Evergy
2019 DSM Potential Study

Final Report

Volume 2: Appliance Saturation Study

October 2020

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Eureka Facts supported ICF in conducting the appliance saturation survey.

Introduction

Evergy engaged ICF to conduct this demand side management (DSM) potential study. It assessed technical, economic and achievable potential in the residential, commercial, and industrial sectors within Evergy's service areas in Missouri, Evergy Missouri Metro and Evergy Missouri West. The study covers energy efficiency, demand response, demand-side rates, and combined heat and power.

ICF assessed five achievable potential scenarios including Realistic Achievable Potential (RAP), RAP-, RAP+, Missouri Energy Efficiency Investment Act (MEEIA), and Maximum Achievable Potential (MAP) for energy efficiency, demand response and demand side rates. ICF modeled additional stand-alone scenarios for demand response and demand side rates.

As part of the study, ICF conducted an appliance saturation analysis to collect a variety of appliance and end-use data from customers across multiple service territories in Missouri and Kansas, including residential, commercial, and industrial accounts. It included a web and mail survey of residential customers and a computer-assisted telephone interviewing (CATI) survey of business customers. The results of this analysis were used in the market characterization and baseline electricity load analysis in the study.

This study will be used to satisfy the demand-side analysis requirements of the Missouri resource planning regulations at 4 CSR 240-22, particularly Chapter 22.050. In addition, the study also takes into consideration the requirements of demand-side programs under the MEEIA regulations at 4 CSR 240-20.092, 20.093, and 20.094.

Report Organization

This report includes five volumes:

- Volume 1: Executive Summary
- Volume 2: Appliance Saturation Study
- Volume 3: Potential Study
- Volume 4: Program Descriptions
- Volume 5: Appendices

This document is Volume 2: Appliance Saturation Study. It includes the methodology and results of the 2019 Evergy Appliance Saturation Study conducted by ICF. This study included a web and mail survey of residential customers and a Computer Assisted Telephone Interviewing (CATI) survey of commercial and industrial (C&I) customers. Results from the study were incorporated into the Demand-Side Management Market Potential Study presented in Volume 3.

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1. Methodology

The Appliance Saturation Study was designed to collect a variety of appliance and end-use data from residential, commercial and industrial customers across multiple service territories. It included a web and mail survey of residential customers and a computer-assisted telephone interviewing (CATI) survey of business customers between August and October 2019.

These parallel data collection efforts were part of a larger Demand-Side Management (DSM) Market Potential Study. The results of the Appliance Saturation Study feed into the later steps of the project, which resulted in a DSM market potential study for Evergy's Missouri and Kansas territories for the residential, commercial, and industrial sectors.

Please note that the survey was administered at the same time as Kansas City Power & Light (KCP&L) and Westar underwent a renaming and rebranding to become Evergy. So, whereas all survey materials reflect the old brand and territory names, the results in this report use the new Evergy brand and territory names.

The survey project included five phases, as shown in Figure 1, with tasks for the Residential and Commercial & Industrial (C&I) studies occurring concurrently.

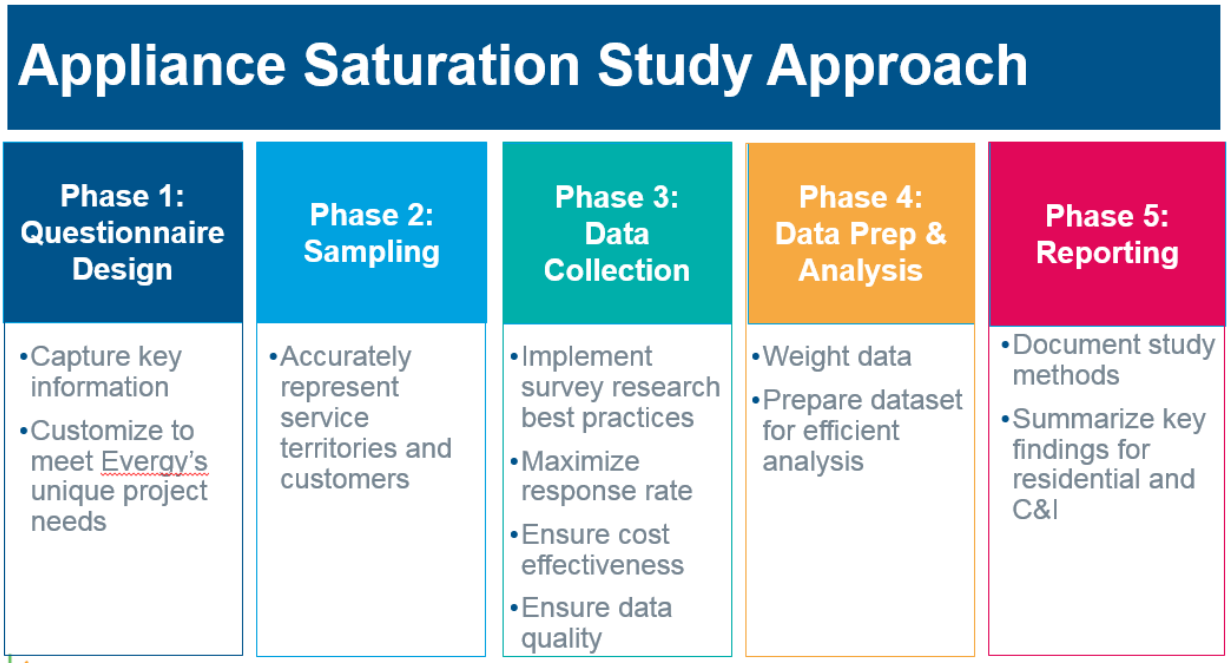


Figure 1: Appliance saturation survey approach

2. Questionnaire Design

While the 2016 survey instruments were maintained to the greatest degree possible, the questionnaire development phase included revisions to existing questions and development of new questions. These updates were designed to streamline the instrument, support the required DSM analysis, and incorporate new technologies and policy priorities. Revisions to both the residential and C&I questionnaires were the subject of multiple discussions between ICF and Evergy until final versions were approved. The final questionnaire topics are shown in Table 1 below.

Table 1: Questionnaire Topics

Residential	Commercial & Industrial
Occupant characteristics	Other end-uses
Heating, cooling and ventilation	Business characteristics
Water heating	Heating, cooling and ventilation
Lighting	Water heating
Refrigerators	Lighting
Ranges, ovens, and microwaves	Refrigeration equipment
Dishwashers	Cooking equipment
Clothes washers and dryers	Other commercial equipment
Televisions	Computers and computer equipment
Set-top boxes	Electric vehicles and charging stations
Computers and computer equipment	Other end-uses
Well pumps, swimming pools, and hot tubs	
Solar, electric vehicles, charging stations	

The main updates to the 2019 Residential questionnaire, compared with the 2016 version, included the following:

- Revising the order of topics and creating distinct sections (with headers)
- Removing the question about “who is billed” for different services
- Streamlining the primary heating, back-up heating, and cooling sections and simplifying the skip instructions
- Expanding the thermostat section to ask what systems are controlled, what the typical settings are, and whether the respondent has any interest in smart thermostat capabilities
- Adding a new open-ended question: *What additional energy-efficiency programs and/or rebates would you like to see your utility offer customers?*
- Adding a new section on energy efficiency to gauge awareness of various programs and willingness to engage in various programs based on different incentive levels (Missouri customers only)
- Removing the final section offering respondents a $10 check for participating

The Residential questionnaire was formatted into an 8-page mail booklet that followed KCP&L and Westar brand guidelines. ICF also programmed the corresponding web survey in ICF’s Voxco web data collection platform.

The main updates to the 2019 C&I questionnaire for 2019, compared with the 2016 version, included the following:

- Organizing the contents into distinct sections
- Adding instructions to most questions that ask respondents to think about *all buildings* at the sampled location (if they had multiple buildings)
- Reducing the list of business activities to focus on those needed for analysis
- Revising the primary heating, secondary heating, and cooling questions to obtain the same level of detail:
    - Presence of system and total floor area heated or cooled
    - Type of system
    - Fuel used
    - Age of system

- Adding specificity to the lighting questions
- Moving the “hours of operation” question to the lighting section
- Adding new questions about awareness of energy-efficiency programs and willingness to engage in various programs based on different incentive levels (Missouri customers only)
- Removing the final section offering respondents a $10 Amazon gift code for participating

The C&I questionnaire was programmed for CATI administration by ICF’s partner EurekaFacts, and all interviewers completed a two-hour training prior to launch.

3. Sampling

I. Residential Saturation Survey Sampling Overview

This section details the sampling and data processing made by ICF to produce the residential sampling frame and sample for fielding of the KCP&L Residential Appliance Saturation Survey. ICF used customer data to create a sampling frame. Over 17,000 residential records were sampled to target 800 completed surveys per service territory (3,200 total).

Target Population

ICF defined the target population of the Residential Survey as residential customers in the KCP&L and Westar service territory (KCPL-M, KCPL-K, GMO, and Westar).

Frame Sources

ICF was provided two different data sources to develop the residential sampling frame:

- KCP&L Customer Data Extract
- Westar Customer Data Extract

Note: the KCPL&L customer data extract contained both residential and C&I customers. As a result, additional exclusions were made for the development of the residential sampling frame (discussed in the section “Frame Exclusions”). The Westar customer data extract separated commercial and residential customers in different datasets, so additional residential exclusions were not used.

Frame Exclusions

To be eligible for selection in the Residential Survey, a customer had to fulfill the following criteria:

- Have an annual usage of at least 1,000 kWh in the past year
- Be a residential customer located within the four utility service territories
    - Evergy Missouri Metro (formerly KCP&L-MO)
    - Evergy Kansas Metro (formerly KCP&L-KS)
    - Evergy Kansas Central (formerly Westar)
    - Evergy Missouri West (formerly KCP&L-GMO)
- Have a valid and complete residential address
    - Records with email addresses were oversampled (1.5 to 1) and contacted once using that mode

Put another way, there were three main exclusions:

- Non-residential or Unknown Customer Types,

- Inactive Customers (<1,000 kWh usage in the past 12 months), and
- Improper Contact Information (invalid premise address).

Non-residential Exclusion

For the KCP&L data source, we used the variable "CustomerClass" and "PremiseType" to define a residential record; a record must have had an "R" for customer class and one of the following premise types:

- "SNGLEFAM"
- "MOBLHOME"
- "DUPLEX"
- "APARTMENT"
- "SEASONAL"

For Westar, the variable ACCTCLASS was reviewed to identify nonresidential cases that may have been present in the frame, as these were not eligible for the survey. No records were identified.

Inactive Customer Exclusion

In both the KCP&L and Westar data sources, kWh usage for each record was summed across a 12-month time period and records with usage totaling less than 1,000 kWh were excluded.

Invalid Premise Address

After combining the KCP&L and Westar data sources, ICF reviewed the premise street address for entries that only contained numeric values as they would not be a valid address. These records were removed.

Sampling Unit

For the KCP&L data source, the unique sampling unit is defined by the ACCOUNTID and PREMISEID variables found in the data. For the Westar data source, the sampling unit is defined by a unique combination of the customer name and premise address (using the variables CUSTOMERNAME, SERVICEADDRESS, SERVICECITY, SERVICESTATE, and SAMOD).

ICF reviewed the frame sources for duplicate records based on the sampling unit and removed duplicates from the final sampling frame. For the purpose of eligibility, energy usage from duplicated records was aggregated before being removed from the frame to ensure total kWh usage was accounted for.

Multifamily/Single Family Classification

For KCP&L, records with the PREMISETYPE value of "DUPLEX" or "APARTMENT" were classified as multifamily dwellings. In addition, based on a word search algorithm, ICF searched the address field for the following strings that would indicate a multifamily premise type:

- Apartment indicators: "*#*", "*APT*", "*FL*", "*UNIT*", "*FRONT HOUSE*"
- Comma followed by an alphanumeric value: For example, "*123 Main St, 312*" or "*113 3rd Street, A102*"

If a record was identified as having any of these strings in the address field, it was considered a multifamily dwelling even if the PREMISETYPE value indicated otherwise.

For Westar records, because there was no premise type variable available, ICF instead identified multifamily dwellings as records with duplicate premise street addresses, excluding unit numbers (using the variables SERVICEADDRESS, SERVICECITY, and SERVICESTATE). Additionally, ICF identified multifamily dwellings through the SAMOD variable, which contained additional address information such

as apartment numbers and property information. After removing the most common forms of non-address information, records that contained an entry in the SAMOD variable were considered multifamily dwellings as well.[1]

Residential Sample Design

ICF selected an overall sample size of 17,087 records across all service territories to reach or surpass the target of 3,200 complete residential customer surveys overall, and 800 completed surveys per service territory.[2] This sample size was large enough to produce results with error margins of plus or minus 3.5% at the 95% confidence level. ICF anticipated a differential response rate between premise types based on historical data, and assumed a 23% response rate for single-family dwellings and 13% for multifamily dwellings.

Each service territory was stratified by premise type (single-family and multifamily dwellings). Within each service territory, the sample was allocated to premise type strata using the Neyman Allocation method, taking into account the size of the strata and the variability of kWh. The Neyman Allocation method allocates more sample to strata with higher levels of variability and less sample to strata with lower levels of variability. This method maximizes the precision for a survey given a fixed sample size. ICF also oversampled records (i.e., increased the proportion of records in the sample compared to the population) with email addresses 1.5 to 1 within each stratification to boost response rates and oversampled by premise type to reflect the anticipated differential response rates across single family and multifamily dwellings. Table 2 outlines the sample allocations based on this design.

Table 2: Residential Sample Design

Service Territory	Premise Type	Email Available?	Total Premises (N)	Sample (n)	Target Completes
KCPL-M	Single Family	No Email	88,981	1,026	236
		Email	73,164	1,265	291
	Multifamily	No Email	69,799	1,162	152
		Email	44,721	1,131	146
KCPL-K	Single Family	No Email	73,773	939	215
		Email	86,345	1,639	378
	Multifamily	No Email	48,337	808	104
		Email	39,680	977	128
Westar	Single Family	No Email	89,414	635	146
		Email	232,294	2,461	567
	Multifamily	No Email	13,101	115	16
		Email	54,047	754	97
GMO	Single Family	No Email	86,193	1,283	295
		Email	68,807	1,539	354
	Multifamily	No Email	35,193	738	97
		Email	19,155	615	79
Total			**1,123,004**	**17,087**	**3,300**

[1] The following strings were excluded in consideration of classification of multifamily dwellings: “CABIN”,”TRLR”,*"POOL", “GARGE", "GARAG", "GARA", "GAR", "SAL", "PAL", "PAL", "BARN", "SHOP", "SHED", "STOR", "STRG", "PUMP", "HOUSE", "WELL", "PUMP", "POLE", "SPRNK", "STRGE", "HOME", "FARM", "LNDRY", "GRNHS", "+P", "+S", "+", "(", ")", "&"*

[2] This represents a slight increase from the proposed initial sample size of 16,500 to account for oversampling multifamily records.

II. C&I Saturation Survey Sampling Overview

This section details the sampling and data processing decisions made by ICF to produce the commercial and industrial (C&I) sampling frame and sample for fielding of the KCP&L C&I Survey. In total, 15,400 records were sampled in order to target 800 completed phone surveys.

Target Population

ICF defines the target population of the C&I Survey as non-residential customers from the KCP&L and Westar service territories (KCPL-M, KCPL-K, GMO, and Westar).

Frame Sources

ICF was provided two different data sources to develop the C&I sampling frame.

- KCP&L Customer Data Extract
- Westar Customer Data Extract

Note, the KCPL&L customer data extract contains both residential and C&I customers, and as a result, additional exclusions were made for the development of the residential sampling frame (discussed in the section “Frame Exclusions”). The Westar customer data extract separated commercial and residential customers in different dataset, so additional commercial exclusions were not used.

Frame Exclusions

The main exclusions for the C&I Survey were:

- Customer class and premise types
- Inactive customers (<1,000 kWh usage in the past 12 months)
- Non-building addresses
- Improper contact information (invalid premise address or missing business phone numbers)
- Westar key customers

Customer Class and Premise Type Exclusion

For the KCP&L data source, ICF used the variable “CustomerClass” and “PremiseType” to define a C&I record. For customer class, ICF only excluded the following class types:

- R - Residential
- CUSE - Company Use
- BKR - Bankruptcy Residential
- BKNR - Bankruptcy Non-Residential

Once ineligible customer classes were excluded, ICF then excluded records based on residential premise types:

- APARTMNT - Apartment
- DUPLEX - Duplex
- MOBLHOME - Mobile Home
- SNGLFAM - Single Family Home
- SEASONAL – Seasonal

For Westar, the variable ACCTCLASS was reviewed to identify residential cases, and no records were identified. No additional exclusions were used to identify nonresidential records.

Inactive Customer exclusion

In both the KCP&L and Westar data sources, kWh usage for each record was summed across a 12-month time period and records with usage totaling less than 1,000 kWh were excluded.

Similar to the residential sample design, the timeframe for calculating the period of interest was different between data sources. For the KCP&L data source, ICF defined the past 12 months as the period from 6/28/18 to 6/28/19, which is equivalent to one year from the most recent billing date found in the KCP&L data. For Westar, the past 12 months were derived from the preexisting fields kWhMONTH1 to kWhMONTH12.

Non-Building Addresses

Building information obtained either through the SAMOD variables (Westar) or the address field (KCP&L) gave additional insight into the eligible of the records. Records primarily associated with nonbuilding structures like cell towers, water fountains, or highway signs, were excluded from the sample.

Invalid Premise Address

After combining the KCP&L and Westar data sources, ICF reviewed the premise street address for entries that only contained numeric values, as they would not be valid addresses. These records were removed.

Westar Key Customers

Finally, in order prevent survey fatigue with key Westar customers, ICF removed any Westar records that had value “K” in the field “BUSINESS_CENTER_IND”, which indicate that the record was a key customer for Westar. ICF relied on Westar to identify and contact top customers for the “Top Customer” strata.

Sampling Unit

For the KCP&L data source, the unique sampling unit was defined by the ACCOUNTID and PREMISEID variables. For the Westar data source, the sampling unit was defined by a unique combination of the customer name and premise address (using the variables CUSTOMERNAME, SERVICEADDRESS, SERVICECITY, SERVICESTATE, and SAMOD).

ICF identified duplicate records within the frame sources based on the sampling unit and removed duplicates from the final sampling frame. For the purpose of eligibility, energy usage from duplicated records was aggregated before being removed from the frame to ensure total kWh usage was accounted for.

SIC Classification and Stratification

ICF created sample stratifications that grouped records by both business classification and energy usage (kWh). Similar to the 2016 methodology, ICF produced SIC groups to reflect industrial energy usage classifications and the most common commercial business types. The following classifications were based on the results of the entire frame.

Industrial SIC Classification

Industrial groupings were identified using classification used by the U.S. Energy Information Administration’s (EIA) National Energy Modeling System (NEMS): Industrial Demand Module (IDM).[3] The IDM estimates energy consumption for 15 manufacturing and six non-manufacturing industries. The

[3] “Assumptions to Annual Energy Outlook 2019: Industrial Demand Module.” Retrieved from https://www.eia.gov/outlooks/aeo/assumptions/pdf/industrial.pdf.

manufacturing industries are subdivided further into the energy-intensive manufacturing industries, non-energy-intensive manufacturing and non-manufacturing industries.

Table 3: Industry Categories and NAICS Codes

Energy-intensive manufacturing		Non-energy-intensive manufacturing		Non-manufacturing	
Food products	311	Metal-based durables industries		Agriculture: crop production	111
Paper and allied products	322	Fabricated metal products	332	Other agricultural production	112, 113, 115
Bulk Chemicals		Machinery	333	Coal mining	2121
Inorganic	325120-325180	Computer and electronic products	334	Oil and natural gas extraction	211
Organic	325110, 32519	Electrical equipment and appliances	335	Metal and other non-metallic mining	2122-2123
Resins	3252	Transportation equipment	336	Construction	23
Agricultural chemicals	3253	Wood Products	321		
Glass and glass products	3272, 327993	Plastic and rubber Products	326		
Cement and lime	327310, 327410	Balance of manufacturing	312-316, 323, 3254-3256, 3259, 3271,327320,327330, 327390, 327420, 3279 (except 327993), 3314, 3315, 337, 339		
Iron and steel	331110, 3312, 324199				
Aluminum	3313				

The classifications were originally categorized by NAICS codes shown in Table 3 but were translated into SIC codes for the purposes of this study.

The petroleum refining industry is excluded from the NEMS IDM, but is included in the energy intensive manufacturing category for the purpose of this study.

Records for which a valid SIC code was not available, but Westar-identified records had classified as industrial (ACCTCLASS = “I”), were coded as “Non-Manufacturing/Other Industry.”

Commercial SIC classification

Records were considered “commercial” if they contained a SIC code that was not previously identified as “industrial” or, for Westar records, if the data identified the record as commercial (ACCTCLASS = “C”).

Commercial stratifications were generated by selecting the 100 most common non-industrial SIC codes and categorizing them into the following common groupings:

- Service

- Real estate
- Retail
- Office
- Church
- Restaurant
- Government/utilities
- Health
- Telecom
- Warehouse
- School
- Grocery store
- Lodging
- College

These SIC groupings account for 71% of all commercial records on the frame. The remaining SIC codes were coded as "Other."

Unknown SIC Classification

Records for which neither SIC nor ACCTCLASS information was available were placed in the "Unknown" strata.

kWh Size Classification

Within each commercial and industrial segment, three size strata were defined. Breakpoints for the size strata within each segment were determined using the Dalenius-Hodges approach, which ensures that strata breakpoints minimize the within-strata kWh variance.[4]

Commercial Sample Design

In its review of the frame, ICF identified duplicate phone numbers across premises. To reduce burden on the respondents, ICF employed a two-stage sampling design. This design allowed for the estimation of premise level results while preventing the same phone number from being contacted for more than one record in the sample.

First Stage Sampling (Deduplicating Phone Numbers)

In first stage of selection, ICF selected records with no duplicate phone numbers as a certainty (i.e., 100% chance they will be selected). Records that shared the same phone number were grouped and one record from each phone number was randomly sampled. This resulted in a sample that had a unique phone number for each record.

Second Stage Sampling (SIC and Size Stratification)

After the first stage of selection, ICF selected an overall sample size of 15,400 records across all service territories to obtain a target of approximately 800 complete commercial and industrial customer surveys overall. The sample was stratified based on several criteria.

First, 200 of the largest customers, defined by demand over a 12-month period, were selected into the sample, with the expectation to obtain 40 total completed surveys from this group (20% response rate). Based on discussions with Evergy, ICF attempted to obtain 20 responses from the Top KCP&L 200 kW Customer strata and 20 responses that were identified and invited by Westar to complete the survey.

The remaining records were stratified by Commercial and Industrial SIC groupings and by low, medium, and high energy usage over a 12-month period. ICF assumed a 5% response for the remaining records.

[4] Calculations for the Dalenius-Hodges approach were conducted utilizing the cumulative root function in the R package "*stratification*."

Based on this sample size, ICF anticipated 800 completed surveys, which was sufficient to produce results with error margins of plus or minus 3.5% at the 95% confidence level.

Sample Counts by Stratification

Table 4 provides an overview of the sample design, which produced an overall sample size of 15,400 records and anticipated 800 completed surveys. Counts were allocated by C&I SIC strata and size strata using the Neyman's Optimal Allocation method.

Table 4: Proposed Sample Counts by Stratification

C&I SIC Strata	Size Strata	Frame	Sample	Response Rate	Target Complete
Top 200 kW Customers					
Largest Customer by kW		**200**	**200**	**20%**	**40**
Commercial Customers					
Church	Low kWh	6,824	80	5%	4
	Medium kWh	147	91	5%	5
	High kWh	3,278	278	5%	14
College	Low kWh	917	40	5%	2
	Medium kWh	302	36	5%	2
	High kWh	169	26	5%	1
Government/Utilities	Low kWh	42	76	5%	4
	Medium kWh	16	130	5%	7
	High kWh	2,487	63	5%	3
Grocery Store	Low kWh	281	198	5%	10
	Medium kWh	58	267	5%	13
	High kWh	897	154	5%	8
Health	Low kWh	189	101	5%	5
	Medium kWh	73	113	5%	6
	High kWh	2,272	223	5%	11
Lodging	Low kWh	430	107	5%	5
	Medium kWh	193	71	5%	4
	High kWh	684	100	5%	5
Office	Low kWh	187	283	5%	14
	Medium kWh	89	374	5%	19
	High kWh	5,139	61	5%	3
Other	Low kWh	507	1725	5%	86
	Medium kWh	76	1646	5%	82
	High kWh	21,041	497	5%	25
Real Estate	Low kWh	2,271	190	5%	10
	Medium kWh	409	192	5%	10
	High kWh	8,974	303	5%	15
Restaurant	Low kWh	1,150	108	5%	5
	Medium kWh	262	113	5%	6
	High kWh	2,062	308	5%	15
Retail	Low kWh	1,147	140	5%	7
	Medium kWh	603	139	5%	7
	High kWh	3,483	360	5%	18
School	Low kWh	1,078	151	5%	8
	Medium kWh	329	124	5%	6
	High kWh	1,507	187	5%	9
Service	Low kWh	484	470	5%	24
	Medium kWh	230	498	5%	25
	High kWh	11,207	268	5%	13
Telecommunication	Low kWh	1,320	79	5%	4

	Medium kWh	222	87	5%	4
	High kWh	3,147	26	5%	1
Warehouse	Low kWh	404	67	5%	3
	Medium kWh	37	83	5%	4
	High kWh	1,454	74	5%	4
Industrial Customers					
Energy Intensive	Low kWh	496	231	5%	12
	Medium kWh	57	73	5%	4
	High kWh	9	14	5%	1
Non-Energy Intensive	Low kWh	6,639	925	5%	46
	Medium kWh	698	688	5%	34
	High kWh	128	146	5%	7
Other Industry	Low kWh	6,172	232	5%	12
	Medium kWh	769	443	5%	22
	High kWh	115	147	5%	7
Unknown Customers					
Unknown SIC Code	Low kWh	22,373	601	5%	30
	Medium kWh	2,709	588	5%	29
	High kWh	486	405	5%	20
Total (All Strata)		**122,265**	**15,400**		**800**

4. Data Collection

Data collection for both surveys lasted approximately two months. The Residential Survey achieved 3,963 completed surveys by web and mail, exceeding the target of 3,200. This yielded an overall margin of error of +/- 1.61% at the 95% confidence level. The C&I study also surpassed its target, achieving 860 completed surveys, with a margin of error of +/- 3.89% at the 95% confidence level.

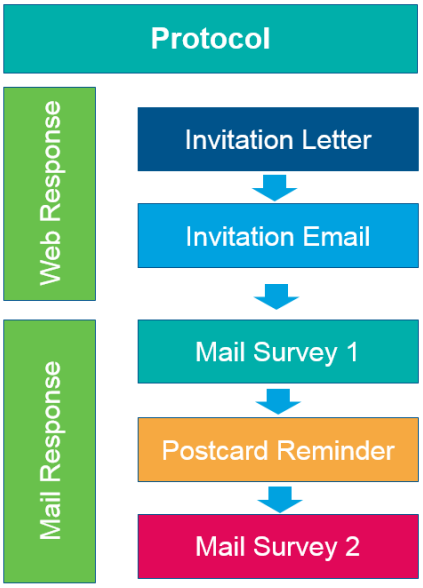
ICF's implementation of the study was conducted in compliance with the ISO 20252 Research Quality Certification for Market, Opinion, and Social Research, which ensures a robust quality management system.

During set-up, fielding, and analysis, ICF held bi-weekly meetings with the Evergy team to discuss progress.

The survey data was processed, weighted, and analyzed in the months leading up to the DSM Potential Study Stakeholder Meeting on December 5, 2019.

I. Residential Data Collection

The Residential Saturation Survey design utilized a multi-mode sequential design over nine weeks of fielding (August 12 to October 7, 2019). The following protocol was used for data collection with residential customers:



1. An **invitation letter**, signed by KCP&L/Westar representative Tim Nelson**,** was sent to all sampled households explaining the purpose of the survey and asking the respondent to complete the survey online using a custom URL (www.KCPLEnergySurvey.com or www.WestarEnergySurvey.com) and unique PIN provided in the letter. In addition, the letter provided a telephone number and email address to an ICF survey helpdesk.

   One week later, all sampled respondents with email addresses in the sample file who had not completed the survey were sent an **email** asking them to respond. Respondents were able to click directly on their personalized links to the survey embedded within the email.

2. One week after the email reminder, all sampled respondents who had not yet responded were sent a **mail survey packet** including a cover letter, KCP&L- or Westar-branded mail booklet, and a business reply envelope. The web version of the survey remained open during the mail fielding of the survey, although no reference to the availability of this mode was made in this specific mailing.

   One week after the mailing of the survey packet, a **postcard reminder** was sent to all non-respondents. The postcard thanked those who had already completed the survey and encouraged those who had not to respond.

3. Finally, two weeks after the mailing of the reminder postcard, a **second mail survey packet** was sent to all non-respondents. This mailing included a revised cover letter, another copy of the mail questionnaire, and a business reply envelope.

Table 5 below shows the date and sample size for each contact attempt.

Table 5: Timeline of Residential Survey Contacts

Event	Date	Quantity sent
Launch/Mail advance letter	Aug 12, 2020	17,087
Email Reminder (to records with an email on file	Aug 19, 2020	10,045
First Survey mail out	Aug 29, 2020	15,596
Postcard mail out	Sept 6, 2019	14,843
Second Survey mail out	Sept 20, 2019	14,047
Survey close	October 10, 2019	N/A

There were no financial incentives offered to participate in either the Residential or Commercial surveys.

As discussed in the sampling plan, the Residential Survey targeted 800 completed surveys per service territory, or 3,200 total completed surveys. At the end of fielding, ICF achieved 3,963 completes by web and mail, exceeding the target. Completes exceeded targets in every region, as shown in Figure 2, and in the multi-family segment (which achieved 939 completes, 15% above the target of 819). The final dataset was composed of 38% web records and 62% mail records. In cases where a person replied both by mail and web, the web response was included in the final survey data.

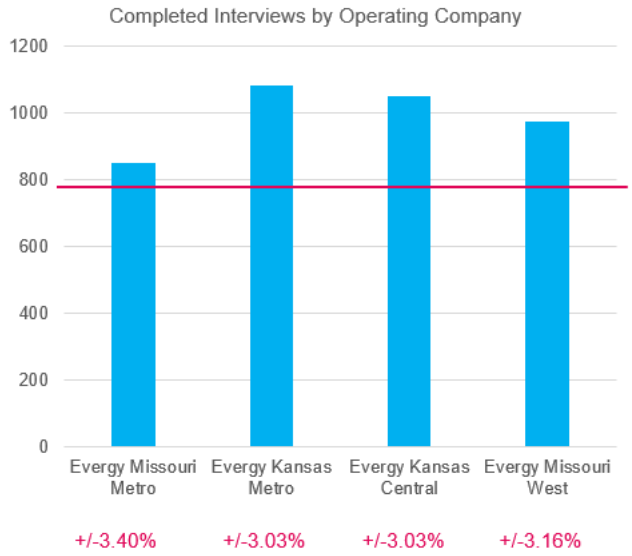


Figure 2: Completed surveys by operating company

This yielded an overall response rate of 23%, with a margin of error of +/- 1.61% at the 95% confidence level. Confidence intervals for each region are shown in Figure 2.

II. C&I Data Collection

The C&I Survey was conducted via telephone using a questionnaire programmed and tested for CATI administration. Except for a sample of largest customers, C&I interviews were conducted by executive interviewers from ICF's partner EurekaFacts, who were trained to conduct the survey by ICF staff. The interviewer training session included an overview of study objectives and a detailed question-by-question review of the data collection instrument.

As noted in the sampling overview, 200 of the largest customers by kW demand were included in the sample. ICF's project management team contacted these customers using a custom outreach approach, which leveraged Evergy's key account representatives and sought to schedule interviews at times most convenient for the respondents. Forty completed interviews were targeted with this group. There were

some challenges in gaining cooperation from larger customers, including survey fatigue and decisions by key account managers to not contact certain customers. ICF was able to complete 16 interviews with this subgroup.

Survey fielding lasted 8 weeks and the average interview length was just under 16 minutes.

The target of 800 was exceeded by 5%—860 interviews were completed and included in the analysis. This resulted in an overall margin of error of +/- 3.89% at the 95% confidence level. Responses by operating company were as follows:

- Evergy Missouri Metro: 130
- Evergy Kansas Metro: 113
- Evergy Missouri West: 261
- Evergy Kansas Central: 356

5. Data Processing and Weighting

I. Data Processing Steps

At the completion of data collection for the Residential Survey, data from the web and mail modes were cleaned and the two data files were combined into a single file for analytical purposes. ICF developed a crosswalk with the relevant variable labels for each survey mode and version to help ensure correct merging.

ICF conducted significant data cleaning on the mail surveys. Because mail survey respondents can ignore skip instructions and enter values not in range, ICF took multiple steps to clean and validate the mail survey data including:

- Reviewing all open-ended responses and “back-coding” them to an existing category where applicable. This was also done for web open-ended responses.
- Developing mail cleaning “rules” to flag and exclude any values that should not have been entered according to skip logic.

The mail survey, especially the lightbulb table, included many out-of-range or invalid entries that needed to be reviewed on a case-by-case basis and cleaned. For example, in the lightbulb table, some respondents entered text, percentages, and counts. Lightbulb counts also needed to be summed by type for additional analysis.

ICF applied the following rules to the merged, combined dataset:

- If there was a mail and web duplicate, the web data was kept.
- For both web and mail, records with fewer than 10 missing values for ASK ALL questions were included in the data. This rule applied to records dispositioned as either complete or partial.

Once ICF received a datafile from EurekaFacts, data processing for the Commercial & Industrial Survey included:

- Checking for invalid and out-of-range values
    - Some respondents answered in percentages, rather than counts, especially for the lighting questions. These needed to be reviewed on a case-by-case basis.
    - Some unexpected values were reviewed and verified using internet research.
- Checking that all value labels matched the questionnaire.

- Checking that no values were missing. This check revealed that 6 questions from the energy efficiency section were missing.
- Checking that variables were in the proper format (such as character and numeric).

At this stage, responses were also recoded into existing categories for analysis. For example, if a respondent provided an open-ended response for total square footage in Q6, that was recoded into a category to match the answer options in Q7. Back-coding of open-ends also took place at this stage, for instance if a business was coded as “something else” but upon review could be categorized as an existing category.

II. Weighting

Residential Weighting

The initial sampling weights were calculated based on the sampling design, which included stratification based on service territory, premise type, and email availability. These weights were then adjusted for nonresponse through a process of post-stratification to the sampling frame totals for service territory and premise type to ensure that the weighted data represented the population of interest.

C&I Weighting:

The initial sampling weights were calculated based on the sampling design, which included stratification by commercial and industrial classification, SIC groupings, and by low, medium, and high kWh usage over a 12-month period. These weights were then adjusted for nonresponse through a process of iterative post-stratification (i.e., raking) to the sampling frame totals for these stratification groupings.

In some cases, the adjustment cells used for post-stratification weighting were too small (<15 survey responses) and required the adjustment cells to be combined. ICF first combined the kWh size strata within SIC groupings, then SIC groupings within commercial and industrial classifications to reach sufficient cell sizes.

Weights were then reviewed for extreme values that could lead to large variance estimates and were trimmed if the weights exceeded three times the interquartile range (IQR) plus the median.

6. Reporting

As part of the analysis for this project, ICF created analytic variables and reviewed frequency counts, measures of central tendency, and association. The survey team, in collaboration with the ICF Commercial Energy Team and Evergy, identified findings of interest to present to utility stakeholders. In addition to this report, results were shared in two presentations:

- November 14, 2019 - Presentation of results to Evergy
- December 5, 2019 - DSM Potential Study Stakeholder Meeting

7. Results

I. Residential Survey

This section presents the Residential Survey results in detail. In the bar graphs that follow, results for all four operating companies are represented by color-coded columns. A total or average value representing all service territories is represented by the horizontal yellow bar. Results are compared to the 2016 Saturation Study results where possible. However, in some cases the question wording was revised substantially for the 2019 Study, or the calculations were carried out differently, precluding a meaningful comparison.

II. About Your Home

The Residential Survey opened with questions about housing characteristics. Figure 3 shows the primary housing types for utility customers. About three-quarters of homes in the more rural territories (Evergy Kansas Central and Evergy Missouri West) were single-family homes detached from other houses, while in the metro territories, 15-20% of respondents lived in multi-family housing with five or more units.

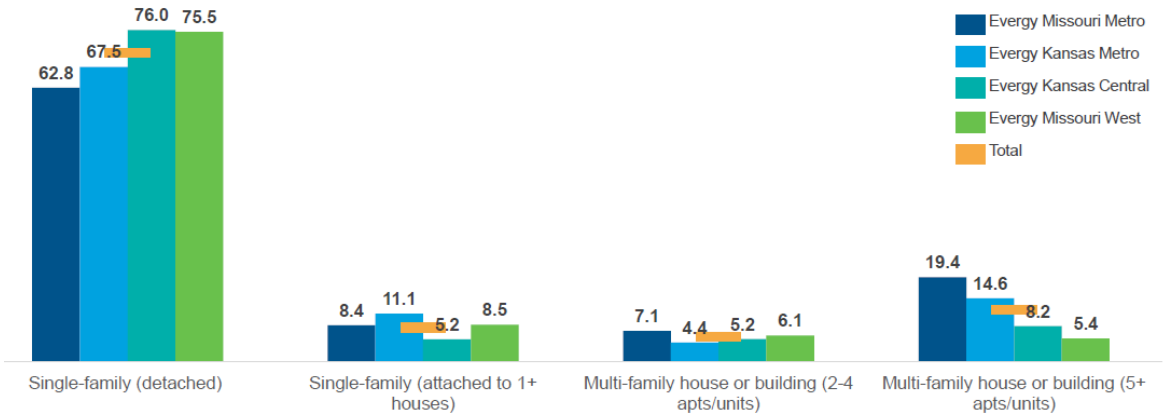


Figure 3: Q1. Which of the following best describes your home?

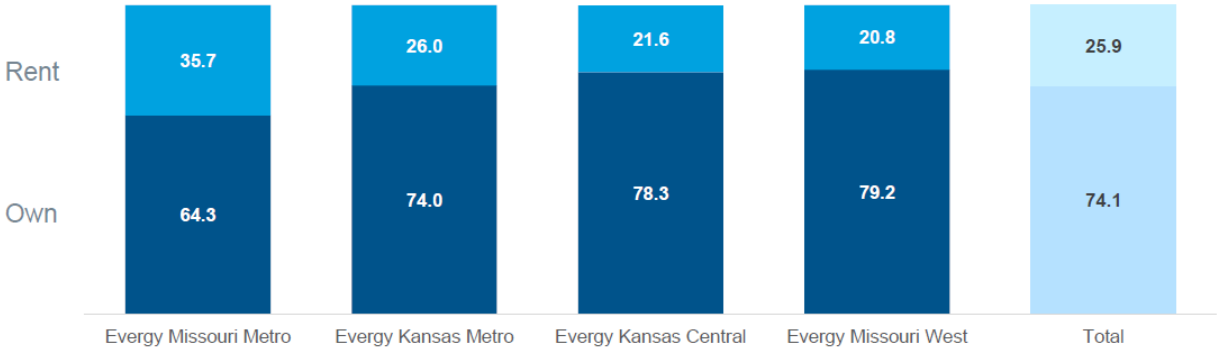


Figure 4: Q3. Do you own or rent your home?

Less than 5% of residents lived in mobile/manufactured home or “other” housing types (cottage, townhouse, single apartment or cabin).

Overall, about three-quarters of residents owned their homes, while one-quarter rented. Ownership rates were highest in Evergy Missouri West (79.2%) and lowest in Evergy Missouri Metro (64.3%).

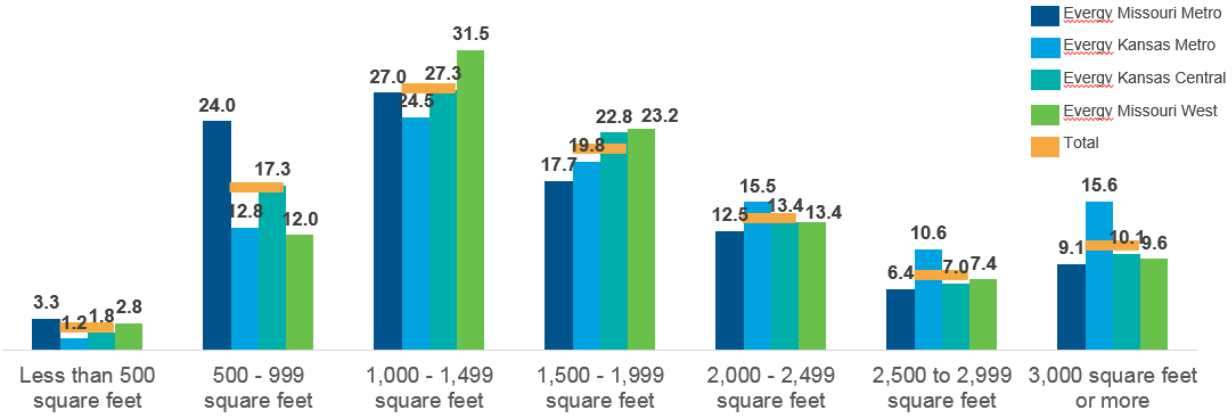


Figure 5: Q4. What is the approximate square footage of your home?

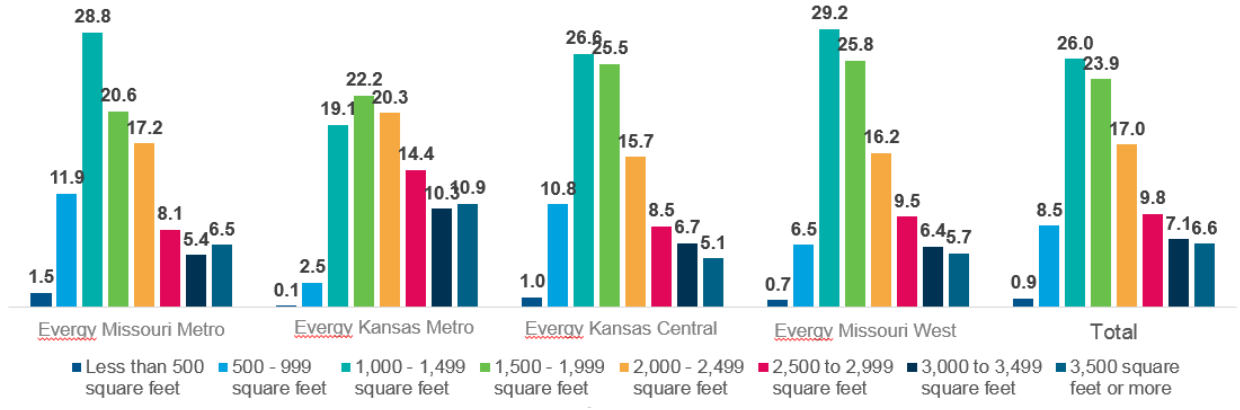


Figure 6: Q4. What is the approximate square footage of your home? (Single Family)

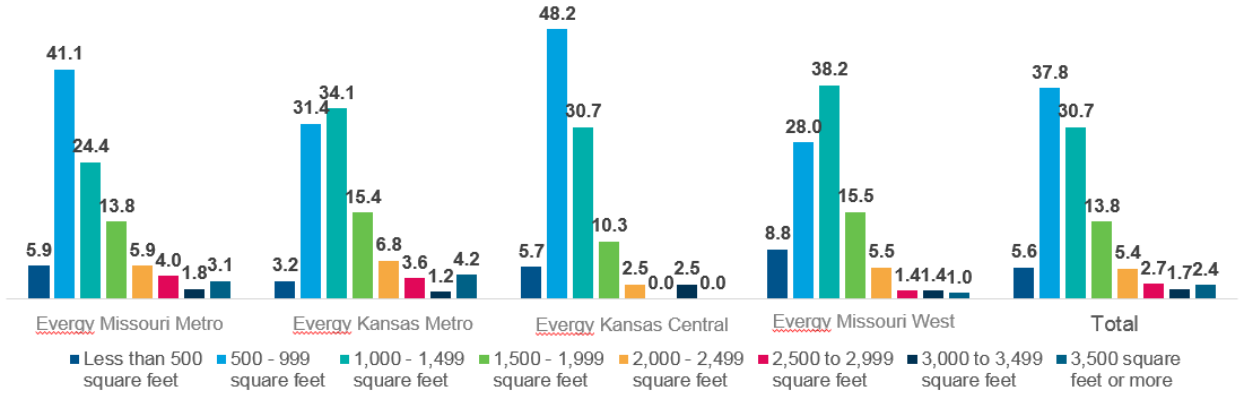


Figure 7: What is the approximate square footage of your home? (Multi-Family)

Figure 5 and Figure 6 show square footage by service territory and by single/multi-unit housing type. Across all territories, about a quarter of **single-family homes** measured between 1,000 and 1,499 square feet and the plurality of **multi-family units** measured 500 to 999 square feet (37.8%).

Across all territories, 36% of homes were built before 1970. Evergy Missouri Metro had the largest proportion of older homes (46.8% were over 50 years old).

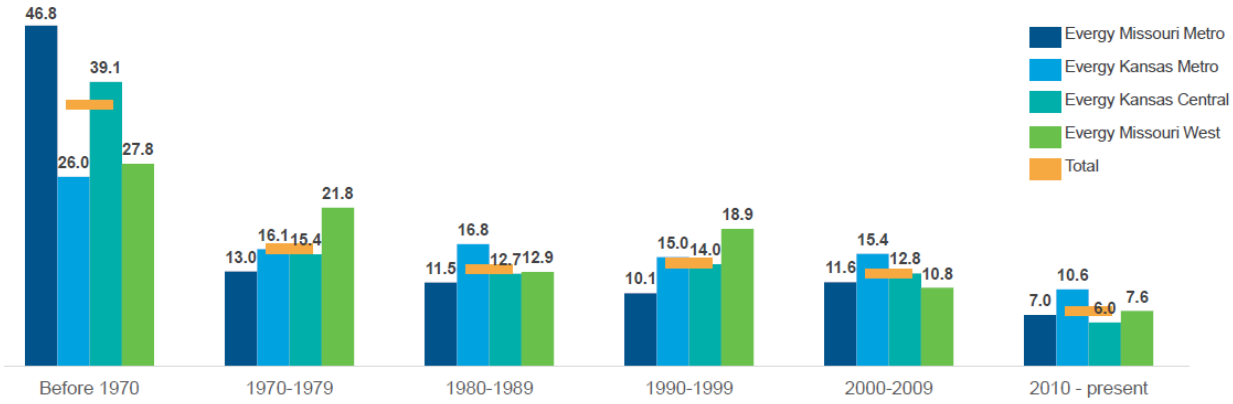


Figure 8: Q5. Approximately when was your home built?

III. Heating

The most common primary residential heating systems were natural gas central warm air furnaces with ducts and vents to individual rooms (58.2%), followed by electric central warm air furnace with ducts and vents to individual rooms (27.1%).

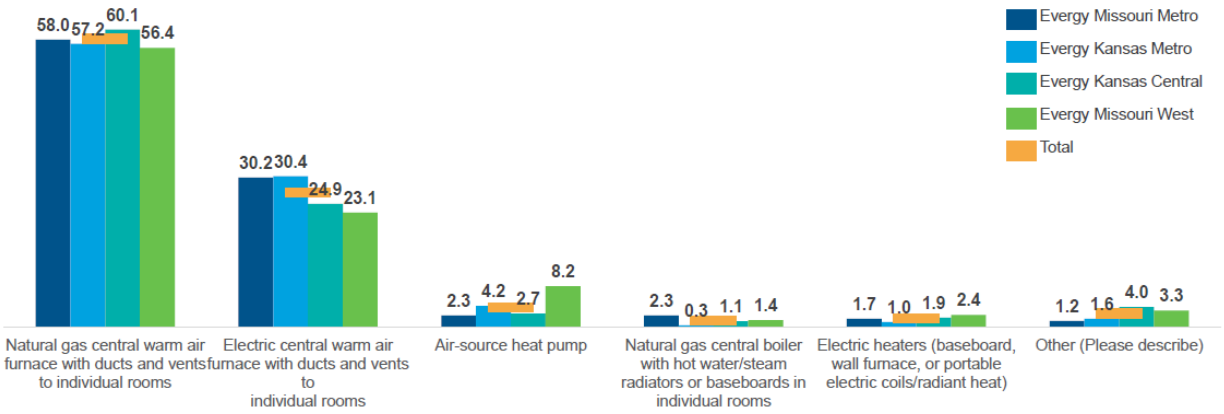


Figure 9: Q6. Which of the following heating systems do you use to heat all or most of your home?

The age of the heating system was almost evenly split across the four response options, with approximately one-quarter of systems in each category. A greater proportion of residents of Evergy Kansas Central reported older heating systems (28.4% were over 15 years old), compared to residents of Evergy Kansas Metro (where 29.6% were built in the last 5 years).

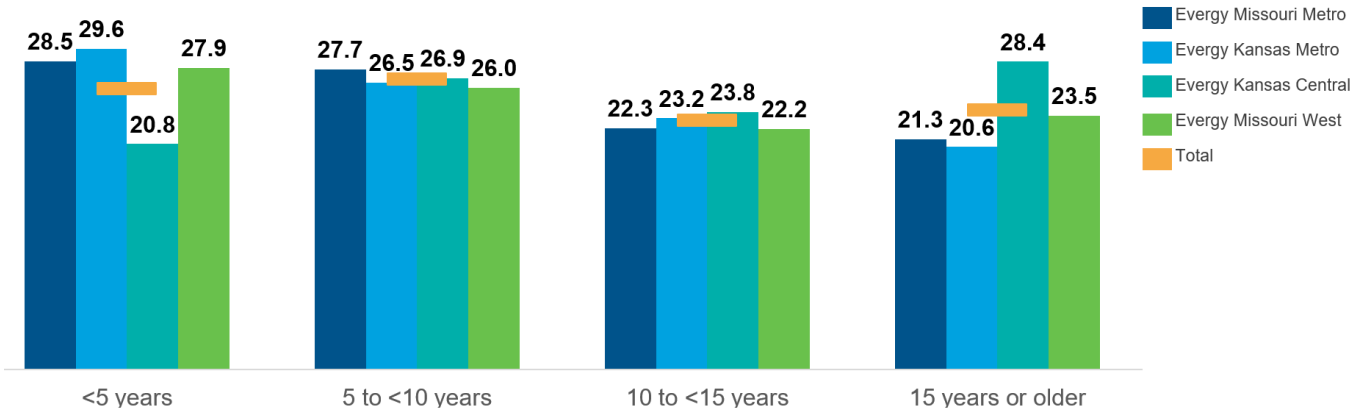


Figure 10: Q7. How old is your heating system?

Respondents who used a heat pump as their primary heating system (4.9% of total) were asked what kind of back-up system they used. Just under half of heat pump owners in all territories used an electric back-up (47.8%), while just under one-quarter had a natural gas back-up (23.3%).

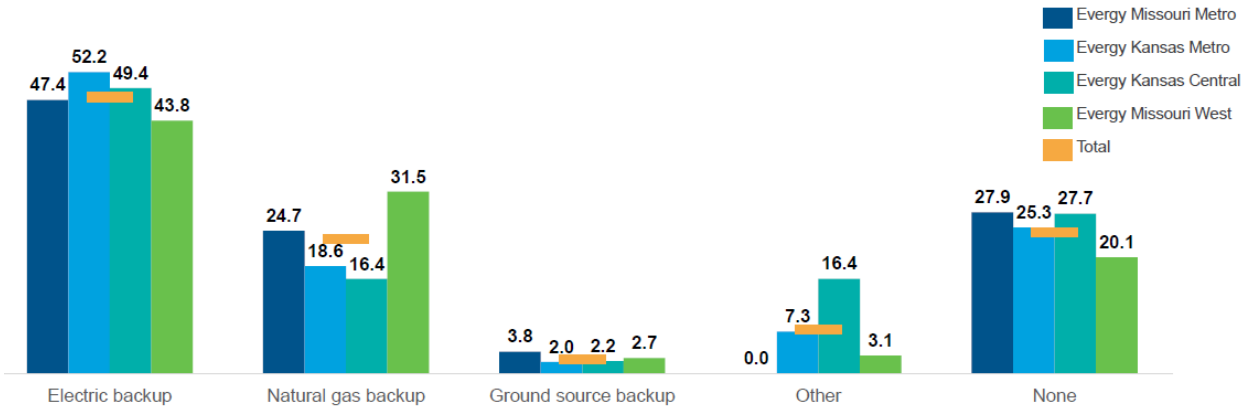


Figure 11: Q8. What type of backup system do you use in addition to your heat pump? [Multiple response].

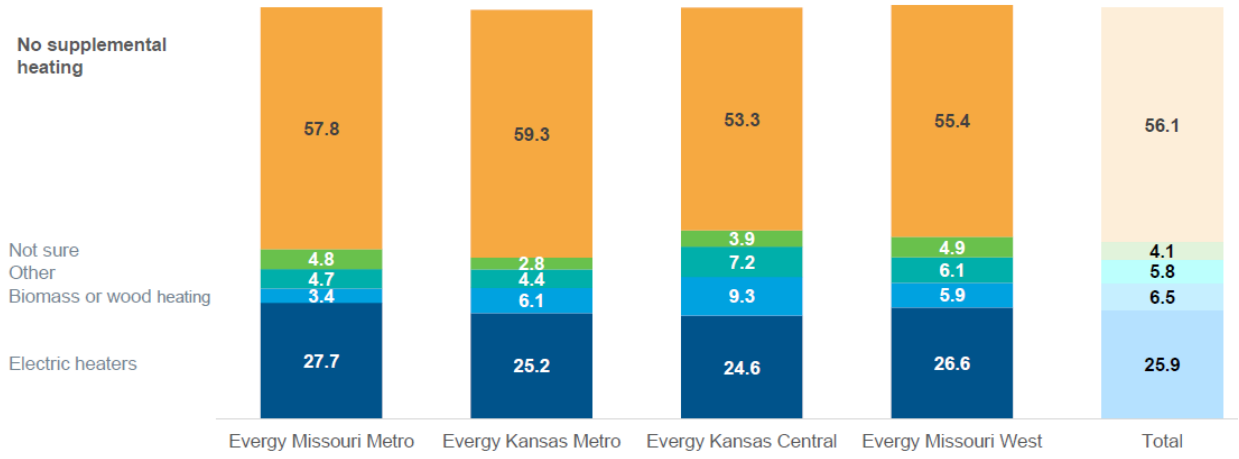


Figure 12: Q9. Which of the following systems do you use as supplemental heating?

A majority of homes across all territories had no supplemental heating (56.1%). Among those who did have supplemental heating, the most common system was electric heater (25.9%), including baseboard, wall furnace, or portable electric coils/radiant heat.

IV. Cooling

Central air-conditioning systems were the most common cooling systems across all territories (87.4% of homes reported this system type). Residents of Evergy Missouri West territory were relatively more likely to have an air-source heat pump (6.8%) than residents of other service territories. Only 0.2% of homes reported having no cooling.

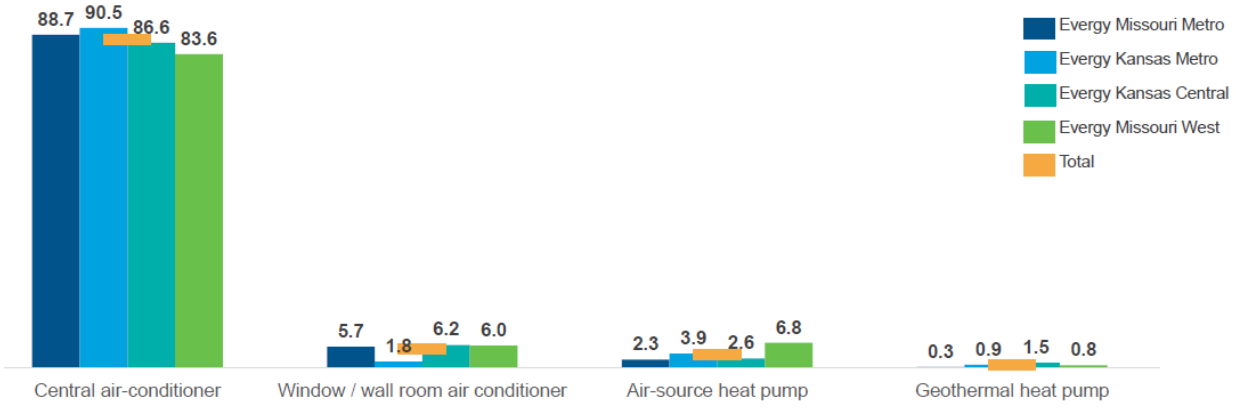


Figure 13: Q10. Please indicate which of the following systems you use to cool all or most of your home

Respondents with certain cooling systems were asked how many of each they had in their home. The mean number of central air-conditioners and air-source heat pumps was one, while the mean number of window/wall systems was two.

Thirty percent of customers reported that their cooling system was under five years old. Homes in Evergy Kansas Central tended to have slightly older cooling systems—nearly one-quarter of customers there have systems that are 15 years or older (23.8%).

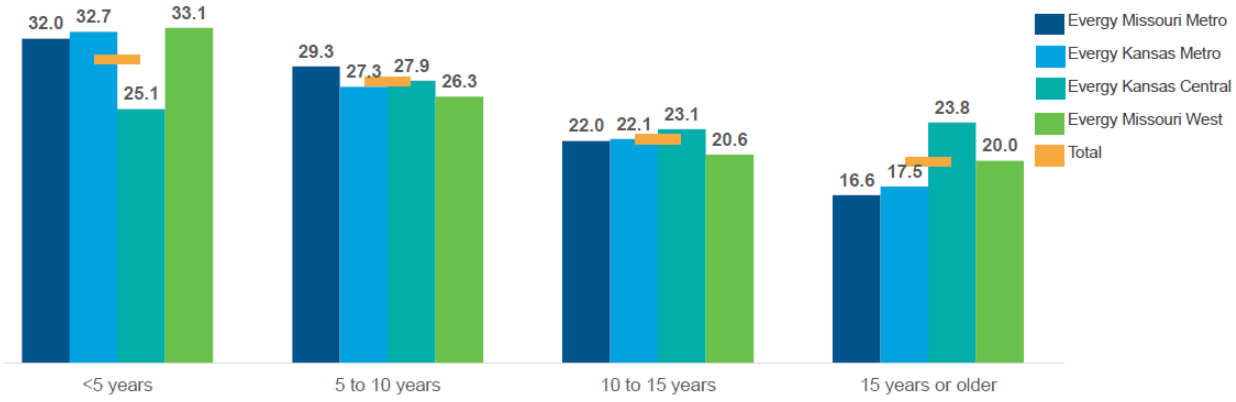


Figure 14: Q11. How old is your cooling system?

Just under one-quarter of homes reported having no supplemental cooling (22.9%), while seventy percent had a ceiling fan (70.7%). Homes in Evergy Missouri Metro were relatively more likely to have a whole house fan as a supplemental cooling system (17.9%) compared to homes in other service territories.

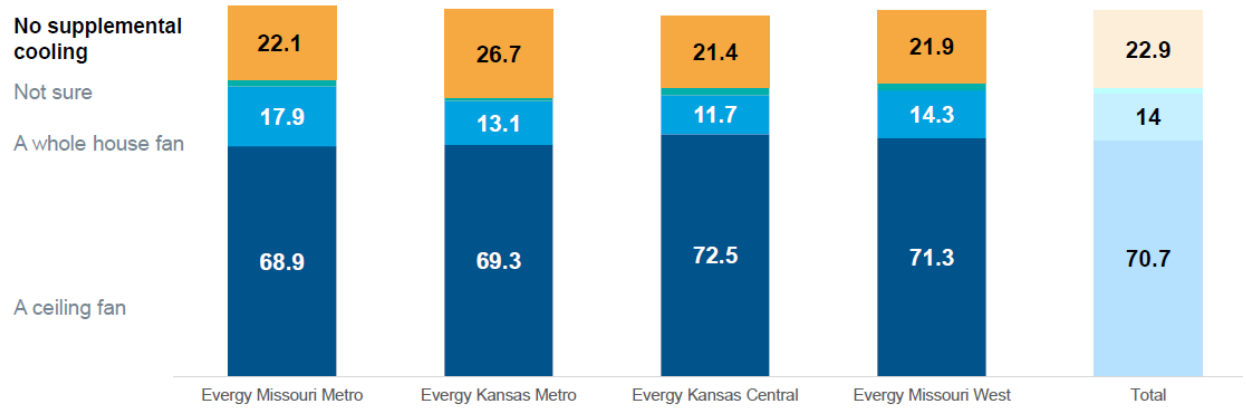


Figure 15: Q12. Which of the following do you use as supplemental cooling systems? [Multiple response]

V. Thermostat Control

Just over half of customers reported having a standard manual thermostat (52.2%) while 42.7% had a programmable thermostat. Just under 2% had no thermostat. Almost all manual and programmable devices controlled both heating and cooling. Table 6 shows the mean temperature that customers set their thermostats to at different times of year.

Table 6: Q14. What temperature do you typically set your thermostat to at the following times of year?

Time of year	Mean Temperature
Summer when home is occupied	74.0˚
Summer when home is unoccupied	76.1˚
Winter when home is occupied	71.4˚
Winter when home is unoccupied	67.5˚

Half of the customers with a programmable thermostat ran their device on programmed settings for most of the year (50.1%) while one-quarter manually adjusted it like a traditional thermostat (25.9%).

Table 7: Q15. Does your programmable thermostat actually operate in a programmed mode for most of the year?

Settings	Percentage
No, not programmed, we manually adjust it like a traditional thermostat	25.9%
Yes, we occasionally run programmed settings	22.5%
Yes, we always run programmed settings	50.1%
Not sure	1.5%

Most customers with a programmable thermostat reported that their device was NOT Wi-Fi enabled (58.2%). One in five had a Wi-Fi enabled device that allowed them to communicate with it over the internet (19.1%). Just under 7% of programmable thermostat owners had a “smart thermostat” that adjusts heating and cooling based on past behavior to improve performance.

All respondents were asked how interested they were in having a next generation smart thermostat in their home, on a scale of 0 to 10, where 0 meant “very uninterested” and 10 meant “very interested.” Just under one-third of customers showed interest in the technology, rating it an 8, 9 or 10 (31.9%). The

mean interest was 5 out of 10, meaning that about equal proportions of respondents were interested as were not interested.

Respondents were similarly asked to rate their interest in being able to control different home equipment or appliances from a cell phone or other Wi-Fi enabled device. As shown in Table 8, about 18 to 26 percent of respondents were very interested in these Wi-Fi-enabled technologies, rating them an 8, 9, or 10.

Table 8: Q18. How interested would you be in having the ability to automatically control the following from a cell phone or another Wi-Fi enabled device?

Home equipment or appliance	Mean rating	Proportion of customers showing interest (rated the technology 8, 9, 10)
Lighting in your home	4.3	26.5%
Smart water heater controller (such as Aquanta)	3.6	18.4%
Home security	4.6	25.4%
Ceiling Fan	3.4	19.4%
Blinds/Shades	3.3	18.4%

VI. Water Heating

A large majority of residents had only one water heater in their home (92.4%). Across all service territories, only 4.6% of homes had two water heaters.

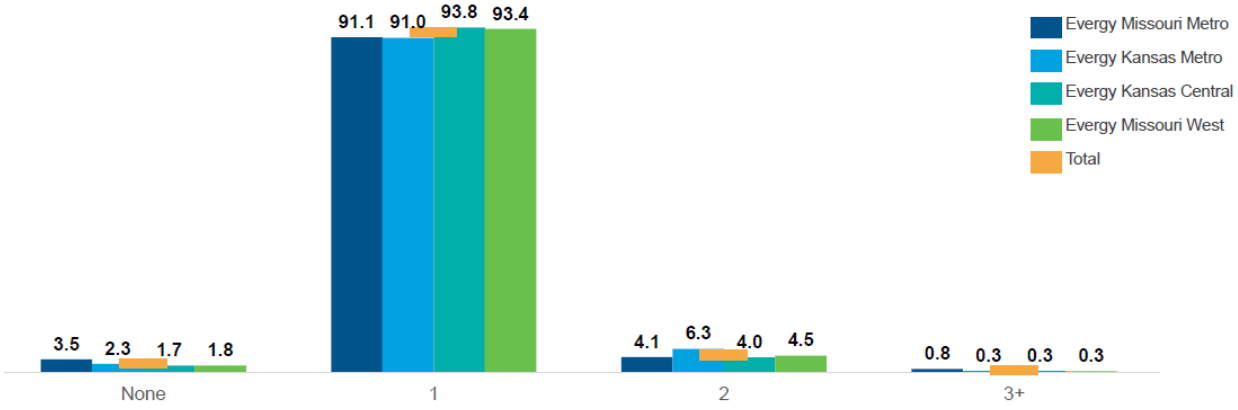


Figure 16: Q19. How many water heaters do you have in your home?

The most common type of water heating system was a natural gas standard tank (54.8% across all territories), followed by an electric standard tank (31.9%). Just under 10% of customers in Evergy Missouri Metro reported not knowing their water tank type (compared to 6.6% of all respondents), possibly because of the higher proportion of respondents in multi-family housing who may be renters.

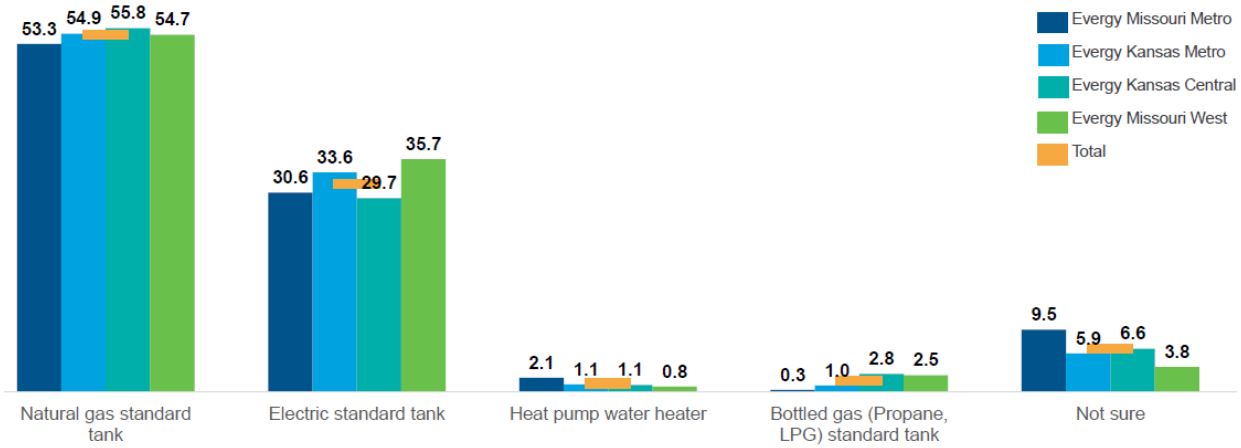


Figure 17: Q20. What type of water heating system do you use in your home?

Those with a tank-based system were asked the approximate size of their tank. The most common tank size was 40 gallons (41.7% of all customers), though a sizable number—one in five—did not know the size of their tank. This was especially the case for Evergy Missouri Metro customers (27.5%).

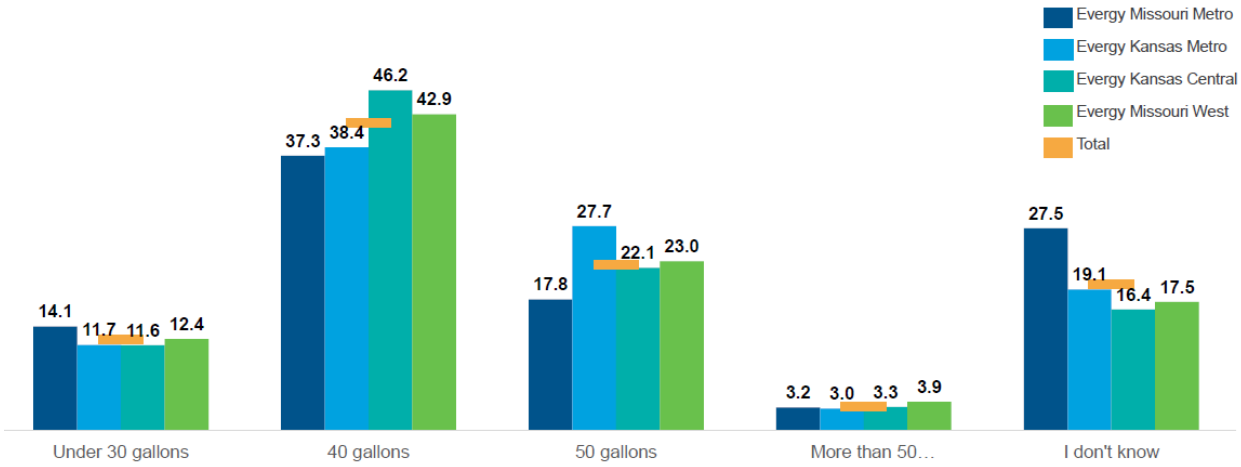


Figure 18: Q21. What is the approximate size of your primary water heater tank, in gallons?

VII. Appliances, Computers, Entertainment and Other Equipment

The figures below show the proportion of customers with different home appliances. The rectangular boxes underneath the bar show the mean number of devices for households that said “Yes” to owning at least one of those appliances. The most common items—refrigerators and microwave ovens—have near universal ownership/saturation. Customers in Evergy Kansas Metro were more likely to have a dishwasher (93% of homes there had one, versus 82.7% overall). Customers in more rural regions (Evergy Kansas Central and Every Missouri West) were more likely to have standalone freezers (just over half of homes in those territories had one).

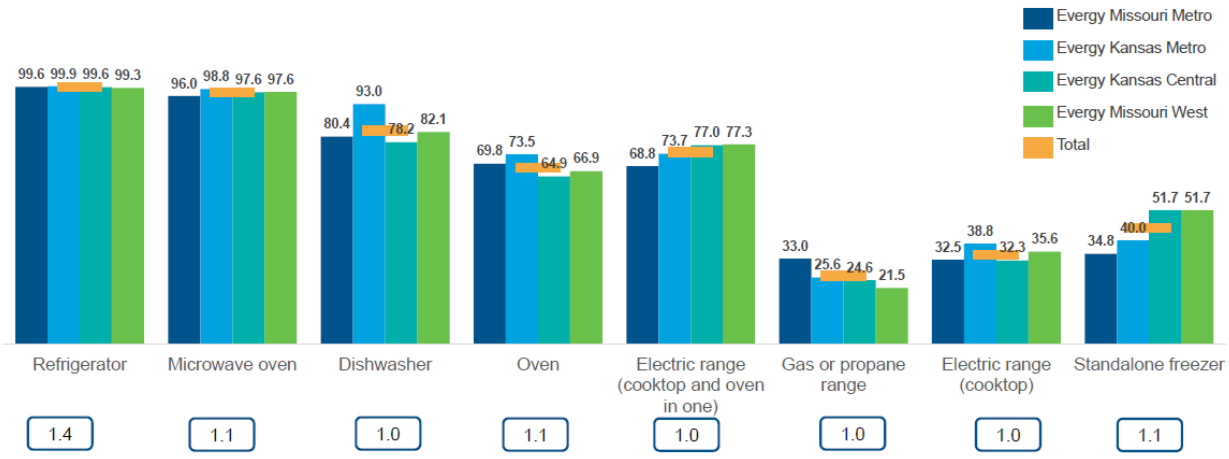


Figure 19: Q22. How many of the following [Kitchen] appliances do you have in your home?

For almost all these kitchen appliances, the mean number per household was one. The one exception was refrigerators, with a mean of 1.4. Between one-quarter and one-third of customers (29.3%) had a second refrigerator, and about 5% of customer had a third. Overall, 92.3% of customers reported having a clothes washer and 84.4% of reported having an electric clothes dryer.

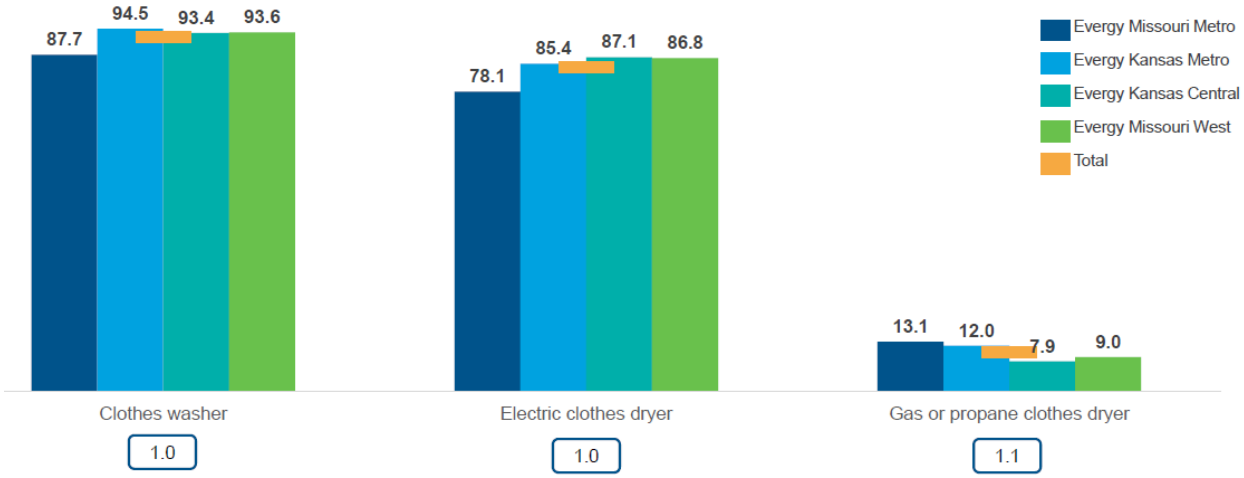


Figure 20: Q22. How many of the following [Laundry] appliances do you have in your home?

In terms of entertainment equipment, the most common item was an LCD or LED flat screen TV (95.9% of customers had at least one). Though the mean number per home was 2.1 ("3 or more" devices was counted as 3), just under four in ten customers reported having 3 or more of this kind of TV (37.9%).[5]

Fifteen percent of customers have a traditional tube-type television (15.1%) and 7.5% had a rear projection or plasma TV. Evergy Missouri Metro residents were less likely to have a VCR/DVD or Blu-Ray player (65.6%) than respondents overall (71.4%).

[5] Mean appliances per household are not compared to 2016 because the 2016 report shows appliances per household for the entire population, whereas this report shows them only for those who have one.

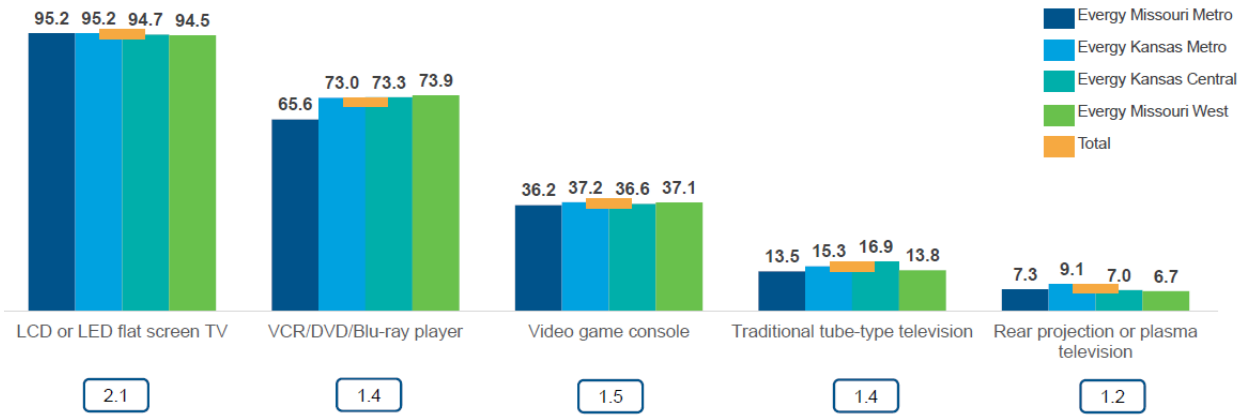


Figure 21: Q23. How many of the following types of entertainment equipment are in your home?

Just over half of all customers had a cable set-top box and 42.9% had a streaming device such as Apple TV or Roku. Interestingly, one quarter of customers reported having a smart speaker like a Google Home or Amazon Alexa. This device was not even included as a questionnaire item in 2016.

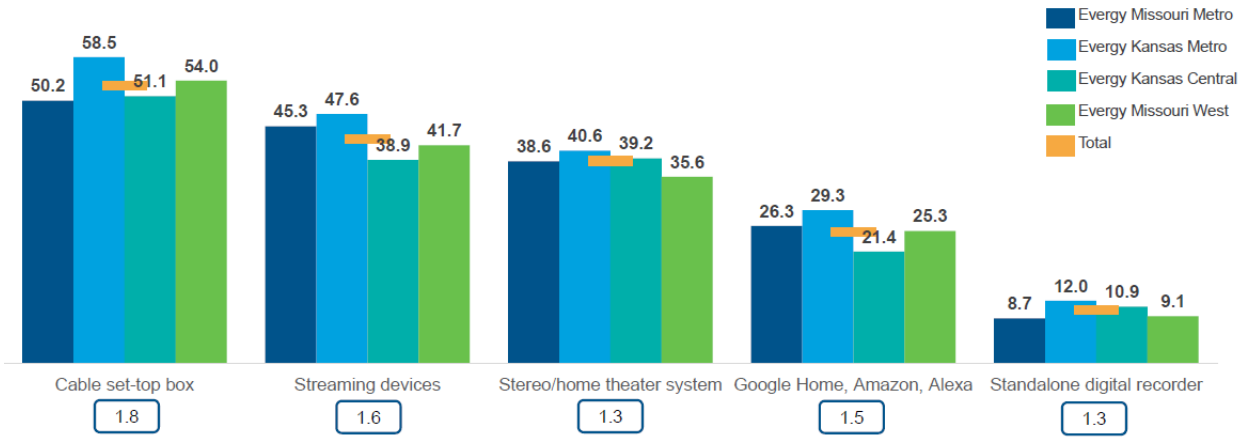


Figure 22: Q23. How many of the following types of entertainment equipment are in your home? Electronic Accessories.

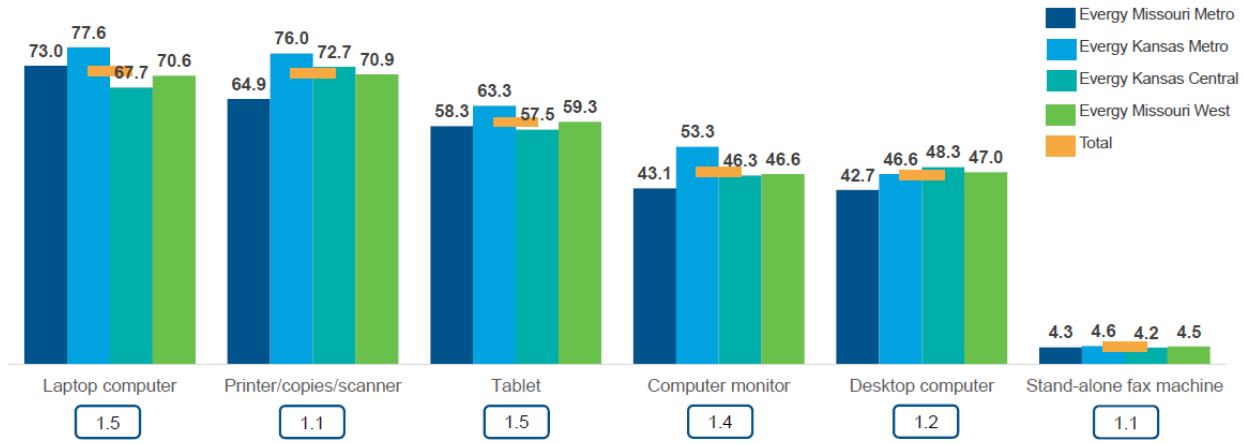


Figure 23: Q24. How many of the following types of computer and office equipment are in your home?

In regards to office equipment, 71.7% of customers reported owning a laptop computer. Residents of Evergy Kansas Metro were more likely to own laptops, printers, tablets and monitors relative to residents

of other regions. Standalone fax machines were uncommon, with only 4.3% of customers reporting having one.

In regards to other miscellaneous home appliances, 29.8% of customers had a dehumidifier, although residents of Evergy Kansas Metro were much more likely to own one (38.9%) compared to residents in all regions. Residents of Evergy Kansas Central were more likely to own a back-up generator (10%) compared to residents in all regions (6%).

While less than 1% of customers had solar panels or other photovoltaic panels on their home, customer open-ended feedback (see pg. 30) showed that solar is of interest to customers generally.

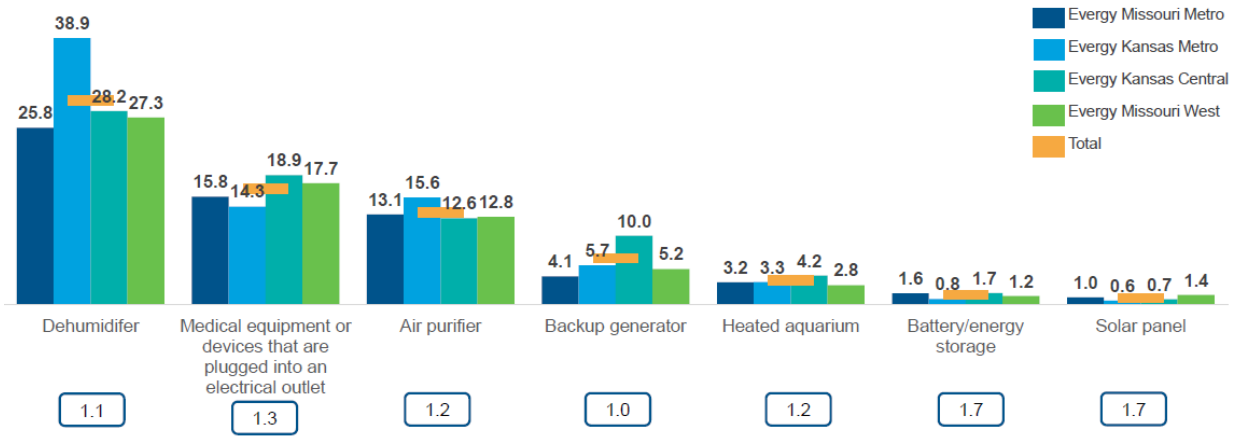


Figure 24: Q25. How many of the following types of other equipment are also located in your home?

Residents of Evergy Kansas Metro were more likely to report having a sump pump and residents of Evergy Kansas Central were more likely to have a well-water pump, compared with respondents in other service territories.

For those with a pool heater or pool pump (4% of all customers), the most common energy type was electricity (84%), with a much smaller number using natural gas (11%).

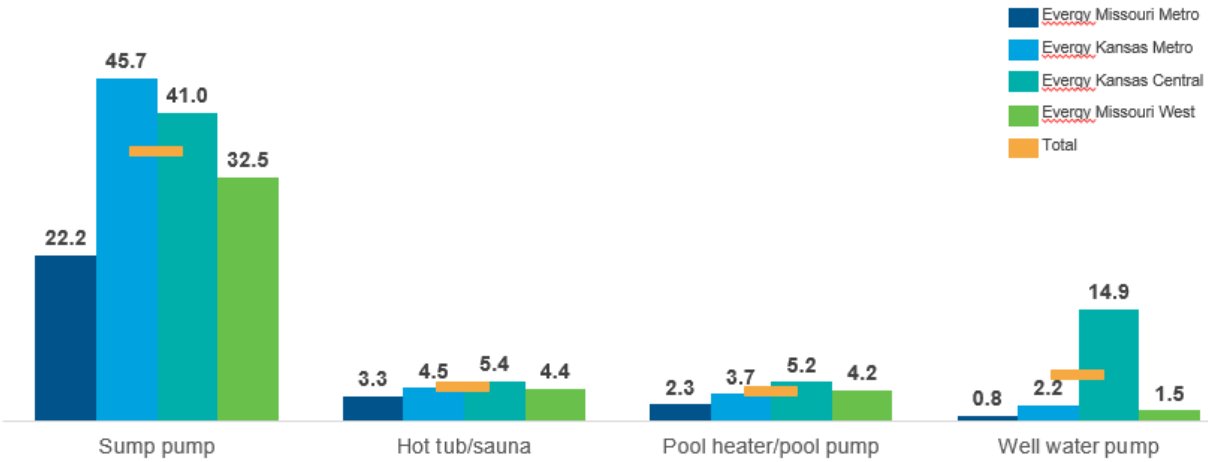


Figure 25: Q25. How many of the following types of other equipment are also located in your home?

VIII. Electric Vehicles

Just over one percent of residents overall said their household had an electric vehicle (EV). This is up about half a percentage point from 2016 (0.8%).

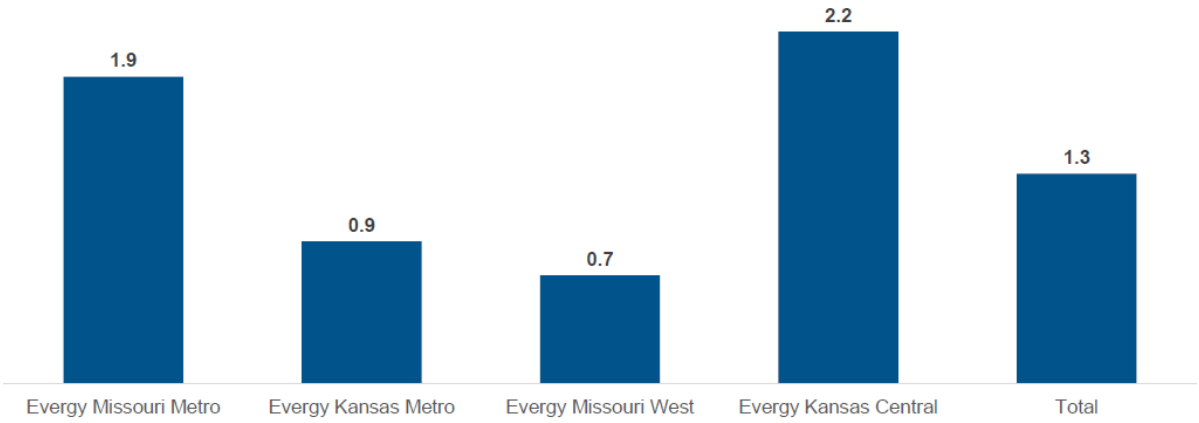


Figure 26: Q27. How many electric vehicles does your household have?

Most respondents with an EV had a single electric vehicle (87.2%) and a single dedicated fast-charging outlet (62.8%).

IX. Lighting

All respondents were asked to report the number of light bulbs or lamps of different types in their home. Figure 27 shows each fixture type as a percentage of all lights. Conventional/incandescent lamps made up 36.5% of all lamps, while LED bulbs constituted just over a third (34%). There are no clear differences by service territory, although these estimates have changed considerably since 2016. Then, the proportion of LED bulbs was 10.8%, and the proportion of incandescent was 50.1%.[6]

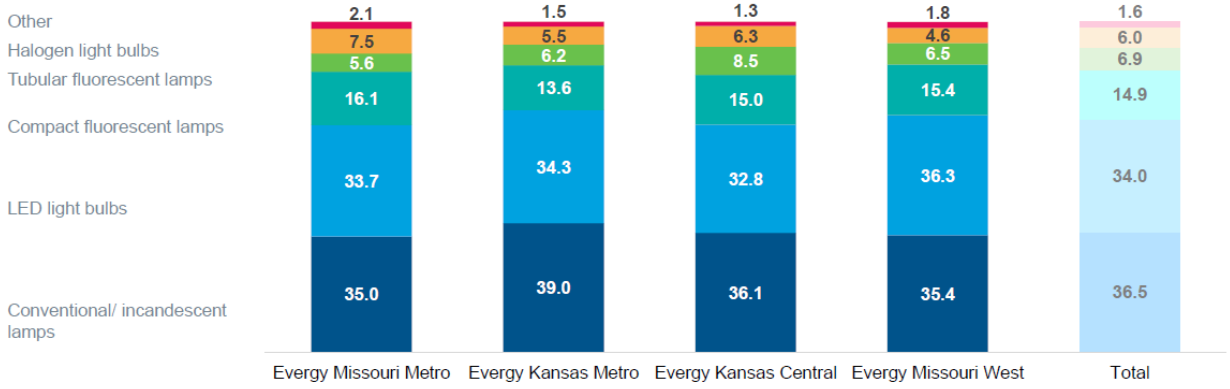


Figure 27: Q28. About how many of the following types of light bulbs/lamps are currently being used in your home?

X. Energy Efficiency

All respondents were asked whether they had undertaken any of a list of actions to save energy in their homes in the previous five years. The most-selected option was a tune-up to the cooling system so that it would operate more efficiently (35.8%). Other popular actions were tune-ups to the heating system (32.1%) and weather stripping to windows or doors (33.1%). At the same time, over one-third of customers said they did not undertake any of the listed actions (35.5%).

[6] It is not clear whether the 2016 calculations were household means or proportions relative to all lights.

Table 9: Q29. Has your household undertaken any of the following actions to save energy in your home during the last 5 years?

Action	Percent
Had the cooling system tuned up to operate more efficiently	35.8%
Added weather-stripping or caulking to windows or doors	33.1%
Had the heating system tuned up to operate more efficiently	32.1%
Installed new, more energy-efficient windows	21.4%
Added insulation to ducts, ceilings, walls, attics and/or foundation	16.3%
Added water pipe insulation	7.5%
Installed motion or occupancy sensors to switch lights off when not in use	7.5%
Installed one or more 'smart' power strips that automatically turn off devices when not in use	4.0%
Other	5.7%
None of the above	35.5%

Next, respondents were asked if they perform any of a list of actions *consistently* in their home. The majority of customers reported using ceiling fans to help cooling/heat their home (70.6%) and turning down heating or cooling at night or when they are away (65.9%).

Table 10: Q30. Which of the following actions are you consistently doing in your home? By consistently, we mean that you do this every time, or on a regular basis.

Action	Percent
Using ceiling fans or whole house fans to substantially help in the cooling or heating of your home	70.6%
Turning down heating and/or cooling equipment when away from home and/or at night	65.9%
Performing annual maintenance on your HVAC equipment	50.7%
Other	3.0%
None of the above	8.9%

Respondents were asked to consider all the windows in their home and report how many were single pane (windows with just 1 layer of glass) versus double pane or better (2 or more layers of glass). Customers reported a mean of six single-pane windows and 12 double-pane windows in their homes.

The majority of customers across all territories had heard of ENERGY STAR® before (74.2%). Residents of Evergy Kansas Central were less likely to have heard of the label (68.1%) than respondents in other service territories. For comparison purposes, a 2016 study found that 85% of households nationally had seen or heard of the ENERGY STAR label, without a visual aid.[7]

[7] EPA Office of Air and Radiation, Climate Protection Partnerships Division. National Awareness of ENERGY STAR® for 2016: Analysis of 2016 CEE Household Survey. U.S. EPA, 2017.

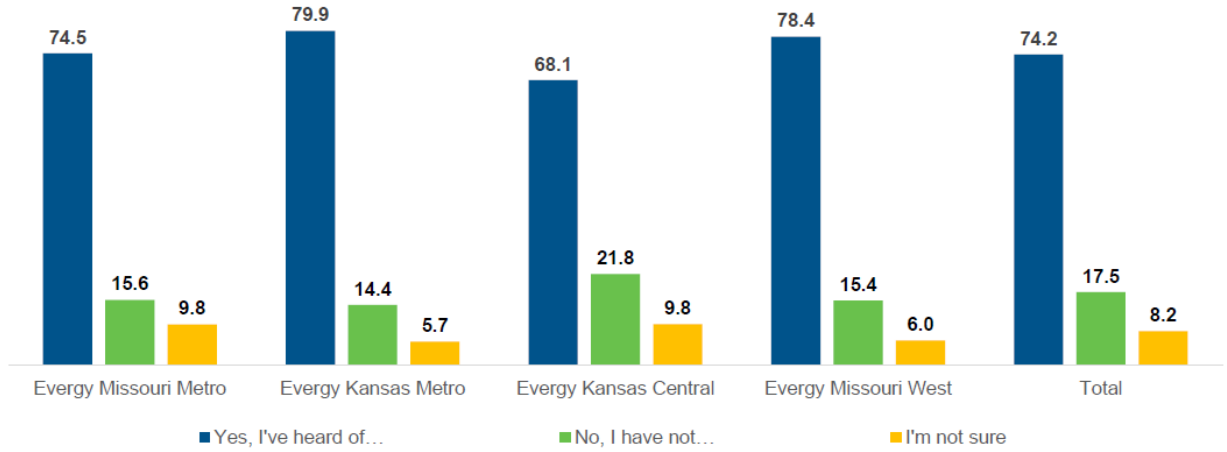


Figure 28: Q32. Have you heard of the ENERGY STAR® label for appliances and other equipment?

Those who had heard of the ENERGY STAR label (74.2% of all customers) were asked if they had installed any ENERGY STAR-rated appliances in their home in the previous five years. Just over half of all customers who were aware of the label had installed an ENERGY STAR appliance (52.1%). Additionally, 16.4% of customers were unsure whether or not they had installed an ENERGY STAR rated appliance.

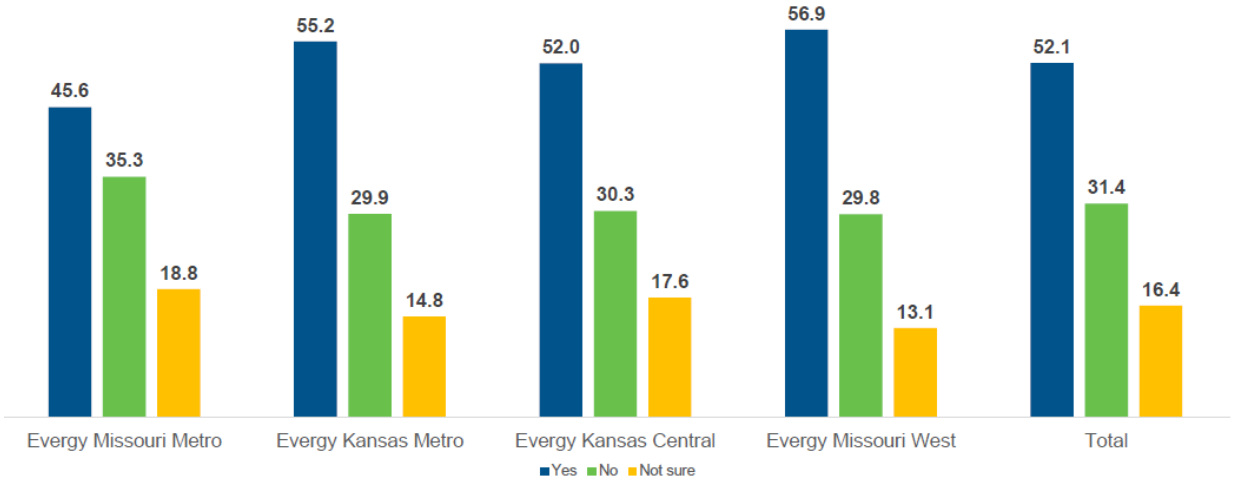


Figure 29: Q33. Have you installed any ENERGY STAR appliances in your home in the last 5 years?

Customers who were familiar with the ENERGY STAR label were also asked at how often they would hypothetically buy an ENERGY STAR rated model. Just over half of this group said they would “always” purchase an ENERGY STAR model (53.4%). The proportion was highest in Evergy Missouri West (58.4%).

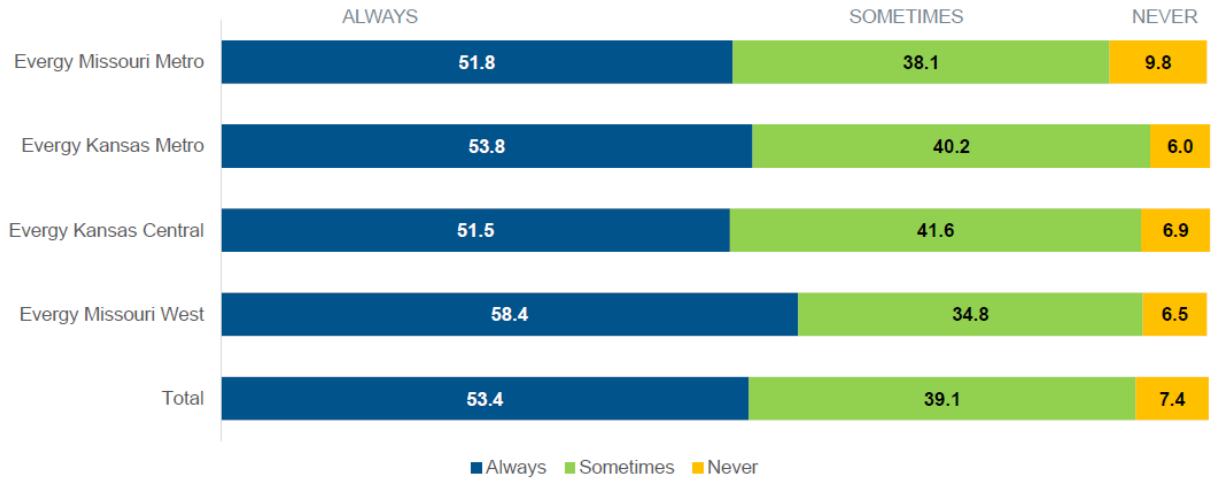


Figure 30: Q34. When you need a new appliance or other type of energy-using equipment, would you say you purchase an ENERGY STAR-labeled model?

Missouri-based customers were asked if they had ever heard of four different energy efficiency incentives offered by Evergy. Across both Missouri-based territories, more residents (about 47%) were familiar with the heating and cooling rebates and the thermostat program compared to other programs. The program with the lowest level of awareness was the LED rebate program (19.8%).

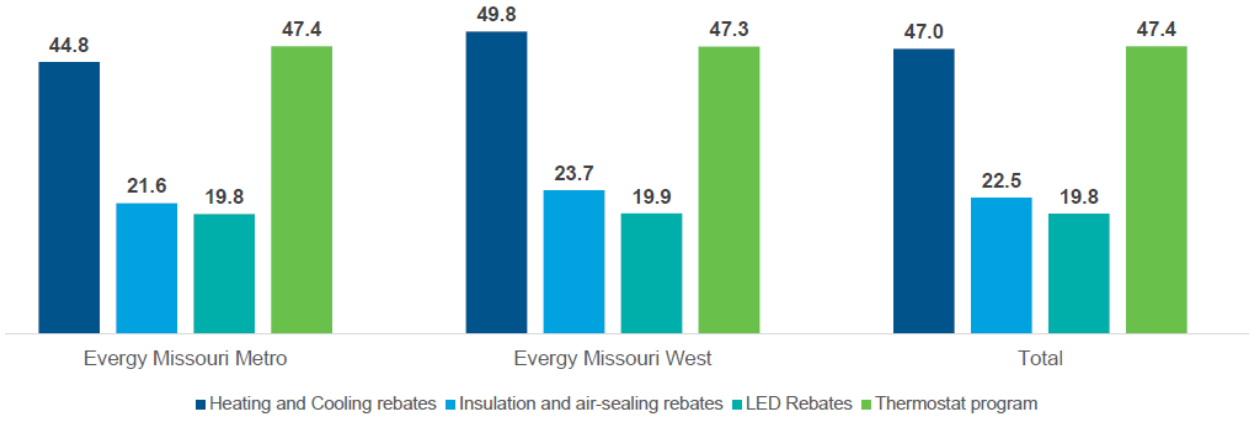


Figure 31: Q35. The following list details the energy-efficiency incentives offered by your utility. Please indicate your familiarity with each of the items below. (Missouri customers only)

XI. Customer Feedback

All respondents were asked what additional energy efficiency programs or rebates they would like to see their utility offer. They could provide their responses in an open-ended field, which was analyzed and coded using thematic analysis. Thematic analysis is a qualitative method employed to systematically identify and classify data.[8] This process allows for thematic clusters to emerge with greater clarity.

[8] Judith C. Lapadat, "Thematic Analysis," in *Encyclopedia of Case Study Research* (Thousand Oaks: SAGE Publications, Inc., 2010), 926–27, https://doi.org/10.4135/9781412957397.

Variations of “don’t know” and “nothing” were the top two responses. These were removed and the remaining open-ended responses (n=1,246) were coded into categories using thematic analysis.

The most commonly mentioned item was “solar,” with 220 mentions. Many respondents also provided answers that, while well-intentioned, were too vague to categorize thematically, such as “I’m open to anything.” The substantive feedback that respondents provided could be grouped into one of the following “umbrella” categories:

- **Renewable Energy Sources**: Aside from “solar,” the top mentions were for “wind” (7 individual mentions).
- **Home improvements**: The most common items here were “windows” (64 mentions), “HVAC” (51), “efficient appliances” (30), “lighting” (18) and “LEDs” (11). There may be an opportunity for outreach and education here given that the utility’s LED lighting program has relatively low customer awareness (see Figure 31).
- **Services/Offerings by the Utility**: “Lower bills” was the second most common substantive theme to emerge from customer feedback after “Solar” (78 mentions). It was followed by “special discounts” for certain populations (seniors, disabled, veterans – 61 mentions) and “more/better rebate” programs (48).

Figure 32 below shows the open-ended themes broken out into three primary thematic groups.

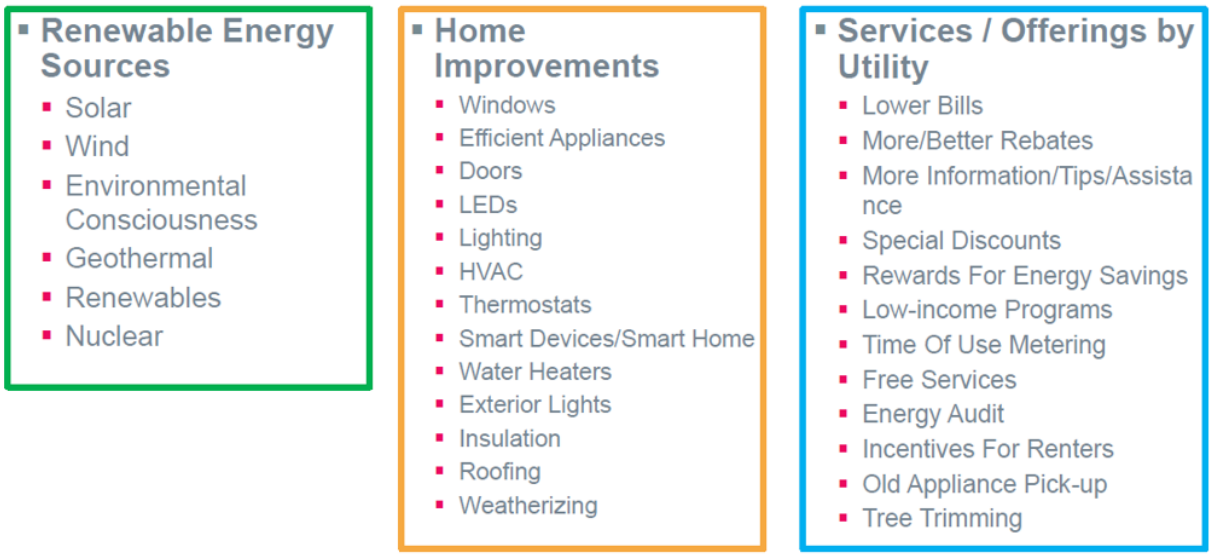


Figure 32: Q37. What additional energy efficiency programs and/or rebates would you like to see your utility offer customers?

8. Commercial and Industrial Survey

The Commercial and Industrial CATI survey started with a screener, or introductory section, used to qualify or disqualify potential respondents, on top of the refinements conducted during sampling. To qualify, a respondent had to affirm that he or she was the person most familiar with energy use at the sampled location. Next, the respondent had to specify whether his or her operation at the sample location was an enclosed space, an outdoor structure such as a billboard or communications tower, or both. Respondents whose operation included only an outdoor structure were deemed ineligible and thanked for their time.

I. Business Characteristics

Once a record was deemed eligible for the interview, the respondent was asked how many buildings at the sampled location were part of their operation. The mean number of buildings was 1.67 per establishment. Table 11 shows the business activities for all buildings. ICF reviewed and recoded responses that interviewers may have originally categorized as “something else” if they had an applicable existing category. Traditional office-based businesses and retail businesses make up one-third of all buildings (33.7%).

Table 11: Q5A-Q5F. What type of business activity does your organization operate at this location?

Business type	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Traditional Office-Based Business	27,295	16.4	27,295	16.4
Retail	28,725	17.3	56,020	33.7
Grocery	962	0.6	56,982	34.2
Restaurant / Food Service	7,081	4.3	64,063	38.5
Warehouse	13,547	8.1	77,610	46.6
School	10,077	6.1	87,687	52.7
Health Care	4,397	2.6	92,084	55.3
Nursing Home / Assisted Living	2,742	1.7	94,826	57.0
Lodging	13,082	7.9	107,907	64.8
Not-For-Profit Housing	972	0.6	108,879	65.4
Entertainment / Recreation	5,829	3.5	114,708	68.9
Public Assembly/Transportation	4,962	3.0	119,670	71.9
Worship (Church/Temple/Synagogue)	7,113	4.3	126,783	76.2
Manufacturing/Production/Processing	12,937	7.8	139,720	84.0
Data Center	213	0.1	139,932	84.1
Something else	26,505	15.9	166,437	100.0

Half of all businesses reported a total square footage under 5,000 square feet (50.3%).

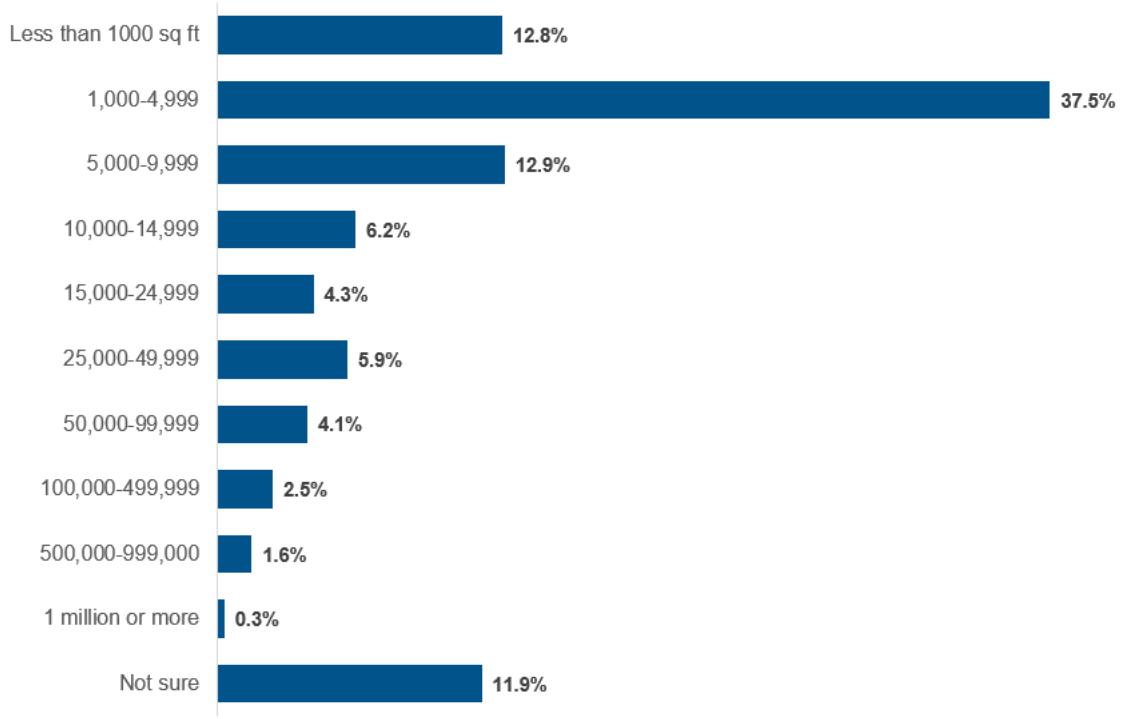


Figure 33: Q6. What is the approximate total square footage that your business occupies at this location?

Just under one-third of businesses were built before 1970. About one in six customers were unsure and could not report the age of the facility (16.8%).

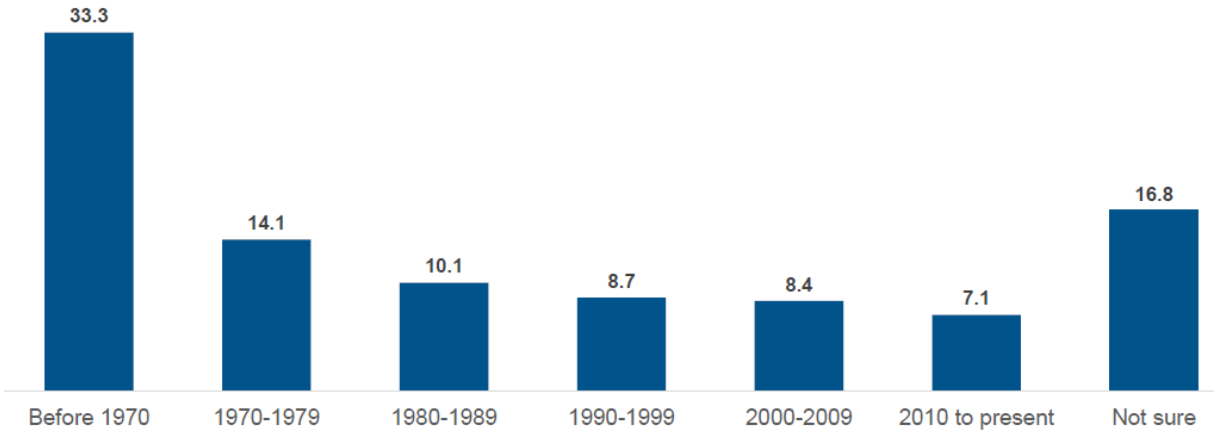


Figure 34: S10. Approximately when was this facility built?

Overall, just over 68% of businesses own their space, however this varies considerably by industry, as shown in Figure 35. This ownership rate is five percentage points higher than in 2016. Data centers,

lodging, and worship organizations were more likely to own their buildings, whereas healthcare and food service businesses were more likely to rent their spaces.

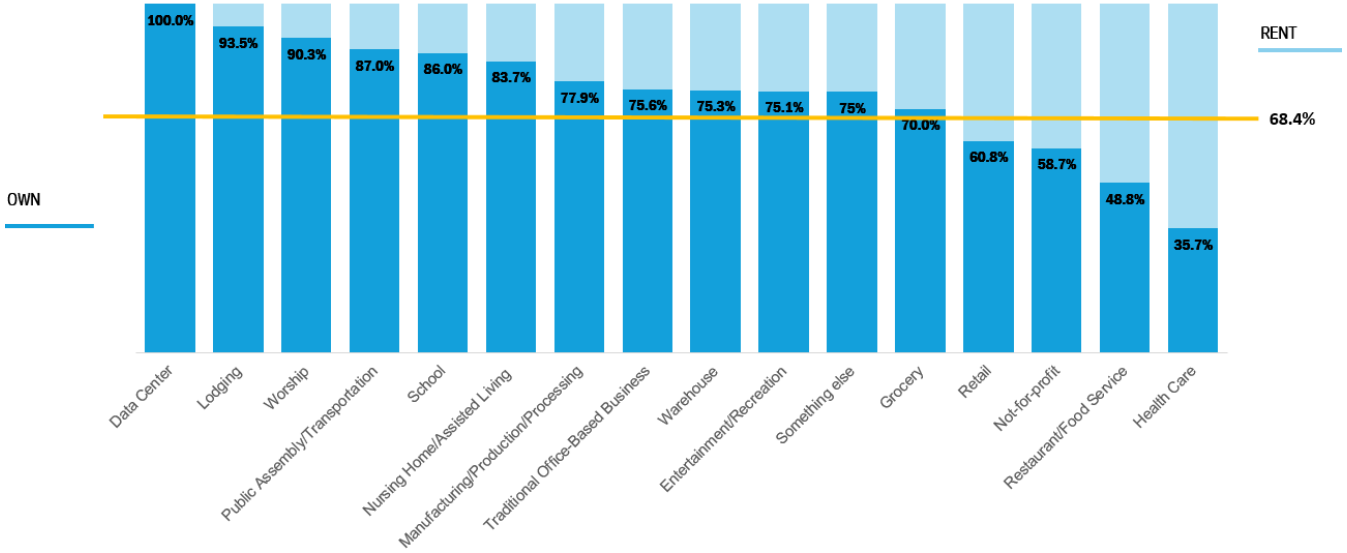


Figure 35: Q3. Does your business own or lease the space at this location?

Respondents were asked to report the total number of part-time and full-time employees at their location. Over two-thirds of businesses had fewer than five part-time employees while just under half of all businesses reported fewer than 5 full-time employees.

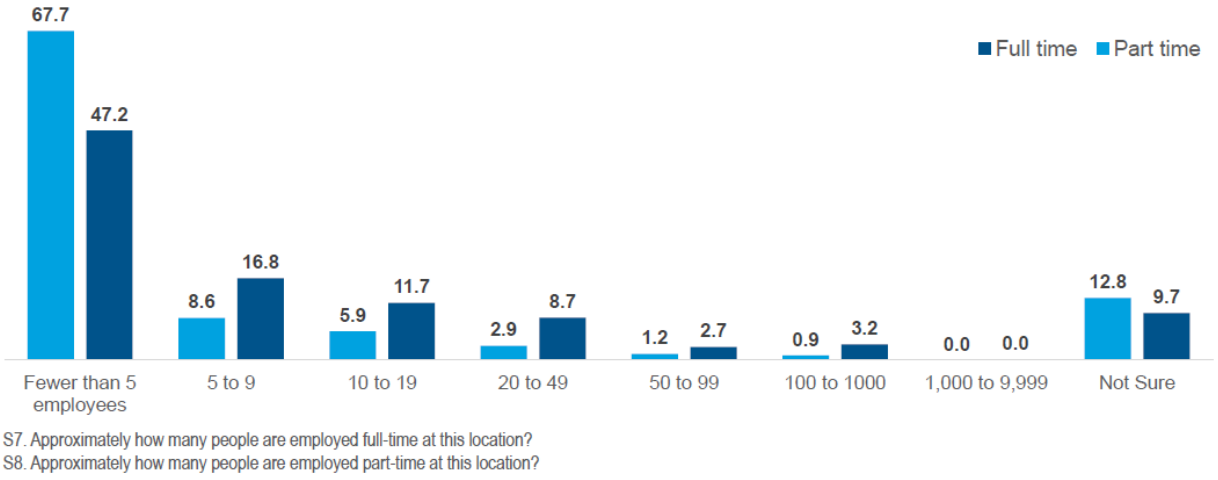


Figure 36: S7-S8: Approximately how many people are employed full-time/part-time at this location?

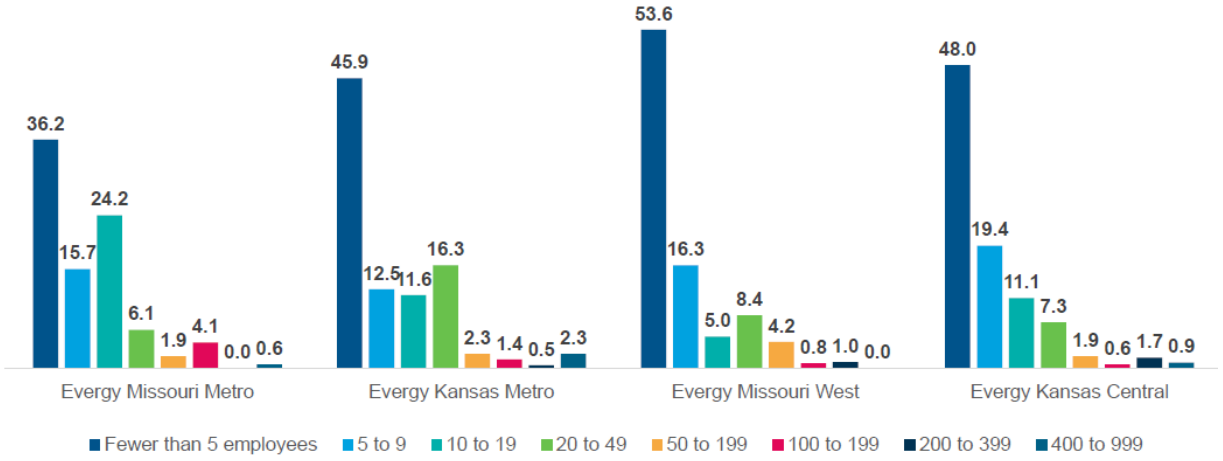


Figure 37: S7: Approximately how many people are employed full-time at this location?

II. Building Exterior

All respondents were asked what proportion of all the windows on the exterior walls of their building were single-pane or double-pane. The majority of windows were double pane windows or better (mean of 59.5%) whereas single-pane windows made up 40.5% of all windows, on average, matching the 2016 numbers.

Continuing on the building exterior characteristics, more than one-third of businesses had a white or light-colored roof (36.2%), down from 41% in 2016. Just over one-quarter had a dark colored roof (27%) and less than 5% had a green roof, meaning the roof area was partially or completely covered with vegetation and soil. Just over one in eight businesses did not know the color of their roof.

Table 12: Q10. Which of the following best describes the color of the roof or roofs at this facility?

Roof color	Percent
Dark	27.0%
Medium-dark	20.7%
White or light	36.2%
Green roof	3.2%
Not sure	12.9%

III. Heating and Cooling

The vast majority of businesses reported that more than 90% of the space their business occupied at the sampled location was heated (81.9%). Just over one in ten businesses reported that most of their space was unheated (11.7%).

Just under half of all businesses with some heating had a central furnace as their primary heating system (46.9%). This type of system was most common in Evergy Kansas Central (53.1%) and least common in Evergy Kansas Metro (32%).

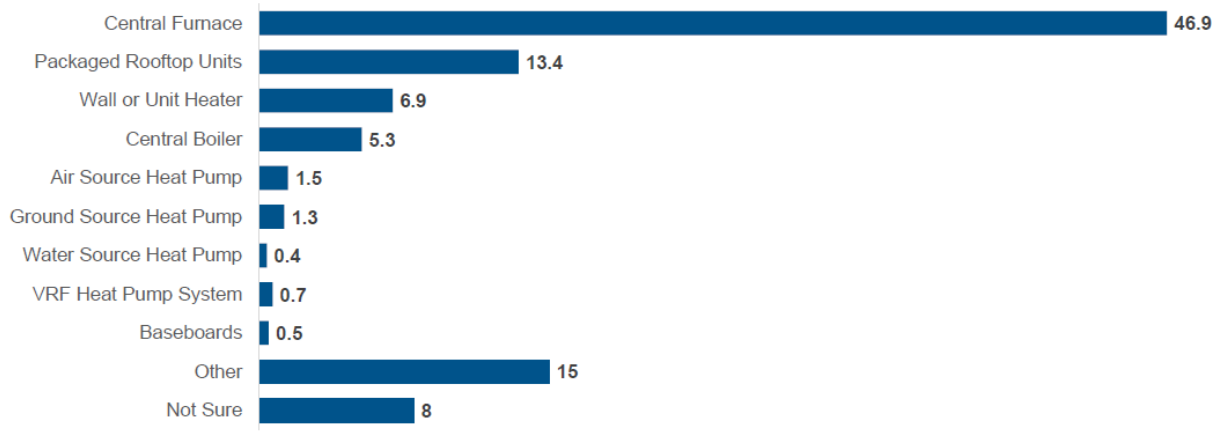


Figure 38: Q12a. What type of primary heating system do you have?

Within the "other" primary heating system category, respondents specified "central heat and air," "electric heater," "forced air," "infrared radiant heater" and "passive solar."

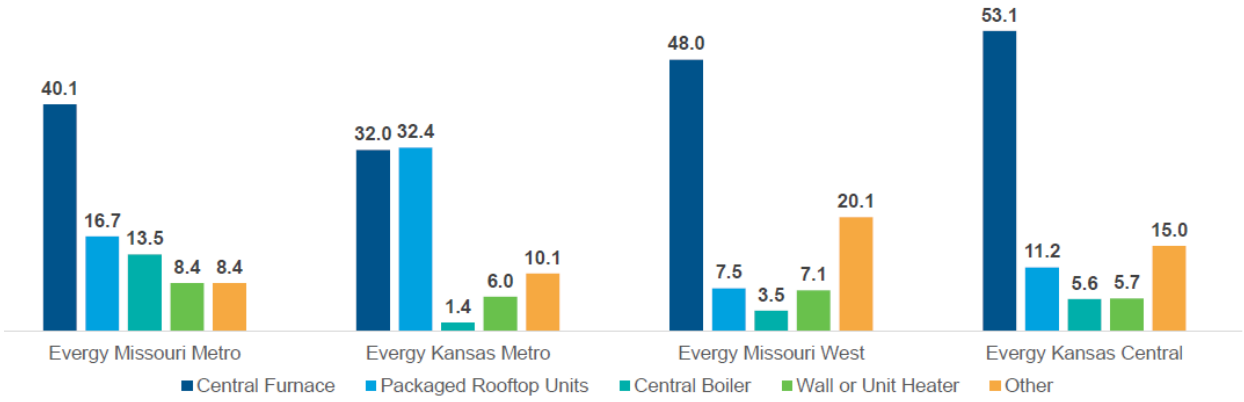


Figure 39: Q12a. What type of primary heating system do you have? [By Operating Company]

The most common fuel type for the primary heating system was natural gas (62.3%), followed by electricity (25%).

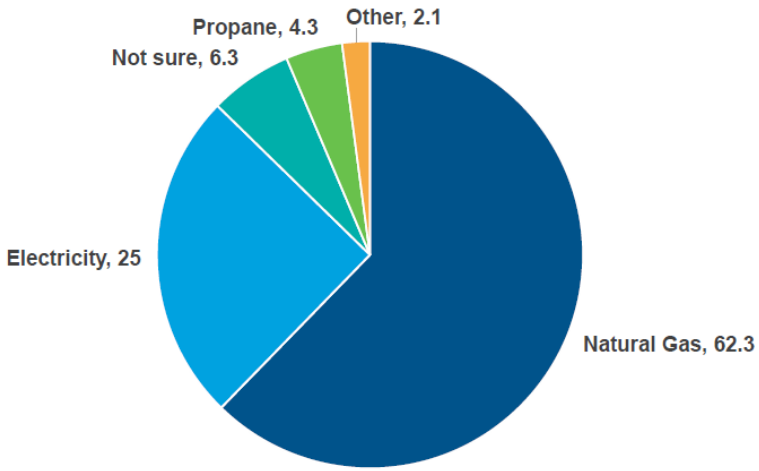


Figure 40: Q12a. What type of fuel does this primary heating system use?

The age of the primary heating system was fairly evenly split across the response options offered, with just under one quarter of businesses having a new system installed in the previous 5 years, installed between 5-10 years ago and older than 15 years.

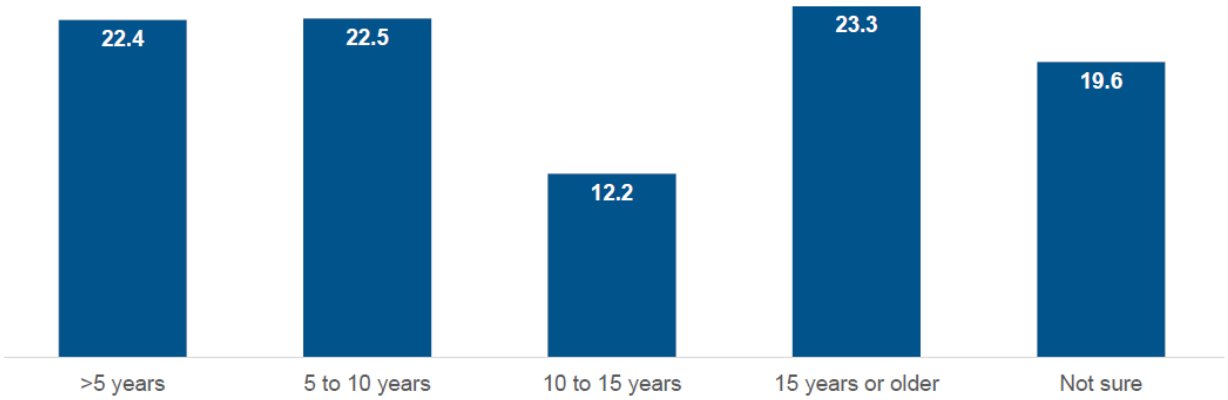
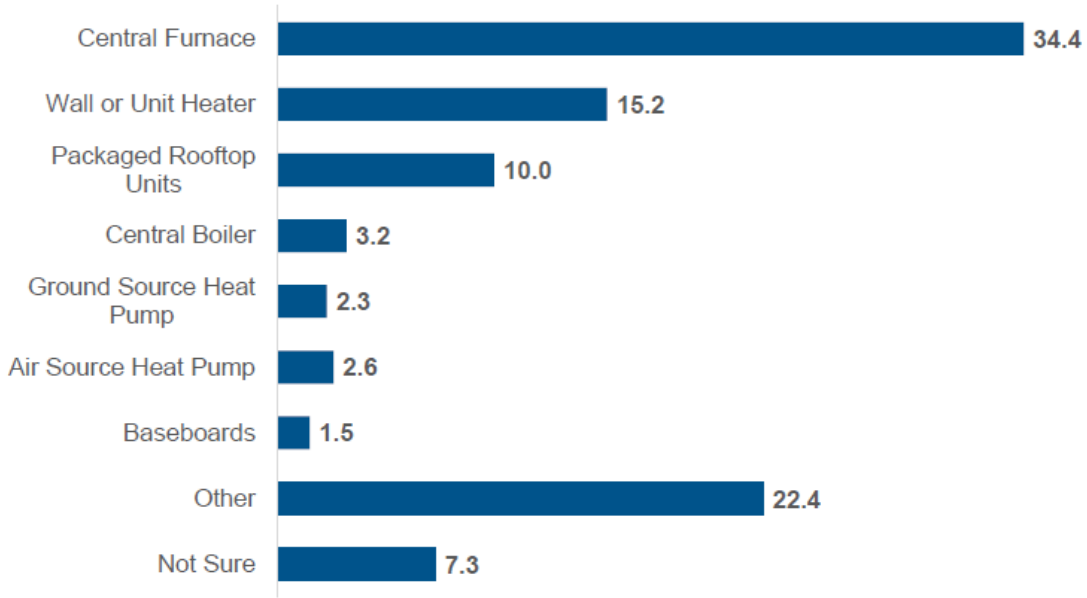


Figure 41: Q12c. How old is this primary heating system?

Just over one in ten businesses had a secondary heating system (11.5%). Of those, one-third had a



central furnace (34.4%) and just over half used natural gas as their fuel type (57%). Over one-third of secondary heating systems are 15 years or older (36%).

Figure 42: Q13a/b/c. Characteristics of secondary heating system

About half of these secondary systems heated less than 30% of the building. Just under one in four systems heated a majority of the building.

Approximately two-thirds of respondents reported that their business had cooling in more than 90% of the space. Seven percent of businesses reported no cooling.

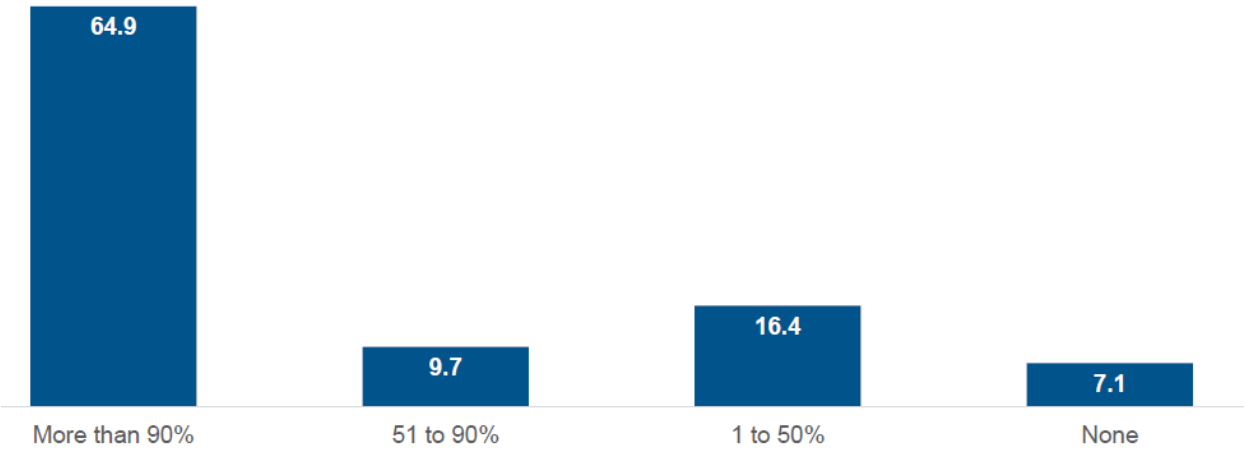


Figure 43: Q15. Approximately what percentage of the space your business occupies, or uses, at this location is cooled?

The most common cooling system was a residential-style central air-conditioner (37.8%), which was most common in Evergy Missouri West (44.9%) and least common in Evergy Kansas Metro (30.1%). The next most common cooling system was a packaged rooftop air conditioner unit (23%), which was most common in Evergy Kansas Metro (37.6%) and least common in Evergy Kansas Central (13.8%).

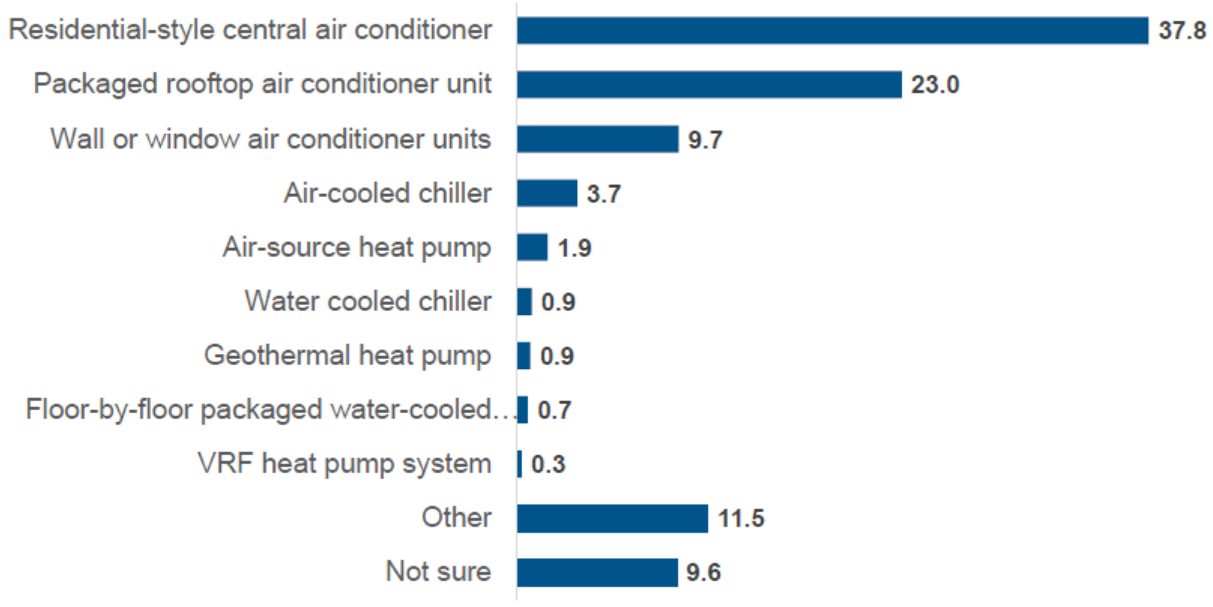


Figure 44: Q16a/b/c. Characteristics of cooling system

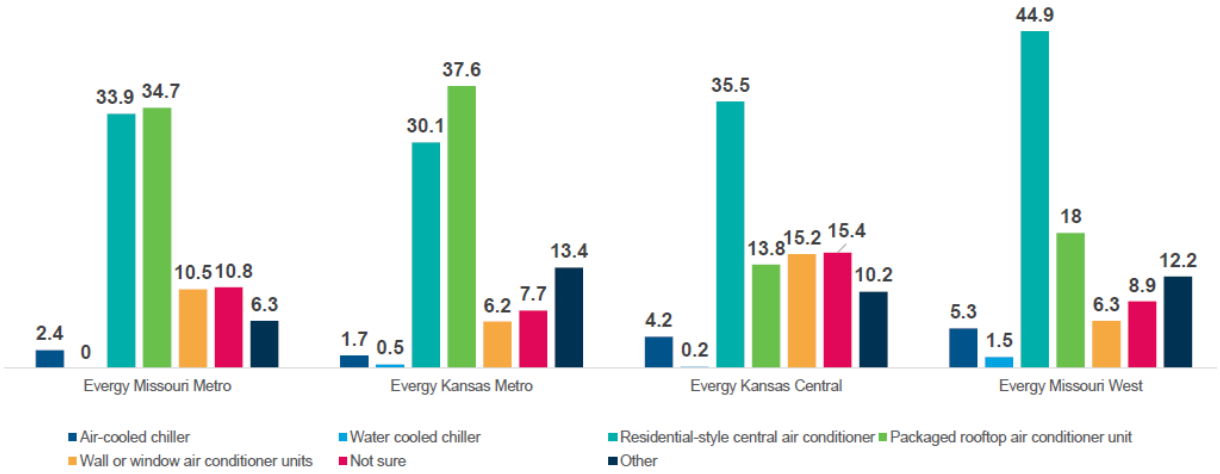


Figure 45: Q16a. What type of system or equipment is used as the primary means of cooling your space? [by Operating company]

Nearly all (94.8%) businesses used electricity to run their cooling system.

The age of the primary cooling system mirrored the age of the heating system to some extent, with just under half having a system that is less than 10 years old.

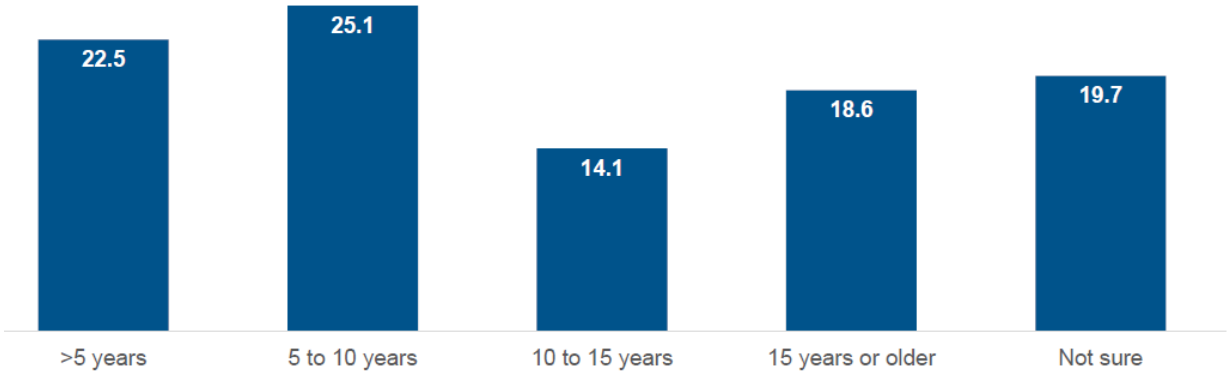


Figure 46: Q16c. How old is this primary cooling system?

Fewer than one in ten businesses have a secondary cooling system (7.7%). One-third of businesses with a secondary system said they had an "other" system not listed. When asked to specify, most of these said they had "fans." Within the list, the most commonly selected secondary system was a wall or window air-conditioning unit (about one-quarter of those with a secondary system). The vast majority of these secondary cooling systems (85.2%) were powered by electricity. As with the primary cooling system, the age of the secondary cooling system was fairly split, with a plurality being 15 years or older (27.5%).

Just under half of businesses with some heating or cooling used a programmable thermostat to control their heating and/or cooling systems (48%), while 37.8% had a manual thermostat. The vast majority of both types of thermostats controlled both heating and cooling.

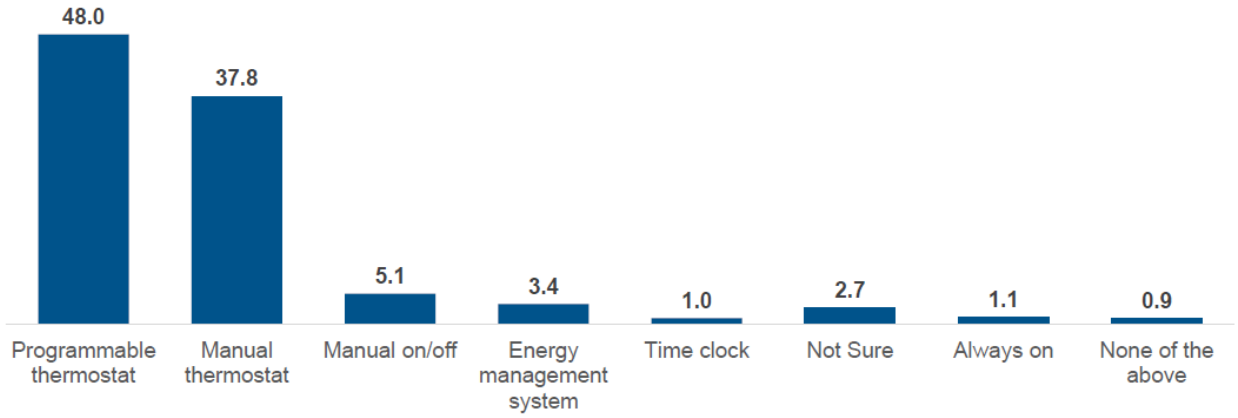


Figure 47: Q20. What type of controls are primarily used in your heating and/or cooling systems?

The most common type of water heating system was a self-contained or stand-alone storage water heater/boiler (20.9%), however just under 20% of respondents were unsure about their system and an additional 12% said they had a different system not included in the list. When asked to specify the "other" system, many reported either the fuel type used (electric or gas) or provided a simpler response, such as "regular water heater" or a "small hot water heater." Additionally, 8% of businesses had no water heating on site.

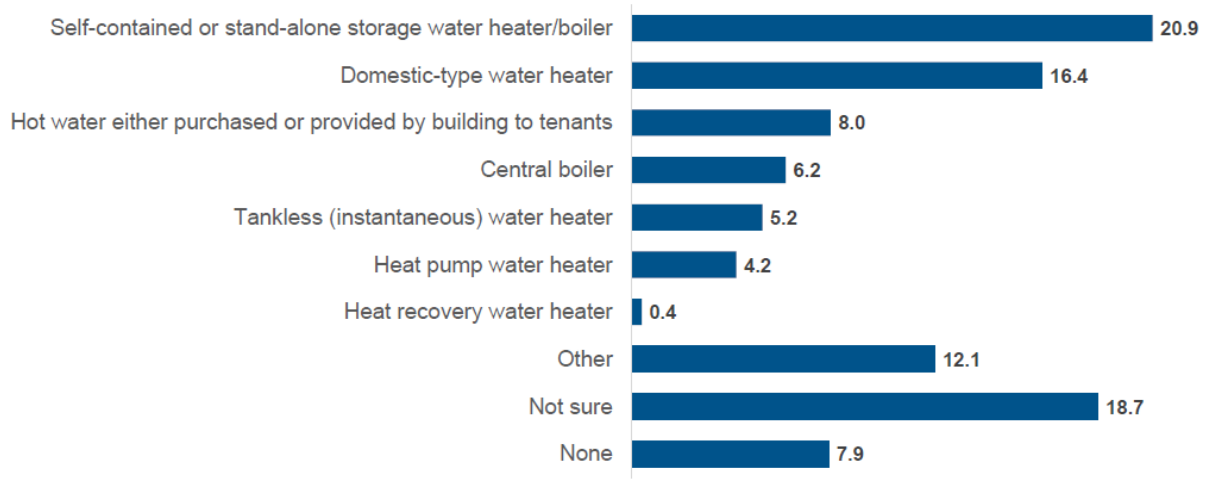


Figure 48: Q21. What type of water heater does your business use?

Respondents with a tanked system were asked to report the size of their primary tank. Just under one-quarter of businesses had a tank smaller than 30 gallons, while 36.6% had a tank between 30 and 54 gallons and 17.3% were unsure of their water heater tank size.

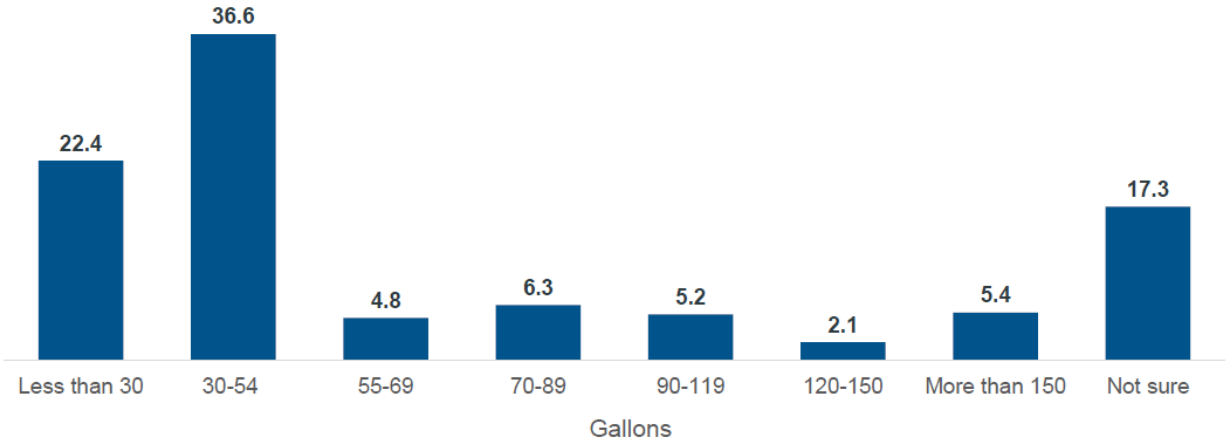


Figure 49: Q22. What is the tank size of your primary water heater?

The most water heating common fuels were natural gas (42.8%) and electricity (39.2%).

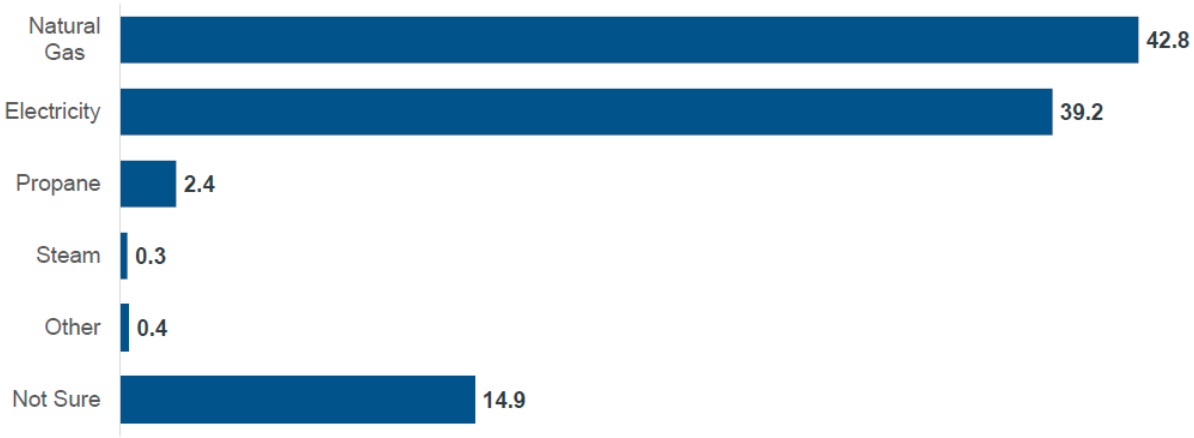


Figure 50: Q23. What type of fuel is used by the water heater?

IV. Lighting

Respondents were asked to report the number of lamps or fixtures used in the interior and exterior of their businesses. The table below shows the proportion of interior lights that fall into each category. The most common system was linear or tubular fluorescent lights (58.6% of all lights), followed by LED lamps that replace linear fluorescent lights (27.8%).

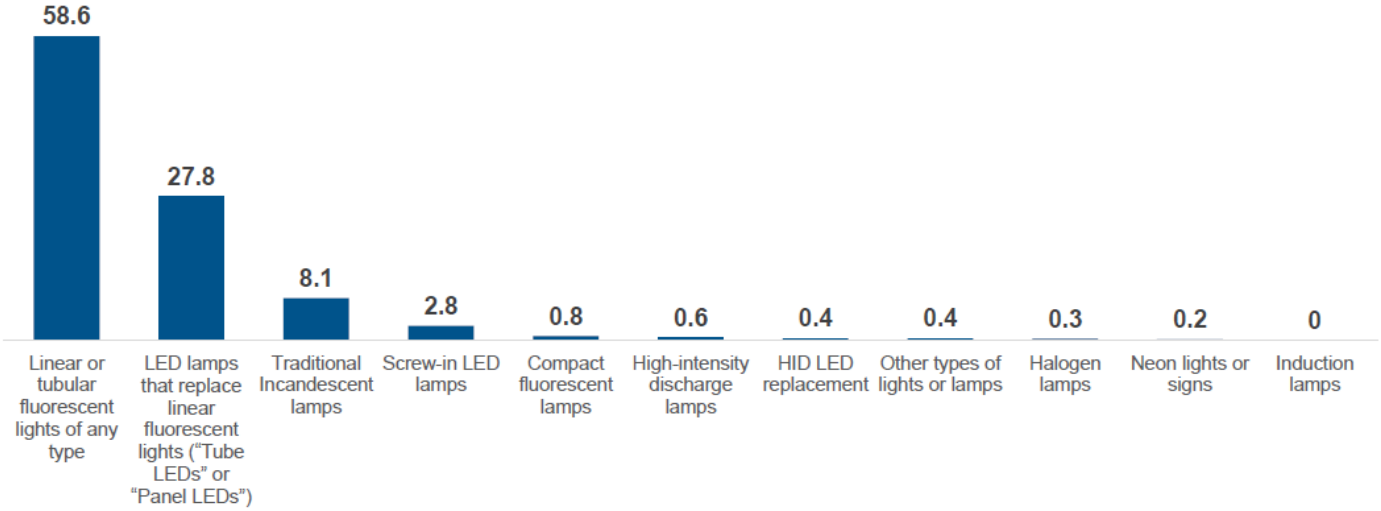


Figure 51: Q24. Approximately how many of the following lights or lamps do you have in your facility? [Interior]

All respondents were asked what systems they used to control their interior lighting. The most common system was a manual – single switch (78.2%), followed by manual – bi-level (dual) switch (21.8%).

Table 13: Q26. What system do you use to control your interior lighting?

Lighting Control System	Percent
Manual – single switch	78.2%
Manual – bi-level (dual) switch	21.8%
Occupancy sensor	4.8%
Timers / Time clock	3.2%
Photocell	0.3%
Daylighting sensor	0.9%
Manual – circuit breaker	4.7%
Energy management system	1.3%
Other	2.3%
Not sure	2.9%

When asked to report how many days of the week the business is typically open, 40.7% said they were open 5 days a week. Just under one-quarter were open every day (22.5%).

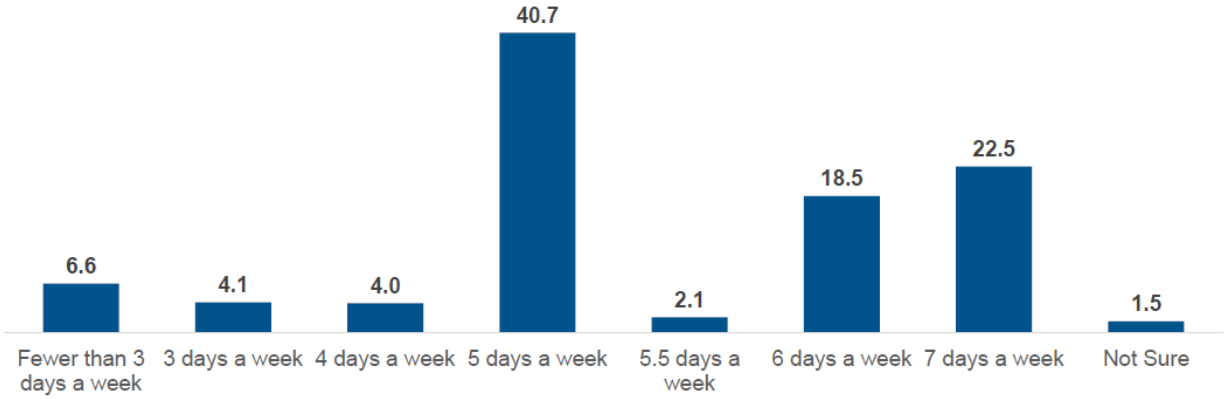


Figure 52: Q5. During the times of year your facility is in operation, on how many days of the week is it typically OPEN?

Approximately three-quarters of businesses said they had exterior lights (73.8%). Just under half of businesses with exterior lights used Photocell/Daylighting sensors to control them (47.6%), and the next most popular systems were timers/time clock (44.5%) and manual – single switch (21.1%).

V. Appliances & Amenities

Just under three-quarters of businesses (72%) reported having a computer monitor on site, with the mean number of monitors being 27. A smaller proportion (62%) reported having one or more desktop computers.

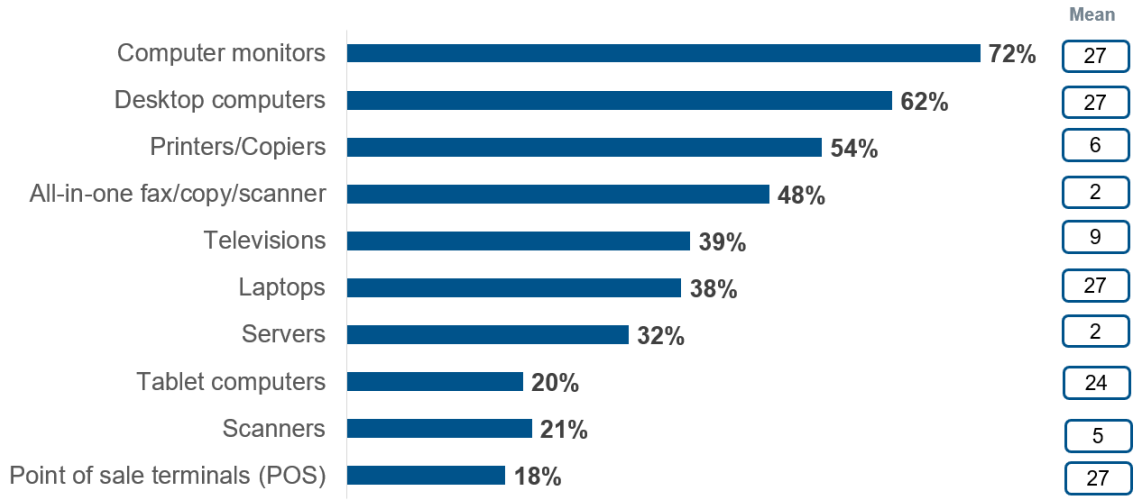


Figure 53: Q42. How many of each of the following types of equipment can be found in your facility?

Over half of the businesses had some kitchen facilities onsite used for food preparation or storage (57%). Figure 54 shows the proportion of businesses with each type of kitchen appliance, amenity or equipment. The mean number of items on site is shown in the column to the right. Just under 80% of businesses had a standalone refrigerator (79.7%), with the mean number being five units on site.

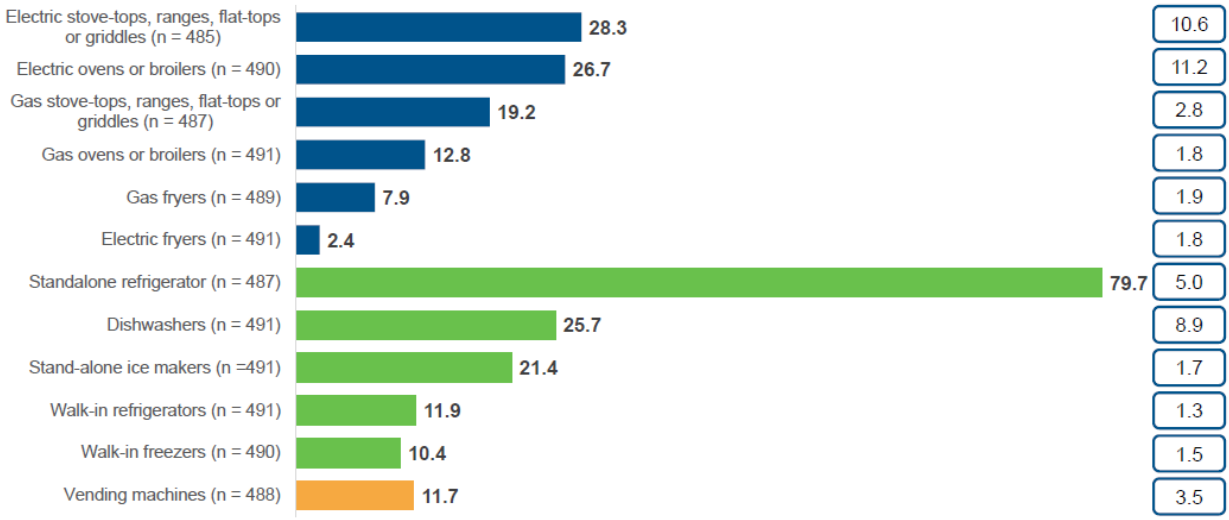


Figure 54: Q44. How many of the following units can be found in your kitchen, food preparation, or storage areas?

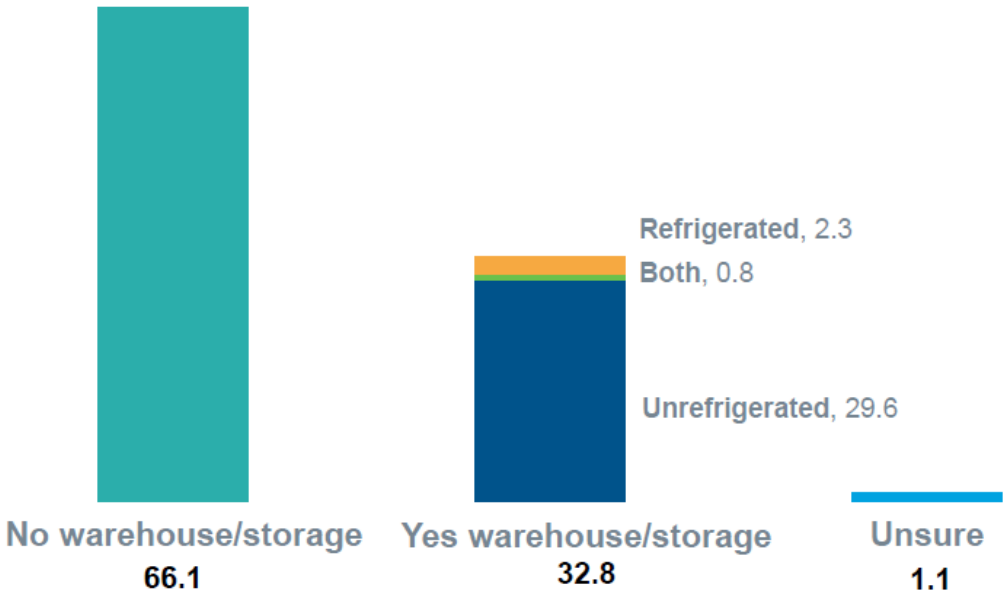


Figure 55: Q47. Do you have any warehouse space, or large storage space, within the area that your business uses at this location?

Two thirds of businesses reported having no warehouse or storage space on site (66.1%). For those with warehouse or storage space, most of this space was unrefrigerated.

VI. Motors

Just under one-quarter of industrial businesses reported having fans and blowers on site (23.8%) while just under one-fifth had compressed air systems (18%).

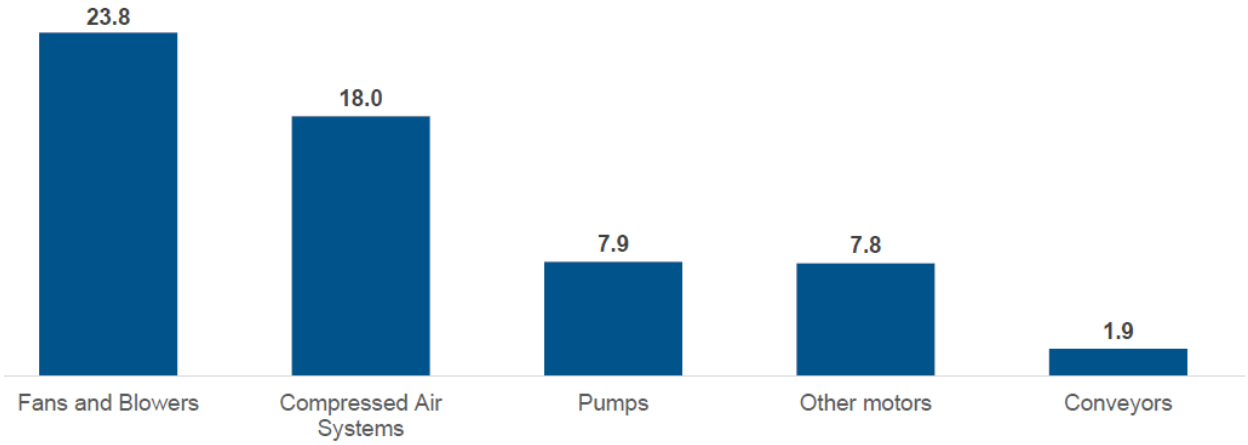


Figure 56: Q58. Does your facility have any of the following types of motors?

On average, less than half of the different motor types had variable frequency drives, as shown in Table 14.

Table 14: Q59. About what percentage of the motors on your fans / blower equipment have Variable Speed, or Variable Frequency drives?

Motor Type	Frequency with Variable Frequency drives?
Fans & blowers	43.2%
Pumps	22.8%
Compressed Air Systems	12.9%
Conveyors	24.9%
Other Motors	30.0%

VII. Electric Vehicles and Electricity Generation

Less than five percent of businesses reported having electric vehicle charging stations at their location (4.7%). In most cases (60%), the business paid for the stations. Four percent of businesses reported that there were solar panels or photovoltaic systems on site (4.1%), about the sample percentage as in 2016.

VIII. Energy Efficiency

The final section of the survey sought to measure awareness of different rebate programs and efficiency programs among Missouri-based customers only. Evergy offers standard cash-back rebates for energy-efficient upgrades on a one-for-one basis for equipment like air compressors, lighting and controls, refrigeration, and water heating. The utility also offers custom rebates for business customers, which are paid based on the amount of a project's energy reduction. This program applies to projects such as new construction, chiller systems, building controls, and energy management systems.

The standard rebate system was more well-known than the custom program, with half of businesses having heard of the standard program (49.2%). Only one-third of businesses were aware of the custom rebate program (34.1%).

All respondents were asked what additional energy efficiency programs and/or rebates they would like to see their utility offer customers. The responses from customers fell into three main categories, as shown in Figure 57.

Figure 57: Q70. What additional energy efficiency programs and/or rebates would you like to see your utility offer customers?

Similar to its popularity in the residential survey, “Solar” was the most-mentioned category overall by commercial and industrial customers. “Lower Rates” and “More/Bigger Rebates” were also frequently mentioned. In terms of equipment improvements, “LED” was the most common response.

Finally, respondents were asked if they implemented any of a list of energy-efficiency measures related to lighting, heating/cooling, and water heating at their location in the past three years. As shown in the three tables below, most businesses did not implement any of these measures (45.7%), though four in ten businesses did replace traditional incandescent lights with CFLs, LEDs, or higher efficiency light bulbs in lighting fixtures (40.6%) and just under one-third replaced traditional incandescent lights with CFLs, LEDs, or higher efficiency light bulbs in lighting fixtures (29.6%) .

Table 15: Q71. Thinking about all of the space at your facility, which of the following energy-efficiency measures related to lighting have been implemented at this location within the last 3 years?

Energy-efficiency measure related to lighting	Proportion of respondents who selected this option
Replacing traditional incandescent lights with CFLs, LEDs, or higher efficiency light bulbs in lighting fixtures	40.6%
Upgrading or renovating fluorescent lighting system(s)	29.6%
“Delamping” – or the elimination of some fluorescent fixtures and adding reflectors to others to reduce the total number of lighting fixtures or lamps without reducing the total light available	9.8%
Installing occupancy/motion sensors to turn lights off when rooms are not in use	9.3%
Installing daylighting sensors to turn interior lights off when sufficient daylight is available	4.4%
No measures implemented	45.7%

Energy efficiency measures related to heating/cooling have not been widely implemented in the past three years—three quarters of commercial customers had not implemented any of the measures listed (73.6%). The most popular measure, conducting a "retro-commissioning" of HVAC systems, was carried out by 12.6% of businesses, followed by adding insulation to the ductwork that serves heating and/or cooling systems, which was implemented by 11.4% of businesses.

Table 16: Q72. Which of the following energy efficiency measures related to heating / cooling have been implemented at this location within the last 3 years?

Energy-efficiency measure related to heating/cooling	Proportion of respondents who selected this option
Conducting a "retro-commissioning" of your HVAC systems – essentially reviewing all elements of system performance and flow to ensure your operating procedures optimize system performance	12.6%
Adding insulation to the ductwork that serves your heating and/or cooling systems	11.4%
Installing variable speed drives on fan motors that are part of your HVAC system – to allow the motors to run at many different speeds, rather than "on" or "off"	7.1%
Adding an energy management/control system	6.3%
Installing a heat recovery system that would capture waste heat from chillers or refrigeration systems to use for heating	4.6%
Adding an economizer (air-side or water-side) - Which of the following energy efficiency measures related to heating / cooling have been implemented at this location within the last 3 years?	4.1%
No measures implemented	73.6%

Table 17: Q73. Which of the following energy efficiency measures related to water heating have been implemented at this location within the last three years?

Energy-efficiency measure related to water heating	Proportion of respondents who selected this option
Purchasing a higher than standard efficiency water heater when needing to replace a unit	14.2%
Reducing the temperature of the hot water that your water heater(s) delivers	12.1%
Insulating, or improving the insulation, for the pipes that carry hot water throughout your facility	8.3%
Installing 'low flow' nozzles that reduce the amount of hot water used	7.2%
Installing faucet aerators that introduce air into the flow of hot water, reducing the total amount of water used	7.2%
No measures implemented	75.5%

Similarly, three-quarters of businesses have not implemented any energy efficiency measures related to water heating, though 14.2% did purchase a higher than standard efficiency water heater and 12.1% have reduced the temperature of their hot water.