gas. These three segments are further subdivided into single family and multi-family homes.

Figure 25 shows the distribution of electricity and natural gas energy consumption by end use for all homes. Figure 26 shows the electricity and natural gas intensities (annual use per household) for these segments.

Figure 25 Residential Electricity and Natural Gas Use by End Use (2011), All Homes

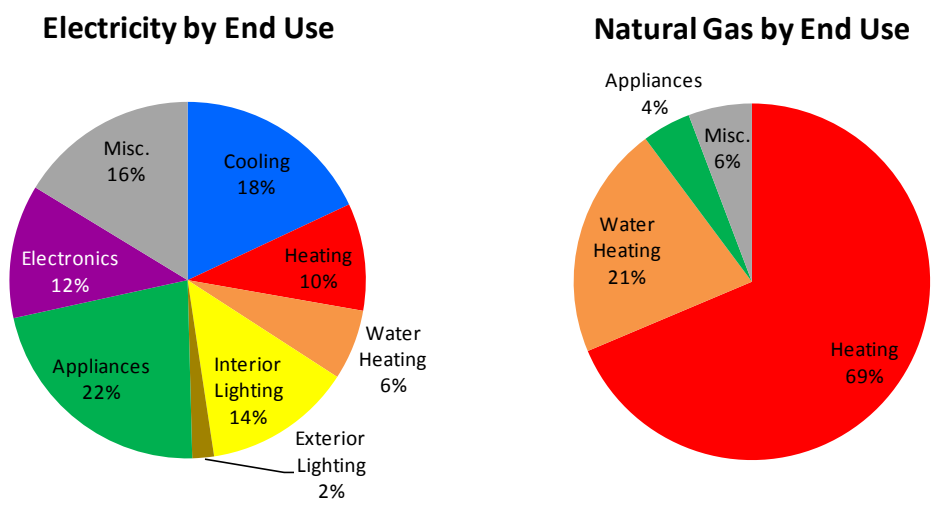
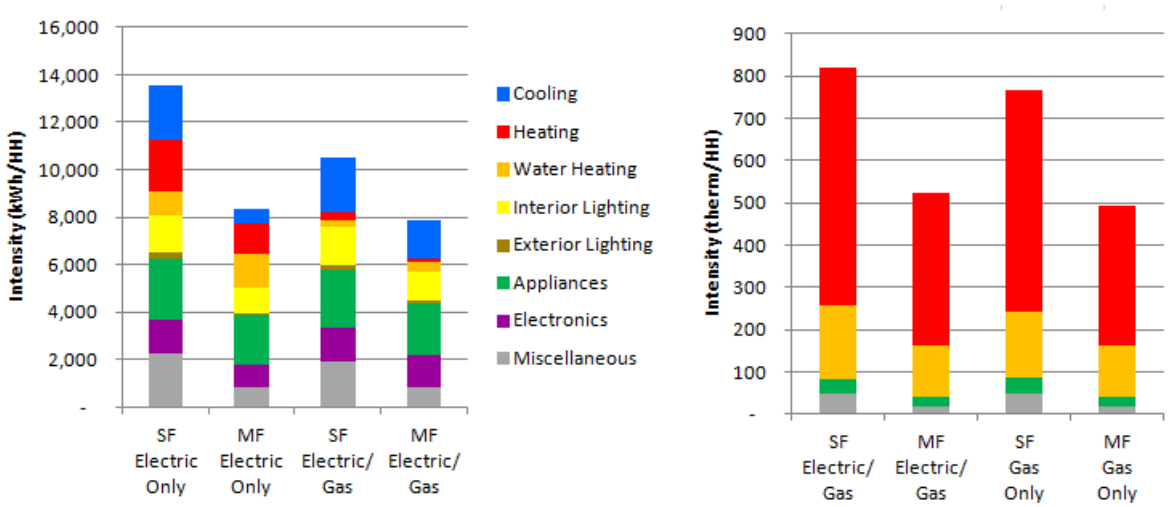


Figure 26 Residential Electricity and Natural Gas Use per Household by Housing Type



Commercial

The total amount of electricity consumed by Ameren Illinois commercial customers in 2011 was 12,414 GWh and the total natural gas energy consumed was 207 (million therms).

Figure 27 shows the distribution of electricity and natural gas energy consumption by end use for all commercial buildings served by Ameren Illinois. Electric usage is dominated by lighting, with interior and exterior varieties accounting for over one third of consumption. Natural gas usage is dominated by space heating (58%) and water heating (24%), with a small amount in food preparation and miscellaneous.

Figure 28 presents the electricity intensity in kWh per square foot by end use and building type. As is true across the entire commercial sector, lighting is a major end use in each building type, as is cooling. Figure 29 present the natural gas intensity in therms per square foot by end use and building type. Space heating is a significant end use across all building types but food preparation dominates in restaurants.

Figure 27 Commercial Electricity and Natural Gas Use by End Use (2011), All Buildings

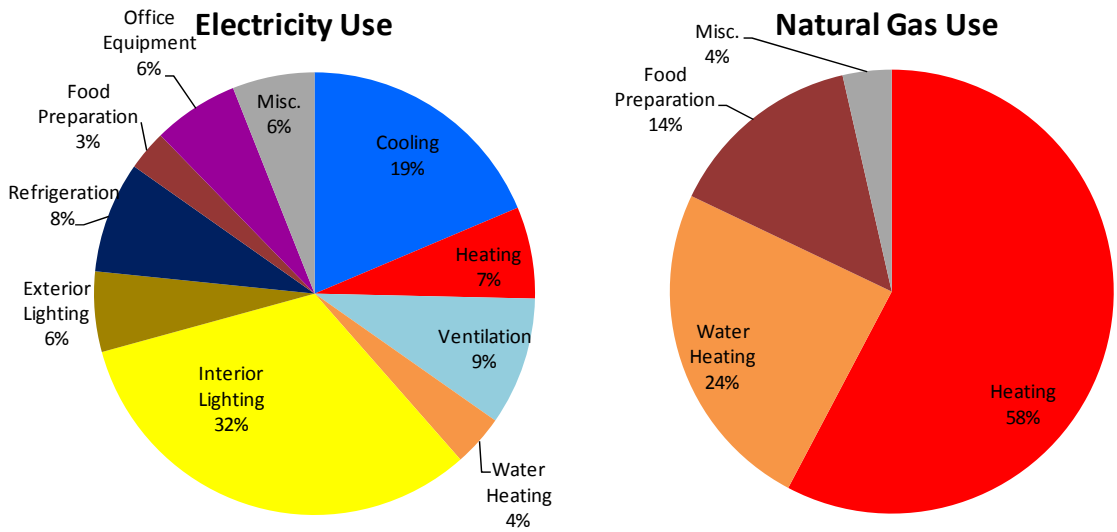


Figure 28 Commercial Electricity Intensity (kWh/sq ft, 2011)

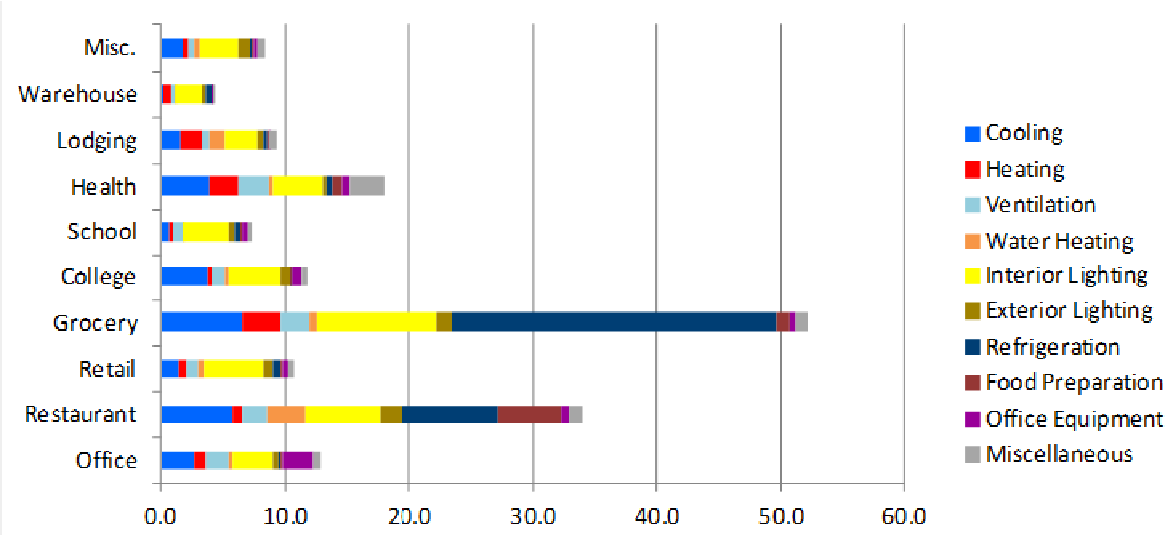
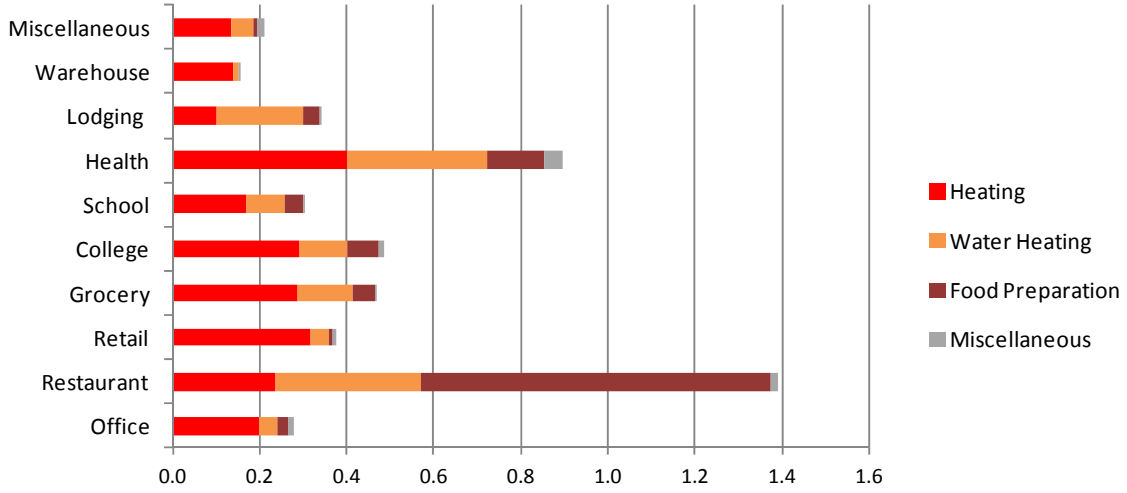


Figure 29 Commercial Natural Gas Intensity (therms/sq ft, 2011)



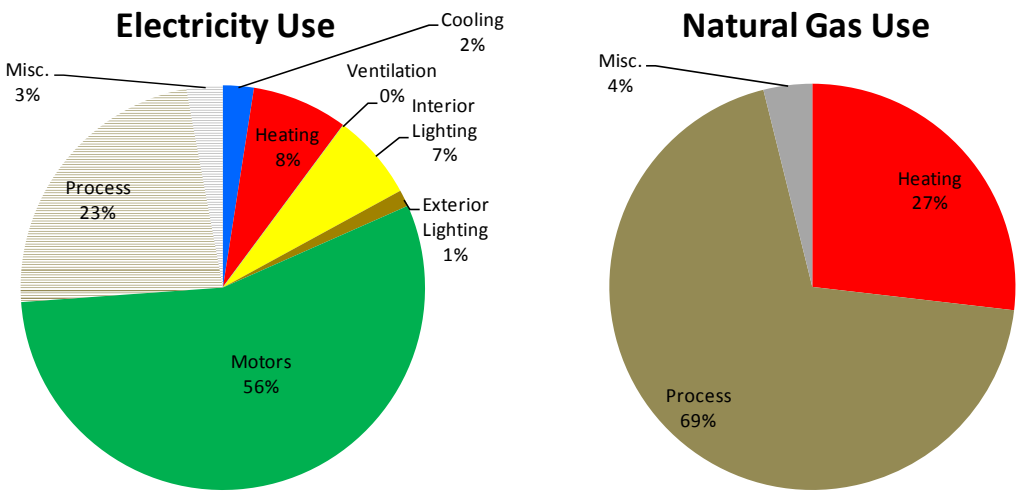
Industrial

The total electric energy consumed by industrial customers in Ameren service territory in 2011 was 12,580 GWh and the total natural gas energy consumed was 330 (million therms)[2]. Figure 30 shows the distribution of electricity and natural gas energy consumption by end use for all industrial customers. Motors are clearly the largest overall electric end use for the industrial sector, accounting for 56% of energy use. Note that this end use includes a wide range of industrial equipment, such as air compressors, refrigeration compressors, pumps, conveyor motors, and fans. The process end use accounts for 23% of electricity use, which includes refrigeration, and electro-chemical processes. Heating is the next highest, followed by interior lighting, miscellaneous, and cooling.

Natural gas usage is dominated by the process end use at 69%, primarily coming from process heating. Space heating (27%) and miscellaneous (4%) comprise the remainder of the sector's natural gas usage.

[2] This does not include the natural gas use for Self-Direct Customers.

Figure 30 Industrial Electricity and Natural Gas Use by End Use (2011), All Industries



Total energy use was allocated to four key industries: petroleum, metals, food products and machinery. The remaining industries were grouped together in the "other industrial" category. Figure 31 presents the electric consumption by end-use and industry type. The petroleum industry is the largest user of electricity and motors are the dominant end use across all segments.

Figure 32 presents the natural gas consumption by end-use and industry type. The metals industry is largest in terms of natural gas use.

Figure 31 Industrial Electricity Use by End Use and Segment (GWh, 2011)

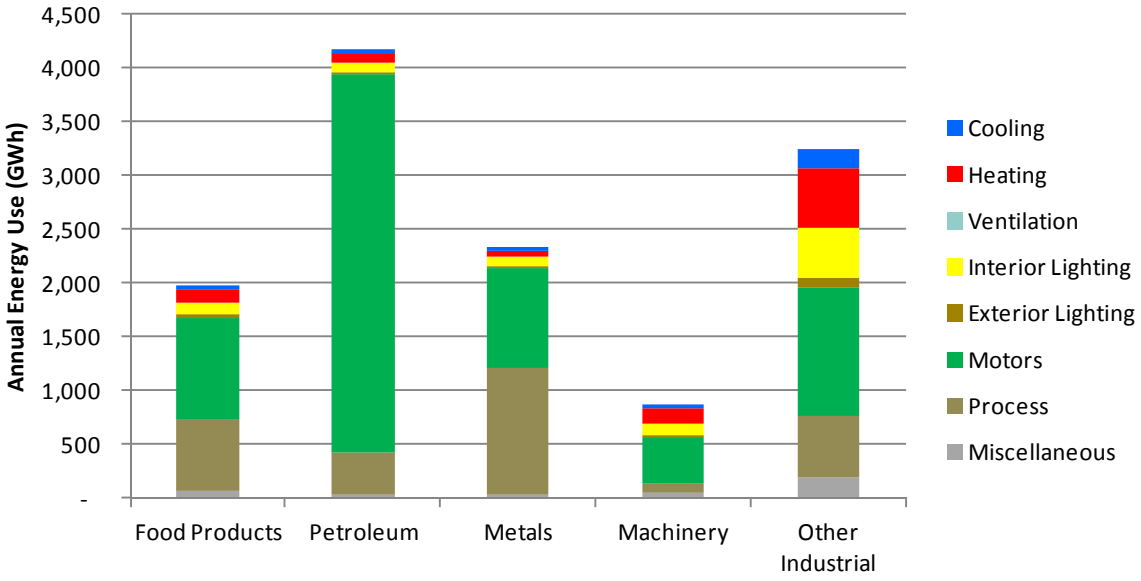
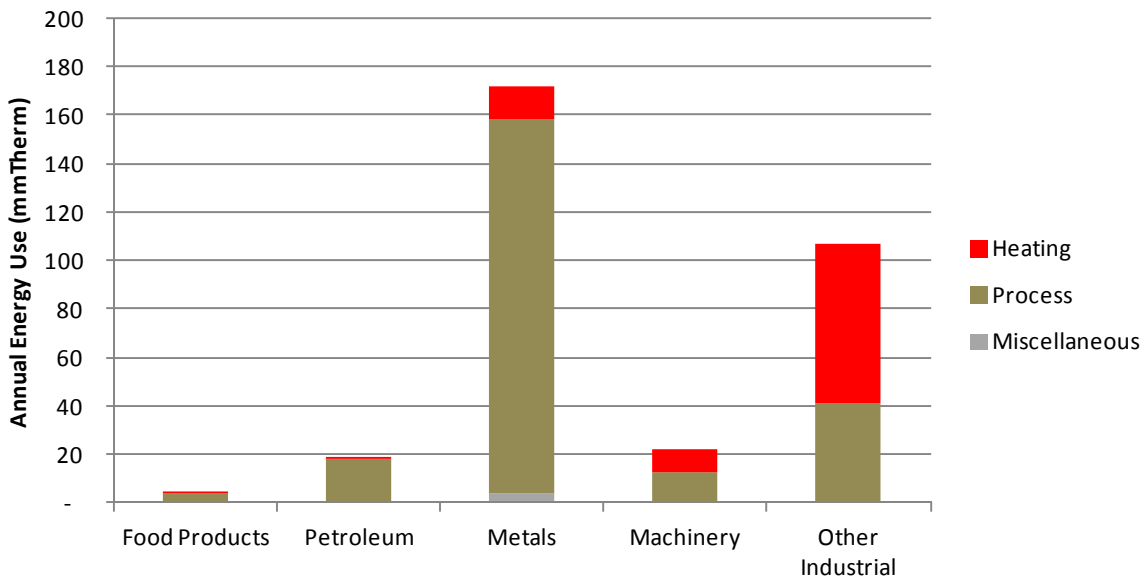


Figure 32 Industrial Natural Gas Use by End Use and Segment (Actual million therms, 2011)



Baseline Projection

The baseline projection is an end-use load forecast that incorporates a forecast of customer growth, changes in electricity and natural gas prices and trends in fuel shares. It also includes expected impact of appliance/equipment standards and building codes. For this study, we developed two baseline projections: one without naturally occurring efficiency and a second with naturally occurring efficiency. The baseline projections represent what the consumption is likely to be in the future in absence of new efficiency programs and it serves as the metric against which energy efficiency potentials are measured. In the following, we present the baseline forecast with naturally occurring efficiency.

Residential

Figure 33 presents the baseline projection for electricity at the end-use level for the residential sector as a whole. Residential use decreases from 11,577 GWh in 2011 to 10,712 GWh in 2016, a decrease of 4.2%, or an average reduction of 1.4% during the program years. This projection reflects the most recent wave of federal appliance efficiency standards, including the EISA lighting standard. The naturally occurring efficiency savings come primarily from interior lighting and exterior lighting, as customers adopt CFL light bulbs instead of the minimum standard.

Figure 34 presents the residential sector baseline projections for natural gas at the end use level.

Figure 33 Residential Electricity Baseline with Naturally Occurring Efficiency

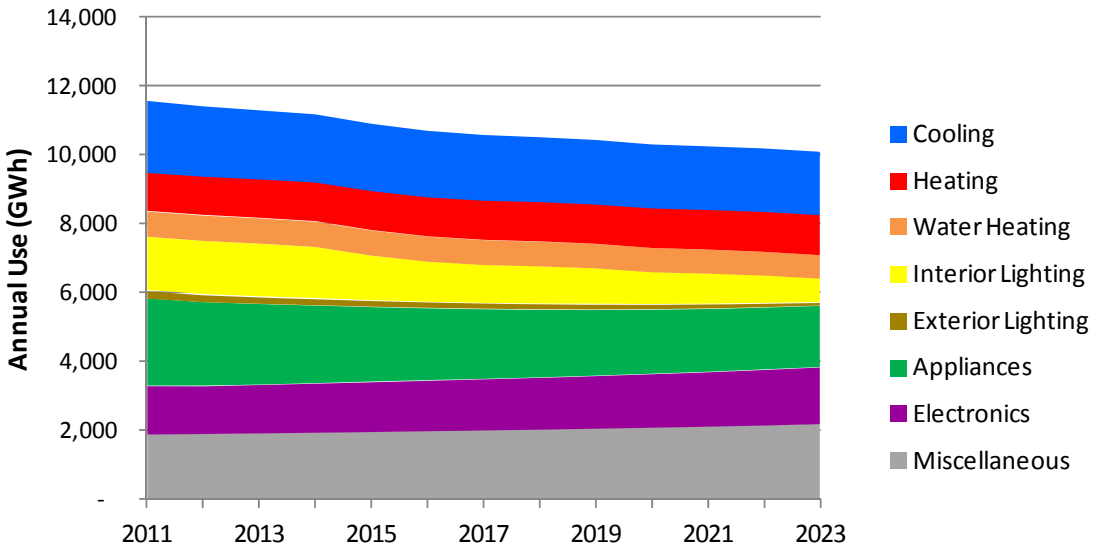
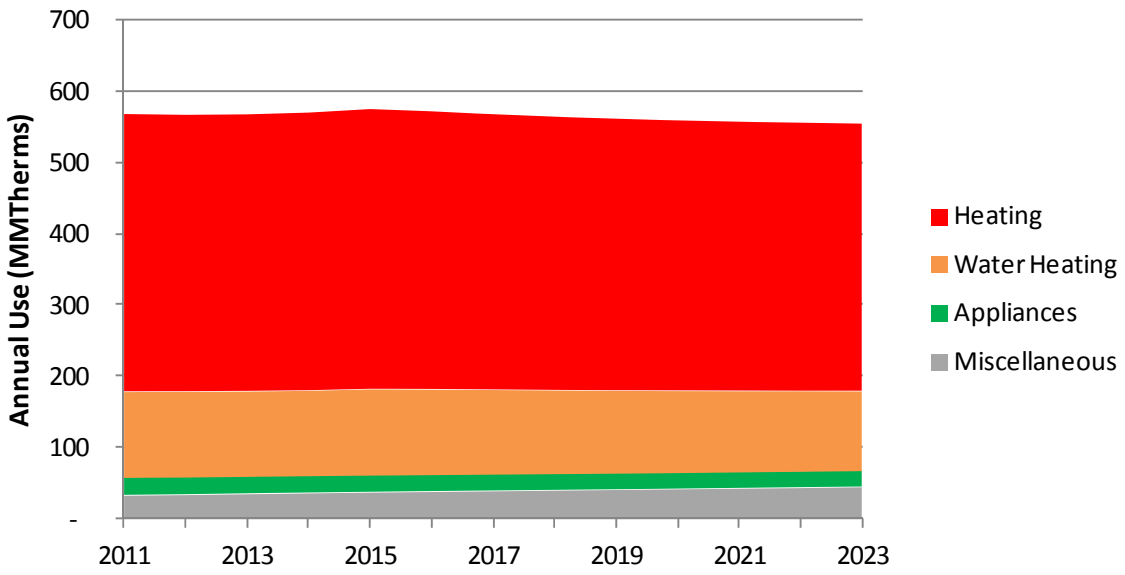


Figure 34 Residential Natural Gas Baseline with Naturally Occurring Efficiency



Commercial

Figure 35 presents the electricity baseline projection at the end-use level for the commercial sector as a whole. Electricity use shows a decline of 2% overall during the program years. Commercial usage starts at 12,414 GWh in 2011, and decreases to 11,332 GWh in 2016. This is a result of the EISA standard and customers adopting the higher efficiency lighting options that are currently available.

The natural gas baseline projection is shown in Figure 36. Natural gas use is projected to increase by only 1.8% between 2011 and 2016.

Figure 35 Commercial Electricity Baseline with Naturally Occurring Efficiency

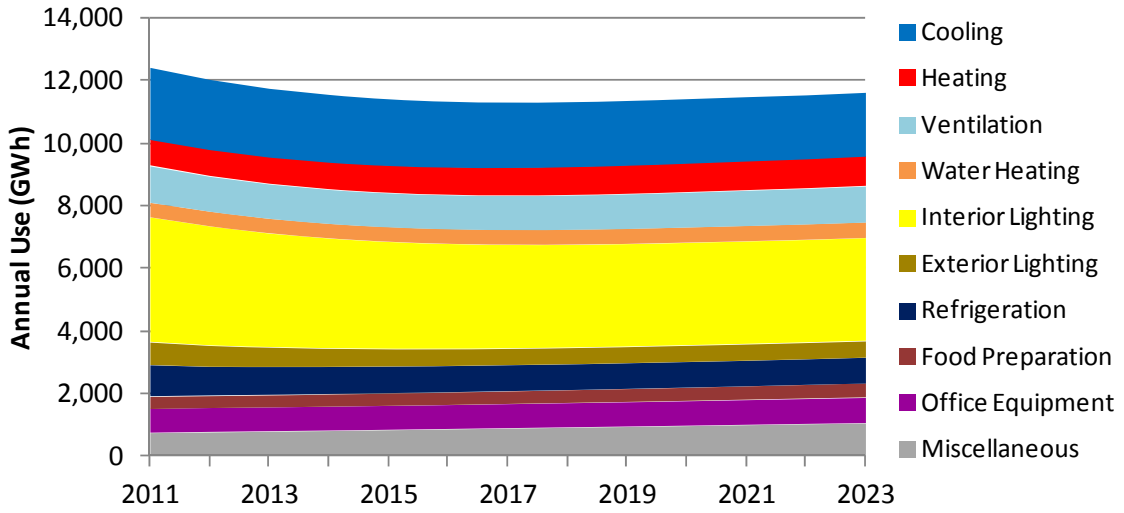
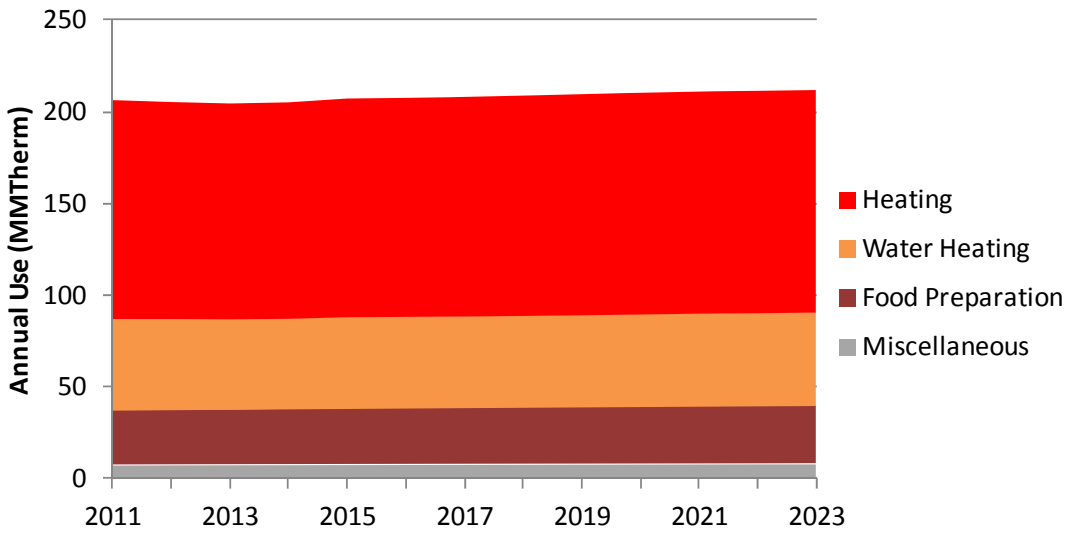


Figure 36 Commercial Natural Gas Baseline with Naturally Occurring Efficiency



Industrial

Figure 37 presents the industrial sector electricity baseline projection. Growth in this sector is projected to be fairly robust. Figure 38 shows a different story for the industrial natural gas baseline projection, which remains essentially flat from 2011 to 2016.

Figure 37 Industrial Electricity Baseline Projection with Naturally Occurring

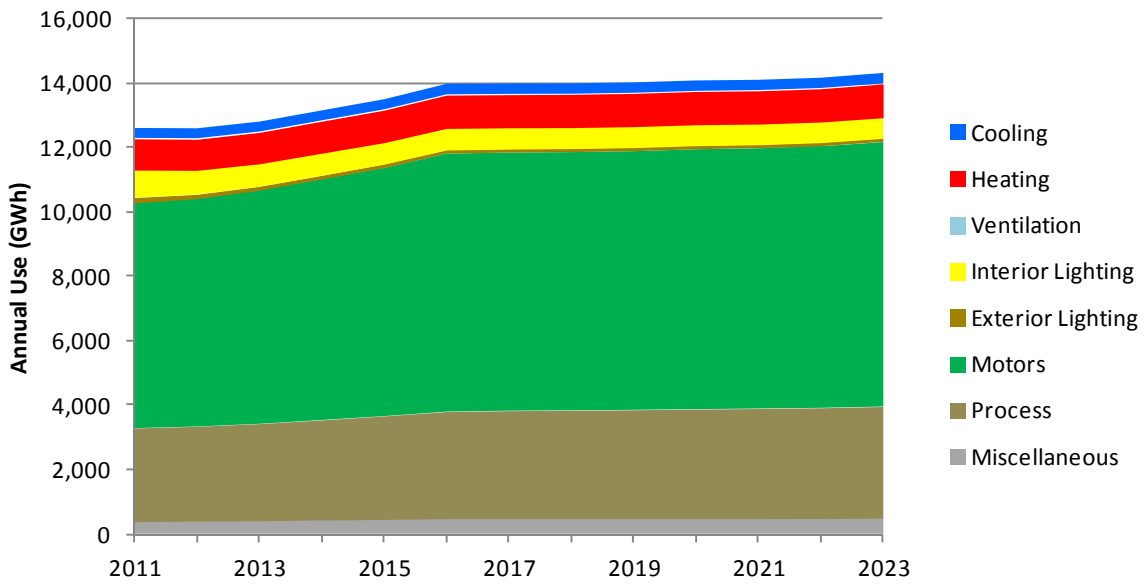
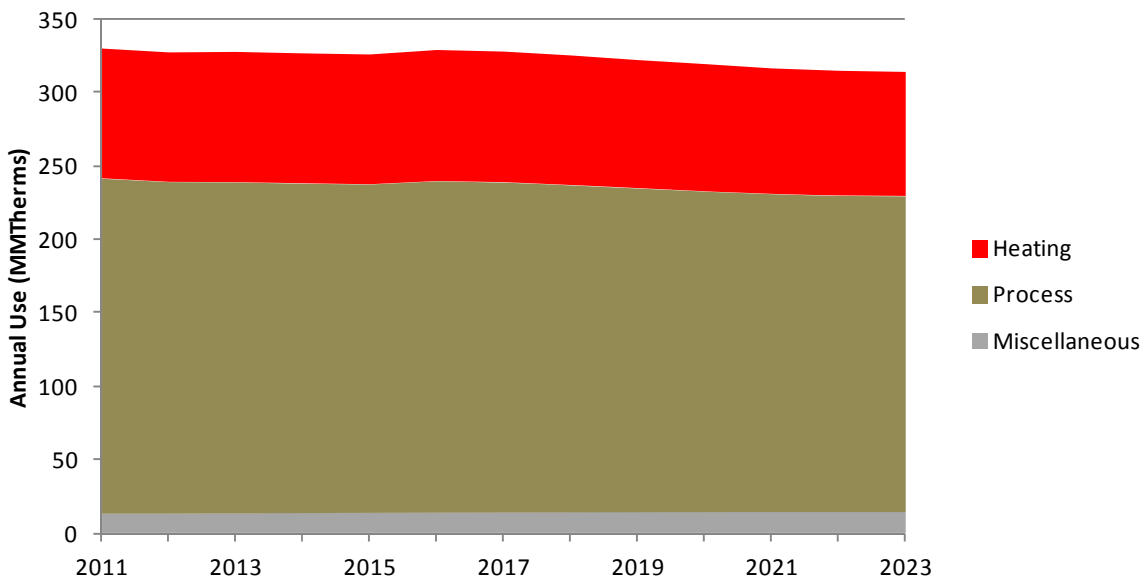


Figure 38 Industrial Natural Gas Baseline with Naturally Occurring Efficiency



Combining the three sectors, overall electricity and natural gas use are projected to be flat over the next program cycle (see Table 5 and Table 6).

Table 5 Electricity Baseline Projection Summary (GWh)

Sector	2011	2014	2015	2016	2023	% Change	Avg. Growth Rate
Residential	11,577	11,188	10,915	10,712	10,104	-7.5%	-1.6%
Commercial	12,414	11,547	11,415	11,332	11,613	-8.7%	-1.8%
Industrial	12,580	13,130	13,480	13,955	14,295	10.9%	2.1%
Total	**36,571**	**35,865**	**35,810**	**35,999**	**36,012**	**-1.6%**	**-0.3%**

Table 6 Natural Gas Baseline Projection Summary (million therms)

Sector	2011	2014	2015	2016	2023	% Change	Average Growth Rate
Residential	569	570	575	572	555	0.7%	0.1%
Commercial	207	205	207	208	212	0.6%	0.1%
Industrial	330	326	326	329	314	-0.3%	-0.1%
Total	**1,105**	**1,102**	**1,109**	**1,109**	**1,081**	**0.4%**	**0.1%**

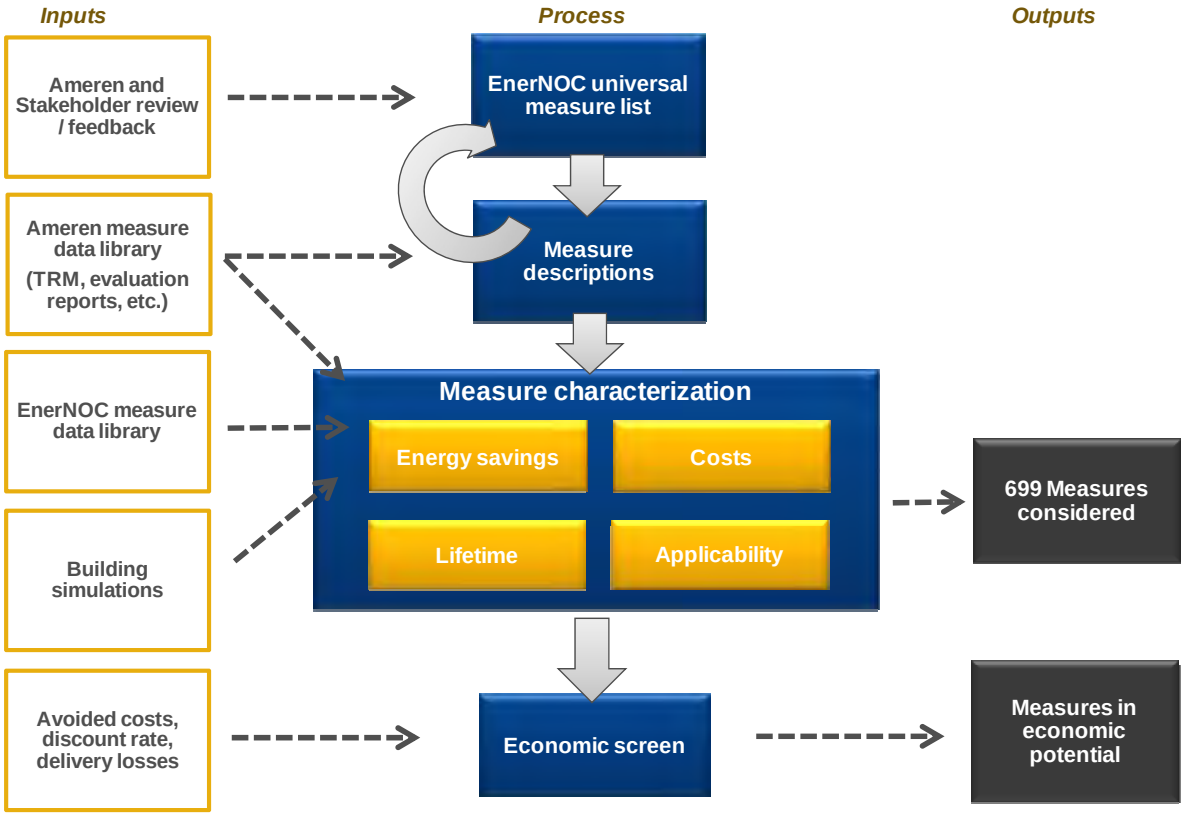
Potential Savings from Energy Efficiency Measures

Once the baseline projections were developed, analysis of energy-efficiency potential proceeded. This activity began with the identification and screening of energy-efficiency measures and continued with estimation of potential as described below.

EE Measure Database

The process for developing and characterizing energy-efficiency measures is depicted in Figure 39. The first step of the energy efficiency measure analysis is to identify the list of all relevant energy efficiency measures that should be considered for the Ameren Illinois potential assessment. The project team assembled this list of measures and it was vetted by stakeholders. Sources for the measure assumptions were primarily drawn from the Illinois TRM. Additional sources included Ameren Illinois past program experience, EnerNOC's building simulation tool (BEST), EnerNOC's measure database (DEEM), California's measure database (DEER), measure workbooks from the Northwest Power and Conservation Council, other secondary sources, and data from EnerNOC's previous studies and program work. Full measure characterization for each sector and segment can be found in Volume 6.

Figure 39 EE Measure Development Process



Measure-Level Energy Efficiency Potential

Electricity efficiency potential is summarized above in Figure 1 and recapped as follows:

- **Realistic Achievable Potential for Electricity.** In 2014, net realistic achievable savings are 483 GWh which is 1.3% of the baseline projection. By 2016, cumulative net realistic achievable savings grow to 1,093 GWh which represents 3.0% of the baseline projection.
- **Maximum Achievable Potential for Electricity**. In 2014, savings for this case are 630 GWh or 1.8% of the baseline and by 2016 cumulative net savings reach 1,432 GWh or 4.0% of the baseline projection.

Natural gas efficiency potential is summarized above in Figure 2. Achievable potential is summarized below.

- **Realistic Achievable Potential for Natural Gas**. In 2014, net realistic achievable savings are 6.1 (million therms) which is 0.5% of the baseline projection. By 2016, cumulative net realistic achievable savings grow to 14.1 (million therms) which represent 1.3% of the baseline.
- **Maximum Achievable Potential for Natural Gas**. In 2014 net savings for this case are 9.0 million therms or 0.8% of the baseline and by 2016 cumulative net savings reach 20.8 (million therms) or 1.9% of the baseline projection.

Below, we present results of the measure-level potential analysis for each sector.

Residential Measure Potential

Electricity potential for the residential sector is shown in Table 7.

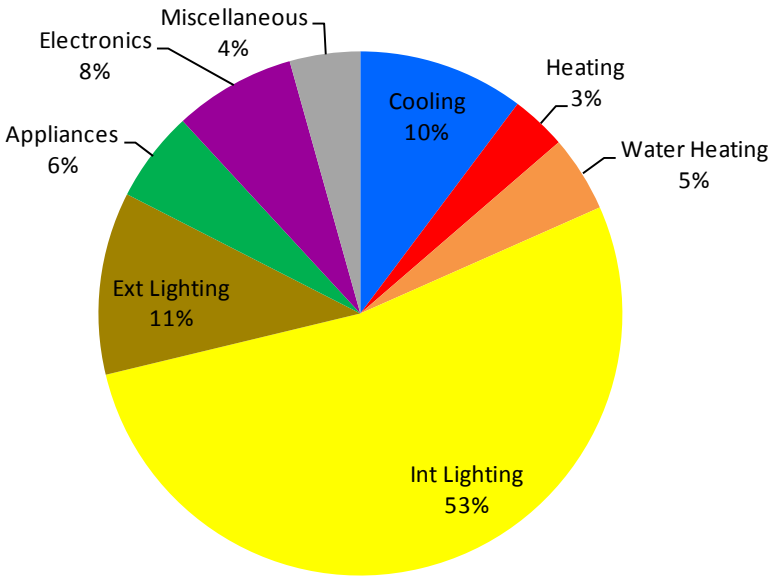
Table 7 Electricity Energy Efficiency Potential for the Residential Sector

	2014	2015	2016
Baseline Projection (GWh)	11,188	10,915	10,712
Cumulative Net Energy Savings (GWh)			
Realistic Achievable Potential	103	233	322
Maximum Achievable Potential	135	296	409
Economic Potential	317	721	996
Technical Potential	520	1,069	1,478
Energy Savings (% of Baseline)			
Realistic Achievable Potential	0.9%	2.1%	3.0%
Maximum Achievable Potential	1.2%	2.7%	3.8%
Economic Potential	2.8%	6.6%	9.3%
Technical Potential	4.7%	9.8%	13.8%

Figure 40 focuses on the net realistic achievable potential in program year 2016. Lighting equipment replacement accounts for the highest portion of the savings in the near term as a result of the efficiency gap between CFL lamps and advanced incandescent lamps, even those that will meet the EISA 2007 standard. Although Ameren Illinois has achieved significant savings in lighting already, there are still significant savings available by encouraging customers to adopt CFL lighting and more efficient specialty bulbs that are not affected by the EISA standard. Electronics, cooling, and appliances also contribute significantly to the savings. Detailed measure information is available in Volume 6, Appendix B. The key measures comprising the potential are listed below:

- Lighting: mostly CFL lamps and specialty bulbs
- Electronics (reduce standby wattage, televisions, set top boxes, PCs)
- Second refrigerator/ freezer removal
- HVAC: Removal of second room AC unit, efficient air conditioners, ducting repair/sealing, insulation, home energy management system and programmable thermostats

Figure 40 Residential Electric Realistic Achievable Potential by End Use in 2016



Natural gas efficiency potential is presented in Table 8 below.

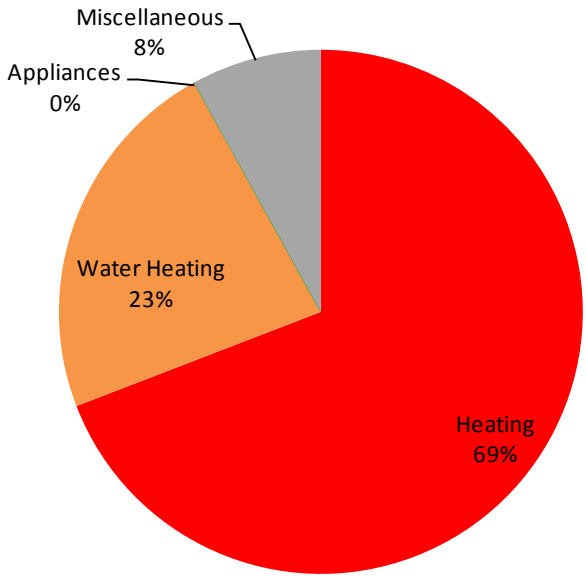
Table 8 Natural Gas Energy Efficiency Potential for the Residential Sector

	2014	2015	2016
Energy Projections (million therms)	570	575	572
Cumulative Net Energy Savings (million therms)			
Realistic Achievable Potential	2.6	4.1	6.3
Maximum Achievable Potential	3.8	6.1	9.2
Economic Potential	8.9	13.9	20.8
Technical Potential	15.1	23.9	34.8
Energy Savings (% of Baseline Projection)			
Realistic Achievable Potential	0.4%	0.7%	1.1%
Maximum Achievable Potential	0.7%	1.1%	1.6%
Economic Potential	1.6%	2.4%	3.6%
Technical Potential	2.6%	4.2%	6.1%

Figure 41 focuses on the range of net realistic achievable potential in 2016. As expected, space heating and water heating savings are the largest opportunities. The key measures comprising the potential are listed below:

- Efficient furnaces & boilers, boiler hot water reset ,ducting repair/sealing, insulation, home energy management system & programmable thermostats
- Efficient water heaters, low-flow showerheads, faucet aerators, and water heater tank blankets

Figure 41 Residential Natural Gas Realistic Achievable Potential by End Use in 2016



Commercial Potential

Electricity Efficiency Potential. The baseline projection for the commercial sector only grows slightly, which reflects the sluggish near-term economy and forthcoming codes and standards. Nevertheless, the opportunity for energy-efficiency savings is still significant for the commercial sector. Table 9 presents estimates for the four types of potential for the residential sector.

Table 9 Electricity Efficiency Potential for the Commercial Sector

	2014	2015	2016
Baseline Projection (GWh)	11,547	11,415	11,332
Cumulative Net Energy Savings (GWh)			
Realistic Achievable Potential	197	319	434
Maximum Achievable Potential	269	442	604
Economic Potential	440	704	950
Technical Potential	610	915	1,211
Savings (% of Baseline)			
Realistic Achievable Potential	1.7%	2.8%	3.8%
Maximum Achievable Potential	2.3%	3.9%	5.3%
Economic Potential	3.8%	6.2%	8.4%
Technical Potential	5.3%	8.0%	10.7%

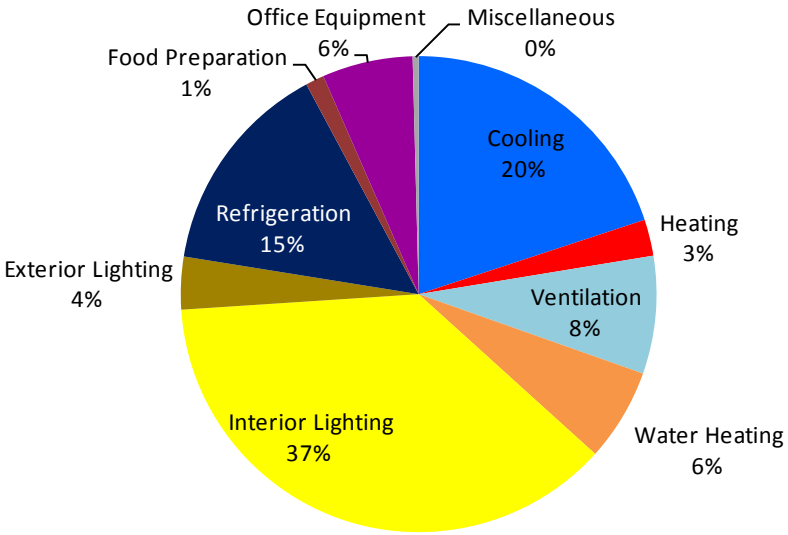
Figure 42 focuses on realistic achievable potential savings by end use. Not surprisingly, interior lighting delivers the highest achievable savings throughout the study period. In 2016, exterior

lighting is second, and refrigeration is third, followed in descending order by cooling, ventilation, office equipment, and small amounts of the other end uses.

Detailed measure information is available in Volume 6, Appendix C. The key measures comprising the potential are listed below:

- Lighting – CFLs, LED lamps, linear fluorescent, daylighting controls, occupancy sensors, and HID lamps for exterior lighting
- Energy management systems & programmable thermostats
- Ventilation – variable speed control
- Refrigeration – efficient equipment, control systems, and anti-sweat door heater
- Custom measures

Figure 42 Commercial Realistic Achievable Potential Electricity Savings by End Use in 2016



Natural Gas Efficiency Potential. Table 10 presents the net savings associated with each level of potential in the commercial sector.

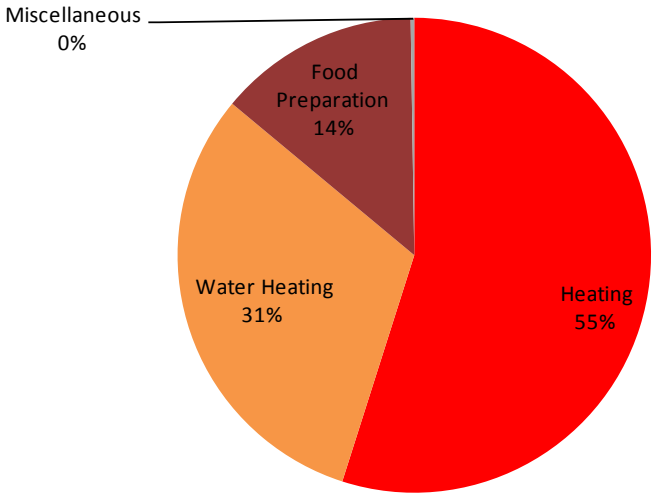
Table 10 Natural Gas Efficiency Potential for the Commercial Sector (million therms)

	2014	2015	2016
Energy Projections (million therms)	205	207	208
Cumulative Net Energy Savings (million therms)			
Realistic Achievable Potential	2.0	3.3	4.8
Maximum Achievable Potential	3.1	5.0	7.4
Economic Potential	5.0	8.1	11.8
Technical Potential	6.5	10.4	15.0
Energy Savings (% of Baseline Projection)			
Realistic Achievable Potential	1.0%	1.6%	2.3%
Maximum Achievable Potential	1.5%	2.4%	3.6%
Economic Potential	2.5%	3.9%	5.7%
Technical Potential	3.2%	5.0%	7.2%

Figure 43 below shows net realistic achievable potential savings by end use. Water heating provides the largest share of the savings, with heating and food preparation each successively smaller. The key measures comprising the potential are listed below:

- Energy management systems, programmable thermostats, HVAC occupancy sensors
- Efficient boilers, boiler maintenance, steam trap repair and hot water reset
- Efficient water heaters
- Efficient food preparation equipment for the restaurant segment
- Insulation and high efficiency windows

Figure 43 Commercial Natural Gas Realistic Achievable Potential Savings by End Use in 2016



Industrial EE Measure Potential

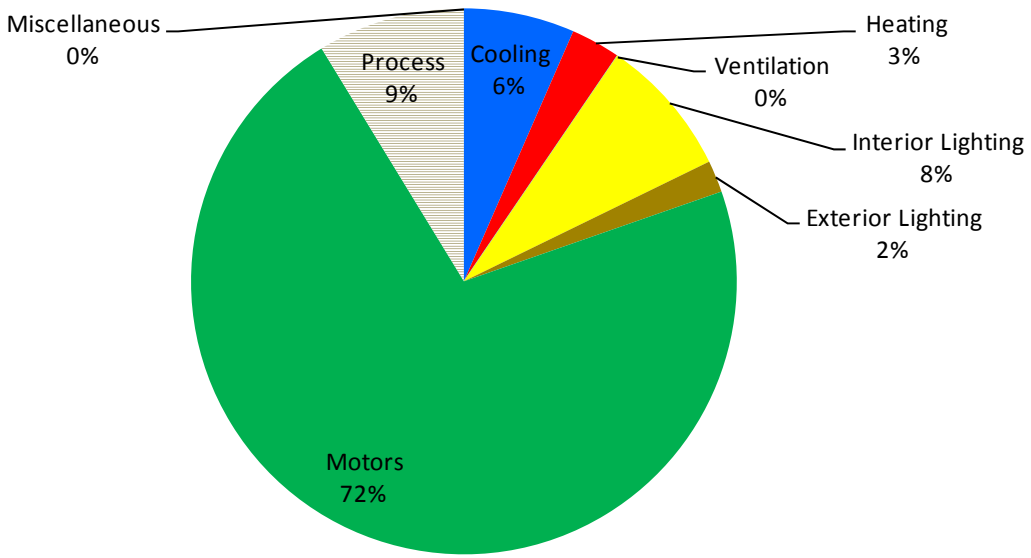
Electricity Efficiency Potential. The industrial sector in Ameren Illinois accounts for about one-third of total energy consumption, but slightly more than one-third of the potential electricity savings. Table 11 presents the net savings for the various types of potential considered in this study.

Table 11 Electric Efficiency Potential for the Industrial Sector

	2014	2015	2016
Energy Projections (GWh)	13,130	13,480	13,955
Cumulative Net Energy Savings (GWh)			
Realistic Achievable Potential	182	251	336
Maximum Achievable Potential	226	312	418
Economic Potential	392	533	705
Technical Potential	453	620	828
Energy Savings (% of Baseline Projection)			
Realistic Achievable Potential	1.4%	1.9%	2.4%
Maximum Achievable Potential	1.7%	2.3%	3.0%
Economic Potential	3.0%	4.0%	5.0%
Technical Potential	3.5%	4.6%	5.9%

Figure 44 illustrates the cumulative realistic achievable potential savings by electric end use in 2016 for the industrial sector. The largest shares of savings opportunities are in the motors and machine drives. Potential savings for straight equipment change-outs are diminishing due to the National Electrical Manufacturer's Association (NEMA) standards, which now make premium efficiency motors the baseline efficiency level. As a result, there are not substantially more efficient upgrade options to drive incremental efficiency improvements. Many of the savings opportunities in this end use come from controls, timers, and variable speed drives, which improve system efficiencies where motors are utilized. Beyond the replacement of motors, there are significant opportunities for savings in cooling, high-bay lighting, process timers and controls, ventilation, and finally space heating.

Figure 44 Industrial Realistic Achievable Electricity Potential Savings by End Use in 2016



Natural Gas Efficiency Potential. Table 12 presents the net cumulative savings for the various types of potential considered in this study for the industrial sector.

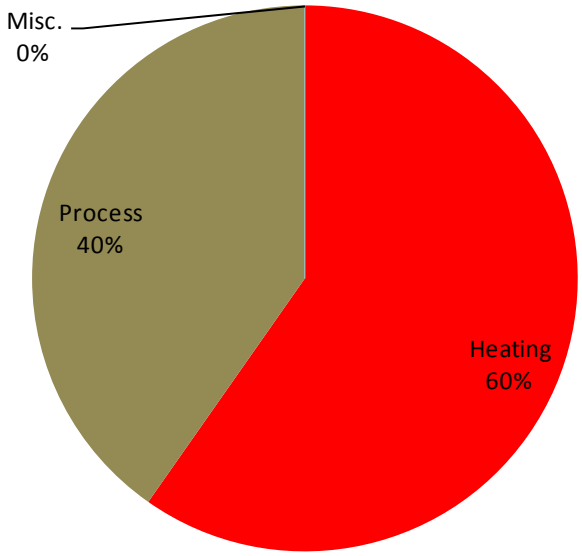
Table 12 Natural Gas Efficiency Potential for the Industrial Sector

	2014	2015	2016
Energy Projections (million therms)	326	326	329
Cumulative Net Energy Savings			
Realistic Achievable Potential	1.5	2.1	3.0
Maximum Achievable Potential	2.0	2.9	4.2
Economic Potential	3.5	4.9	6.9
Technical Potential	7.5	11.0	15.6
Energy Savings as a % of Baseline			
Realistic Achievable Potential	0.5%	0.6%	0.9%
Maximum Achievable Potential	0.6%	0.9%	1.3%
Economic Potential	1.1%	1.5%	2.1%
Technical Potential	2.3%	3.4%	4.7%

Figure 45 illustrates the net realistic achievable potential savings by natural gas end use in 2016 for the industrial sector. Space heating and process heating are the only opportunities to speak of. The key measures comprising the potential are listed below:

- Energy management systems & programmable thermostats
- Efficient boilers & furnaces
- Insulation

Figure 45 Industrial Natural Gas Realistic Achievable Potential Savings by End Use in 2016



Program Analysis

The measure-level estimates shown above for technical, economic, and achievable potential in this report were determined by screening measure for cost-effectiveness at the measure-level. This method does not take into account the program costs of delivering measures to end-use customers. The additional costs associated with the delivery of energy efficiency measures includes: Measure Incentives, Program Administration, Education and Marketing, Implementation, and Evaluation. For budgeting and cost-effectiveness purposes, the major categories are broken down into Incentives and Non-Incentives.

Utility Program Cost Assumptions. Utility program costs were developed for each program-level achievable potential scenario, with estimates of incentives and non-incentives required to achieve the related savings levels. The cost estimates were based on past program costs for Ameren Illinois, evaluations of past programs, and industry best practices.

Table 13 presents the program spending levels for each program-level achievable scenario. Also presented are Ameren Illinois' first year costs per energy saved for each scenario by fuel type. Key cost assumptions include:

- Incentives required to achieve savings ranged from 53-75% of measure incremental cost
- Non-Incentive costs required to achieve savings ranged from 23-37% of measure incremental cost
- First year electricity cost per kWh saved ranged from $0.25-0.40 per first year kWh saved
- First year natural gas cost per therm saved ranged from $3.16-4.63 per first year therm saved

Table 13 Cost Assumptions for Program Achievable Potential Scenarios

	Average Costs as Percent of Measure Cost		Average Utility cost per First-Year Unit of Energy Saved	
Achievable Scenario	**Incentive**	**Non-Incentive**	**Electricity ($/kWh)**	**Natural Gas ($/therm)**
Program Low	52%	23%	$0.25	$3.16
Program High	75%	37%	$0.40	$4.63

Costs to Achieve Program Potential. The costs associated with achieving energy efficiency potential are broken down into Incentive and Non-Incentive (Administration, Marketing, Delivery, and Evaluation) costs. The costs to achieve the electric and natural gas program-level potential are detailed in Table 14 and Table 15.

Table 14 Cost to Achieve Electric Program-Level Achievable Potential Scenarios

	2014	2015	2016
Incentive Costs			
Program Low	$59,572,278	$59,037,129	$64,800,584
Program High	$118,720,702	$117,397,971	$127,993,118
Non-Incentive Costs			
Program Low	$26,536,190	$26,077,992	$27,915,274
Program High	$58,991,921	$57,906,786	$61,777,189
Total Utility Costs			
Program Low	**$86,108,468**	**$85,115,121**	**$92,715,858**
Program High	**$177,712,622**	**$175,304,757**	**$189,770,307**

Table 15 Cost to Achieve Natural Gas Program-Level Achievable Potential Scenarios

	2014	2015	2016
Incentive Costs			
Program Low	$9,510,317	$9,576,566	$10,093,826
Program High	$19,740,073	$19,907,091	$21,227,937
Non-Incentive Costs			
Program Low	$3,771,990	$3,797,531	$3,930,407
Program High	$9,203,424	$9,274,397	$9,654,207
Total Utility Costs			
Program Low	**$13,282,307**	**$13,374,097**	**$14,024,233**
Program High	**$28,943,497**	**$29,181,488**	**$30,882,143**

About EnerNOC

EnerNOC's Utility Solutions Consulting team is part of EnerNOC's Utility Solutions, which provides a comprehensive suite of demand-side management (DSM) services to utilities and grid operators worldwide. Hundreds of utilities have leveraged our technology, our people, and our proven processes to make their energy efficiency (EE) and demand response (DR) initiatives a success. Utilities trust EnerNOC to work with them at every stage of the DSM program lifecycle – assessing market potential, designing effective programs, implementing those programs, and measuring program results.

EnerNOC's Utility Solutions deliver value to our utility clients through two separate practice areas – Implementation and Consulting.

- Our Implementation team leverages EnerNOC's deep "behind-the-meter expertise" and world-class technology platform to help utilities create and manage DR and EE programs that deliver reliable and cost-effective energy savings. We focus exclusively on the commercial and industrial (C&I) customer segments, with a track record of successful partnerships that spans more than a decade. Through a focus on high quality, measurable savings, EnerNOC has successfully delivered hundreds of thousands of MWh of energy efficiency for our utility clients, and we have thousands of MW of demand response capacity under management.
- The Consulting team provides expertise and analysis to support a broad range of utility DSM activities, including: potential assessments; end-use forecasts; integrated resource planning; EE, DR, and smart grid pilot and program design and administration; load research; technology assessments and demonstrations; evaluation, measurement and verification; and regulatory support.

The team has decades of combined experience in the utility DSM industry. The staff is comprised of professional electrical, mechanical, chemical, civil, industrial, and environmental engineers as well as economists, business planners, project managers, market researchers, load research professionals, and statisticians. Utilities view EnerNOC's experts as trusted advisors, and we work together collaboratively to make any DSM initiative a success.

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Ameren Illinois Energy Efficiency Market Potential Assessment

Report Number 1404

Volume 2: Market Research

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INTRODUCTION

Background

Ameren Illinois contracted with EnerNOC to conduct an electricity and natural gas Energy Efficiency (EE) Market Potential study covering the period of performance from June 1, 2014 through May 31, 2017 to aid the development of a three-year plan for programs implemented by Ameren Illinois in Cycle 3. In addition, the analysis also included the period of performance from June 1, 2017 through May 31, 2024 to aid in benchmarking and other tasks related to future analyses. This study identifies the potential to achieve the kWh and therm annual load reduction targets within the rated caps identified in Sections 8-103 and 8-104 of the Illinois Public Utilities Act. In addition, the electric component of the study identifies the potential to achieve additional kWh savings per Section 5/16-111.5Bnew of the Act absent rate cap limitations. This comprehensive study includes primary market research, a full demand side management (DSM) potential analysis for electricity and natural gas, energy efficiency program design, supply curve development, and analysis of wasted energy.

EnerNOC teamed with YouGov|Definitive Insights and Washington University in St. Louis to perform saturation surveys and program-interest research with Ameren Illinois customers. The EnerNOC team worked in collaboration with Applied Energy Group who, under separate contract with Ameren Illinois, performed the program analysis. This report represents the combined effort of these four organizations. This volume focuses on the results of the primary market research conducted with YouGov|Definitive Insights.

Objectives

Ameren Illinois is investigating the market potential for a wide variety of Demand Side Management (DSM) options by completing a comprehensive DSM Study which consists of three primary components: **market research**, a full **DSM potential analysis,** and **quantification of wasted energy due to customer behavior**. The market research component has collected electricity and natural gas end-use data, end-use saturation data, customer demographics and psychographic information that will provide insight on how Ameren Illinois customers make decisions related to electric and natural gas usage and energy efficiency investment decisions. This report describes the outcomes of that market research effort.

Broad questions embedded in this phase of this research that will help Ameren Illinois better understand energy-efficiency potential include:

- How likely are customers to participate in various electric- or natural gas-related energy efficiency programs Ameren Illinois is considering offering?
- Which of these energy efficiency measures offer the highest likely participation rates?
- How does likelihood to participate differ by payback period for customers?
- What overall demographic/firmographic and psychographic characteristics correspond to a higher likelihood to participate in energy efficiency programs?
- What segments can be derived within each sector, and how do these segments differ in terms of their impact on the likelihood to participate, as well as on customer demographic/firmographic and psychographic characteristics?
- Which of these segments represent the best opportunities for Ameren Illinois to focus their marketing on?
- What messaging strategies would likely be useful to help foster participation among these high opportunity segments?

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Report Organization

This report is presented in 6 volumes as outlined below. This document is **Volume 2: Market Research Report**.

- Volume 1, Executive Summary
- Volume 2, Market Research Report
- Volume 3, Energy Efficiency Potential Analysis
- Volume 4, Program Analysis
- Volume 5, Supply Curves
- Volume 6, EE Potential Analysis Appendices

RESIDENTIAL METHODOLOGY

This section covers sample design, questionnaire development and data analysis for the residential sector.

Sample Design

Ameren Illinois provided the EnerNOC team with billing data for all residential and business customers. This customer data included a variety of information for each customer, including name, address, annual kWh usage, annual therm usage, division, account number, etc. The EnerNOC team created a sample design with 48 separate sample cells – against which survey responses were targeted and monitored, and which took into account gas usage, electric usage and region / climate zone – which was implemented separately and independently for each of the two surveys (the Program Interest survey and the Saturation survey).

The EnerNOC team generated a total of approximately 42,000 randomly selected households distributed across six separate and independent sample tranches (three per survey). In total, postcard invitations were mailed to the households included in sample tranches one and two for the Program Interest survey and tranches one and two for the Saturation survey (with approximately 13,000 postcards mailed for each of the two surveys). Postcards invited respondents to go online and complete the survey. Customers were offered a $10 check for completing the survey. Although the team prepared for three tranches, the sample targets were hit with tranche 2 respondents.

In order to qualify to complete the survey, respondents had to meet the following criteria:

- Must have primary or shared responsibility for making energy-related decisions
- Must be at least 18 years old
- Must not work for a gas or electric utility company and must not have a household member that works for a gas or electric utility company
- Must be billed for electricity or natural gas directly by Ameren Illinois

A total of 749 Ameren Illinois Residential customers completed the Program Interest survey, while 726 completed the Saturation survey.

- Approximately 88% of those who attempted to complete the survey qualified based on applying the criteria above.
- The overall net response rate was approximately 8%
- Approximately 14% of those who started the surveys abandoned them before completing the survey.
- Average online survey length was about 25-30 minutes depending on the survey

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Questionnaires

The **Program Interest** questionnaire was designed to cover multiple content areas, including:

1. Screening questions
2. Description of major end uses in the household
3. Attitudes toward Ameren Illinois
4. Attitudes toward using energy
5. Energy efficiency measures implemented to-date (with a focus on lighting)
6. Attitudes toward appliance purchasing
7. Interest in potential EE programs that could be offered by Ameren Illinois
8. Attitudes toward shopping
9. Demographics

The **Saturation** questionnaire was designed to cover multiple content areas, including:

1. Screening questions
2. Description of household structure (including windows)
3. Description of heating and cooling equipment
4. Description of lighting (bulbs and fixtures / interior and exterior)
5. Description of major appliances
6. Description of energy related actions
7. Awareness of EE-related energy programs
8. Demographics

Data Analysis

Estimating Take Rates

Market researchers have long recognized that customers tend to over-estimate their likelihood to participate in new programs and services within the context of a market research study:

- This means that it has been long recognized that some customers who say that they would be "certain" to participate in a given program in a survey would, in reality, not participate
- This is often referred to as the "say-do" problem; the problem that survey respondents are typically more likely to say they would do something than actually end up doing it
- The analytic challenge, as a result, is to appropriately adjust stated likelihood-to-participate ratings into more realistic estimates of likely customer response
- Different options are available for making these adjustments, and the best option depends in part on the nature of the product, service, or program being evaluated. For example, reactions to socially desirable (including "green") options need to be adjusted down more aggressively, while those for certain new technologies need to be adjusted less.
- The method used by the YGDI / EnerNOC team is based on proprietary research conducted by YGDI during 2010. This research captured stated likelihood to adopt / purchase a variety of new products / services, at one point in time, and then tracked actual product / service adoption /

purchase over 6 -12 months. As we expected, people were less likely to actually purchase products / services than they estimated they would at an earlier point in time1.

- The primary adjustment factors that were observed in that research were used here to translate "stated intent" to realistic estimates of likely behavior, and they are outlined in the table below. The adjustment factors depend on how the respondent answered each of the "likelihood to acquire" questions, AND on their level of information about, and familiarity with, EE issues
- Note that these primary adjustment factors are intended to apply to relatively infrequent purchases (no more often than once a year or so). For more regular purchases – those that occur several times a year – YGDI uses a somewhat different formula, and information about this "regular purchase adjustment" is provided later in this section.
- Essentially, the primary adjustment for irregular purchases says that among those respondents who rate a given program as a "10" ("extremely likely to participate") AND if who are rated as "high" on EE information / familiarity, then realistically, about 41% of those people will ultimately sign up for the program. At the other end of the scale, it says that among the respondents who rate their likelihood to participate as a "1" on the scale ("extremely unlikely to participate"), only 5% of those households will ultimately sign up for the program. For purposes of this analysis, the team assumed that Ameren Illinois could potentially achieve "high" information levels for all customers, and so used those adjustment rates for all respondents.

Table 2-1 Translating Stated Intent into Take Rates for Irregular Purchases

Scale Rating	Adjustment Value for Those High on Information
1	5%
2	5%
3	6%
4	6%
5	18%
6	20%
7	31%
8	38%
9	44%
10	56%

As noted above, YGDI uses a different adjustment for products that are purchased more frequently, since customers are more familiar with their "choice set" and have typical purchases that they tend to make in a given category. Lighting is the only measure tested in this survey which falls into this "regular purchase" category, and the adjustment values outlined below were used for this option and applied them the same way that was outlined above. Note that Information level (familiarity with the category) is not used as a differentiator in adjustments for this category since – by definition – all "buyers" are more familiar with regular purchases.

[1] The research tested the purchase of a wide array of products, equipment, or services ranging from relatively expensive ($2,500+) to relatively less expensive products and services. Note that these were a wide range of products services and did not focus on testing energy efficiency products.

Table 2-2 Translating Stated Intent into Take Rates for REGULAR Purchases

Scale Rating	Adjustment Value for Regular Purchases
1	3%
2	3%
3	3%
4	8%
5	15%
6	22%
7	35%
8	40%
9	44%
10	62%

Testing Programs at Different Payback Levels

In order to provide insight about the impact that varying payback periods might have on customer response to the programs tested, the survey explored response to each program for which payback period was relevant, at 1, 3, and 5 year payback levels. The survey used a method developed by an economist by the name of von Westendorp to capture this information; this technique begins by asking respondents to assess their likelihood to adopt a program at a 3 year payback, and then (a) if they respond positively to this option, asks them to respond to a 5 year payback, or (b) if they respond negatively to this option, asks them to respond to a 1 year payback period. In order to deal with issues of survey length, the tested program measures were sorted into different categories that were similar in terms of scale of investment and type of measure. The full 1, 3, and 5 year payback assessment were then conducted for a single program within each category. The remaining programs within each category were evaluated at the 3 year payback level only. Regression analysis was then used to develop the 1 and 5 year payback values for each measure, using the slopes observed for the example program in each category.

Weighting

In order to better mirror the residential market in Ameren Illinois's service territory, data were weighted on the basis of the 48 sample cells, in order to ensure that the weighted sample mapped back to the underlying population on electric usage, gas usage, and region / zone.

Psychographic Segmentation Analysis

One of the goals of the analysis was to explore whether or not there were psychographic customer segments that could be helpful in providing an understanding of why customers responded as they did to the programs tested, and to support initial thinking about how to prioritize marketing efforts and marketing communications. Several steps were involved in developing this psychographic segmentation:

First, the team analyzed the groups of items that were included in the questionnaire which were designed to generate psychographic insights (these included Q1-5 (questions addressing opinions toward Ameren Illinois), Q6 (questions exploring how customers think about using energy in their home), Q22-Q24 (questions about appliance purchasing attitudes), and Q41 (questions about how people shop for appliances)).

Second, the team conducted analyses that were intended to identify groups of items that respondents tended to evaluate similarly. This process is called “factor analysis,” and refers to the process of finding and interpreting these groups of items that people think of as similar. The results of the factor analyses conducted in this work are described in Chapter 3, section 2: Understanding Customer Perspectives on Energy Issues in which we outline the six separate attitude bundles that appeared to best describe the way that residential customers think about energy issues.

Third, the team considered all of the attitudinal factors that were identified in step two, along with a variety of other variables to find the ones that generated the most useful segmentation model. This was partly a trial and error process, but ultimately, the variables selected to be included in the segmentation model included:

- Overall satisfaction with Ameren Illinois (Q3)
- Overall importance rating given to the question of how important they believe it is for Ameren Illinois to actively encourage its customers to participate in energy saving, and cost saving programs (Q4-1)
- Agreement / disagreement with the item “You are very concerned about the environmental effect of electric power plants” (Q6-5)
- Agreement / disagreement with the item “Conserving energy at your home will make no difference to the quality of the environment overall” (Q6-6)
- Agreement / disagreement with the item “You would do more to make your home more energy efficient, but you don’t know where to start” (Q6-7)
- Agreement / disagreement with the item “It’s worth spending more money to get the highest quality product available” (Q24-6)
- A calculated variable that was called “EE Informed Level” and was based on indicators of experience with / awareness of EE end use options to-date, and awareness and use of existing Ameren EE programs
- A calculated variable that was called “Likely Taker Level” and was based on a count of the frequency that a given respondent rated themselves as “8” or higher on the “1” to “10” likelihood to participate scale for each of the 25 EE programs tested

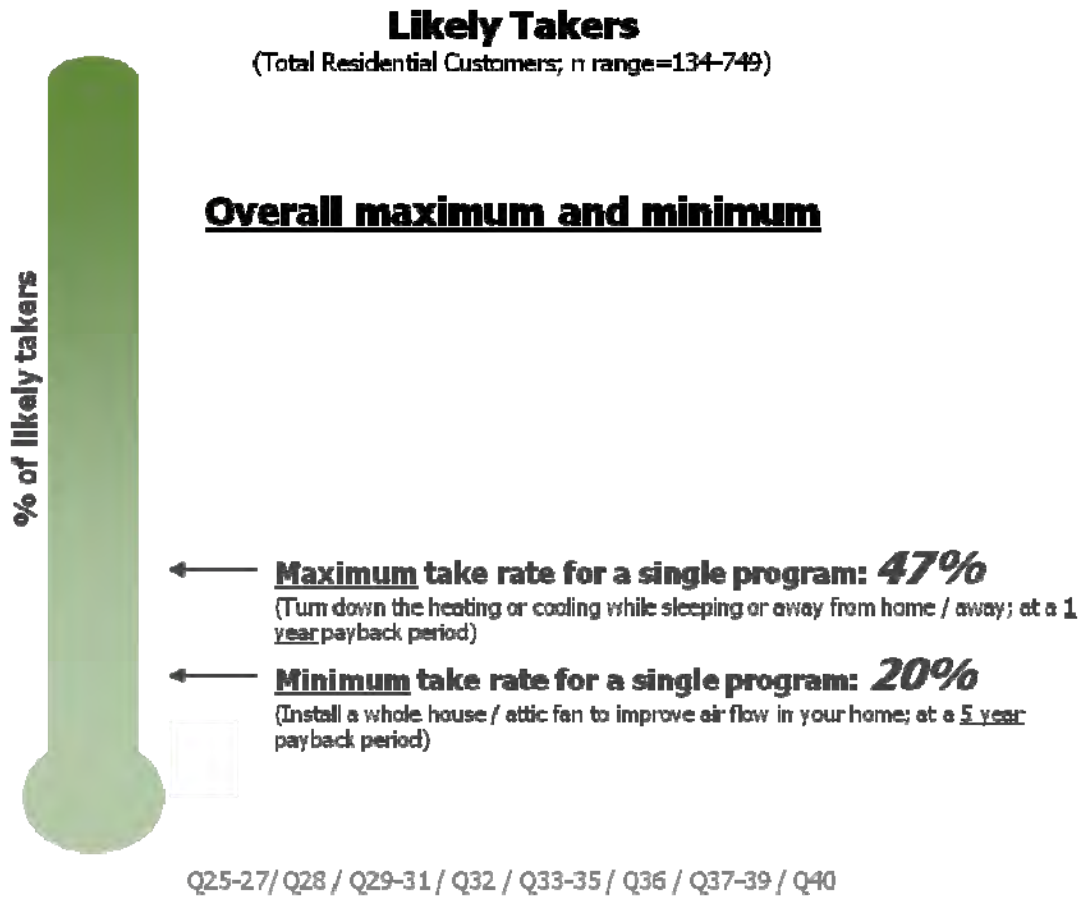
Once these inputs were identified, the team tested a wide variety of segmentation solutions, ultimately selecting a solution that optimized relative segment size, absolute segment sample size, and overall meaningfulness of segment profiles. The solution selected as most appropriate was a solution containing 6 segments with different response patterns to the final set of selected segmentation inputs.

RESIDENTIAL PROGRAM INTEREST SURVEY RESULTS

Note that the "take rates" that are reported in this chapter have been adjusted using the say / do adjustment model referenced in Chapter 2. As such, they represent the team's best estimate of the most likely proportion of customers who would actively sign up for each program, given that they were eligible to do so, and were fully aware of the program and its potential benefits for them.

The range of take rates across the full range of programs / measures tested spans from a low of around one-fifth of all eligible customers to a high of just under one-half of all eligible customers (Figure 3-1).

Figure 3-1 Maximum and Minimum Take Rates for Residential Customers



The first full category of EE measures that were explored considered the idea of purchasing higher than standard efficiency appliances within the context of a normal replacement cycle. As shown in Figure 3-2, within the ten appliances or end uses considered, refrigerators and light bulbs were the technologies that residential customers are estimated to be the most likely to upgrade to an EE option at each payback period level (for light bulbs, this is largely due to the use of the "regular purchase" adjustment for this product category). Across the other technologies, the take rates don't differ greatly (ranging from a high of 41% to a low of 32% at a one year payback level). As expected, take rates are higher for lower payback periods.

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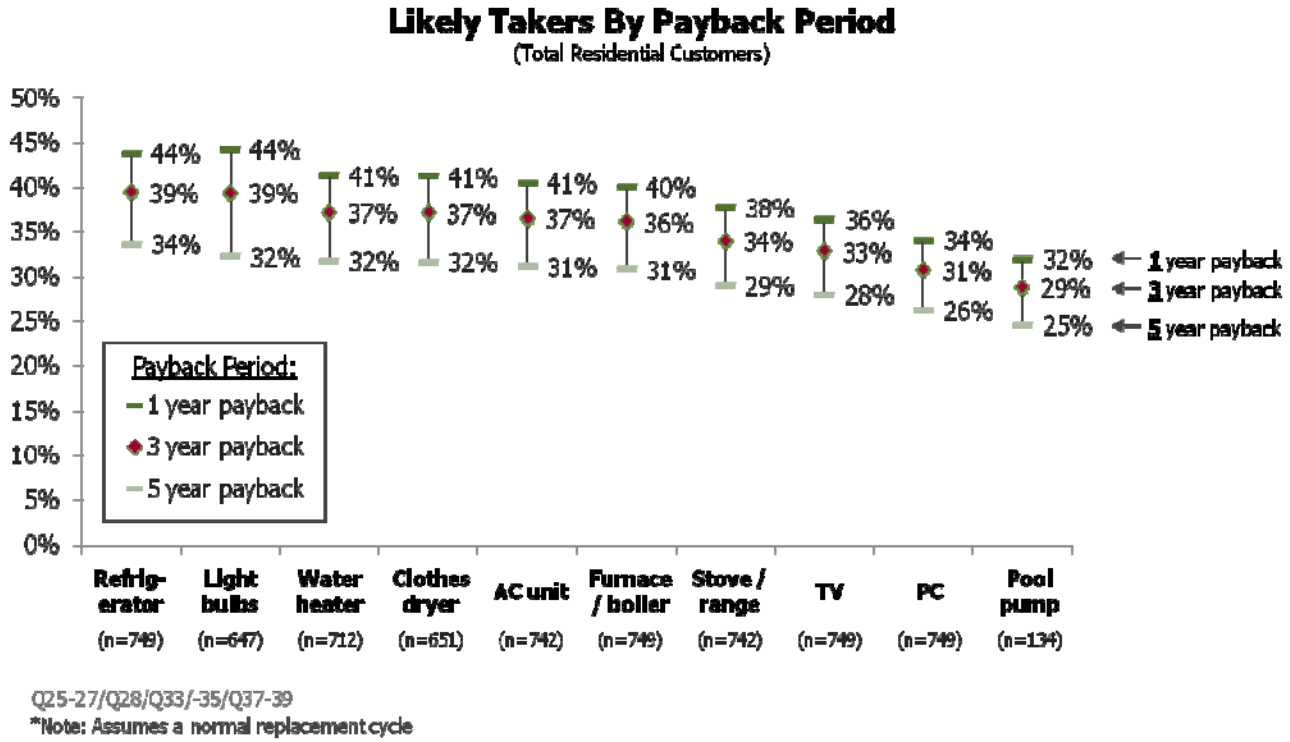
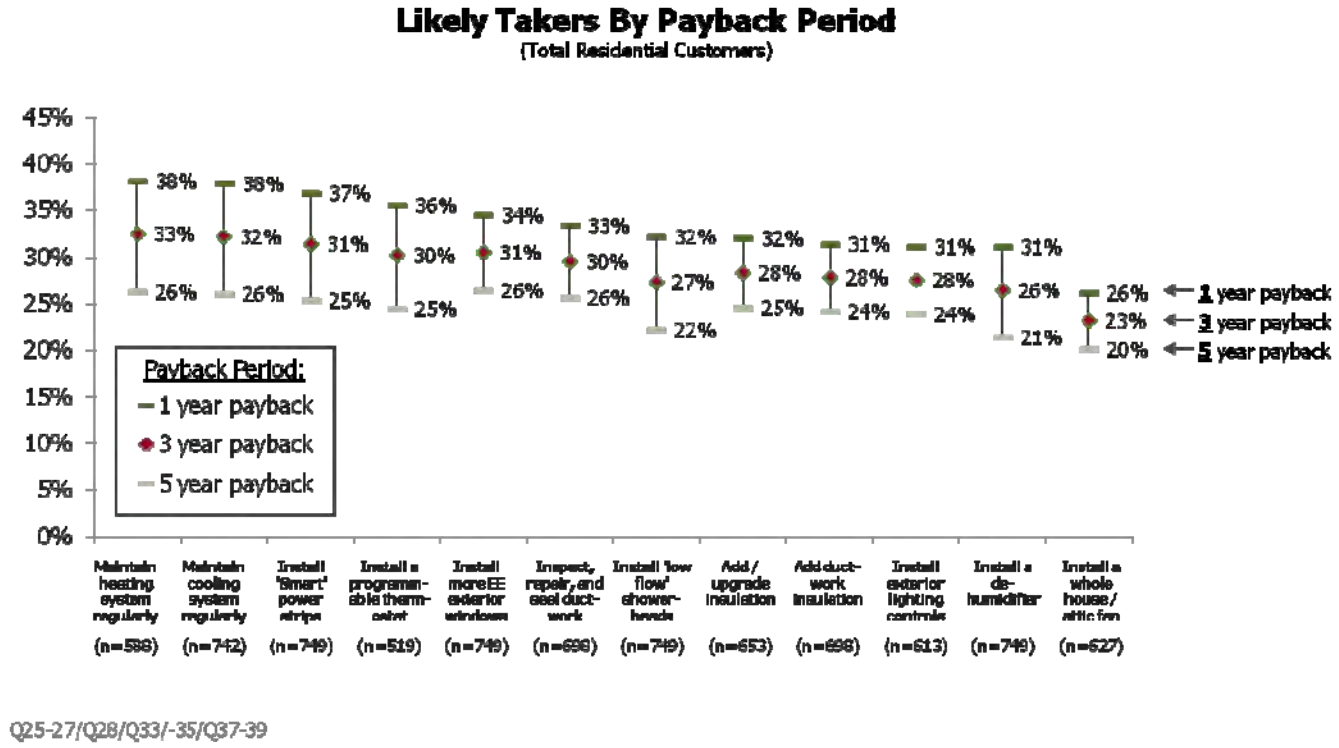
Figure 3-2 Measures for Purchasing / Installing Energy Efficient Equipment*



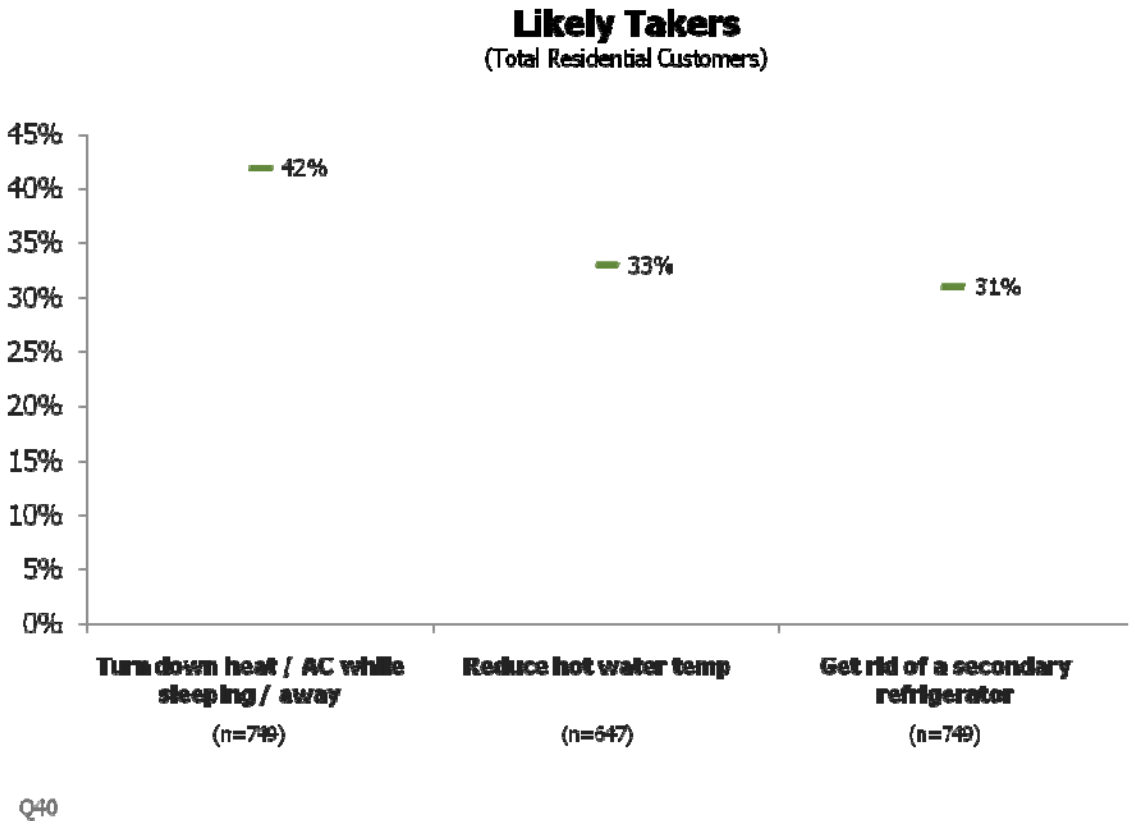
Among a dozen options having to do with housing envelope upgrades, or improved maintenance, Figure 3-3 shows that residential customers indicate a slightly higher likelihood to maintain heating or cooling systems. Once again, the take rates only differ somewhat across these options (going from a high of 38% for regularly maintaining the home's heating system at a one year payback to a low of 26% at the same payback level for installing a whole house fan).

Figure 3-3 Measures for Improving Energy Efficiency of Existing Systems



The last group of measures tested includes more traditional energy conservation measures that do not require any up-front investment on the part of the customer. As such, these measures are not associated with different payback periods (Figure 3-4).

Figure 3-4 Measures Not Requiring an Investment by the Customer (and not involving a payback period)



Considering all of the measures tested, as shown in Table 3-1the group of measures with the highest adoption rates is comprised almost entirely of measures associated with purchasing or installing energy efficient equipment". It is interesting to note that, because they are based on a normal replacement cycle, the measures in the "Purchasing / Installing Energy Efficient Equipment" group are among those that take the least amount of additional effort to implement, especially in comparison to the measures with the lowest take rates.

Table 3-1 Opportunities for Measures, High to Low

Measures: Highest Opportunity	Likely Takers @ 3yr Payback (or payback irrelevant for *No Upfront Investment Measures)* (n range=134-749)	Measures for:
Turn down the heating or cooling while sleeping/away from home[2]	42%	No Upfront Investment
Purchase an EE refrigerator[3]	39%	Purchasing / Installing EE Equipment
Purchase EE light bulbs[2]	39%	Purchasing / Installing EE Equipment
Purchase an EE water heater[2]	37%	Purchasing / Installing EE Equipment
Purchase an EE clothes dryer[2]	37%	Purchasing / Installing EE Equipment
Purchase an EE air conditioner[2]	37%	Purchasing / Installing EE Equipment
Purchase an EE furnace / boiler[2]	36%	Purchasing / Installing EE Equipment
Measures: Middle Opportunity	**Likely Takers @ 3yr Payback (n range=134-749)**	**Measures for:**
Purchase an EE stovetop or range[2]	34%	Purchasing / Installing EE Equipment
Purchase an EE color TV[2]	33%	Purchasing / Installing EE Equipment
Reduce water heater temperature[1]	33%	No Upfront Investment
Maintain heating system regularly	33%	Improving EE of Existing Systems
Maintain cooling system regularly	32%	Improving EE of Existing Systems
Install more EE exterior windows	31%	Improving EE of Existing Systems
Install 'Smart' power strips	31%	Purchasing / Installing EE Equipment
Get rid of a secondary refrigerator[1]	31%	No Upfront Investment
Purchase an EE personal computer[2]	31%	Purchasing / Installing EE Equipment
Inspect / repair HVAC ductwork	30%	Improving EE of Existing Systems
Install a programmable thermostat	30%	Improving EE of Existing Systems
Measures: Lowest Opportunity	**Likely Takers @ 3yr Payback (n range=134-749)**	**Measures for:**
Swimming pool pump	29%	Improving EE of Existing Systems
Add / upgrade home insulation	28%	Improving EE of Existing Systems
Add HVAC ductwork insulation	28%	Improving EE of Existing Systems
Install exterior lighting controls	28%	Improving EE of Existing Systems
Install 'low flow' showerheads	27%	Improving EE of Existing Systems
Install a dehumidifier	26%	Improving EE of Existing Systems
Install a whole house / attic fan	23%	Improving EE of Existing Systems

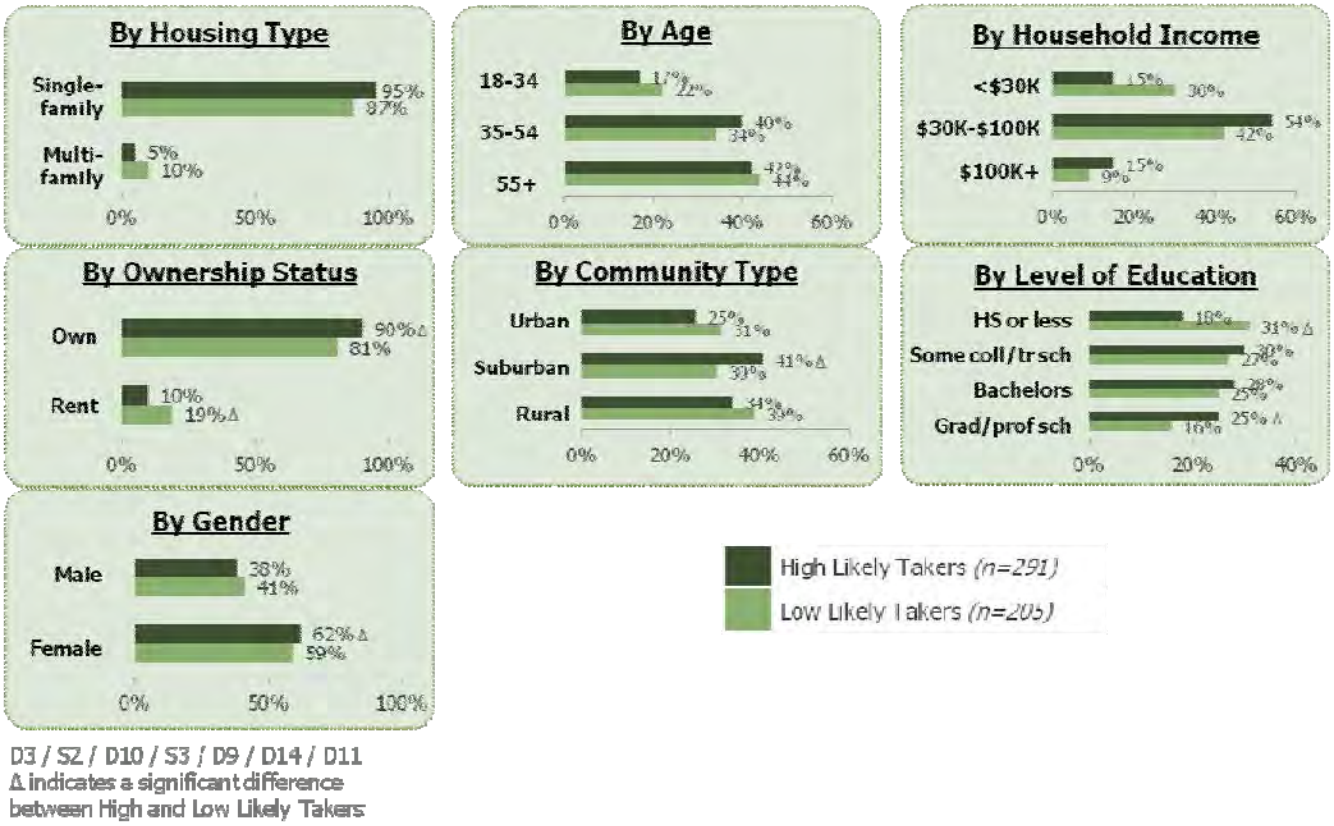
Some subtle differences exist in the mean take rates among various demographic groups (Figure 3-5). Groups exhibiting the higher opportunity than their counterparts include:

- Individuals who own their own home

[2] No Payback period associated with measure
[3] Assumes a normal replacement cycle

- Individuals living in suburban areas
- Households with greater than $30,000 in annual income
- Individuals having achieved some college/trade school or graduate/professional school
- Females

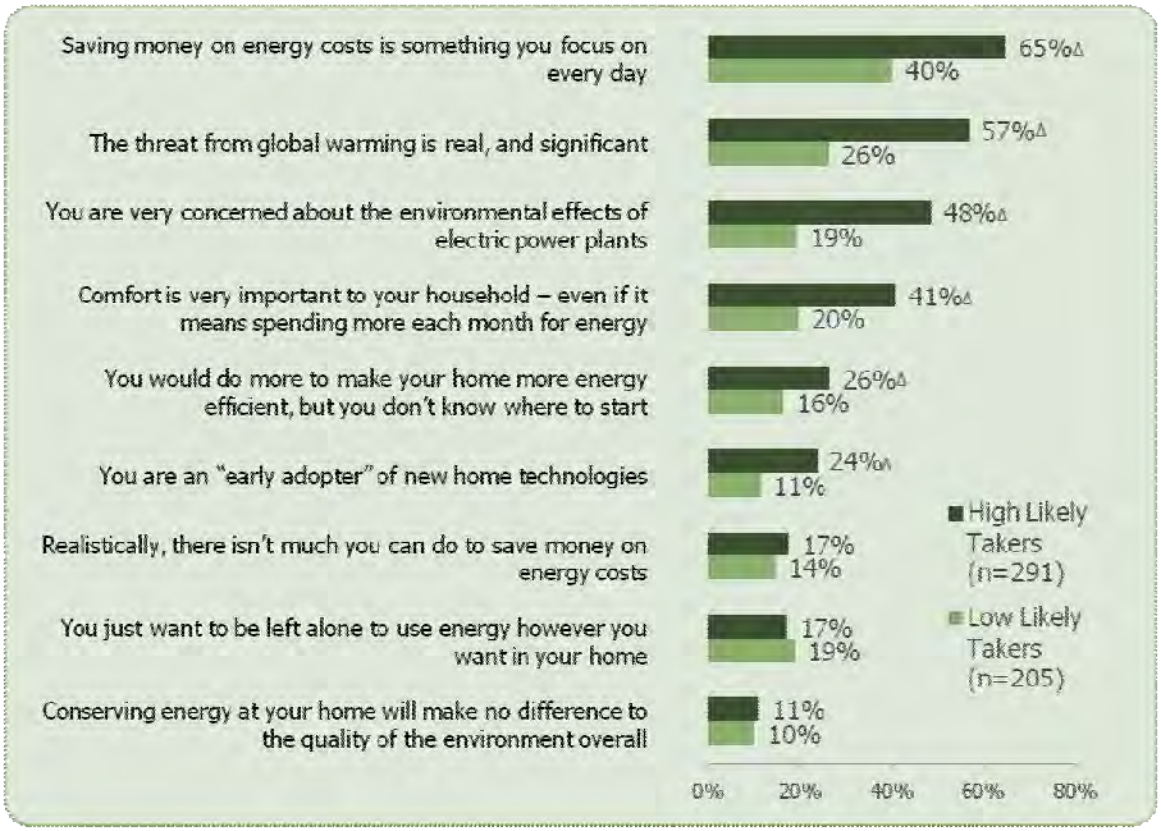
Figure 3-5 Likely Takers by Demographic Differences



D3 / S2 / D10 / S3 / D9 / D14 / D11
Δ indicates a significant difference between High and Low Likely Takers

More striking differences in the mean take rate, however, relate to attitudinal differences as shown in Figure 3-6. Unsurprisingly, customers who have highly "green" and/or highly cost-savings-focused attitudes consistently show much higher likelihoods to adopt energy efficiency measures.

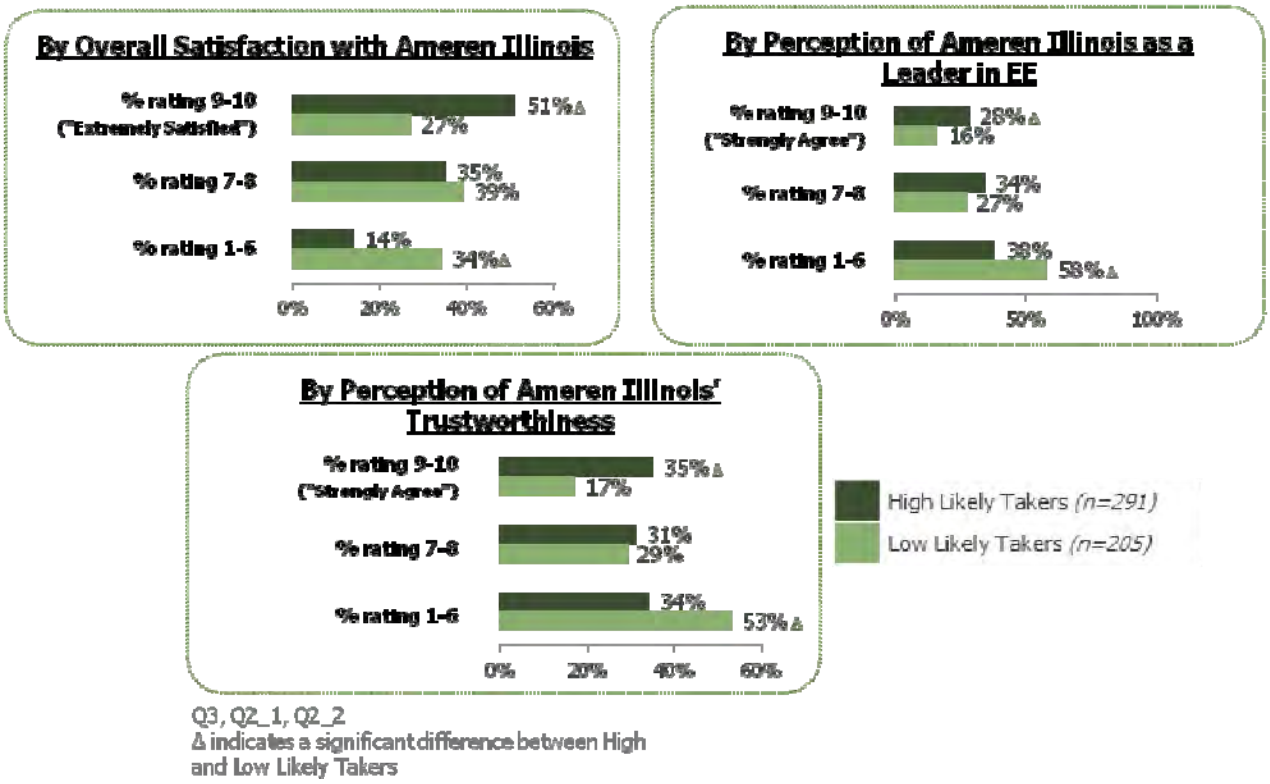
Figure 3-6 Likely Takers by General Attitudinal Differences (% Top Box, 8-10)



Q6
Δ indicates a significant difference between High and Low Likely Takers

Another key factor in likelihood to adopt energy efficiency measures appears to be the degree to which customers have favorable opinions of Ameren Illinois (Figure 3-7). Customers who have more favorable opinions about Ameren Illinois (are extremely satisfied with Ameren Illinois, perceive Ameren Illinois as a leader in energy efficiency, strongly agree that Ameren Illinois is extremely trustworthy) consistently show much higher likelihoods to adopt energy efficiency measures.

Figure 3-7 Likely Takers by Attitudinal Differences about Ameren Illinois



Summary: Overall Response to EE Programs by Ameren Illinois Customers

As the preceding pages have suggested, it appears that psychographic factors (attitudes) have a larger impact on customer response to tested EE programs than do demographic differences. This means that how customers think about Ameren Illinois is likely to be much more important in predicting how they will respond to new EE programs offered by the company, than will differences in how they are situated (where they live or how large is their income).

This is important for two reasons:

- It may explain why the overall take rates for Ameren Illinois's programs are lower than they are for those observed at many other US utilities.
- It is even more important to understand the impact of customer attitudes by understanding psychographic segments.
    - These segments may identify the confluence of attitudes and concerns that map to differences in overall reaction to potential Ameren Illinois EE programs.
    - In fact, the segmentation analysis reported in the following section focuses on just these issues, focusing in particular, on the role of customer attitudes and perceptions in contributing to likely response to EE programs.

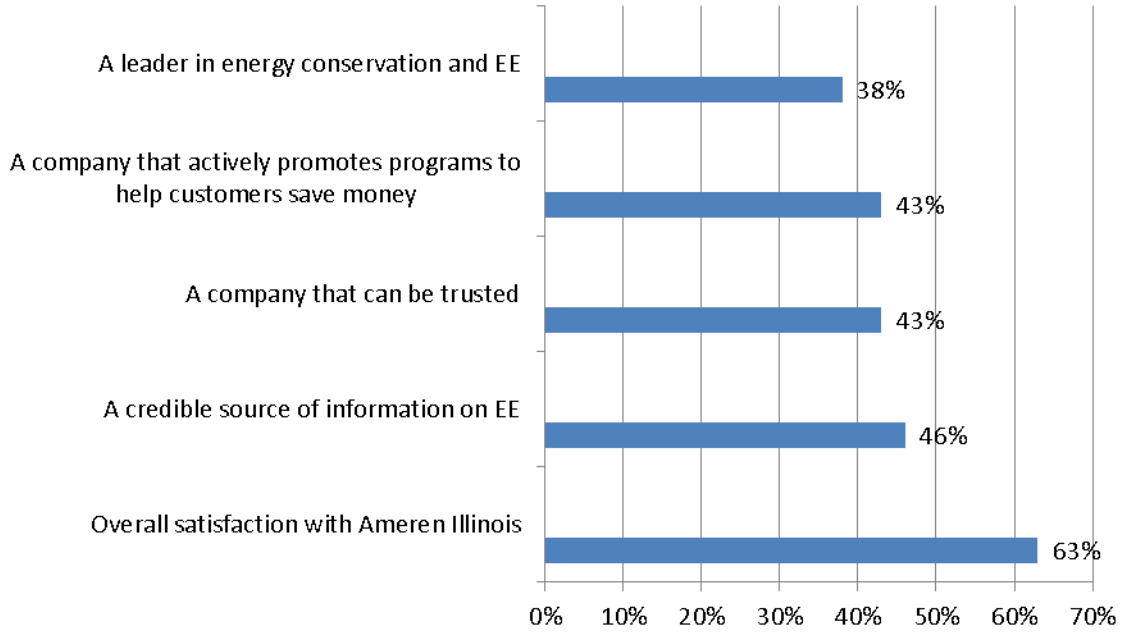
UNDERSTANDING RESIDENTIAL CUSTOMER PERSPECTIVES ON ENERGY ISSUES

Understanding Overall Customer Opinions of Ameren Illinois

In order to understand what lies beneath customer reaction to new EE options that might be offered by Ameren Illinois, it is worth exploring overall customer perspectives, both toward the company, and toward energy issues as a whole.

We begin this section by exploring overall customer perspectives toward Ameren Illinois and these findings are reported in Figure 4-1 below. In terms of their overall opinion toward the company, nearly two-thirds (63%)[4] give the company a top-three box rating (8-10 on a 10-point scale) on overall satisfaction. On the more specific attributes relating to the company's activity and credibility in promoting, and providing information about energy efficiency, fewer people (and less than half) give the company top three box ratings.

Figure 4-1 Overall Ratings of Ameren Illinois (ratings of 8-10 on 10 pt. scale)



Turning to the question of whether or not Ameren Illinois **should** promote energy efficiency, and/or, greener energy options, the results suggest that a majority of customers do support this activity (Figure 4-2). A total of 60% or more believe the company should "actively encourage" customers to participate in energy / cost savings programs, while just slightly fewer (56%) say the company should operate in a "completely environmentally friendly way."

[4] Note that this compares to a 53% top-three-box rating for Ameren Missouri that we observed in similar research conducted in July 2009.

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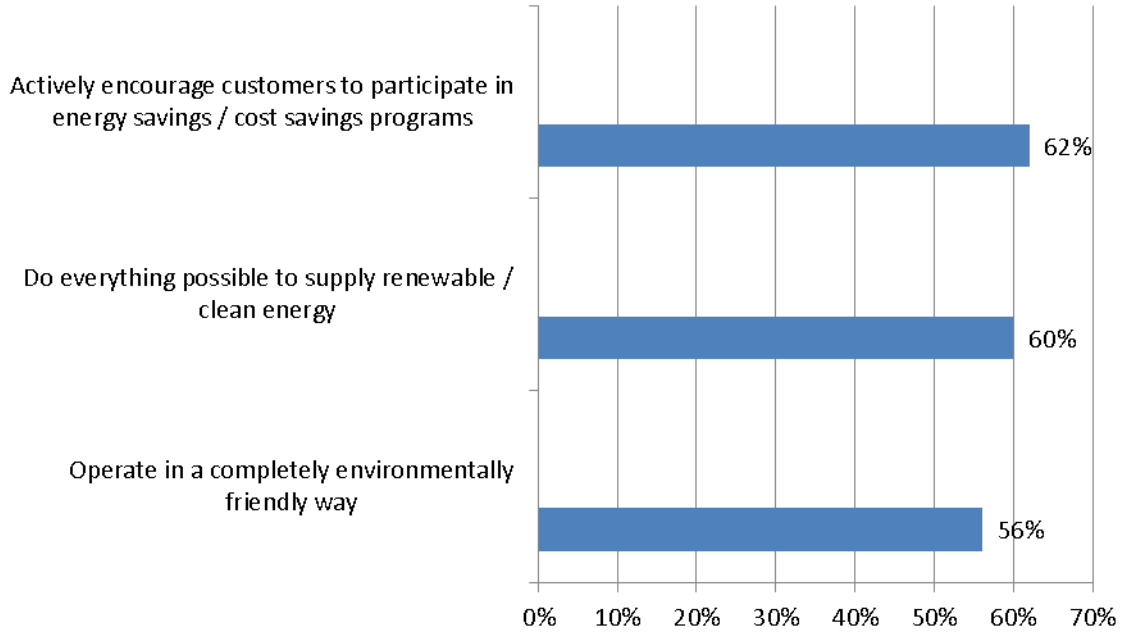
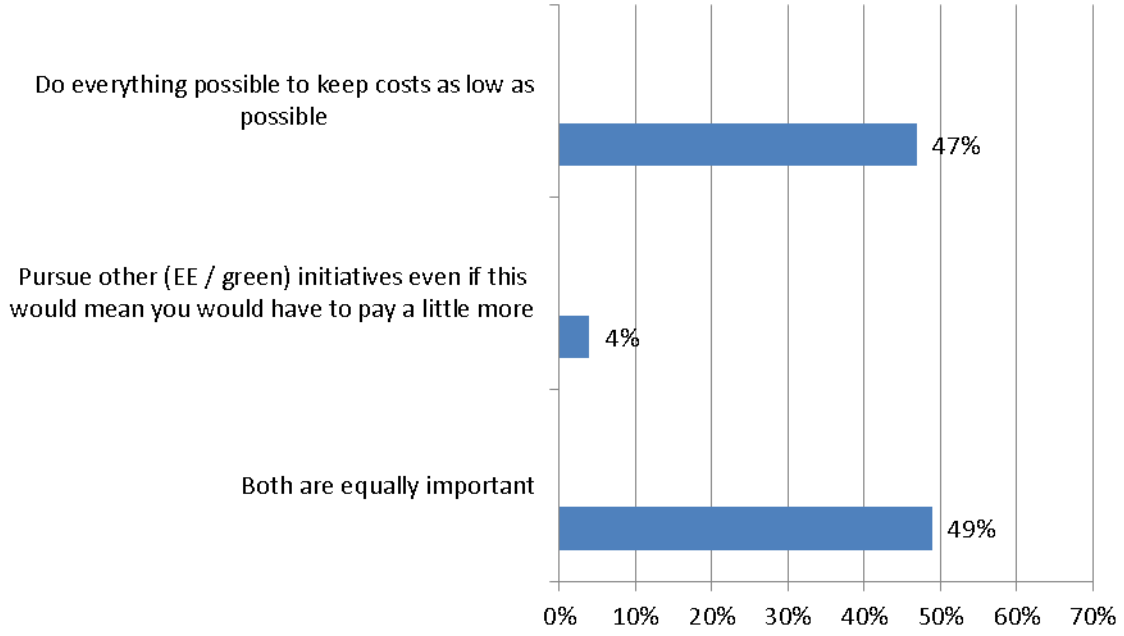
Figure 4-2 Ratings of Ameren Illinois on EE-Specific Issues (ratings of 8-10 on 10 pt. scale)



It is interesting – and important – to note, however, that while Ameren Illinois customers appear to support EE and green-focused activities by the company in the abstract, **they do not want** these activities to cost them more. As shown in Figure 4-3, when customers are asked a forced choice question, half say that the company should do everything possible to keep costs as low as possible, while only 4% say the company should pursue EE or green options if doing so would mean they would have to pay a little more. The remainder of the population wants both things at the same time (to keep costs as low as possible **and** pursue these other initiatives).

Figure 4-3 Responses to forced choice question on EE / Green vs. Cost Options



Understanding Customer Perspectives on Energy Issues

In order to provide additional context and understanding concerning why customers, are – or are not – interested in implementing a variety of EE measures, the research team explored customer thinking across a variety of background energy issues. These specific questions covered the following issues:

- How customers think about using energy in their homes (how much they think about energy costs, for example, or the relative importance of comfort vs. cost)
- What is important to them as they evaluate new appliances (initial cost vs. operating cost savings, for example)
- How they shop for new appliances

In order to understand how customers think about these issues, we conducted what is called a factor analysis of all of the attitudinal items included in these different sections of the questionnaire. What factor analysis allows us to do is to understand how customers organize their thinking about energy issues by grouping together the questionnaire items that customers evaluate similarly.

The first block of items that customers tend to rate similarly – suggesting that they see these items as addressing the same – or at least very similar issues – are questions that asked them to rate the importance of:

- The total amount of money that a product or service would cost
- Any cost savings you might see from using the product
- Any rebates or purchase discounts that might be offered
- The features and functions included with the product

This finding suggests that customers tend to aggregate together all of the cost related issues as similarly important, and further, they tend to link in feature functionality as tied to cost.

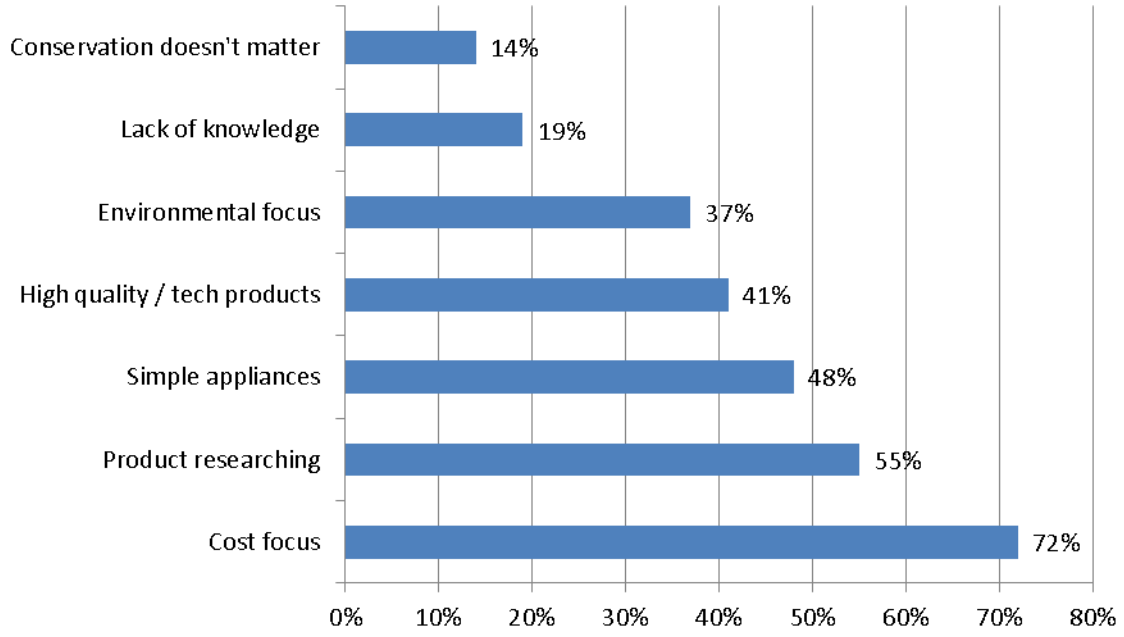
Besides this first bundle of customer perspectives on energy issues – which we might label as "cost focus," the findings suggest that there are there are five other factors – or bundles – of customer opinions on these issues. These include:

- **High quality / tech products.** The items aggregated here include expressed preferences for high quality and innovative products that help customers to save time and money. What is perhaps most interesting here is having a product labeled as EE or ENERGY STAR is viewed as fitting in with this bundle of attributes.
- **Environmental focus**. The questionnaire items that were aggregated together in this bundle of opinions included those that had to do with being concerned about the environmental effects of electric power plants; the effects of global warming, and any environmental effects from using products. Also interesting here was that being an "early adopter" of new products was connected with these "green" attitudes.
- **Product researching**. Customers also reacted similarly to items that had to do with descriptions of themselves as taking the time to research and shop carefully for products. Also included in this grouping were items that described the respondent as living in a do-it-yourself sort of household, and in a household that tended to only buy things when they were on sale.
- **Conservation doesn't matter**. Respondents did also rate similarly the questionnaire items that indicated a lack of confidence in the impact of energy efficiency / conservation: that conserving energy will make no difference to the economy, that there isn't much they can do to save money on energy costs, and that they just want to be left alone to use energy however they want in their homes.
- **Simple appliances**. Customers also rated similarly statements that focused on using appliances that are simple and functional, but also included in this grouping, the desire to purchase products in a physical store, rather than on the internet.

- **Lack of knowledge**. Finally, customers rated a questionnaire item that described the respondent as willing to do more to make their home more efficient, but not knowing where to start, by itself – not grouping it together with other items.

Saying that customers organized their responses into these bundles of items does not, of course, tell us which of these bundles of items was rated as most important or descriptive of Ameren Illinois customers as a whole. Figure 4-4 below indicates that customers most commonly rated the items in the "cost focus" bundle as most important to them, followed by the "product researching" bundle. The question bundles having to do with not valuing energy conservation or having a lack of knowledge about what to do to conserve energy were rated as least important or descriptive of them.

Figure 4-4 Average importance / agreement for top items in each attitude bundle

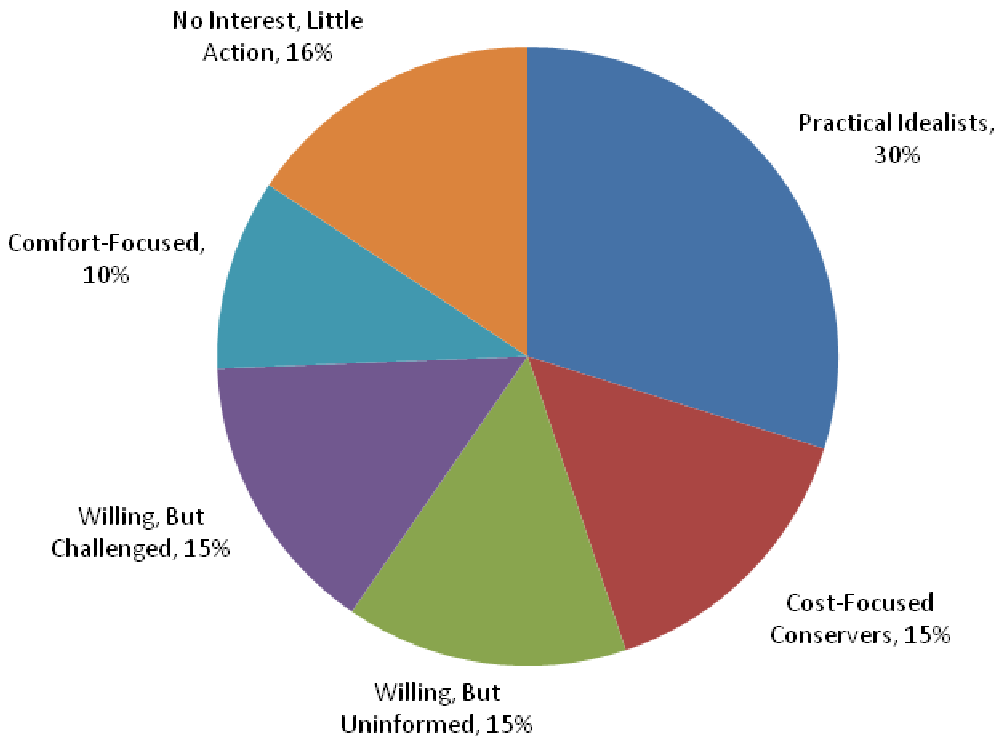


Exploring Customer Segments

So far, our analysis of customer perspectives on energy issues has only considered customers as a whole. Customers differ, however, and this section of the report explores some of the key divisions that exist within the residential customer base. Specifically, the team developed a segmentation model that disaggregated residential customers into groups that differ in terms of whether, and why, they might be interested in pursuing energy efficiency options. The goal of the segmentation analysis was to define groups of customers that were different in ways that would allow Ameren Illinois to prioritize customer targets for EE program marketing, and to develop targeted messages for each of those segments.

Using a variety of attitudinal and behavioral inputs (see the discussion earlier in this report), the team identified a set of six residential customer segments that seemed to best represent the differences in this population on these issues. The segment sizes are outlined in Figure 4-5 below.

Figure 4-5 Residential Segment Distribution



Base Segment Descriptions

Summary descriptions for each of the segments follow:

Practical Idealists (30%)

Concerned with conserving energy, both from a cost-focus and an environmental perspective (they are the "greenest" segment). They are tech and feature oriented when considering appliances, but they also say they research options and compare prices. Higher education and income, and with the largest homes (though with only average total annual kWh usage), but tend to say their economic situation is worse than it was a year ago. Tend to be high on familiarity, and experience, with EE / conservation measures to date, and are very likely to say that they would adopt new EE / conservation measures.

Cost-Focused Conservers (15%)

Informed about, and interested in, conservation / EE measures, but for cost reasons rather than environmental reasons. This group believes in the value of EE as a way to save money, and has taken many prior EE actions. They do not trust Ameren Illinois very highly, however, and do not see it as the job of the company to encourage customers to save energy or money. They would prefer the company reduce rates than spend money on EE or green options. They have higher than average education and income levels, and the second largest homes on average, and the second highest average kWh. They have the second highest program take rate.

Willing, But Uninformed (15%)

This group is positive in its assessment of Ameren Illinois, and green in their environmental perspectives (though this is not a daily, top-of-mind issue). They are relatively less experienced with EE / conservation measures to-date, however, and unsure of what they could be doing in this area, or if any of their actions would actually lead them to save money. They prefer simple, functional

appliances that are on sale, and which they can purchase locally, rather than online. They have average sized homes and average annual kWh usage, as well as have lower than average income and education levels. They are moderate on take rates across programs, but are the lowest on familiarity / experience with EE conservation measures currently.

Willing, But Challenged (15%)

This group has relatively high opinions of Ameren Illinois and believes that the company should be pursuing EE options for its customers, while also supporting green initiatives. They are relatively low on EE / conservation information currently, however, and have implemented fewer such measures than others to-date. Appliance cost is critical to them and it appears that they do not think that they can afford to purchase higher quality / higher EE appliances. They live in the smallest homes, and have lower than average income and education levels, as well as the lowest annual kWh usage. They are moderate to low in their interest in participating in new EE / conservation options.

Comfort Focused (10%)

This group is quite positive in its overall assessment of Ameren Illinois, but does not see the company as a leader in energy efficiency, nor do they think the company should be a leader in this area (i.e., in encouraging customers to be more efficient), or in green energy. Rather, the company should just focus on keeping costs low. Comfort is important to them, and they just want to be left alone to use energy as they please. They are concerned about appliance cost, but worry more about functionality (particularly as this relates to comfort) than about environmental / energy saving considerations. They tend to live in average sized homes, but have the highest annual kWh levels, along with higher than average incomes and educations. They are moderate on both familiarity with EE programs / options to-date, and their likelihood to participate in new programs.

Low Interest, Little Action (16%)

This group has very little interest in conservation or EE. This group actively dislikes Ameren Illinois, particularly on the dimensions of trust and being a leader in EE. They do not want the company to encourage customers to save energy, nor do they want it to pursue green options. They do want the company to keep costs low as its sole focus. They have smaller than average homes, but average kWh levels, and are more likely to live in multi-family structures and to have somewhat lower levels of education and income. They are the lowest on likelihood to adopt new EE programs and one of the lowest on existing familiarity / experience with EE / conservation options.

Segment Marketing

Table 4-1 Segment Marketing

Segment	Marketing Effort	Potential Load Impact	Receptivity to Future Conservation Programs	Going Forward
Practical Idealists (30%)	Receptive to messages on both the positive environmental impact of EE / conservation, as well as cost-savings – plus satisfaction with Ameren Illinois is high, making them likely to trust their utility as a reliable source for energy efficiency suggestions.	Home size is large, but annual kWh usage is average, suggesting that this segment is probably already relatively efficient in its use of energy. Having said that, given a large number of end uses that could be impacted, there is still likely to be opportunity for additional efficiency gains. As one of the wealthier segments they also may have the income to invest more aggressively in EE	Projected take rates are the highest here of any of the other segments. Also note that high opinions of Ameren Illinois would likely make them more receptive to further education/ encouragement on the benefits of participating in new EE options.	As they are the most likely to have purchased/plan on purchasing EE appliances, there is potential ground to be gained in terms of future EE appliance rebate participation. They are already inclined to take EE actions – and they have already made some EE changes. Encouraging them to do more may just mean helping them to find the opportunity.
Cost-Focused Conservers (15%)	This segment would be the most receptive to messages focused on the cost savings they can get from EE investments. They are not overly concerned with functionality, environmental impacts, or how much it improves their lives. They just want things (including Ameren Illinois) to be cheap.	Homes tend to be larger than average and their average kWh usage is the second highest of any segment. Having said that, they are quite familiar with EE and conservation actions and programs, so while there may be opportunity for load reduction, the simple (and low cost) things have probably been done already.	They are not fans of Ameren Illinois, but are fans of saving money (they have the second highest average new program take rate). Environmental messages will not have much effect on them, nor will messages that feel like “education” (since they already think they are pretty knowledgeable).	This group will represent a difficult balance for Ameren Illinois. On the one hand, they seek out information about ways to save money on energy and should be responsive to new opportunities to do so. On the other hand, they do not want Ameren Illinois to spend “their” money on helping other customers to save money or to invest in green initiatives that do not benefit them directly.

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Segment	Marketing Effort	Potential Load Impact	Receptivity to Future Conservation Programs	Going Forward
Willing But Uninformed (15%)	This is a challenging segment because they appear to be green, but are not deeply so. They agree with overall statements of environmental concern, but when pushed, admit that they do not typically worry about the environmental effects of their day-to-day actions. Even more importantly, they say they don't know how to conserve energy or if doing so would have any impact.	This group has average size homes and average annual kWh use, but relatively little experience with EE / conservation to-date (and a lack of confidence in the potential benefit of these activities). Given their lack of action so far, there should be substantial opportunity to improve the EE of these homes. Getting the attention of these homeowners will be the challenge.	This segment expresses moderate take rates across the new EE / load control options, though as was just noted; getting them to act on those opportunities will be a real challenge. Green messages are unlikely to be compelling, as are cost savings messages (since they will likely not believe them). This group will likely need a "do-it-for-me" approach.	Since this group tends to like and trust Ameren Illinois, they should be open and receptive to messages from the company about reasons to consider EE / conservation actions. The challenge with this group will be convincing them to "trust" that they should invest the time and energy to do so because they will actually see a benefit. Starting simple, with easily demonstrable savings would be a help.
Willing, But Challenged (15%)	This is also a challenging segment for Ameren Illinois. While they have some interest in EE, they have not done much so far, and they appear to think that they cannot afford "higher end" solutions. They are broadly favorable to the company and its efforts to help customers save energy (and to green efforts), but they do feel confident in their abilities to save on their own.	This group has the lowest annual kWh use and the smallest homes, along with lower than average levels of education and income. They are also among the groups least likely to have purchased a variety of new appliances in the last year. Beyond this, they are (along with the other "willing" group) less informed about, or experienced with EE measures to-date. All of this means that opportunities for energy savings are likely to exist, of course.	This group is also somewhat responsive to the EE measures tested, though obviously, there are huge barriers to implementation for them. On the one hand, they lack the upfront financial resources that might be necessary to implement some changes, and lack the experience with, or confidence in, EE measures that would make it easy for them to justify any expense on this front.	This group also likes and trusts Ameren Illinois, and looks to the company to help customers save money on energy. Having said that, they lack the resources to do much on their own (at least they think so). Zero upfront cost solutions would likely be an important starting point for this population.

Segment	Marketing Effort	Potential Load Impact	Receptivity to Future Conservation Programs	Going Forward
Comfort Focused (10%)	This segment is broadly positive toward Ameren Illinois, but does not want to hear about the company spending money on helping customers to save energy or about green initiatives. Ameren Illinois job – from their perspective – is just to keep costs low and let them use energy the way they want to.	Houses are average in size, but average annual kWh usage is highest of all the segments. They also have higher education and income, though are only average of familiarity with EE and are less likely to have participated in prior EE programs. All of this means there is probably substantial EE opportunity here, if it can be realized.	Take rates are low for this segment, and they have little or no interest in saving energy, whether for environmental benefits, or if it costs them any feature functionality or comfort. They are not opposed to saving money, but only if this does not "cost" them in other ways.	Attempting to sell this segment on the societal benefits of EE is probably a losing proposition. Getting their attention on implementing new EE (but not load control measures) will mean convincing them that they can save money without giving up anything in terms of time, effort, or comfort.
Little Interest, Little Action (16%)	This segment would likely be the most difficult to market to as they are the least likely to like Ameren Illinois, and the least concerned with environmental issues. Beyond this, they appear to simply be unconcerned with energy issues, appliances, and related issues.	Houses in this segment tend to be somewhat smaller than average, but with average kWh. In addition, lower than average incomes may limit the EE behaviors these customers adopt. Having said that, they have done relatively little to-date in terms of EE measures.	Take rates are the lowest in this group and familiarity / experience with EE is also very low. Given their lack of involvement in this category, it is not clear at all what sort of messaging would be likely to get this group's attention.	While it could be argued that EE education is needed with this group, it is unclear how to get their attention to attend to any type of education.

Residential Segments – At a Glance

Table 4-2 Segment Prioritization

	Practical Idealists	Cost-Focused Conservers	Willing, But Uninformed	Willing, But Challenged	Comfort Focused	Little Interest, Little Action
Size	30%	15%	15%	15%	10%	16%
Opportunity	**High** They have done a lot already, but are open to – and able to – do more	**Medium-High** Experienced in EE and willing to do more; if the money is right	**Medium-Low** Willing to be convinced of the advisability of EE actions, but not convinced to date	**Medium-Low** Open to the possibility of EE actions, but see themselves as very limited in their opportunity to take advantage and have not done so yet	**Low** No interest in the EE category; "leave me alone"	**Very Low** Totally uninvolved with the energy category and no interest in becoming so
Role for Ameren Illinois	**Trusted Green Partner:** They like the company and see Ameren Illinois as having an important role in both EE and promoting green initiatives	**Save Us Money:** Broadly negative toward the company; just want Ameren Illinois to focus on lowering costs (for me)	**Help Me:** They like the company and want it to help them become more energy efficient (though they are not certain this is possible).	**Help Me:** They like the company but do not think that EE is something that is relevant for them, or is something that they can afford, or figure out how to make work for them	**Leave Me Alone:** Don't like the company, don't trust it, and just want to b left alone	**Don't Bother Me:** Like the company, but not interested in energy issues generally, and see little likely value in EE actions

Table 4-3 Likely Takers given a 3 year payback period

	Practical Idealists	Cost-Focused Conservers	Willing, But Uninformed	Willing, But Challenged	Comfort Focused	Low Interest, Little Action
Size	30%	15%	15%	15%	10%	16%
Measures for purchasing/installing energy efficient equipment (Assumes a normal replacement cycle)						
Light bulb	52%	41%	38%	38%	31%	22%
Refrigerator	49%	40%	40%	35%	36%	27%
Water heater	48%	38%	37%	31%	33%	21%
Air conditioner	47%	40%	36%	32%	33%	20%
Clothes dryer	47%	39%	38%	32%	32%	21%
Furnace or boiler	46%	39%	37%	30%	32%	20%
Color TV	43%	33%	35%	27%	28%	20%
PC	41%	33%	30%	27%	23%	18%
Stovetop or range	46%	35%	33%	30%	30%	18%
Swimming pool pump	32%	28%	36%	25%	29%	15%
Measures for improving energy efficiency of existing systems						
Maintain heating system regularly	45%	37%	29%	26%	31%	18%
Maintain cooling system regularly	43%	35%	29%	26%	30%	19%
Install Smart power strips	41%	35%	33%	27%	22%	18%
Install a programmable thermostat	39%	30%	30%	33%	23%	16%
Inspect, repair, and seal HVAC ductwork VAC ductwork	40%	31%	28%	26%	23%	16%
Install exterior lighting controls	34%	31%	28%	24%	20%	19%
Install more EE exterior windows	37%	36%	31%	27%	23%	19%
Install improved home insulation	36%	33%	30%	23%	20%	17%
Install “low flow” showerheads	38%	29%	28%	23%	19%	15%
Add insulation to HVAC ductwork	37%	32%	27%	25%	22%	15%
Install a dehumidifier	34%	31%	27%	22%	21%	15%
Install a whole house/attic fan	30%	27%	24%	20%	17%	13%
Measures not requiring an investment by the customer						
Turning down the heating/cooling systems while sleeping/away	33%	29%	21%	23%	22%	16%
Reduce water heater temperature	33%	22%	17%	18%	17%	13%

Get rid of secondary refrigerator	25%	22%	16%	18%	14%	13%

RESIDENTIAL SATURATION SURVEY RESULTS

Household Demographics

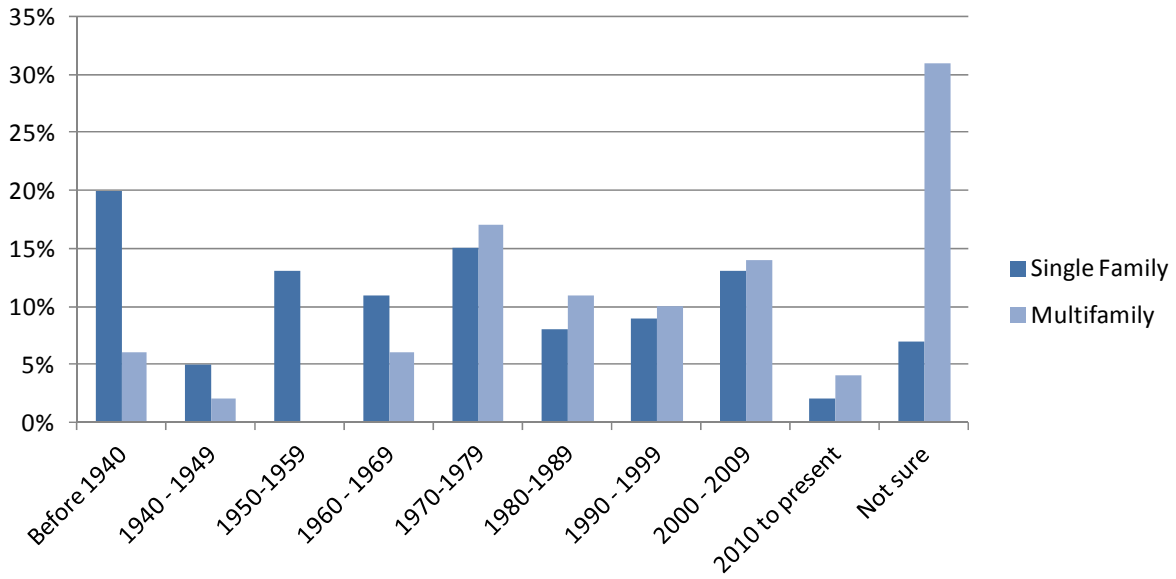
The sample was split by housing type into two segments for analysis: single-family detached homes and multi-family homes. Single-family detached homes include single-family homes and mobile or manufactured homes. The multi-family home segment includes single-family homes that are attached to one or more other homes, multi-family homes in a building with 2-4 units, and multi-family homes in a building with 5 or more units. Seventy-nine percent of respondents live in a single-family home while 21% live in a multi-family home. The average number of individuals living in a single-family home is 2.6 and the average number of individuals living in a multi-family home is 2.0.

Several household demographic questions were asked that are important to a household's energy use. Key demographics include the age of home, the size of the home, and the number of individuals who work from home or are home during the weekday.

Age and Size of Home

The approximate year the home was built was asked to determine the age of the home. The current housing stock of single family homes if fairly old with 64% built before 1980. Figure 5-1 shows twenty-five percent of single-family homes were built prior to 1950.

Figure 5-1 Year Home was Built



Almost a third of respondents did not know when their multi-family home was built (31%). The majority of those that were able to answer the question reported that their multi-family home was built in the last 40 years.

Home size is related to energy use. That is, larger homes use more energy than smaller homes. In the Ameren Illinois area, the majority of single-family homes are in the 1,000 to 2,499 square foot range (Figure 5-2). Twenty-three percent of single-family homes are 2,500 square feet or more and only 8% are less than 1,000 square feet. Multi-family homes are significantly smaller with the majority under 1,499 square feet (75%).

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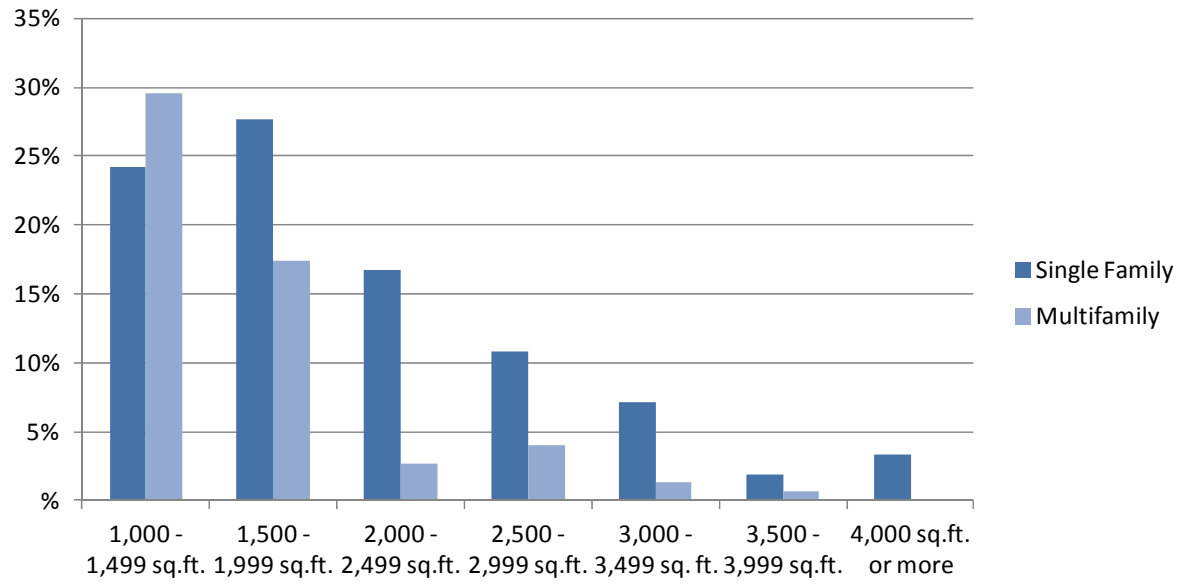
Figure 5-2 Square Footage of Home

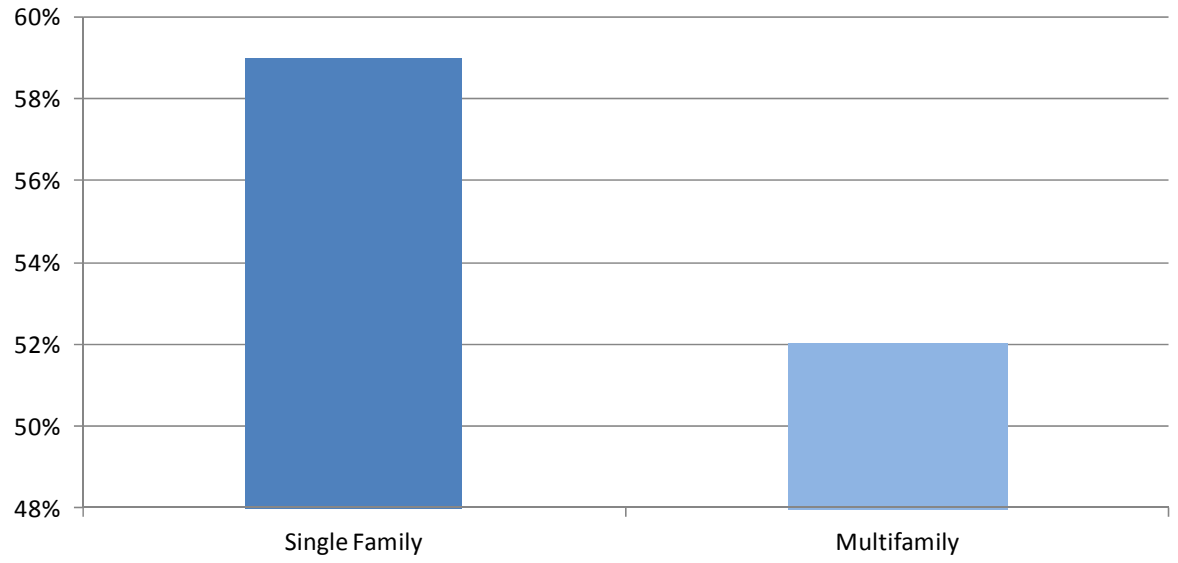


Individuals Home During the Weekday

Energy use tends to be higher in homes where one or more household members are home during the day. Similarly, in the summer, peak demand tends to be higher.

Most homes in the Ameren Illinois service territory have a member who is regularly home during the day on weekdays (Figure 5-3). Fifty-nine percent of single-family and 52% of multi-family customers say someone is home during the weekday, either because they work at home or regularly stay at home all or most weekdays (four days or more).

Figure 5-3 Customers with Someone Home All or Most Weekdays

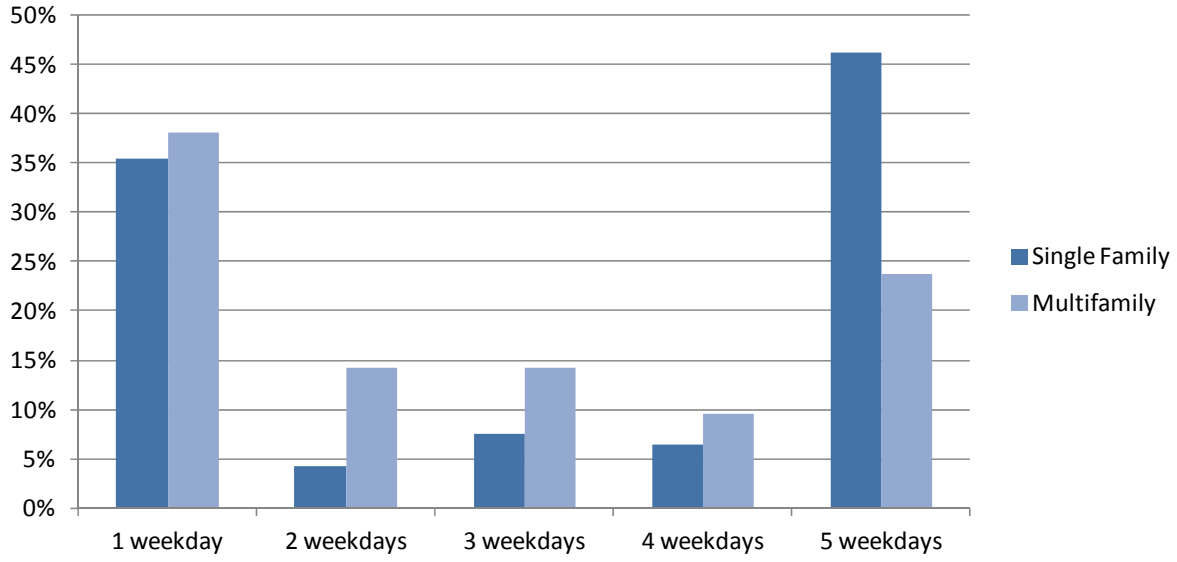


Within the group presented in Figure 5-3 is a subset of respondents that are working at home. Sixteen percent of respondents in the single-family segment have a member who telecommutes or

works from home at least one day during the day on weekdays. A slightly smaller percentage (13%) of those living in multi-family homes telecommutes or works from home.

A large proportion of those working from home, do so 5 days a week (Figure 5-4). Respondents living in single-family homes tend to work at home more days than those living in multi-family homes. Note that the percentage numbers shown in Figure 4-4 are the percent of those that work from home, not of the total population.

Figure 5-4 Number of Weekdays Spent Working at Home



Household Equipment and Appliances

Respondents were asked about the type of equipment and appliances they have, the type of fuel used for heating, cooling and water heating, and hours of operation for lighting and electronics.

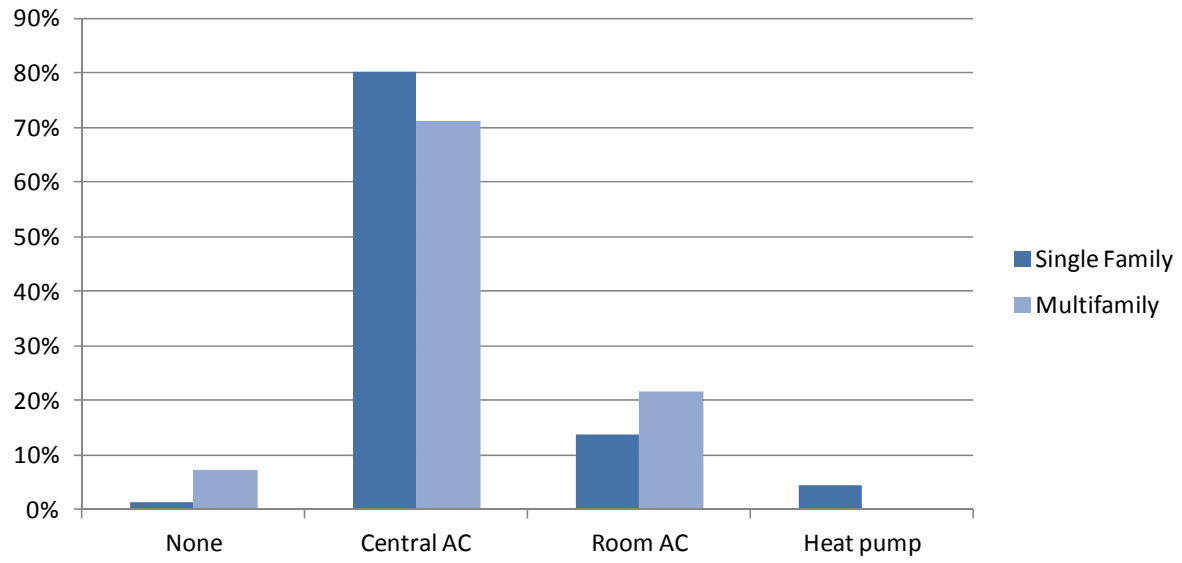
Heating, Cooling and Water Heating

Most respondents have central air conditioning both in single-family homes and multi-family homes (Figure 5-5). Eighty percent of respondents in single-family homes have central air conditioning and an additional 4% have a heat pump for cooling. Seventy-one percent of respondents in multi-family homes have central air conditioning and none have a heat pump. The remaining customers rely on room air conditioners or do not have cooling.

Almost two-thirds of primary cooling systems in single-family homes have been purchased since 2000 compared to 39% in multi-family homes. Forty-two percent of respondents in multi-family homes did not know when their primary cooling system was purchased.

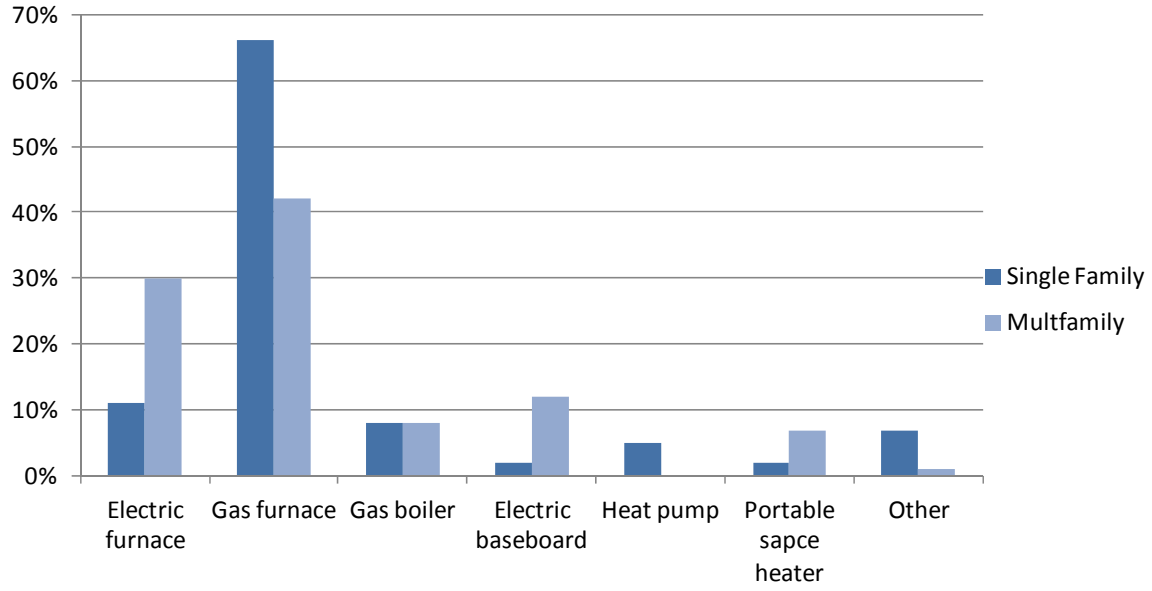
Fifty-seven percent of respondents in single-family homes have programmable thermostats, compared to only 30% in multi-family homes.

Figure 5-5 Type of Primary Cooling by Segment



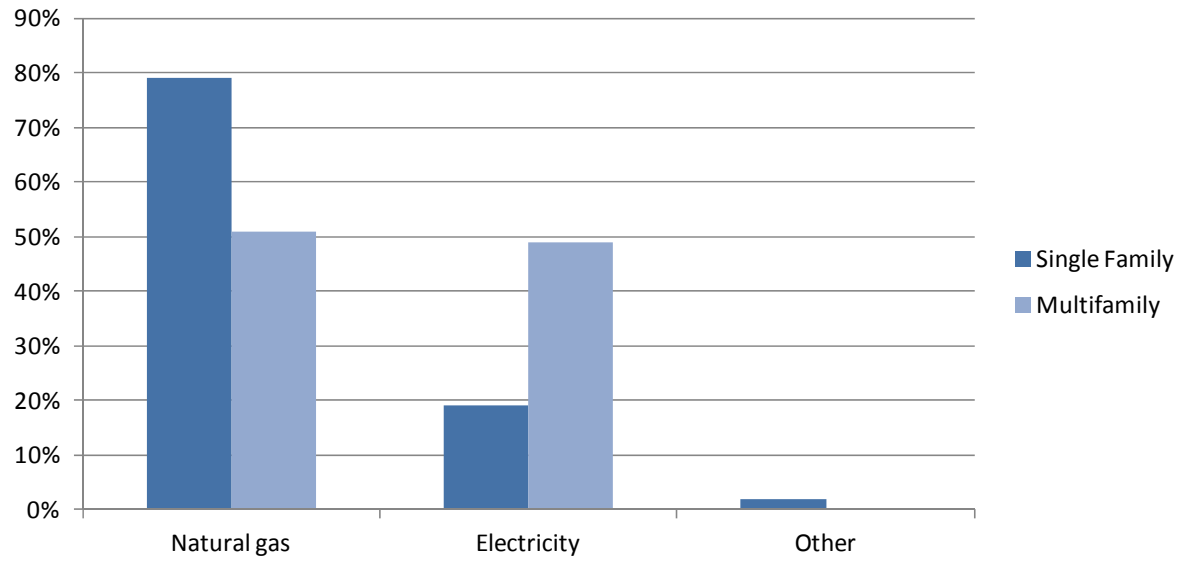
The majority of respondents in single-family homes have a gas furnace (66%) and eleven percent have an electric furnace. Most respondents in multi-family homes have either a gas or an electric furnace (Figure 5-6). Several respondents reported using supplemental heating such as portable space heaters and fireplaces as their main type of space heating; 9% of single-family and 8% of multi-family homes use these other types of space heating.

Figure 5-6 Type of Space Heating



Similar to heating, the majority of respondents in single-family homes have gas water heating, while in multi-family homes the fuel used for water heating is more evenly split between gas and electric (Figure 5-7).

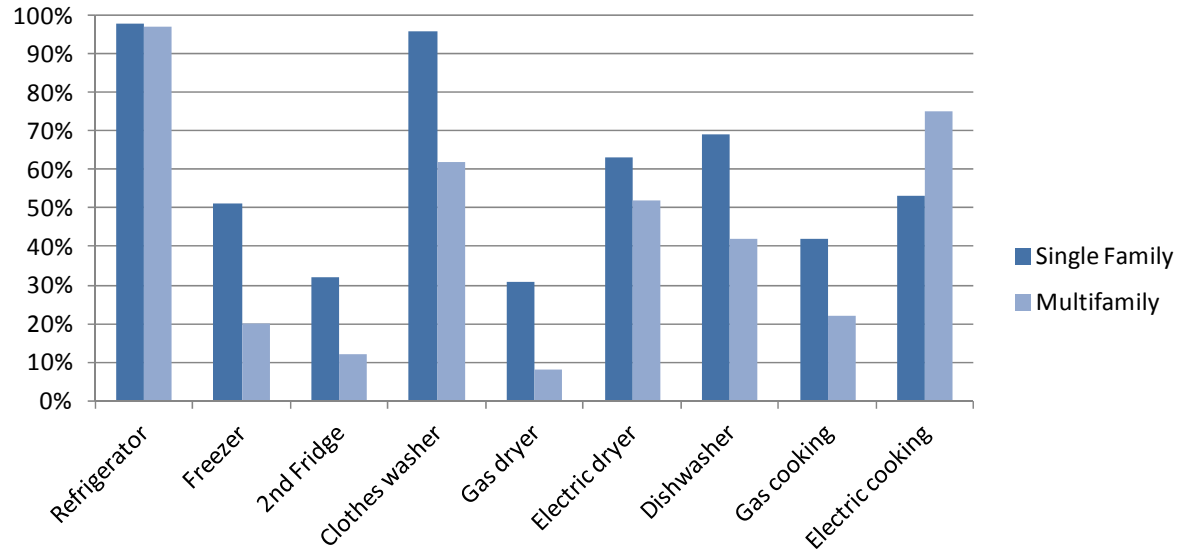
Figure 5-7 Water Heating Fuel



Appliances

Almost all respondents living in single-family homes have a refrigerator. In addition, more than half have a stand-alone freezer and 32% have a second refrigerator (Figure 5-8). Sixty-nine percent of respondents in single-family homes have a dishwasher and 53% use electricity for cooking. Ninety-six percent of respondents in single-family homes also have a clothes washer, and 94% have a clothes dryer. Sixty-three percent of respondents have an electric dryer; 31% have a gas unit.

Figure 5-8 Appliance Saturation – Single-Family Segment



With the exception of refrigerators, those living in multi-family homes have fewer appliances. Only 20% have a stand-alone freezer and 12% have a second refrigerator. Forty-two percent have a dishwasher, and 75% use electricity for cooking. Sixty-two percent have a clothes washer and 60% have either an electric or gas clothes dryer. Similar to the single-family house segment, the majority of clothes dryers are electric.

Lighting

The average number of light bulbs in a single-family home is 46, while a multi-family home has an average of 38 total light bulbs (Table 5-1). Almost half (48%) of the light bulbs in both segments are conventional incandescent bulbs. CFLs represent about one-third of the light bulbs.

Table 5-1 Average Number of Light Bulbs by Segment and Type

Segment	Incande-scent	CFL	LED	Tubular Fluore-scent	Halogen	Low Voltage	Other
Single Family	47%	32%	1%	10%	4%	4%	2%
Multi-family	50%	31%	1%	9%	3%	4%	2%
Total	48%	31%	1%	10%	3%	4%	2%

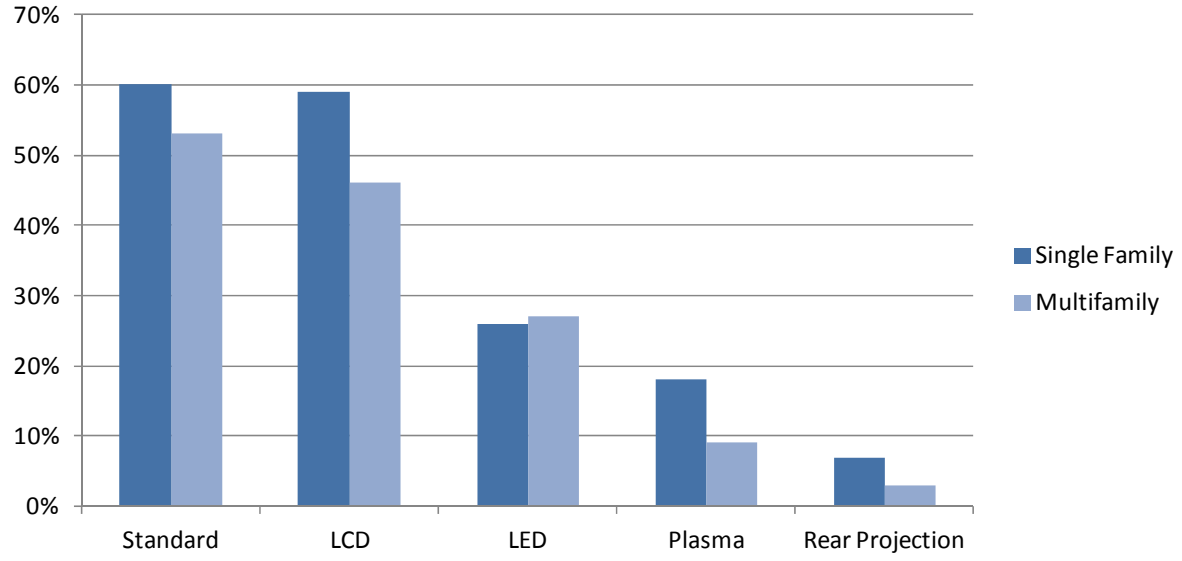
Few respondents in single-family homes use some sort of lighting controls on their interior lighting. Sixteen percent in single-family homes use lighting timers compared to 14% of those in multi-family homes. Fourteen percent in single-family homes use motion detectors compared to 4% of those in multi-family homes.

Several respondents use lighting controls for the exterior lighting in their homes. Twenty-one percent of those in single-family homes use motion detectors, compared to 9% in multi-family homes; 26% in single-family homes use dusk-to-dawn lights compared to 13% in multi-family homes; and 7% in single family homes and 3% in multifamily homes use timers.

Electronics

Respondents in single-family homes have an average of 2.9 TVs per household, while those in multi-family homes have an average of 2.1 TVs. The majority of respondents have at least one standard TV, and 59% of those in single-family homes and 46% of those in multi-family homes have at least one LCD TV (Figure 5-9). Smaller percentages have one or more LED, plasma or rear projection TV.

Figure 5-9 Type of TV by Segment



Respondents in single-family homes report that their household watches TV on average a total of 10.34 hours per day on all their TVs combined, while those in apartments watch TV 8.6 hours per

day on all their TVs. Forty-seven percent of respondents in single-family homes and 42% in multi-family homes have at least one ENERGY STAR TV.

Ninety-five percent of respondents in single-family homes and 94% in multi-family homes have at least one computer. Respondents in single-family homes have an average of 2.1 computers. Respondents in multi-family homes have an average of 1.6 computers per household. Respondents in single-family homes use their computers an average of 8.0 hours per day and have them in stand-by mode an average of 15.6 hours. Multi-family homes use their computers 8.1 hours per day and have them in stand-by mode 10.7 hours. Thirty-nine percent of respondents in single-family homes and 36% in multi-family homes have an ENERGY STAR computer

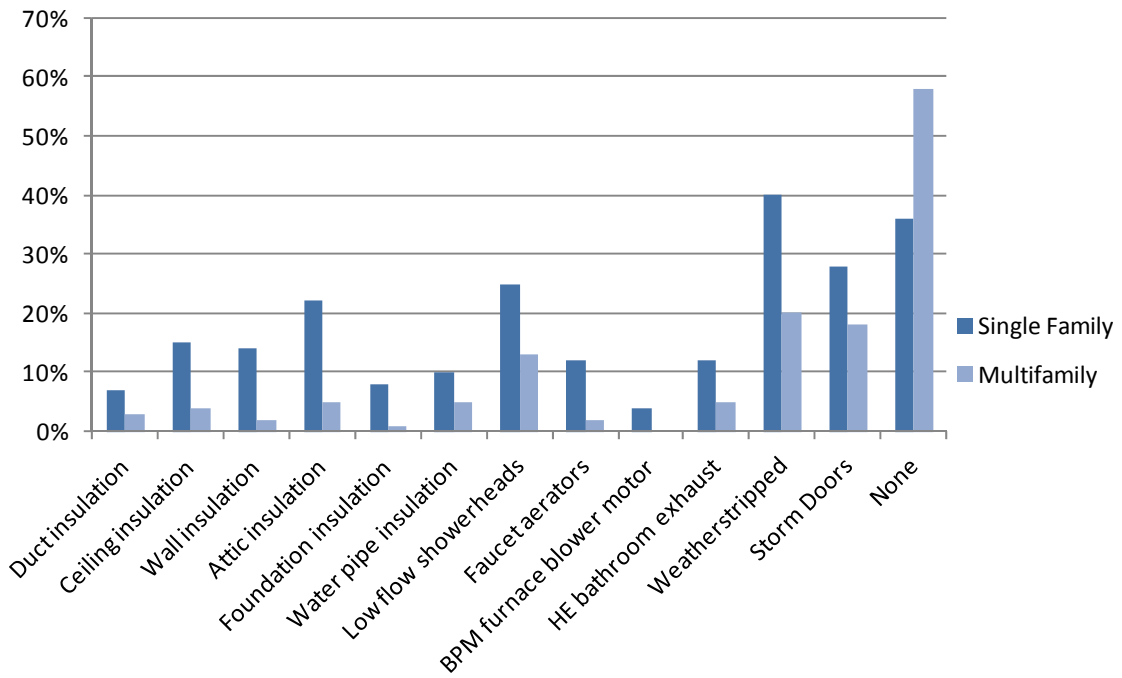
Energy Actions

Respondents were asked what recent home improvements they had made, whether they intended to make improvements in the next 6 to 12 months and what types of actions they took to improve their household's energy efficiency. They were also asked about their participation in utility-sponsored energy efficiency programs. This information was used to determine the current saturation of energy-efficiency measures and to develop the adoption rates for the forecast.

Home Improvements

The majority respondents living in single-family homes have made at least some improvements to their home (Figure 5-10). Sixty-four percent of respondents in single-family homes said they or a previous owner had made a home improvement or remodeled the home since it was built. Not surprisingly, fewer respondents living in multi-family homes had made improvements. Forty-two percent of respondents living in multi-family homes said they or a previous occupant/owner had made a home improvement or remodeled the home since it was built.

Figure 5-10 Home Improvements



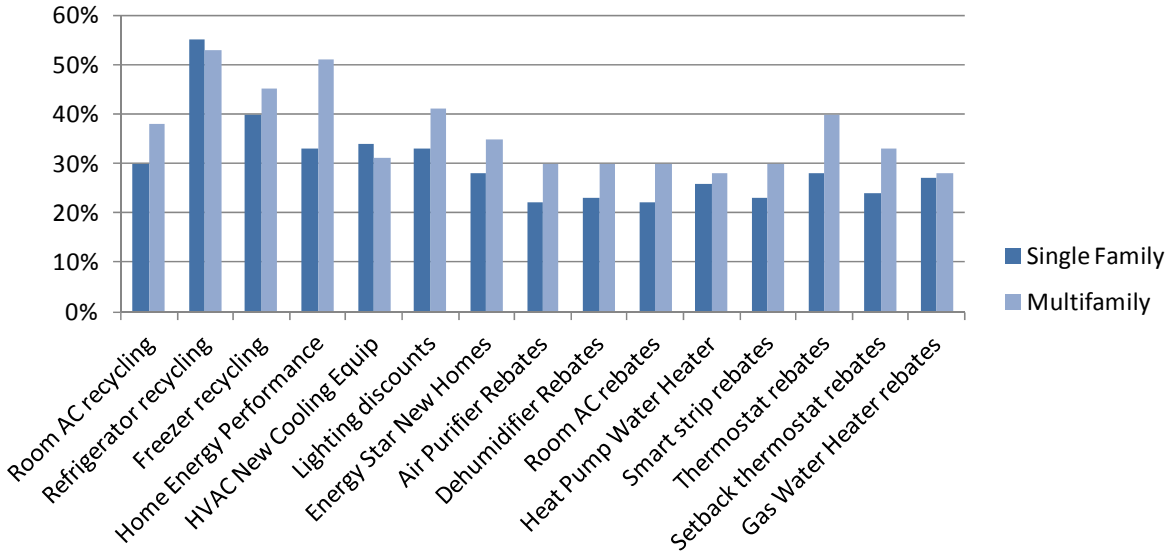
The most popular home improvements are weather-stripping/caulking windows and doors, adding storm doors and installing low flow showerheads.

Program Awareness and Participation

About a quarter of respondents in both segments stated they were aware of programs that offer conservation rebates, loans or price discount programs. Similar percentages have participated in at least one program in the last 3 years.

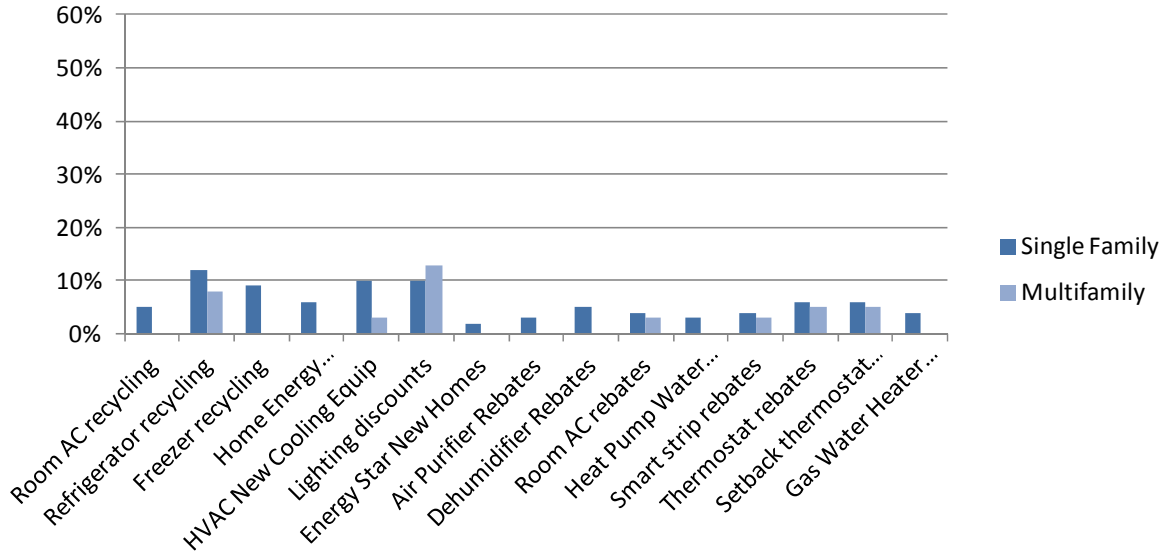
When asked specifically about Ameren Illinois programs, the refrigerator recycling programs was the program the majority of respondents were aware of in both segments (Figure 5-11). Half of multifamily respondents are also aware of the Home Energy Performance program.

Figure 5-11 Awareness of Ameren Illinois Programs



Rebate programs have the lowest levels of awareness. Overall multifamily respondents are more aware of the programs available than are single family respondents.

Figure 5-12 Participation in Ameren Illinois Programs



Few respondents have participated in Ameren Illinois' programs in the last 3 years (Figure 5-12). Twelve percent of single family respondents have participated in the refrigerator recycling program, and 13% of multifamily customers have participated in the lighting discounts program.

C&I METHODOLOGY

This section covers sample design, questionnaire development and data analysis for the commercial and industrial market research.

Sample Design

As mentioned above, Ameren Illinois provided the EnerNOC team with billing data for residential and business accounts that included a variety of information for each commercial customer, including company name, address, annual kWh usage, annual therm usage, division, account number, etc. Contact names of individuals were not provided in the list. The EnerNOC team created a sample design with 124 separate sample cells – against which survey responses were targeted and monitored, and which took into account industry, gas usage and electric usage. This grid was implemented separately and independently for each of the two surveys (the Program Interest survey and the Saturation survey). Appendix A provides additional information about the business sample design.

The EnerNOC team generated a total of 19,074 randomly selected company locations. In total, postcard invitations were mailed to all of the locations included in the list, with 9,529 cards sent for Program Interest and 9,545 sent for the Saturation survey. These postcards were allocated across the desired quota cells and invited respondents to go online and complete a survey.

- Customers were originally offered a $25 check for completing the survey, but that amount was increased to $50 approximately halfway through fielding to increase response to the survey site
- Due to the somewhat limited nature of the list, cards were mailed to all respondents at one time, and the mailing was followed by several rounds of reminder emails and phone calls

In order to qualify to complete the survey, respondents/companies had to meet the following criteria:

- The site must be a business, or a residence used for a home-operated business
- The respondent must be knowledgeable about decision-making for energy issues for the business at the specified location
- The company must be responsible for the cost of their electricity or natural gas, and Ameren must be a provider of either electricity and/or natural gas
- The location must not ONLY be an outdoor structure or facility

A total of 622 Ameren Illinois Business customers completed the Program Interest survey.

- Approximately 72% of those who attempted to complete the survey qualified based on applying the criteria above.
- The overall net response rate was approximately 10%
- Approximately 21% of those who started the surveys abandoned them before completing it
- Average online survey length was about 26 minutes

Questionnaires

The **Program Interest** questionnaire was designed to cover multiple content areas, including:

1. Screening questions
2. Customer energy needs

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3. Basic energy usage
4. Attitudes toward energy usage
5. Energy efficiency measures already taken
6. Purchasing attitudes / behavior & environmental attitudes
7. Interest in potential energy efficiency measures offered by Ameren Illinois

The **Saturation** questionnaire was designed to cover multiple content areas, including:

1. Screening questions
2. Description of building type: business-use area
3. Description of building type: entire building area
4. Heating and cooling
5. Lighting
6. Office and other equipment
7. Manufacturing / processing operations
8. Energy efficiency measures

Data Analysis

Estimating Take Rates

Market researchers have long recognized that customers tend to over-estimate their likelihood to participate in new programs and services within the context of a market research study. This means that it has been long recognized that some customers who say that they would be "certain" to participate in a given program in a survey would, in reality, not participate. This is often referred to as the "say-do" problem; the problem that survey respondents are typically more likely to say they would do something than actually end up doing it. The analytic challenge, as a result, is to appropriately adjust stated likelihood-to-participate ratings into more realistic estimates of likely customer response.

Different options are available for making these adjustments, and the best option depends in part on the nature of the product, service, or program being evaluated. For example, reactions to socially desirable (including "green") options need to be adjusted down more aggressively, while those for certain new technologies need to be adjusted less. The method used by the YGDI / EnerNOC team is based on proprietary research conducted by YGDI during 2010. This research captured stated likelihood to adopt / purchase a variety of new products / services, at one point in time, and then tracked the actual product / service adoption / purchase over 6 -12 months. As we expected, people were less likely to actually purchase the specific products / services that they estimated they would at an earlier point in time.

The primary adjustment factors that were observed in that research were used here to translate "stated intent" to realistic estimates of likely behavior, and they are outlined in the table below. The adjustment factors depend on how the respondent answered each of the "likelihood to acquire" questions. Note that these primary adjustment factors are intended to apply to relatively infrequent purchases (no more often than once a year or so). For more regular purchases – those that occur several times a year – YGDI uses a somewhat different formula, and information about this "regular purchase adjustment" is provided later in this section.

Essentially, the primary adjustment for irregular purchases says that among those respondents who rate a given program as a "10" ("extremely likely to participate") AND if who are rated as "high" on EE information / familiarity, then realistically, about 41% of those people will ultimately sign up for the program. At the other end of the scale, it says that among the respondents who rate their likelihood to participate as a "1" on the scale ("extremely unlikely to participate"), only 5% of those

businesses will ultimately sign up for the program. For purposes of this analysis, we assumed that Ameren Illinois would be able to move all businesses to a "high" level of information / familiarity with the relevant EE options.

Table 6-1 Translating Stated Intent into Take Rates for Irregular Purchases

Scale Rating	Adjustment for Those High on Information
1	3%
2	3%
3	4%
4	8%
5	30%
6	38%
7	48%
8	58%
9	61%
10	72%

As noted above, YGDI uses a different adjustment for products that are purchased more frequently, since customers are more familiar with their "choice set" and have typical purchases that they tend to make in a given category. Lighting is the only measure tested in this survey which falls into this "regular purchase" category, and the adjustment values outlined below were used for this option and applied them the same way that was outlined above. Note that Information level (familiarity with the category) is not used as a differentiator in adjustments for this category since – by definition – all "buyers" are more familiar with regular purchases.

Table 2-2 Translating Stated Intent into Take Rates for REGULAR Purchases

Scale Rating	Adjustment For Those Making Regular Purchases
1	0%
2	0%
3	0%
4	5%
5	12%
6	26%
7	44%
8	58%
9	67%
10	83%

Testing Programs at Different Payback Levels

In order to provide insight about the impact that varying payback periods might have on customer response to the programs tested, the survey explored response to each program for which payback period was relevant, at 1, 3, and 5 year payback levels. The survey used a method developed by an

economist by the name of von Westendorp to capture this information; this technique begins by asking respondents to assess their likelihood to adopt a program at a 3 year payback, and then (a) if they respond positively to this option, asks them to respond to a 5 year payback, or (b) if they respond negatively to this option, asks them to respond to a 1 year payback period. In order to deal with issues of survey length, the tested program measures were sorted into different categories that were similar in terms of scale of investment and type of measure. The full 1, 3, and 5 year payback assessment were then conducted for a single program within each category. The remaining programs within each category were evaluated at the 3 year payback level only. Regression analysis was then used to develop the 1 and 5 year payback values for each measure, using the slopes observed for the example program in each category.

Weighting

In order to better mirror the business market in Ameren Illinois's service territory, data were weighted on the basis of the 124 sample cells, in order to ensure that the weighted sample mapped back to the underlying population on electric usage, gas usage, and region / zone.

Psychographic Segmentation Analysis

One of the goals of the analysis was to explore whether or not there were psychographic customer segments that could be helpful in providing an understanding of why customers responded as they did to the programs tested, and to support initial thinking about how to prioritize marketing efforts and marketing communications. Several steps were involved in developing this psychographic segmentation:

- First, the team analyzed the groups of items that were included in the questionnaire which were designed to generate psychographic insights (these included Q2 and Q4 (questions addressing opinions toward Ameren Illinois), Q14 (questions exploring how customers think about using energy in their facility), Q23 and Q25 (questions about priorities when evaluating energy-related products and services for their facility)).
- Second, the team conducted analyses that were intended to identify groups of items that respondents tended to evaluate similarly. This process is called "factor analysis," and refers to the process of finding and interpreting these groups of items that people think of as similar.
- Third, the team considered all of the attitudinal factors that were identified in step two, along with a variety of other variables to find the ones that generated the most useful segmentation model. This was partly a trial and error process, but ultimately, the variables selected to be included in the segmentation model included:
    - Whether the business owns or leases their facility (QS5)
    - Overall satisfaction with Ameren Illinois (Q3)
    - Preference for whether Ameren Illinois should focus on pursuing EE and conservation initiative, or on keeping costs low for their customers(Q5)
    - Kilowatt hours (from sample)
    - Agreement / disagreement with the item "Our organization believes that the long-term threat from global warming and climate change is real, and potentially devastating" (Q14_7)
    - Importance of the item "Features and functions included with the product / service" when selecting which pieces of equipment, electronic devices, or other energy-related products or services to purchase for their facility (Q23_6)
    - Agreement / disagreement with the item "The reality is that the most energy-efficient equipment is also almost always the best equipment on the market" (Q25_6)
    - Agreement / disagreement with the item "Since energy costs make up such a small portion of our total operating costs, energy issues just don't get a lot of attention" (Q25_11)

- A calculated variable that was called “EE Informed Level” and was based on indicators of experience with / awareness of EE end use options to-date, and awareness and use of existing Ameren EE programs
- A calculated variable that was called “Likely Taker Level” and was based on a count of the frequency that a given respondent rated themselves as “8” or higher on the “1” to “10” likelihood to participate scale for each of the 34 EE programs tested

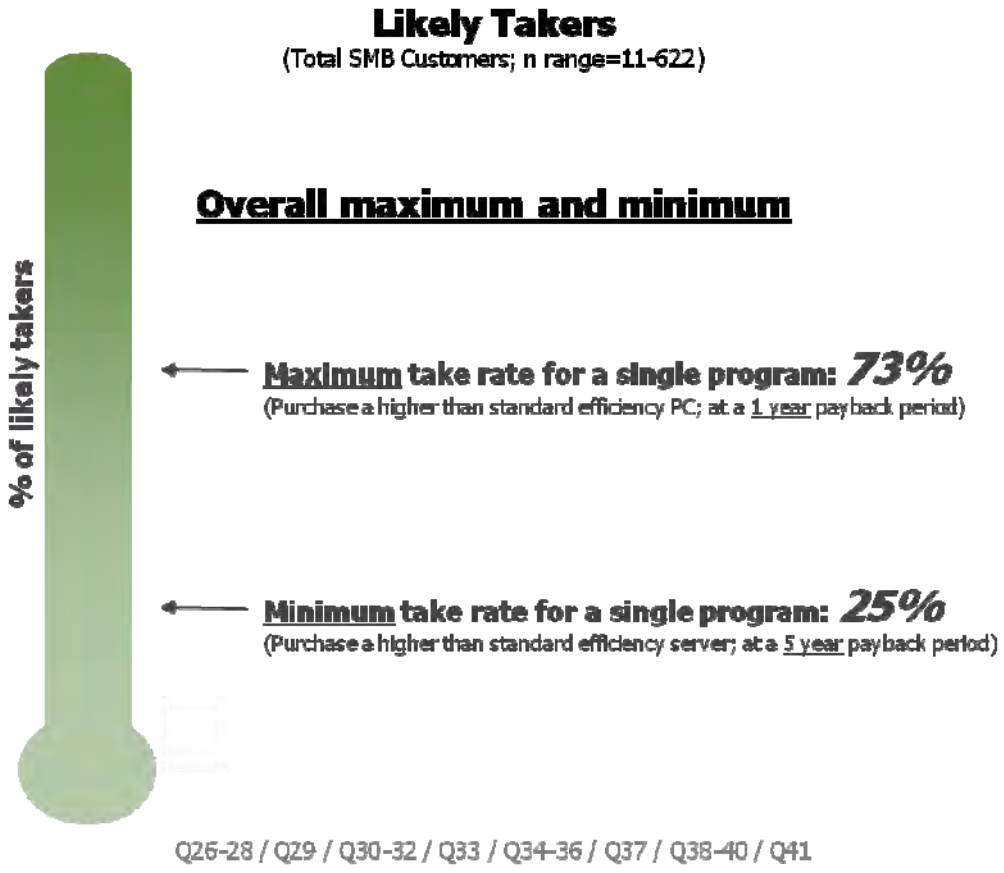
Once these inputs were identified, the team tested a wide variety of segmentation solutions, ultimately selecting a solution that optimized relative segment size, absolute segment sample size, and overall meaningfulness of segment profiles. The solution selected as most appropriate was a solution containing 6 segments with different response patterns to the final set of selected segmentation inputs.

C&I PROGRAM INTEREST SURVEY RESULTS

Note that the "take rates" that are reported in this chapter have been adjusted using the say / do adjustment model referenced in the Methodology section earlier in this report. As such, they represent the team's best estimate of the most likely proportion of customers who would actively sign up for each program, given that they were eligible to do so, and were fully aware of the program and its potential benefits for them.

As shown in Figure 7-1, the range of take rates across the full range of programs / measures tested spans from a low of around one-tenth of all eligible customers to a high of just under 50% of all eligible customers.

Figure 7-1 Maximum and Minimum Take Rates for Business Customers



The first full category of EE measures that were explored considered the idea of purchasing higher than standard efficiency appliances within the context of a normal replacement cycle. Within the nine appliances or end uses considered, light bulbs were the technology that business customers are estimated to be the most likely to upgrade to an EE option at each payback period level (and this is largely due to the use of the "regular purchase" adjustment for this product category). Across the other technologies, the take rates are highest at each payback period level for the least expensive equipment purchases: PCs and light bulbs. While – as expected – take rates are higher for lower payback periods, these ranges are smallest for basic office equipment such as printer and servers

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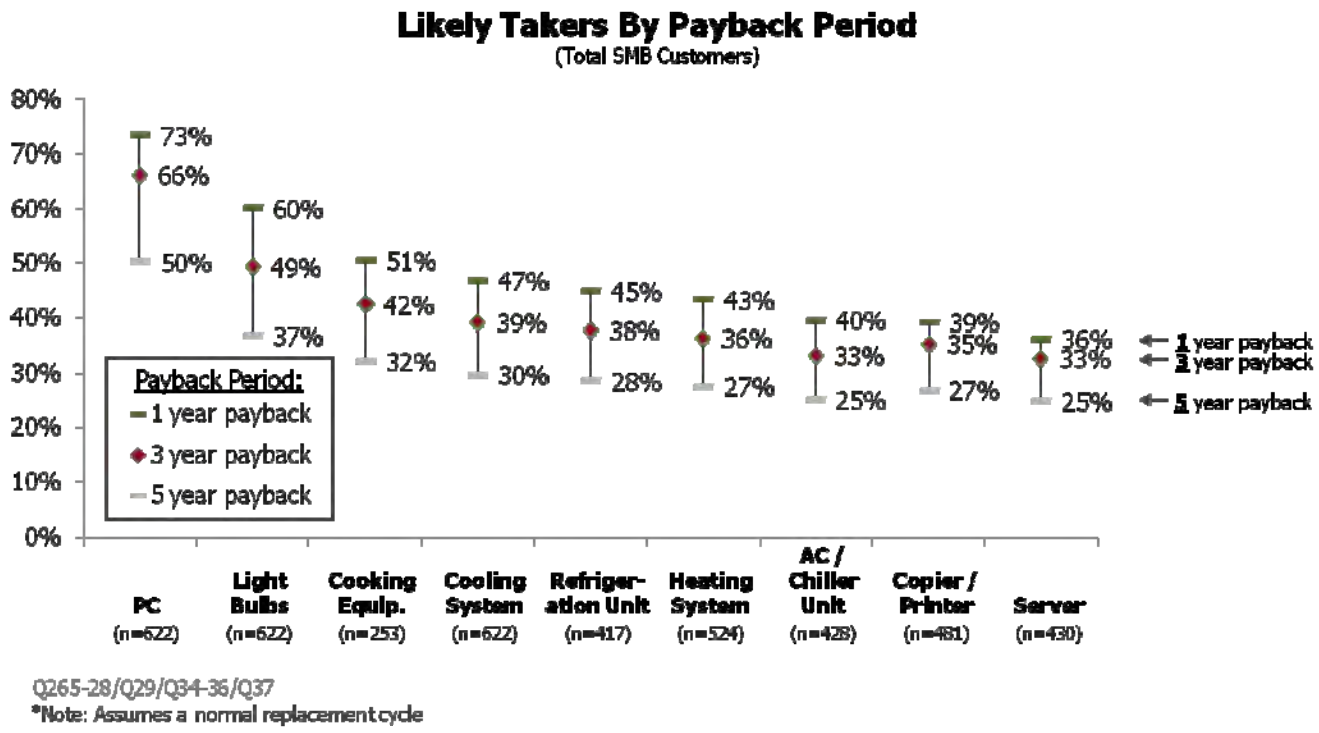
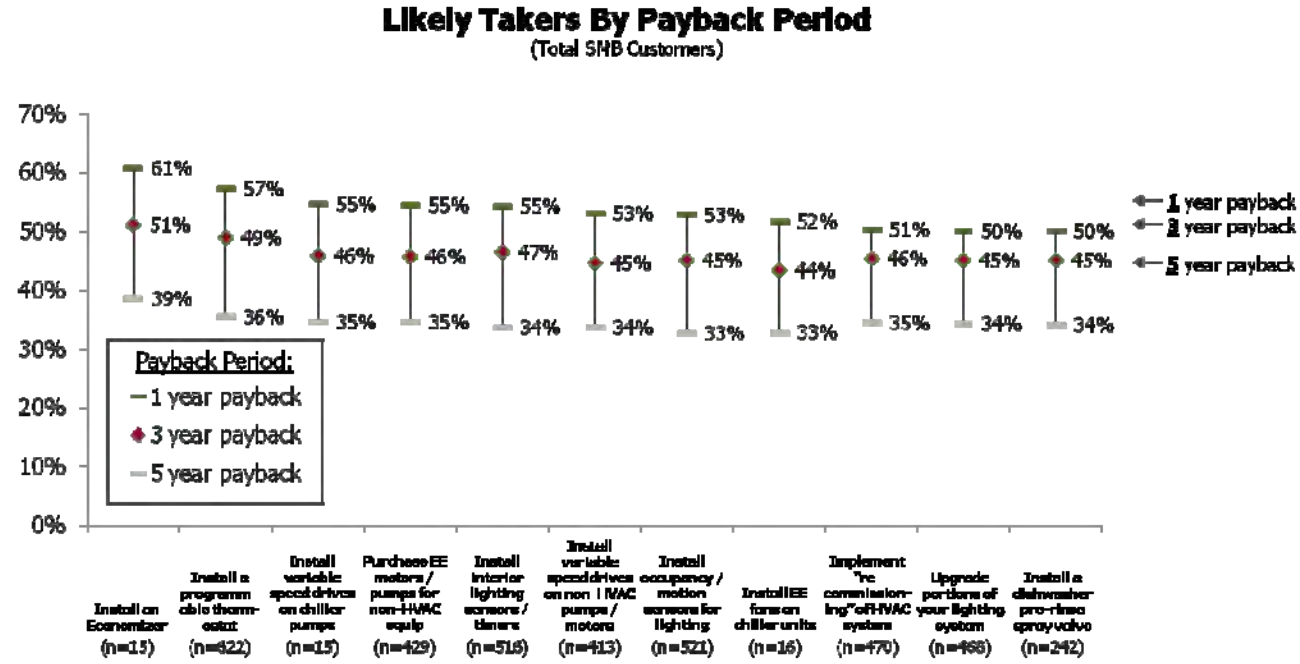
(dipping to 25% at a 5 year payback period). Figure 7-2 shows the take rates for equipment measures.

Figure 7-2 Measures for Purchasing / Installing Energy Efficient Equipment*

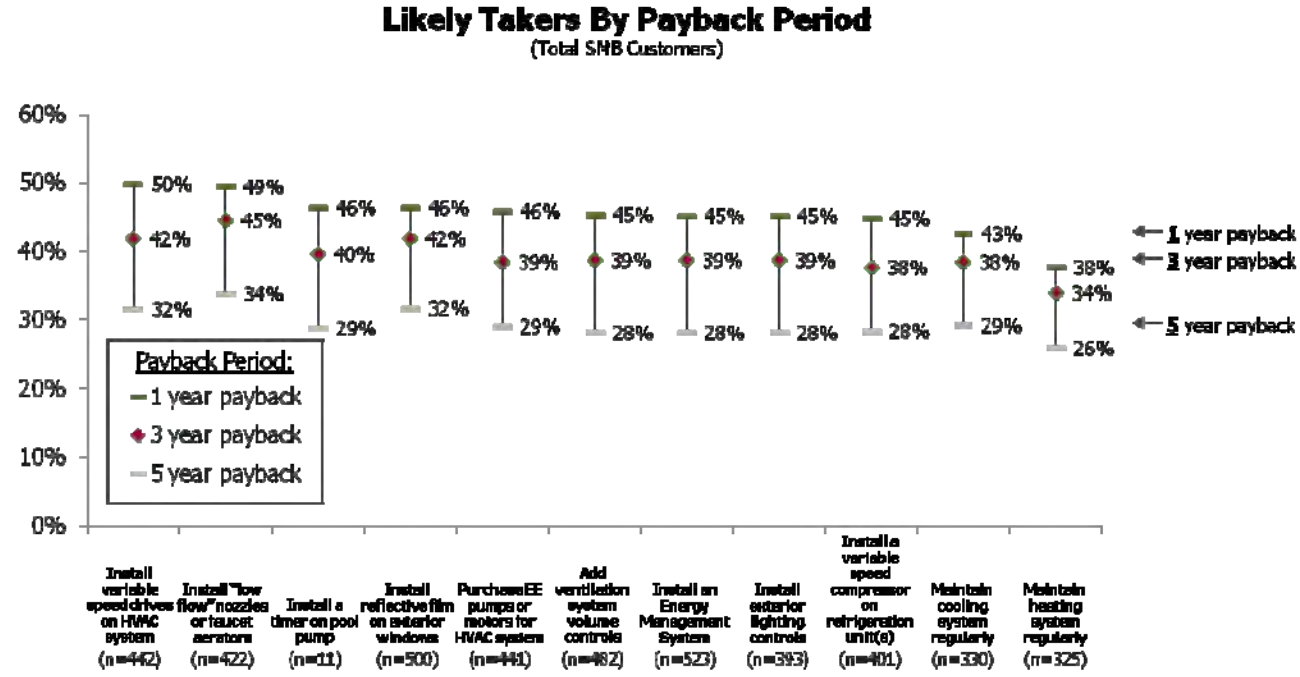


Among 22 options having to do with upgrading existing systems, or improved maintenance, business customers indicate a higher likelihood to install a programmable thermostat, as shown in Figure 7-3. (Though applicable to only a few, take rates are were highest for installing an Economizer). The take rates differ rather widely across these options (going from a high of 61% for installing an Economizer at a one year payback to a low of 26% for regularly maintaining the heating system at 5 year payback period).

Figure 7-3 Measures for Improving Energy Efficiency of Existing Systems



Q29/Q30/Q33/Q37



Q29/Q30/Q33/Q37

Considering all of the measures tested, as shown in Table 7-1, the group of measures with the highest adoption rates is comprised of a mix of both measures associated with purchasing or installing energy efficient equipment and measures for improving the energy efficiency of existing systems. It is interesting to note that, because they are based on a normal replacement cycle, the measures in the "Purchasing / Installing Energy Efficient Equipment" group are among those that take the least amount of additional effort to implement.

Table 7-1 Opportunities for Measures, High to Low

Measures: Highest Opportunity	Likely Takers @ 3yr Payback (or payback irrelevant for *No Upfront Investment Measures)* (n range=11-622)	Measures for:
Purchase EE PC[2]	66%	Purchasing / Installing EE Equipment
Install an Economizer	51%	Improving EE of Existing Systems
Reduce thermostat setting during the winter[1]	50%	No Upfront Investment
Purchase EE light bulbs[2]	49%	Purchasing / Installing EE Equipment
Install an advanced programmable, clock-based thermostat	49%	Improving EE of Existing Systems
Install interior lighting sensors / timers	47%	Improving EE of Existing Systems
Measures: Middle Opportunity	**Likely Takers @ 3yr Payback (n range=15-622)**	**Measures for:**
Install variable speed drives on chiller pumps	46%	Improving EE of Existing Systems
Purchase EE motors / pumps for non-HVAC equip	46%	Improving EE of Existing Systems
Implement "re-commissioning" of HVAC system	46%	Improving EE of Existing Systems
Install occupancy / motion sensors for lighting	45%	Improving EE of Existing Systems
Upgrade portions of your lighting system	45%	Improving EE of Existing Systems
Install a dishwasher pre-rinse spray valve	45%	Improving EE of Existing Systems
Install variable speed drives on non-HVAC pumps / motors	45%	Improving EE of Existing Systems
Install "low flow" nozzles or faucet aerators	45%	Improving EE of Existing Systems
Purchase EE refrigeration unit[2]	44%	Purchasing / Installing EE Equipment
Install EE fans on chiller units[2]	44%	Improving EE of Existing Systems
Reduce water heater temperature[1]	43%	No Upfront Investment
Install EE cooking equipment[2]	42%	Purchasing / Installing EE Equipment
Install variable speed drives on HVAC system	42%	Improving EE of Existing Systems
Install reflective film on exterior windows	42%	Improving EE of Existing Systems
Measures: Lowest Opportunity	**Likely Takers @ 3yr Payback (n range=134-749)**	**Measures for:**
Install a timer on pool pump	40%	Improving EE of Existing Systems
Purchase EE cooling system[2]	39%	Purchasing / Installing EE Equipment
Add ventilation system volume controls	39%	Improving EE of Existing Systems
Install an Energy Management System	39%	Improving EE of Existing Systems
Install exterior lighting controls	39%	Improving EE of Existing Systems
Purchase EE pumps or motors for HVAC system	39%	Improving EE of Existing Systems
Maintain cooling system regularly	38%	Improving EE of Existing Systems
Install a variable speed compressor on refrigeration unit(s)	38%	Improving EE of Existing Systems
Purchase EE heating system[2]	36%	Purchasing / Installing EE Equipment
Purchase EE copier / printer[2]	35%	Purchasing / Installing EE Equipment
Raise your thermostat setting in the summer[1]	34%	No Upfront Investment
Maintain heating system regularly	34%	Improving EE of Existing Systems
Purchase EE central / packaged AC or chiller[2]	33%	Purchasing / Installing EE Equipment
Purchase EE server[2]	33%	Purchasing / Installing EE Equipment