Customer Action Program
Measurement and Verification Report

Prepared for FirstEnergy Ohio Companies:

Ohio Edison Company
The Cleveland Electric Illuminating Company
The Toledo Edison Company

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1 Executive Summary

For 2015, the Ohio Operating Companies, The Cleveland Electric Illuminating Company (CEI), Ohio Edison Company (OE), and The Toledo Edison Company (TE) (collectively "Companies") offered the Customer Action Program ("CAP"). The CAP captures energy savings and peak demand reductions achieved through actions taken by customers outside of utility-administered programs pursuant to R.C. 4928.662. Under this Revised Code section, the operating companies are authorized to count toward the benchmarks energy efficiency savings and peak demand reductions that are: (1) achieved through customer actions that comply with federal standards, including resources recognized as capacity resources by PJM Interconnection, L.L.C.; (2) achieved since 2006, measured on the higher of an as found or deemed basis; and (3) for new construction, counted based on 2008 federal standards.

Under contract with the Companies, ADM Associates, Inc. (ADM) performed evaluation, measurement and verification (EM&V) activities for the CAP. The procedures used to perform the EM&V activities described in this report were informed by the approved State of Ohio Energy Efficiency Technical Reference Manual ("TRM")[1] and ADM's previous experience performing EM&V activities for the Companies' DSM programs. In addition, the procedures chosen built on information collected during a project initiation meeting and succeeding discussions with the Companies' staff, as well as multiple discussions with the FirstEnergy Collaborative group.

The evaluation effort was accomplished by employing a variety of approaches to capture customer and market information, which included surveying efforts; market research; reports from retailers, administrators and trade allies; site verification visits; and other evaluation, measurement and verification activities.

1.1 Residential

ADM employed varying evaluation strategies in performing an impact evaluation of the residential measures of the CAP. There were three residential measure categories investigated in the evaluation: Lighting, Refrigerators and HVAC.

For each measure, ADM employed two strategies to calculate ex-post savings:

- A bottom-up approach utilizing primary data collected from the Companies' service territories via a Random Digit Dialing (RDD) telephone survey.
- A top-down approach utilizing macro-level data.

[1] Vermont Energy Investment Corporation (VEIC), *State of Ohio Energy Efficiency Technical Reference Manual,* Prepared for Public Utilities Commission of Ohio, Draft of August 6, 2010.

In order to ascertain information for the *bottom-up* approach about the energy efficient measures the Companies' residential customers purchased during 2015, ADM conducted a telephone survey. The survey asked a plethora of questions about the customer's energy efficient equipment purchases and resulted in a rich data set of information from 1,800 customers. Statistical tests were conducted to ensure there wasn't a statistically significant difference between the RDD survey sample and the Companies' service territories with respect to demographic characteristics that may influence energy efficient purchasing behavior. The percent of installations for each measure type was then extrapolated to the Companies residential household population for each operating company.

The *top-down* approach utilized market data from U.S. Energy Information Administration, the Association of Home Appliance Manufactures, Air Conditioning Heating and Refrigeration Institute, and EnergyStar with supported allocations to residential households in the Companies' service territories who purchased energy efficient equipment during 2015.

Both approaches were integrated to achieve and corroborate the ex post savings. By employing the bottom-up strategy, ADM estimated energy savings and demand reduction for each lighting and refrigerator measure. For CFLs, LEDs, and halogen bulbs, the top-down approach employed a lighting consumption model as an independent check on the ex-post savings. For refrigerators the top down approach utilized market data as an independent check on ex post savings. Because of the low incidence of survey respondents with HVAC purchases, savings were calculated using the top-down approach. The RDD survey results for HVAC were used as an independent check on ex post savings.

The energy saving calculations were conducted using Ohio TRM Deemed Savings and engineering algorithms. A summary of the measure-level energy savings results is shown in Table 1-1.

Table 1-1: Residential Energy Savings

EDC	*Measure*	*Annual Energy Savings (kWh)*	*Summer coincident peak savings (kW)*	*Lifetime Savings (kWh)*
CEI	HVAC	5,523,813	5,837.45	88,403,954
OE	HVAC	7,671,963	8,107.57	122,783,270
TE	HVAC	2,148,150	2,270.12	34,379,315
Total		**15,343,925**	**16,215.13**	**245,566,539**
CEI	Refrigerator	5,394,903	944.72	91,713,344
OE	Refrigerator	7,492,920	1,312.12	127,379,644
TE	Refrigerator	2,098,018	367.39	35,666,300
Total		**14,985,840**	**2,624.23**	**254,759,288**
CEI	Lighting	48,353,232	6,604.99	529,103,573
OE	Lighting	67,157,266	9,173.59	734,866,074
TE	Lighting	18,804,035	2,568.61	205,762,501
Total		**134,314,532**	**18,347.19**	**1,469,732,148**
Res Total		**164,644,298**	**37,186.56**	**1,970,057,975**

1.2 Commercial & Industrial

The commercial and industrial (C&I) component of the CAP was evaluated by selecting a random sample of the Companies' C&I customers to evaluate energy savings associated with program-associated measures. The sample was generated by stratifying the population of businesses within the Companies' service territories based on average annual energy usage (kWh). For program year 2015, a total of 189,631 businesses comprised the population of entities that may have implemented CAP-associated energy efficiency measures.

Customers were surveyed by phone to collect information pertaining to CAP-associated energy efficiency measures. After a brief introduction, survey respondents were requested to indicate whether or not they installed any energy efficient equipment during 2015, and if they had plans to install energy efficient equipment prior to the end of 2016. Respondents who indicated installing equipment during 2015 were then asked detailed questions regarding the installed equipment. ADM completed decision maker surveys for 2,684 out of 41,570 program-eligible entities. Of those respondents, 358 claimed to have installed energy efficient equipment during 2015. ADM performed a site visit to verify

measure implementation for 169 of these respondents, of which ADM found that 124 of them actually implemented energy efficient equipment resulting in energy savings.

For each business indicating implementation of energy efficiency equipment, ADM completed a process including decision maker interview (survey), documentation collection, and site visit in order to obtain data to enable ADM to calculate energy savings, summer coincident peak savings, and lifetime energy savings.

The 124 survey respondents who were found to have implemented energy efficient equipment during 2015 were associated with 10,076,106 kWh of annual energy savings. The summer coincident peak savings for this sample of businesses is 1,324 kW. A summary of the sample-level energy savings results is shown in Table 1-2.

Table 1-2: C&I Sample Energy Savings

Operating Company	***Energy Savings (kWh)***	***Summer coincidence peak savings (kW)***
CEI	5,755,878	548.08
OE	3,881,350	683.39
TE	438,878	92.73
2015 Total	**10,076,106**	**1,324.20**

Energy savings measures considered for CAP include: Lighting, HVAC, motors, refrigeration, appliances, water heating, and process improvements. The energy savings calculated for each business was a summation of all of the energy efficiency measures observed within the businesses premise.

Savings from the sample were extrapolated to the population based on the sample stratification and are presented by rate class for each operating company. The extrapolated annual energy savings for all operating companies is 90,383,616 kWh. A summary of the savings by rate class is shown in Table 1-3.

Table 1-3: C&I Extrapolated Energy Savings

Strata	*Annual Energy Savings (kWh)*	*Summer coincident peak savings (kW)*	*Lifetime Savings (kWh)*
CE-GP	213,618	52.06	2,634,556
CE-GS	35,509,833	9,420.63	411,352,147
CE-GSU	3,036,339	592.00	39,267,688
CE-GT	4,698,011	301.27	73,620,710
CE-POLS	456,919	127.79	5,414,074
CEI Total	**43,914,720**	**10,493.75**	**532,289,175**
OE-GP	2,556,465	566.38	30,514,965
OE-GS	26,934,628	5,915.86	324,194,401
OE-GSU	2,606,920	520.98	26,930,526
OE-GT	5,406,647	823.27	65,718,768
OE-POLS	160,400	35.12	1,941,748
OE Total	**37,665,060**	**7,861.61**	**449,300,408**
TE-GP	3,033,325	722.95	55,970,211
TE-GS	5,036,417	1,425.76	71,821,723
TE-GSU	194,737	42.43	3,767,547
TE-GT	526,037	96.12	8,095,321
TE-POLS	13,322	3.95	172,271
TE Total	**8,803,838**	**2,291.20**	**139,827,073**
Total	**90,383,616**	**20,646.57**	**1,121,416,654**

2 Introduction and Purpose of Study

The purpose of this report is to present the results of the impact evaluation effort undertaken by ADM to quantify the energy savings and peak demand reductions that were achieved through actions taken by customers outside of the utility-administered programs. This was accomplished by employing a variety of approaches to capture customer and market information; including surveying efforts, market research, analyzing reports from industry groups, and site verification visits.

2.1 Residential

The residential section of this report presents the results of the impact evaluation of the CAP residential customer during 2015. The overall objective for the impact evaluation of the CAP residential program was to verify the gross energy savings (kWh) and peak demand (kW) reduction resulting from energy efficiency measures installed during 2015 by residential customers within the Companies' service territories.

The approach for the impact evaluation had the following main features.

- A RDD survey effort of customers to determine energy efficiency measures installed during the calendar year 2015.
- On-site data collection was conducted for a subsample of survey respondents to gather verification information facilitating determination of CAP energy savings and peak demand reductions.
- Residential energy savings were estimated using the Ohio TRM.

The research questions for the evaluation of the residential component of CAP include the following:

- Are the Companies' residential customers purchasing energy efficient equipment outside of utility-administered efficiency programs?
- What information will residential customers provide regarding energy efficient equipment installed during 2015?

2.1.1 Residential Market Data Acquisition

The sample frame for measurement and verification of residential CAP energy savings includes all 1,853,553 of the Companies' residential customers in single and multifamily dwellings. During the initial stages of the measurement and verification effort, the Companies provided a list detailing the number of residential customers in their service territories by zip code.

ADM purchased contact data for households in each zip code of each service territory in order to develop a residential customer sample representative of each EDC's demographics. Households in this customer sample were randomly contacted by telephone through RDD and interviewed about lighting, appliance, and other equipment purchases made during 2015.

The sample size of the RDD effort facilitated estimation of residential CAP energy savings at +/-10% statistical precision at a 95% confidence level. The target RDD sample size was further augmented to account for a certain number of respondent refusals of on-site visits. A summary of the residential survey is shown in Table 2-1.

Table 2-1: Survey Population

Sample	***Month***	***Customers***
Survey 1	October, 2015	1,200
Survey 2	February, 2016	600
2015 Total		**1,800**

A survey was considered to be complete if the respondent agreed to the survey and indicated whether or not energy efficient equipment was installed during 2015. For cases for which equipment was installed, detailed information about the equipment was acquired. Evaluated energy efficiency equipment included the following categories:

- Lighting
- HVAC
- Refrigeration

Following survey completion, ADM attempted to contact the survey respondent to request participation in a site verification visit. If the respondent agreed, a site visit was scheduled to gather the information to facilitate calculation of energy savings. During site visits, ADM staff verified installation of each energy efficiency measure.

A summary of statistics for residential market data acquisition is shown in Table 2-2.

Table 2-2: Residential Market Data Collection Effort Statistics

Unit	***Quantity***
Population Size (Residential Households)	1,853,553
Customers Completing Survey	1,800
Residential Site Visits	120

2.2 Commercial & Industrial

The overall objective for the impact evaluation of the CAP C&I Programs was to verify the gross energy savings (kWh) and peak demand (kW) reduction resulting from energy efficiency measures installed during 2015 by businesses within the Companies' service territories.

The approach for the impact evaluation included the following main activities and approaches:

- Customers were recruited for a study to identify energy efficiency measures installed during calendar year 2015.
- Available documentation from the participants was reviewed, with particular attention given to proof of purchase, verification of equipment installation, and verification of the quantity of equipment installed.
- On-site data collection visits were conducted to gather information to facilitate calculation of CAP energy savings and peak demand impacts. Monitoring was also conducted, when necessary, to obtain more accurate information on the hours of operation for lighting equipment.
- Program energy savings were estimated using the Ohio TRM:
    - Analysis of lighting savings was accomplished using ADM's custom-designed lighting evaluation tool with system parameters (fixture wattage, operating characteristics, etc.) based on information on operating parameters collected on-site, from the Ohio TRM, and, if appropriate, industry standards.
    - Analysis of non-lighting measures was accomplished using ADM's custom-designed non-lighting evaluation tool based on information on operating parameters collected on-site, from the Ohio TRM, and, if appropriate, industry standards

The research questions for the C&I CAP are presented below:

- Are the Companies' C&I customers purchasing energy efficient equipment outside of efficiency programs?

- Will C&I customers willingly provide information on energy efficient equipment installed in 2015?

2.2.1 Participant Commercial and Industrial Market Data Acquisition

ADM developed a sample of the Companies' C&I customers to facilitate measurement and verification of CAP energy savings achieved by the population of C&I customers. The Companies provided ADM with customer-level data on the energy use of their C&I customers. The data included customer contact information that assisted ADM's survey administration efforts. In order to generate the appropriate population of C&I customers, the database was filtered to remove the following customers:

- Customers without 12 prior months of meter data (4/30/2014 to 5/31/2015).
- Customers with non-current or expected non-current accounts.
- Customers with any months of zero or negative savings within the chosen 12-month time period.[2]
- Customers with less than 2,000 annual kWh usage.
- Opt-out customers of the Companies' energy efficiency programs.

For each EDC, the remaining population of C&I customers (189,631) were grouped into strata based on the customer level of annual energy usage. Six sampling strata were created for each EDC. The sample size facilitated estimation of C&I CAP energy savings at +/-10% statistical precision at a 95% confidence level for each EDC. The target sample size was further augmented to account for a certain number of respondent refusals of on-site visits. In order to achieve the desired number of survey respondents, a large number of businesses were randomly chosen for the sample. The size of the sample is designed to meet a 95% confidence interval and 10% precision for the sample. The total number of businesses chosen from the population in which sampling was performed was 41,570.

Customers in each sample were divided into two groups: high energy users and low/medium energy users. For the high energy users, ADM contacted customers by referencing contact information provided by the Companies' account representatives. For low/medium energy users, ADM contacted customers by referencing phone contact information contained in data provided to ADM by the Companies. The samples are shown in Table 2-3.

[2] The provided database of commercial and industrial businesses contained negative meter data for some businesses.

Table 2-3: C&I Market Data Collection Effort Statistics

Sample	***Time Period of Data Collection***	***Randomly selected segments of C&I population from which sampling was performed***
Pilot	September/October	764
Sample 2	November	8,457
Sample 2.5	December	13,407
Sample 3	January/February	18,942
2015 Total		**41,570**

The survey population was presented a survey to determine:

- Energy efficiency equipment installed in 2015
- Energy efficiency equipment planned to be installed in the remainder of 2015 or in 2016
- Which energy efficiency equipment was installed in 2015
- Which energy efficiency equipment was planned to be installed at a future date

In order to obtain businesses to participate in the survey, they were called up to 5-7 times over the course of 3-4 weeks. Call backs were made at different times of the day, and different days of the week. A survey was considered to be complete if the respondent agreed to the survey and answered whether or not energy efficient equipment was installed or planned to be installed in 2015. After this point, detailed information about the equipment was acquired. Energy efficiency equipment was broken down into the following categories:

- Lighting
- HVAC
- Refrigeration
- Water Heating
- Refrigerated Vending Machines
- Washing Machines
- Motors
- Others and Process Improvements

These categories of topic areas were chosen based on information provided in the Ohio TRM and Department of Energy's list of Standards and Procedures for calculating energy savings.

Upon completion of the survey, each respondent willing to participate was contacted by an ADM Associate through email and follow-up phone call. The email template can be seen in Appendix C. The intent of the email was to gather documentation and information not acquired during the survey. Documentation included:

- Letter of Attestation for equipment installed in 2015
- Proof of purchase: invoices, receipts, etc.
- A signed W-9

Upon further communication with each respondent a site visit was scheduled, for those willing to continue their participation, to gather the necessary information to calculate an accurate energy savings. Site visits included the verification of each energy efficient measure installed within the business.

A summary of statistics for participant acquisition is shown in Table 2-4.

Table 2-4: Participation Statistics

Sample	***Customers***
Sample Size	41,570
Business completing Survey	2,684
Businesses with Installed Measures	358
Site Visits	172

3 Program Description

The CAP captures energy savings and peak demand reductions achieved through actions taken by customers outside of utility-administered programs pursuant to R.C. 4928.662. Under this Code section, the Companies are authorized to count toward the benchmarks energy efficiency savings and peak demand reductions that are: (1) achieved through customer actions that comply with federal standards, including resources recognized as capacity resources by PJM Interconnection, L.L.C.; (2) achieved since 2006, measured on the higher of an as found or deemed basis; and (3) for new construction, counted based on 2008 federal standards.

The primary objective of CAP is to determine the energy savings from the Companies' customers without the influence of an energy efficiency program. CAP is considered to be a Market Research Study (MSS) in which participants are chosen randomly such that energy savings findings can be extrapolated to the population of businesses within the Companies' service territories.

This chapter presents a description of each of the sectors in the customer action program.

3.1 Residential

The residential CAP quantifies energy savings for the population of the Companies' residential customers occurring from actions taken outside of a program design. The energy efficiency measures considered for residential CAP include: lighting, HVAC, and refrigeration. Primary data associated with the Companies' customers' energy efficiency actions and purchasing behaviors was collected via a RDD telephone survey as described in section 1.4.

3.2 Commercial & Industrial

The C&I CAP quantifies energy savings for the population of the Companies' C&I customers occurring from actions taken outside of a program design. All commercial and industrial businesses are eligible for the program but have the option to opt out or not participate. Business customers within the Companies were acquired through the process outlined in Section 1.4. Participants were chosen randomly into a stratified sample based on average annual energy usage (kWh). The population considered for CAP included 189,631 businesses. Energy savings were calculated for each business based on the number of energy efficient measures installed during 2015. Energy savings could only be calculated for businesses that were able to provide the necessary information and documentation in order to verify the date of installation as well as specifications on the equipment and use.

The energy efficiency measures considered for C&I CAP include: lighting, HVAC, refrigeration, motors, washing machines, refrigerated vending machines, and Others. The category of others includes custom equipment, process equipment, and other measures that are quantifiable by EM&V best practices. The methodologies for calculating energy savings were consistent with high energy users and medium/low energy users.

Site level analysis for each business provided the information to calculate annual energy savings (kWh), summer coincident peak savings (kW), and a weighted average estimated useful life for all measures installed in 2015. The site level analyses by stratum were used to extrapolate savings, summer coincident peak savings, and estimated useful life to the population.

3.3 Dual Participation Considerations

In order to ensure savings verified in the CAP were not originally generated though any other program in the Companies' portfolio offerings, ADM crosschecked participation with the 2013-2015 C&I, Mercantile, and Community Connections program data.[3] If a CAP survey respondent was included as a participant in another program offering their calculated savings were not included in CAP or extrapolated to the CAP population.

[3] There were no other programs for 2015 that included measures counted under the CAP to verify dual participation.

4 Methodology

This chapter provides a description of the methodology applied by ADM in the evaluation of the CAP during 2015.

4.1 Residential Methodology

ADM employed varying evaluation strategies in performing an impact evaluation of the residential measures of the program. For each measure, ADM employed two strategies to calculate ex-post savings:

- A bottom-up approach utilizing primary data collected from the Companies' service territories via a telephone survey.
- A top-down approach utilizing macro-level data.

The evaluation strategies for each measure are discussed in more detail in the following sections.

4.1.1 Sampling Design and Extrapolation Methods

In order to ascertain information about the energy efficient measures purchased by the Companies' residential customers during 2015, ADM conducted a telephone survey. The survey asked a plethora of questions about the customer's energy efficient equipment purchases and resulted in a rich data set of information from 1,800 customers.

For a number of the impact analyses of the residential measures in the program, data from the telephone survey was extrapolated to the entire population of the Companies' residential households. ADM ensured the statistical representation of the telephone survey sample through a number of steps. All survey respondents were cross-checked to ensure they had not been a participant in another program offering.

First, ADM purchased a telephone data base for residents in the OH zip codes within the Companies' service territories. Customers from this database were then contacted by a third-party survey implementer in accordance with RDD principles[4]. The number of completes were then frequency matched to the Companies' service territories at the county level.

[4] Before offering customers the opportunity to complete the survey, the survey implementer confirmed that the household was in fact a customer of one of the Companies.

Next, statistical tests were conducted to ensure there wasn't a statistically significant difference between the RDD survey sample and the Companies' service territories with respect to demographic characteristics that may influence energy efficient purchasing behavior. The following comparison uses the 1,800 survey responses collected for the Companies with gold-standard Census Bureau data for that state. The data used is the 2014 five-year household level Public Use Microdata Set (PUMS) of the American Community Survey (ACS). This data set was chosen because it assures coverage of all census blocks over a 5-year period, and has the most granular geography available from the Census Bureau. Other datasets, such as the one and three year ACS and American Household Survey (AHS), lack coverage and the geographic identifiers below state level to conduct this analysis. Two geographies were covered, the state of Ohio, and all the Public Use Microdata Areas (PUMAs) that contained the Companies' service territories. Each is a Census Bureau geographic area constructed of census blocks, and contains at least 100,000 residents. Figure 4-1 below illustrates how well the PUMAs (orange) were contained within the Companies' service territories (blue).

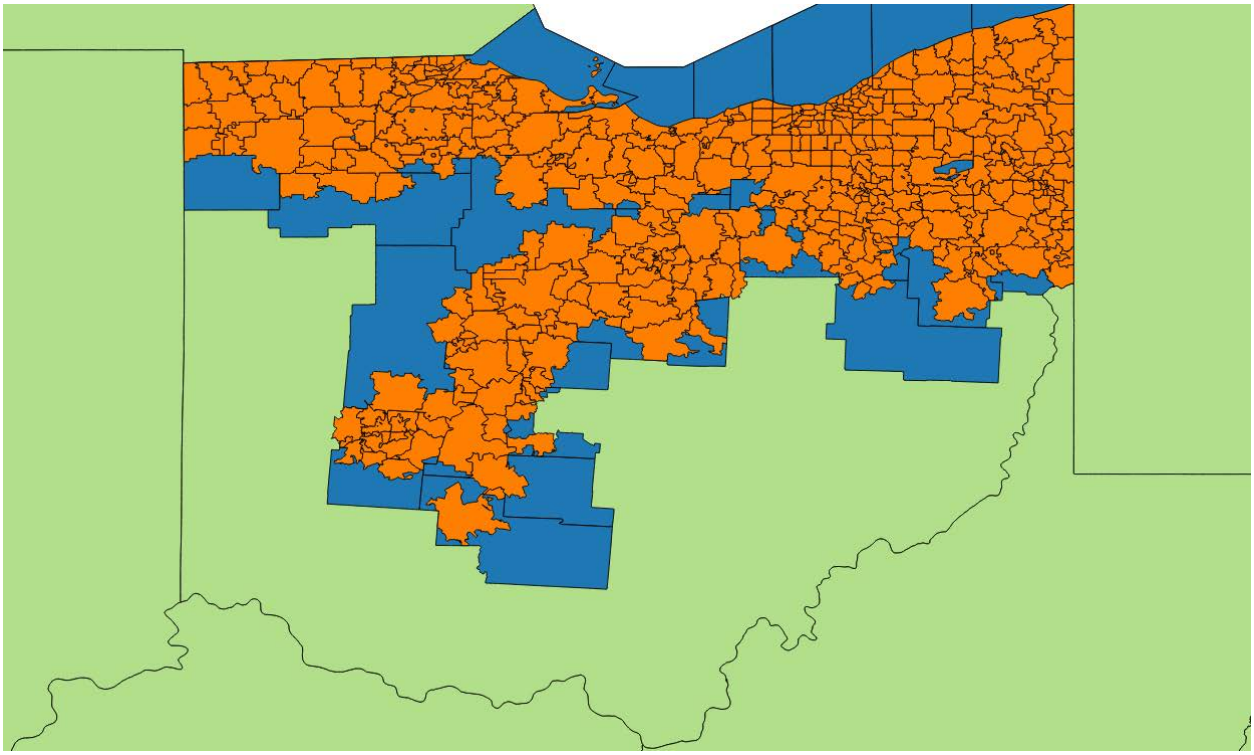

Figure 4-1: Census Tabulation Areas containing the Companies' service territories compared to PUMAs containing the Companies' service territories

There were two variables of interest, the age of the household and household income. Both were re-coded so that the category values matched those found in the data from the

Companies' residential customers. The ACS data was further trimmed to just single-family households. The weight supplied with the ACS data was re-scaled from population size to sample size to make the population weighted Census Bureau data easier to combine with the survey data. The two data sets were combined, and analyzed with the R package "survey", which is designed to handle weighted data and complex sample designs. For the territory level analysis, a list of ZIP codes in the Companies' service territories was related to the larger PUMAs that contained them. The data was filtered to these selected PUMAs to perform the territory level analysis.

T-tests were used to compare the two variables across the two groups within each geographic area. For income no significant difference was found at the state or territory level. Age of household differed significantly for both state and territory comparisons, but the difference was small, less than a whole category i.e. less than half a decade. Table 4-1 below details the T-tests.

Table 4-1: T-tests comparing the telephone survey sample and the Companies' service territories

Variable	***Geography***	***Group***	***t***	***p-value***	***N***
Income	Ohio	ACS	-1.391	0.164	188,479
		ADM Survey			1,246
	The Companies' service territories	ACS	-0.836	0.403	115,565
		ADM Survey			1,246
Year Built	Ohio	ACS	5.621	<.001	198,636
		ADM Survey			1,648
	The Companies' service territories	ACS	7.011	<.001	121,688
		ADM Survey			1,648

Table 4-2 compares the frequency distributions of the building types in the Companies' service territories to the sample of RDD survey respondents. The distributions are very similar, and are dominated by single-family homes.

Table 4-2: Comparison of telephone survey sample and the Companies' service territories building type frequency distributions

Building Type	***Service Territory***	***Telephone Survey***
Single-Family	83%	84%
Mobile Home	3%	1%
Apartment	13%	5%
Condominium	1%	3%
Other	0%	6%

4.1.2 Residential Impact Analysis Methods

There were three residential measure categories investigated in the evaluation of the CAP: Lighting, Refrigerators and HVAC. The sections below detail the impact analysis methodologies for each of these measure categories.

4.1.2.1 Lighting

ADM calculated the energy savings and demand reductions produced by the Companies' customers installing energy efficient lighting during 2015. ADM investigated the following bulb types: halogens, CFLs, and LEDs. ADM employed two evaluation strategies in performing an impact evaluation of the program. The two strategies were:

- A bottom-up approach utilizing primary data collected from the Companies' service territories via a RDD telephone survey. This method was used to calculate ex-post savings.
- A top-down approach utilizing a lighting consumption model. This method was used to corroborate the bottom-up approach.

Bottom-Up Approach

Using the bottom-up strategy, ADM estimated energy savings and demand reduction for each lighting measure using the OH TRM algorithms with data obtained from the telephone survey and augmented as necessary from site visits and ancillary studies.

ADM quantified the total energy savings ($kWhSavingsLighting$) and demand reduction ($kWSavingsLighting$) associated with the Companies' customers installing energy efficient lighting during 2015 by first calculating the total annual savings for each bulb type

t (Equation 1), and then summing all of the annual savings values calculated using Equation 1 (Equation 2).

$$kWhSavings_t = kWh\ Savings_{Bulb_t} * n_{Bulb_t/Household} * n_{FE\ Households}$$

Equation 1

$$kWhSavingsLighting \ = \sum kWhSavings_t$$

Equation 2

Where:

t = the type of light bulbs

= Halogens, CFLS, and LEDs

$kWh\ Savings_{Bulb_t}$ = the average annual savings per bulb for each bulb type *t*

$n_{Bulb_t/Household}$ = the average number of bulbs replaced in each household for each bulb type *t*

$n_{FE\ Households}$ = the number of households in the Companies' service territories[5]

The average annual savings per bulb for each bulb type was calculated using the following OH TRM algorithms for energy and demand.

$$kWh\ Savings_{Bulb_t} = ((\Delta Watts_{Bulb_t})/1000) * HOU_{Bulb_t} * WFHe * ISR$$

Equation 3

Where:

$\Delta Watts_{Bulb_t}$ = The difference between the average wattage for bulb type *t* and the average wattage of the type of bulb type *t* replaced (the "As Found" wattage)[6];

HOU_{Bulb_t} = Average annual hours of use for bulb type *t*;

[5] This value is 1,853,765 and was provided by the Companies.

[6] The "As Found" wattage is a blended value determined from survey questions that captured the various bulb types customers replaced with their newly purchased energy efficient bulbs.

$WFHe$ = Waste Heat Factor for energy[7];

ISR = In Service Rate[8].

$$kW\ Savings_{Bulb_t} = ((\Delta Watts_{Bulb_t})/1000) * WFHd * CF * ISR$$

Equation 4

$$kWSavingsLighting = \sum kWSavings_t$$

Equation 5

Where:

$\Delta Watts_{Bulb_t}$ = The difference between the average wattage for bulb type *t* and the average wattage of the type of bulb type *t* replaced (the "As Found" wattage)[9];

CF = Summer Peak Coincidence Factor[10];

$WFHd$ = Waste Heat Factor for demand[11];

ISR = In Service Rate.

$$n_{Bulb_t/Household} = \sum Survey_{Bulb_t} / \sum Survey_{Participants}$$

Equation 6

Where:

$\sum Survey_{Bulb_t}$ = The sum of all bulbs *t* verified to have been installed by telephone survey participants[12].

[7] Parameter to account for effects on heating/cooling from efficient lighting. This value is 1.07 and from the OH TRM.

[8] This value is 1. The installation rates associated with the bulbs purchased by the Companies' customers was accounted for in the equation that calculates the average number of bulbs replaced in each household.

[9] The "As Found" wattage is a blended value determined from survey questions that captured the various bulb types customers replaced with their newly purchased energy efficient bulbs.

[10] Parameter for accounting for how much of the energy savings coincides with summer peak demand hours. This value is 0.11 and from the OH TRM.

[11] Parameter to account for cooling savings from efficient lighting. This value is 1.21 and from the OH TRM.

[12] This value was derived from a question that asked survey participants how many of each bulb type they purchased during 2015. The value was filtered by a number of factors including: 1) A verification/installation rate based on site visits 2) consistency check questions in the survey 3) the participant's familiarity with light bulb technologies.

$\sum Survey_{Participants}$ = The sum of all customers who participated in the telephone survey[13].

Top-Down Approach

The following top-down approach employs a lighting consumption model as an independent check on the ex-post savings calculated via the bottom-up approach described above. Total 2015 calendar year kWh savings from energy efficient lighting by the Companies' residential households is represented by $kWhSavingsLighting^{2015}$.

In order to calculate $kWhSavingsLighting^{2015}$, ADM examined the difference between the Companies' residential households' total calendar year 2014 lighting consumption (kWh) (the baseline year) and the Companies' residential households' total calendar year 2015 lighting consumption (kWh). This is illustrated in Equation 7 below:

$$kWhSavingsLighting^{2015} = ConsumptionLighting^{2014} - ConsumptionLighting^{2015}$$

Equation 7

Lighting consumption for bulb type *t* (incandescent, halogen, CFL and LED) in year *y* is a function of the bulb counts (units) for each bulb type *t* (Incandescent, Halogen, CFL and LED) at the end of each year y (December 31st) multiplied by the average annual consumption (kWh) for each bulb type *t*. This is illustrated in Equation 8 below.

$$ConsumptionLighting_t^y = n_{Bulb_t}^y * AverageConsumption_{Bulb_t}$$

Equation 8

The summation of the annual lighting consumption across all three bulb types t is equal to the total lighting consumption in year *y*.

$$ConsumptionLighting^y = \sum ConsumptionLighting_t^y$$

Equation 9

[13] There were 1,800 of the Companies' customers who completed the RDD telephone survey.

The bulb count at 12/31/2014 in the Companies' residential households is derived by multiplying the percent of sockets occupied by bulb type t[14] by the average number of sockets per household[15] by the total number of households[16]. This is illustrated in Equation 10 below:

$$n^{y}_{Bulb_t} = \%SocketsOccupied_{Bulb_t} * nSockets_{Bulb_t} * n_{FE\ Households}$$

Equation 10

The average annual consumption for each bulb type b calculated by multiplying the expected annual hours of use for each bulb type b by the average load (W) per bulb type t[17] and dividing by 1,000. This is illustrated in Equation 11 below:

$$AverageConsumption_{Bulb_t} = (ExpectedAnnualHOU_{Bulb_t} * AverageLoad_{Bulb_t})/1000$$

Equation 11

The expected annual hours of use for each bulb type *t* is calculated by multiplying the expected daily hours of use[18] by 365. This is illustrated in Equation 12 below.

$$ExpectedAnnualHOU_{Bulb_t} = ExpectedDailyHOU_{Bulb_t} * 365$$

Equation 12

The bulb count at 12/31/2015 in the Companies' residential households begins with the bulb type *t* count at 12/31/2014 in the Companies' residential households calculated in Equation 10 and the subtracts the number of bulb type *t* that burnout during 2015 and then adds back the number of bulb type *t* that would be replaced in 2015. This is illustrated in
Equation 13 below:

$$n^{2015}_{Bulb_t} = n^{2014}_{Bulb_t} - nBurn^{2015}_{Bulb_t} + nReplace^{2015}_{Bulb_t}$$

Equation 13

[14] http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2012_residential-lighting-study.pdf
[15] http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2012_residential-lighting-study.pdf
[16] This value is 1,853,765 and was provided by the Companies.
[17] http://www.eia.gov/todayinenergy/detail.cfm?id=415
[18] http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2012_residential-lighting-study.pdf

The count of bulb type *t* that will burn out in 2015 is calculated by multiplying the bulb count at 12/31/2014 by the rate at which bulb type *t* burns out (Equation 14).

$$nBurn_{2015} = n_{Bulb_t}^{2014} * BurnRate_t$$

Equation 14

Each bulb type's burn rate is calculated by dividing unity by bulb type *t*'s measure life (years)[19].

$$BurnRate_t = 1/MeasureLife_t$$

Equation 15

The number of type *t* bulbs that replace each of the burned out bulbs[20] was calculated by multiplying the count of bulb type *t* that will burn out in 2015 by the rate at which each bulb type *t* is likely to replace a burned out bulb[21].

$$nReplace_{Bulb_t}^{2015} = nBurn_{2015} * ReplaceRate_{Bulb_t}$$

Equation 16

4.1.2.2 HVAC

ADM calculated energy savings and demand reductions produced by the Companies' residential customers purchasing energy efficient HVAC equipment during 2015. ADM investigated the following HVAC measures: Room Air Conditioners (RAC), Central Air Conditioners (CAC), and Heat Pumps. ADM performed an analysis with data provided by the Companies, the United States Census Bureau[24], the Energy Information Administration[25] (EIA), and the Air-Conditioning, Heating, & Refrigeration Institute (AHRI).

The total annual energy (kWh) savings for each HVAC type *t* was calculated using Equation 17 below.

[19] Each bulb types average life in years was calculated by dividing each bulb's typical rated life (hours) (http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lifetime_white_leds.pdf) by $ExpectedAnnualHOU_{Bulb_t}$.

[20] The Lighting Consumption model assumes that all bulbs which burned out in 2015 were replaced. This was probably not the case and the reason why the savings estimated using the top-down approach is slightly larger than the bottom-up approach.

[21] The bulb *t* replacement rates were derived from questions 24-26 in the RDD telephone survey and question 16 in the April 2016 FE OH Market Potential survey.

$$kWSavingsHVAC_t = kWh\ Savings_{HVAC_t} * n_{HVAC_t}$$

Equation 17

Where:

t = the types of HVAC units

= CAC, RAC, and Heat Pumps

$kWh\ Savings_{HVAC_t}$ = Annual kWh savings per HVAC unit type *t*

n_{HVAC_t} = Number of type *t* HVAC units purchased in 2015

Summing across the annual savings for all HVAC types *t* provides the total savings for the residential HVAC measure.

$$kWSavingsHVAC = \sum kWSavingsHVAC_t$$

Equation 18

The number of type t HVAC units (n_t) purchased in 2015, was calculated by first obtaining the percentage of residences in Ohio in each zip code per income bracket. Next, the percentage of residential households in each zip code per income bracket that purchased a unit in 2015 was determined, as well as the number of the Companies' residential households in each zip code per income bracket. Finally, the above inputs are used in conjunction with the Climate Factor to calculate the number of HVAC units of type *t* in the Companies' service territories during 2015.

The above steps are summarized in Equation 19 below:

$$n_{HVAC_t} = \sum_z \sum_i P_{z_i} * R_i * CF_z$$

Equation 19

Where:

z = Zip Codes in the Companies' service territories[22]

i = Income Bracket Levels[23]

[22] Provided by the Companies.

[23] http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19001&prodType=table

= Annual Income per Residence

= [0,20,000) u [20,000,40,000) u [40,000,60,000) u [60,000,100,000) u [100,000,∞)

P_{z_i} = Number of residential households in Zip Code *z*, with Income Bracket *i*

R_i = Percentage or residential households, with income bracket *i*, with a unit purchased in 2015[24]

CF_z = Climate Factor for Zip Code *z*

= Region rate which effects usage and sales of units[25]

Utilizing data provided by US Census Bureau, the percentage of Ohio households in each zip code per income bracket (P_{z_i}) was calculated using Equation 20:

$$\%OhioRes_{z_i} = \frac{nRes_{z_i}}{nRes_z}$$

Equation 20

Where,

$\%OhioRes_{z_i}$ = Percentage of Ohio residential households in zip code *z* with income bracket *i*

$nRes_{z_i}$ = Number of Ohio residential households in zip code *z* with income bracket *i*[26]

$nRes_z$ = Total number of Ohio residential households in zip code *z*[27]

In Equation 21 below, the percentage of Ohio residences in zip code *z* with income bracket *i* is multiplied by number of the Companies' residential households in zip code *z.*

[24] Energy Information Administration - http://www.eia.gov/consumption/residential/data/2009/#sf?src=‹ Consumption Residential Energy Consumption Survey (RECS)-b1

[25] Energy Information Administration - http://www.eia.gov/consumption/residential/data/2009/#sf?src=‹ Consumption Residential Energy Consumption Survey (RECS)-b1

[26] United States Census Bureau - http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19001&prodType=table

[27] United States Census Bureau - http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19001&prodType=table

$$P_{z_i} = P_z * \%OhioRes_{z_i}$$

Equation 21

Where,

P_z = the Companies' residential households in zip code z[28]

The tables below (Table 4-3, 4-4, 4-5) detail the percentage of residences per income bracket who purchased HVAC measures of type *t* (R_i).

Table 4-3: Percent of Residences with an AC Purchase in 2015[29]

% of Residences that purchased an AC in 2015 (From Energy Information Administration)					
	<20	20-40	40-60	60-100	>100
Total	8.80	13.00	11.40	12.53	10.41
Number < 2 Yrs.	0.65	1.08	1.14	1.12	1.17
Number in 2015	0.32	0.54	0.57	0.56	0.59
% Sold 2015	3.670%	4.140%	5.000%	4.459%	5.639%

Table 4-4: Percent of Residences with a Heat Pump Purchase in 2015[30]

% of Residences that purchased a HP in 2015 (From Energy Information Administration)					
	<20	20-40	40-60	60-100	>100
Total	2.10	2.70	2.60	3.17	2.89
Number < 2 Yrs.	0.15	0.22	0.26	0.28	0.33
Number in 2015	0.08	0.11	0.13	0.14	0.16
% Sold 2015	3.670%	4.140%	5.000%	4.459%	5.639%

Table 4-5: Percent of Residences with a Room AC Purchase in 2015[31]

% of Residences that purchased a AC in 2015 (From Energy Information Administration)					
	<20	20-40	40-60	60-100	>100
Total	7.60	6.80	4.30	4.40	2.60
Number < 2 Yrs.	1.20	0.90	0.60	0.50	0.50
Number in 2015	0.60	0.45	0.30	0.25	0.25
% Sold 2015	7.895%	6.618%	6.977%	5.682%	9.615%

Climate Factors (CF_z) represent the rate at which climate effects usage and sales of HVAC units type *t.* They were determined by using EIA data to categorize each zip code as a climate zone. The climate factors are detailed in Table 4-6 a-c below.

[28] Provided by the Companies

[29] Energy Information Administration - http://www.eia.gov/consumption/residential/data/2009/#sf?src=‹ Consumption Residential Energy Consumption Survey (RECS)-b1 (HC7.5)

[30] Ibid.

[31] Ibid.

Table 4-6a: Climate Factor Central Air Conditioning[32]

% of Homes w/ Central Air Conditioning in FE Territory (From Energy Information Administration)	*Total*	*Very Cold/Cold*	*Mixed-Humid*	*Mixed-Dry/Hot-Dry*	*Hot-Humid*	*Marine*
% of Homes w/ A/C w/o HP	**49%**	**46%**	**52%**	**51%**	**64%**	**11%**
Housing Units Served by Central Air Conditioning Equipment	113.6	38.8	35.4	14.2	19.0	6.3
W/o Heat Pump.....	56.1	17.7	18.4	7.2	12.1	0.7
W/ Heat Pump.....	13.5	1.3	6.9	1.4	3.6	0.4
Do Not Have or use Central Air Conditioning Equipment	44.0	19.8	10.1	5.6	3.3	5.2

Table 4-6b: Climate Factor Heat Pump[33]

% of Homes w/ Heat Pump in FE Territory (From Energy Information Administration)	*Total*	*Very Cold/Cold*	*Mixed-Humid*	*Mixed-Dry/Hot-Dry*	*Hot-Humid*	*Marine*
% of Homes w/ HP	**12%**	**3%**	**19%**	**10%**	**19%**	**6%**
Housing Units Served by Central Air Conditioning Equipment	113.6	38.8	35.4	14.2	19.0	6.3
W/o Heat Pump	56.1	17.7	18.4	7.2	12.1	0.7
W/ Heat Pump	13.5	1.3	6.9	1.4	3.6	0.4
Do Not Have or use Central Air Conditioning Equipment	44.0	19.8	10.1	5.6	3.3	5.2

Table 4-6c: Climate Factor Room Air Conditioning[34]

% of Homes w/ Room Air Conditioning in FE Territory (From Energy Information Administration)	*Total*	*Very Cold/Cold*	*Mixed-Humid*	*Mixed-Dry/Hot-Dry*	*Hot-Humid*	*Marine*
% of Homes w/ Room AC	**23%**	**30%**	**24%**	**16%**	**15%**	**16%**
Housing Units Served by Central Air Conditioning Equipment	113.6	38.8	35.4	14.1	19.1	6.3
W/Window or Wall Unit	25.9	11.6	8.4	2.2	2.8	1.0

Energy savings per CAC/RAC unit was calculated via Equation 22:

[32] Energy Information Administration - http://www.eia.gov/consumption/residential/data/2009/#sf?src=‹ Consumption Residential Energy Consumption Survey (RECS)-b1 (HC7.7)

[33] Ibid.

[34] Ibid.

$$kWh_{Annual} = \frac{EFLH_{Cool} * Cap * [\frac{1}{SEER_{Existing}} - \frac{1}{SEER_{Installed}}]}{1000}$$

Equation 22

Where,

$EFLH_{Cool}$ = weighted average of effective full load hours per EFLH location by the Companies residential households[35]

= 438.73

Cap = Capacity (kBTU)

= Size of the equipment installed

= 34.30[36]

$SEER_{Existing}$ = SEER efficiency of existing unit

= 10

$SEER_{Installed}$ = SEER efficiency of installed unit

= 13

ADM calculated energy savings per Heat Pump unit with the following Equation 23[37].

$$kWh_{Annual} = \frac{EFLH_{Cool} * CAP * [\frac{1}{SEER_{Existing}} - \frac{1}{SEER_{Installed}}]}{1000} + \frac{EFLH_{Heat} * CAP * [\frac{1}{HSPF_{Existing}} - \frac{1}{HSPF_{Installed}}]}{1000}$$

Equation 23

Where,

$EFLH_{Cool}$ = weighted average of effective full load hours per EFLH location by the Companies' residential households

= 438.73

$EFLH_{Heat}$ = weighted average of effective full load hours per EFLH location by the Companies' residential households

= 1549.01[38]

Cap = Capacity (kBTU)

[35] Weighted average of Run Hours compared to number of residences per location 2010 Ohio Technical Reference Manual, August 6, 2010. Vermont Energy Investment Corporation, pp. 31.

[36] Weighted average of capacity compared to number sold nationally. AHRI http://www.ahrinet.org/App_Content/ahri/files/Statistics/Monthly%20Shipments/2015/December_2015.pdf

[37] 2010 Ohio Technical Reference Manual, August 6, 2010. Vermont Energy Investment Corporation, pp. 33.

[38] Weighted average of Run Hours compared to number of residences per location 2010 Ohio Technical Reference Manual, August 6, 2010. Vermont Energy Investment Corporation, pp. 34

= Size of the equipment installed

$SEER_{Existing}$ = SEER efficiency of existing unit
= 13

$SEER_{Installed}$ = SEER efficiency of installed unit
= 15

$HSPF_{Existing}$ = Heating Season Performance Factor of existing unit
= 7.7[39]

$HSPF_{Installed}$ = Heating Season Performance Factor of installed unit
= 8.2

4.1.2.3 Refrigerators

ADM calculated the energy savings and demand reductions produced by the Companies' residential customers installing energy efficient Refrigerators during 2015. ADM developed two analysis approaches to calculate the quantity of residences who purchased refrigerators in 2015.

- A top-down approach utilizing data market research data from U.S. Energy Information Administration and the Association of Home Appliance Manufactures. The quantities estimated from this method were used to calculate the quantity of refrigerators utilized in the ex post savings calculation.
- A bottom-up approach utilizing primary data collected from the Companies' service territories via a RDD telephone survey. This method was used to corroborate the quantity of refrigerators utilized in the ex post savings calculation via the top-down approach.

[39] 2010 Ohio Technical Reference Manual, August 6, 2010. Vermont Energy Investment Corporation, pp. 67.

Top-Down Approach

ADM performed an analysis with data provided by FE OH, the United States Census Bureau[24], the Energy Information Administration[25] (EIA), and the Air-Conditioning, Heating, & Refrigeration Institute[26] (AHRI).

The total annual energy (kWh) savings for Refrigerator type *t* using Equation 24 below.

$$kWSavingsRef_t = kWh\,Savings_{Ref_t} * n_{Ref_t}$$

Equation 24

Where:

t = the types of Refrigerators

= Bottom-freezer, top-freezer, and side-by-side.

$kWh\,Savings_{Ref_t}$ = Annual kWh savings per Refrigeration unit type *t*

n_{Ref_t} = Number of type *t* Refrigeration units purchased in 2015

Summing across the annual savings for all Refrigerator types *t* provides the total savings for the residential Refrigerator measure.

$$kWSavingsRef = \sum kWSavingsRef_t$$

Equation 25

The number of type *t* Refrigerator units (n_{Ref_t}) purchased in 2015, was calculated by first obtaining the percentage of residential households in Ohio in each zip code per income bracket. Next, the percentage of residential households in each zip code per income bracket that purchased a unit in 2015 was determined, as well as the number of the Companies' residential households in each zip code per income bracket.

The above steps are summarized in Equation 26 below:

$$n_{Ref_t} = \sum_z \sum_i P_{z_i} * R_i$$

Equation 26

Where,

z = Zip Codes in the Companies' service territories[27]

i = Income Bracket Levels[28]

= Annual Income per Residential Household

= [0,20,000) u [20,000,40,000) u [40,000,60,000) u [60,000,100,000) u [100,000,∞)

P_{z_i} = Number of residential households in Zip Code *z*, with Income Bracket *i*

R_i = Percentage or residential households, with income bracket *i*, with a unit purchased in 2015[29]

Utilizing data provided by US Census Bureau, the percentage of Ohio residential households in each zip code per income bracket (P_{z_i}) was calculated using Equation 20:

$$\%OhioRes_{z_i} = \frac{nRes_{z_i}}{nRes_z}$$

Equation 27

Where,

$\%OhioRes_{z_i}$ = Percentage of Ohio residential households in zip code *z* with income bracket *i*

$nRes_{z_i}$ = Number of Ohio residential households in zip code *z* with income bracket *i*[40]

$nRes_z$ = Total number of Ohio residential households in zip code *z*[41]

In Equation 28 below, the percentage of Ohio residential households in zip code *z* with income bracket *i* is multiplied by number of the Companies residential households in zip code *z.*

$$P_{z_i} = P_z * \%OhioRes_{z_i}$$

Equation 28

Where,

[40] United States Census Bureau - http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19001&prodType=table

[41] United States Census Bureau - http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B19001&prodType=table

P_z = the Companies' residential households in zip code *z*[42]

Table 4-7 below detail the percentage of residential households per income bracket who purchased Refrigeration measures (R_i).

Table 4-7: Percent of Residences that purchased a Refrigerator in 2015

% of Residences that purchased a Refrigerator in 2015 (From Energy Information Administration)					
	<20	**20-40**	**40-60**	**60-100**	**>100**
Total	23.80	27.50	21.20	23.60	17.80
Number < 2 Yrs.	2.80	2.90	2.60	3.00	2.70
Number in 2015	1.44	1.49	1.34	1.54	1.39
% Sold 2015	6.052%	5.425%	6.309%	6.540%	7.803%

The annual kWh savings per refrigerator unit type *t* ($kWh\ Savings_{Ref_t}$) was derived from the Ohio TRM, and are detailed in the Table 4-8 below:

Table 4-8: Annual Savings for Refrigerators

Refrigerator Type	**kWh**
Bottom Freezer	119
Top Freezer	100
Side by Side	142

The demand savings was calculated using the following formula:

$$kWSavingsRef_t = kW\ Savings_{Ref_t} * n_{Ref_t}$$

Equation 29

n_{Ref_t} was calculated according to Equation 26 and the annual kW savings per refrigerator unit type *t* ($kW\ Savings_{Ref_t}$) was derived from the Ohio TRM, and are detailed in Table 4-9 below:

Table 4-9: Refrigerators Summer Coincidence Peak Savings

Refrigerator Type	**kW**
Bottom Freezer	.03
Top Freezer	.03
Side by Side	.04

[42] Provided by the Companies.

Bottom-Up Approach

ADM corroborated n_{Ref_t} by calculating the percent of households in the RDD telephone survey sample that purchased and installed refrigerators during 2015. This was via Equation 30 below.

$$n_{Ref_t} = (\sum Survey_{Ref_t} / \sum Survey_{Participants}) * n_{FE\ Households}$$

Equation 30

4.2 Commercial & Industrial Methodology

ADM'S evaluation of the 2015 C&I CAP consisted of an impact evaluation. The impact evaluation methodology is described in section 1.8.1.

4.2.1 Impact Analysis Methods

The methodology used to calculate energy savings is described in this section.

4.2.1.1 Sampling Design and Extrapolation Methods

For the C&I portion of the CAP a sample of the population was drawn to generate participants that would provide a +/-10% statistical precision at a 95% confidence level. The sample was drawn randomly to create six strata for each operating company based on average annual energy usage. Due to uncertainties in response rate for the survey, a larger sample was generated. Confidence interval and precision was based on the total of average annual usage (across four years) for each stratum compared to the population.

A multiple of the stratified sample was taken in order to account for the response rate of the survey as well as participant willingness to continue with the program beyond the survey.

4.2.1.2 Review of Documentation

After respondents agreed to participate in the CAP, documentation was requested by email and phone. The documentation requested is described in section 1.4. Remaining documentation was collected on-site during the site visit.

4.2.1.3 On-Site Data Collection Procedures

On-site visits were used to collect data that were essential in calculating savings impacts. The visits to the sites of the sampled projects were used to collect primary data on the facilities participating in the program.

Every business that agreed to participate in the program and responded that they had installed energy efficient equipment was chosen for site visits. Each company was contacted via phone to set up a time for the site visit.

During the on-site visit, the field staff accomplished three major tasks:

- First, they verified the status of all measures for which customers claimed. They verified that the energy efficiency measures were indeed installed, that they were installed correctly, and that they functioned properly.
- Second, they collected the physical data needed to analyze the energy savings that have been realized from the installed improvements and measures. Data were collected using a form that was prepared specifically for the project in question after an in-house review of the provided documentation.
- Third, they interviewed the contact personnel at each facility to obtain additional information on the installed system to complement the data collected from other sources.

When necessary, monitoring was conducted to gather more information on the operating hours of the installed measures. Monitoring was conducted at sites where it was judged that the monitored data would be necessary an accurate calculation of energy savings. Monitoring was not considered necessary for sites where documentation and on-site verification allowed for sufficiently detailed calculations.

4.2.1.4 Procedures for Estimating Savings from Measures

The method ADM employs to determine savings impacts depends on the types of measures being analyzed. Categories of measures include the following:

- Lighting
- HVAC
- Motors
- Water Heating
- Appliances
- Refrigeration
- Others and Process Improvements

ADM uses a specific set of methods to determine energy savings for projects that depend on the type of measure being analyzed. For the CAP the Ohio TRM is utilized first and if additional calculations are necessary, EM&V best practices are used. Typical EM&V methods employed are summarized in Table 4-10.

Table 4-10 Typical Methods to Determine Savings for Custom Measures

Type of Measure	***Method to Determine Savings***
Lighting	Custom-designed lighting evaluation model, which uses data on wattages before and after installation of measures and hours-of-use data from field monitoring.
HVAC (including packaged units, chillers, cooling towers, controls/EMS)	eQUEST model using DOE-2 as its analytical engine for estimating HVAC loads and calibrated with site-level billing data to establish a benchmark.
Motors and VFDs	Measurements of power and run-time obtained through monitoring
Water Heating	Engineering analysis, with monitored data on load factor and schedule of operation
Refrigeration	Simulations with EQuest engineering analysis model, with monitored data
Process Improvements	Engineering analysis, with monitored data on load factor and schedule of operation

Each measure specific energy savings calculation was verified to have not received a rebate from a prescriptive energy efficiency program implemented by the Companies. Projects, by measure type were checked against C&I program participation from 2012 until the present to avoid any double counting scenarios.

The following discussion describes the basic procedures used for estimating savings from various measure types.

4.2.1.5 Lighting Measures

Lighting measures examined include retrofits of existing fixtures, lamps and/or ballasts with energy efficient fixtures, lamps and/or ballasts. These types of measures reduce demand, while not affecting operating hours. Any proposed lighting control strategies were examined that might include the addition of energy conserving control technologies such as motion sensors or daylighting controls. These measures typically involve a reduction in hours of operation and/or lower current passing through the fixtures.

Analyzing the savings from such lighting measures requires data for retrofitted fixtures on (1) wattages before and after retrofit and (2) hours of operation before and after the retrofit. Fixture wattages were taken from a table of standard wattages, with corrections made for non-operating fixtures. Hours of operation were determined from communications with site contact or metered data collected after measure installation for a sample of fixtures.

To determine baseline and post-retrofit demand values for the lighting efficiency measures, ADM used in-house data on standard wattages of lighting fixtures and ballasts

to determine demand values for lighting fixtures. These data provide information on wattages for common lamp and ballast combinations.

ADM used per-fixture baseline demand, retrofit demand, and appropriate post-retrofit operating hours to calculate peak demand savings and annual energy savings for sampled fixtures of each usage type.

The identified hours of use and the fixture wattages are used to calculate post-retrofit kWh usage. Fixture peak demand is calculated by dividing the total kWh usage calculated peak period of the day by the number of hours in the peak period.

Peak Period Demand Savings are calculated as the difference between peak period baseline demand and post-installation peak period demand of the affected lighting equipment.

The baseline and post-installation peak period demands are calculated by dividing the total kWh usage during the Peak Period by the number of hours in the peak period.

ADM calculated annual energy savings for each sampled fixture per the following formula:

$$Annual\ Energy\ Savings = kWh_{Before} - kWh_{After}$$

Equation 31

The values for insertion in this formula are determined through the following steps:

1) Results from the on-site visit are used to calculate the average operating hours of the metered lights for every unique building type/usage area. The data are extrapolated to develop the annual operating profile of the lighting.
2) These average operating hours are then applied to the baseline and post-installation average demand for each usage area to calculate the energy usage and peak period demand for each usage area.
3) The annual baseline energy usage is calculated as the sum of the annual baseline kWh for all of the usage areas. The post-retrofit energy usage is calculated similarly. The energy savings are calculated as the difference between baseline and post-installation energy usage.
4) Savings from lighting measures in conditioned spaces are factored by the region-specific, building type-specific heating cooling interaction factors in order to calculate total savings attributable to lighting measures, inclusive of impacts on HVAC operation. These factors were calculated using DEER prototypical models and Typical Meteorological Year 3 (TMY3) weather data.

4.2.1.6 HVAC Measures

Savings estimates for HVAC measures installed at a facility are calculated based on the calculations provided in the Ohio TRM, or derived by using the energy use estimates developed through DOE-2 simulations. Each simulation produces estimates of HVAC energy and demand usage to be expected under different assumptions about equipment and/or construction conditions. There may be cases in which DOE-2 simulation is inappropriate because data are not available to properly calibrate a simulation model, and engineering analysis provides more accurate M&V results. For the analysis of HVAC measures, the data collected through on-site visits and monitoring are utilized. Using these data, ADM prepared estimates of the energy savings for the energy efficient equipment and measures installed in each of the participant facilities.

When a simulation was necessary, engineering staff prepared a model calibration run. This is a base case simulation to ensure that the energy use estimates from the simulations have been reconciled against actual data on the building's energy use. This run is based on the information collected in an on-site visit pertaining to types of equipment, their efficiencies and capacities, and their operating profiles. Current operating schedules are used for this simulation, as are local (TMY) weather data covering the study period. The model calibration run is made using actual weather data for a time period corresponding to the available billing data for the site.

The goal of the model calibration effort is to have the results of the DOE-2 simulation come within approximately 10% of the patterns and magnitude of the energy use observed in the billing data history. In some cases, it may not be possible to achieve this calibration goal because of idiosyncrasies of particular facilities (e.g., multiple buildings, discontinuous occupancy patterns, etc.).

Once the analysis model has been calibrated for a particular facility, ADM performs three steps in calculating estimates of energy savings for HVAC measures installed or to be installed at the facility.

- First, an analysis of energy use at a facility under the assumption that the energy efficiency measures are not installed is performed. If the measure involves replacement of equipment on failure, the required minimum efficiencies given by the appropriate energy efficiency standard would be used. This methodology holds true for all programs/measures being considered.
- Second, energy use at the facility with all conditions the same but with the energy efficiency measures now installed is analyzed.
- Third, the results of the analyses from the preceding steps are compared to determine the energy savings attributable to the energy efficiency measure.

4.2.1.7 Motors

The energy savings from use of high efficiency motors on HVAC and non-HVAC applications are derived from the Ohio TRM. Energy use is measured only for the high efficiency motor and only after it has been installed. The data thus collected are then used in estimating what energy use would have been for the motor application if the high efficiency motor had not been installed. The equivalent full load hours are determined from on-site interviews with the site contact.

4.2.1.8 VFDs

A variable-frequency drive (VFD) is an electronic device that controls the speed of a motor by varying the magnitude of the voltage, current, or frequency of the electric power supplied to the motor. The factors that make a motor load a suitable application for a VFD are (1) variable speed requirements and (2) high annual operating hours. The interplay of these two factors can be summarized by information on the motor's duty cycle, which essentially shows the percentage of time during the year that the motor operates at different speeds. The duty cycle should show good variability in speed requirements, with the motor operating at reduced speed a high percentage of the time.

Potential energy savings from the use of VFDs are usually most significant with variable-torque loads, which have been estimated to account for 50% to 60% of total motor energy use in the non-residential sectors. Energy saving VFDs may be found on fans, centrifugal pumps, centrifugal blowers, and other centrifugal loads, most usually where the duty cycle of the process provided a wide range of speeds of operation.

ADM's approach to determining savings from installation of VFDs involves (1) making one-time measurements of voltage, current, and power factor of the VFD/motor and (2) conducting continuous measurements of amperage over a period of time in order to obtain the data needed to develop VFD load profiles and calculate demand and energy savings. VFDs are generally used in applications where motor loading changes when the motor speed changes. Consequently, the true power drawn by a VFD is recorded in order to develop VFD load shapes. One-time measurements of power are made for different percent speed settings. Power and percent speed or frequency (depending on VFD display options) are recorded for as wide a range of speeds as the customer allows the process to be controlled; field staff attempt to obtain readings from 40 to 100% speed in 10 to 15% increments.

4.2.1.9 Water Heating

The calculation of savings from water heating is derived from the Ohio TRM. In the case of a custom water heating application, engineering calculation are applied. Aside from nameplate information on the water heating device, these calculations involve (1) determining the amount of hot water consumed over a specified period of time and (2) the temperature and condition of the water exiting the heating device.

4.2.1.10 Refrigeration and Process Improvements

Analysis of savings from refrigeration and process improvements is inherently project-specific. Because of the specificity of processes, analyzing the processes through simulations is generally not feasible. Rather, reliance is made on engineering analysis of the process affected by the improvements. Major factors in ADM's engineering analysis of process savings are operating schedules and load factors. Information on these factors is developed through short-term monitoring of the affected equipment, be it pumps, heaters, compressors, etc. The monitoring is done after the process change, and the data gathered on operating hours and load factors are used in the engineering analysis to define "before" conditions for the analysis of savings. In the case where monitoring is not applicable, detailed information from the site contact is necessary.

4.2.1.11 Appliances

Calculation of energy savings from appliances are derived from the Ohio TRM. This includes refrigerators, washing machines, refrigerated vending machines, and commercial kitchen equipment.

4.2.1.12 Other Equipment

Other equipment is considered for energy savings calculations if calculations are provided in the Ohio TRM and the equipment has federally acknowledged standards and practices.

4.2.2 Summer Coincident Peak Savings

The summer coincident peak period is defined as 3:00 PM until 6:00 PM on non-holiday weekdays from June 1st until the end of September. For lighting analysis, this specific peak period is used in the energy savings calculations. For non-lighting analysis in which calculations from the Ohio TRM were used, the provided coincidence factor in the TRM was used.

4.2.3 Energy Savings Extrapolation

Energy savings for all measures within a site were added to develop a site level energy savings. A strata level energy savings is determined by summing all of the savings within each site in the strata. An energy reduction was determined for each strata by taking the sum of calculated energy savings per strata and dividing by the sum of average annual energy usage.

$$\%\ Reduction\ in\ Energy\ Usage = \Sigma kWh_{Annual\ Savings} / \Sigma kWh_{Annual\ Usage}$$

Equation 32

The percent reduction in annual energy usage from the sample is applied to each site in the population that falls into the same stratum. For each site in the population, then percent reduction in annual energy usage is multiplied by the average annual usage for the site to calculate an estimated annual energy savings. Program level energy savings are then determined by summing all of the energy savings of sites within a rate class for each operating company.

The lifetime savings for the population is determined by extrapolating the estimated useful life (EUL) from the sample. A weighted EUL for each site in the sample was determined by the EUL of each measure within the site. The EUL is weighted by the percent of savings provided a particular measure to the total annual energy savings for the site. An average EUL was then derived for each stratum based on the weighted average EUL for each site. The strata level EUL was applied to each site in the population to determine the lifetime savings for the population. Lifetime savings are reported by rate class for each operating company.

The summer coincident peak savings (kW) is determined for each site based on the calculated summer coincident peak savings for each measure within a site in the sample. The strata level sample kW is the sum of all summer coincident peak savings of sites within the strata. A peak reduction factor is generated by strata by dividing the summer coincident peak savings by the annual energy savings.

$$Summer\ Coincident\ Peak\ kW\ Savings = \Sigma\ kW / \Sigma kWh_{Annual\ Savings}$$

Equation 33

This peak reduction factor is then applied to each site in the population based on its strata. By multiplying the site specific annual energy savings by the peak reduction factor, a summer coincident peak savings is generated for each site in the population. Summer coincident peak savings is reported by rate class for each operating company.

4.2.4 Commercial &Industrial Impact Analysis Summary

The methodology described above allows the results of a sample with +/-10% statistical precision at a 95% confidence level to be applied to a population. The calculations extrapolated to the commercial and industrial population are for: annual energy savings (kWh), summer coincident peak savings (kW), and lifetime savings (kWh).

5 Detailed Evaluation Findings

This chapter provides the findings of the impact evaluation component of this report.

5.1 Detailed Evaluation Findings: Residential

During the 2015 residential CAP evaluation ADM surveyed 1,800 residential customers across all zip codes in the Companies and performed 120 on-site visual verification visits.

5.1.1 Verification of Residential Lighting

Out of the 1,800 RDD sample respondents, 70.2% indicated that they purchased energy efficient light bulbs during 2015. The site verifications determined that 92.6% of the bulbs reported as purchased during the phone survey were in fact installed[43]. After accounting for survey answer consistency checks, applying verification rates and extrapolating to the Companies' service territories, ADM determined the following energy efficient light bulb installations by bulb type in Table 5-1.

Table 5-1 Residential Light Bulb Installations

Bulb Type	***Count***
Halogen	131,137
CFL	1,716,792
LED	1,956,397

Table 5-2 below details which rooms survey respondents installed the energy efficient bulbs they purchased in 2015.

[43] To be counted as "installed", the bulb had to be visually verified and the customer had to verbally confirm the installation date as well as the method of procurement. Bulbs that were either installed during a year other than 2015 or obtained through a utility program were not counted.

Table 5-2 Residential Light Bulb Installations

Location	CFL	LED	Halogen
Basement	7.39%	6.68%	5.92%
Bathroom	11.27%	10.83%	8.71%
Bedroom	14.26%	10.37%	8.71%
Den	2.15%	2.46%	1.74%
Dining Room	5.87%	6.76%	4.18%
Entryway	3.35%	3.38%	2.44%
Garage	5.03%	4.38%	5.23%
Hallway	3.62%	4.07%	2.96%
Kitchen	13.52%	14.90%	15.51%
Living Room	15.15%	13.36%	12.02%
Office	1.68%	1.92%	1.57%
Other Room/Location	9.54%	11.75%	13.94%
Outdoor	3.83%	6.68%	14.11%
Stairway	1.26%	0.84%	0.35%
Store for later installation	2.10%	1.61%	2.61%

Table 5-3 below details which kind of bulbs respondents indicated they replaced with the energy efficient bulbs they purchased in 2015.

Table 5-3 Bulb Replacement Type

Pre-existing bulb	*CFL*	*LED*	*Halogen*
Incandescent	54.28%	51.72%	43.82%
Halogen	18.20%	19.65%	40.74%
CFL	18.44%	12.24%	12.43%
LED	9.07%	16.39%	3.01%

Table 5-4 below shows the kWh savings calculated during the impact evaluation of residential lighting. Table 5-5 shows the kW reduction.

Table 5-4 Residential Lighting annual energy kWh Savings

Measure	*CEI*	*OE*	*TE*	*Total*
Halogen	143,584	199,423	55,838	**398,846**
CFL	22,749,598	31,596,664	8,847,066	**63,193,328**
LED	25,460,049	35,361,179	9,901,130	**70,722,359**
Total	48,353,232	67,157,266	18,804,035	**134,314,532**

Table 5-5 Residential Lighting Summer Peak Coincidence kW Savings

Measure	*CEI*	*OE*	*TE*	*Total*
Halogen	19.90	27.64	7.74	**55.28**
CFL	3,118.70	4,331.53	1,212.83	**8,663.07**
LED	3,466.38	4,814.42	1,348.04	**9,628.84**
Total	6604.99	9173.59	2568.61	**18,347.19**

Customers were generally willing to participate in the data collection effort and interested in sharing information about their energy efficiency actions/purchasing behaviors. Customers seem relatively familiar with CFL and LED lighting technologies and are comfortable with using them to replace traditional incandescent bulbs.

5.1.2 Verification of Residential Refrigerators

Out of the 1,800 RDD sample respondents ADM identified 1,778 respondents who completed all survey questions relevant to refrigerator purchase and installation. 6.81% of sample respondents reported purchasing and installing a refrigerator during the 2015 calendar year. ADM used a supplemental analysis approach to corroborate the primary data and check survey bias potential. The secondary analysis approach described in the methodology section above concluded that 6.4% of residences purchased a refrigerator during the 2015 calendar year. The savings calculation was performed for a quantity of 126,142 refrigerators determined by the primary data collection effort. The breakout by refrigerator type is shown in Table 5-6.

Table 5-6: Refrigerator installations by unit type

Refrigerator Type	Energy Star Quantity Installed	Percent
Bottom-freezer	49	40.5%
Side-by-side	32	26.4%
Top-freezer	40	33.1%
Total	121	100.0%

Table 5-7 shows the kWh savings calculated during the impact evaluation of refrigerators. Table 5-8 shows the kW reduction.

Table 5-7 Residential Refrigerators kWh Savings

Measure	*CEI*	*OE*	*TE*	*Total*
Bottom-freezer	2,188,360	3,039,389	851,029	**6,078,778**
Side-by-side	1,705,352	2,368,545	663,193	**4,737,089**
Top-freezer	1,501,190	2,084,987	583,796	**4,169,973**
Total	5,394,902	7,492,920	2,098,018	**14,985,840**

Table 5-8 Residential Refrigerators kW Reduction

Measure	*CEI*	*OE*	*TE*	*Total*
Bottom-freezer	383.21	532.24	149.03	**1,064 .48**
Side-by-side	298.63	414.77	116.13	**829.53**
Top-freezer	262.88	365.11	102.23	**730.22**
Total	944.72	1312.12	367.39	**2,624.23**

5.1.3 Verification of Residential HVAC

ADM calculated 2.3% of the Companies' residential households purchased a central Air Conditioner or Heat Pump during the 2015 calendar year and an additional 2.2% purchased a Room Air Conditioner. The savings calculation was performed for a quantity of 38,428 Air Conditioners, 2,822 Heat Pumps, and 40,283 Room Air Conditioners. Table 5-9 shows the kWh savings calculated during the impact evaluation of refrigerators. Table 5-10 shows the kW reduction.

Table 5-9 Residential HVAC Savings (kWh) Summary

Measure	*CEI*	*OE*	*TE*	*Total*
Central Air Conditioners	4,803,928	6,672,123	1,868,195	**13,344,247**
Room Air Conditioners	135,594	188,325	52,731	**376,650**
Heat Pumps	584,290	811,514	227,224	**1,623,028**
Total	5,523,812	7,671,963	2,148,150	**15,343,925**

Table 5-10 Residential HVAC demand (kW) Summary

Measure	*CEI*	*OE*	*TE*	*Total*
Central Air Conditioners	5,474.82	7,603.92	2,129.10	**15,207.84**
Room Air Conditioners	174.02	241.70	67.68	**483.40**
Heat Pumps	188.60	261.95	73.34	**3.89**
Total	5,837.45	8,107.57	2,270.12	**16,215.13**

5.2 Detailed Evaluation Findings: Commercial & Industrial

5.2.1 Impact Evaluation Findings

This section provides the results of energy savings for the C&I CAP. Upon completion of the interview process, 172 business locations opted to participate in a site visit performed by an ADM field technician or engineer. Of these 172 sites, 159 sites provided all of the required documentation to verify installation.

The C&I component of CAP requires a unique evaluation effort because of the recruitment of the sampled respondents. Sample respondents are invited to provide information and supporting documentation for energy efficiency installations that occurred outside of the incentive structure of a utility rebate program. The information collected provides a snapshot of energy efficiency activity based on market conditions.

Since participating in the evaluation process is optional, one of the challenges presented in some cases was acquiring the proper documentation to determine an in-service date and validate installation. Because there was no prior knowledge of an energy efficiency program, some businesses had not retained the invoices or purchases orders required to validate a proof of purchase. Others businesses reported installations in the initial survey process but opted out of the evaluation process prior to gathering the proof of purchase information.

The documentation validation component of the evaluation plan provided a degree of conservatism to the savings calculations. For example, there were 14 sample respondents who completed the follow-up interview process but opted out prior to the site visit. There were 11 additional sample respondents who completed both the follow interview and site verification visits but were unable to provide the proof of purchase necessary for the savings verification. ADM estimates the savings from these sample points would account for 320,000 kWh in annual energy savings within the sample. There were additional businesses who chose not to participate in the initially survey contact without a specific indication about equipment insulations.

At a confidence interval of 95%, a relative precision of 5.63% was calculated for the sample of 2,684 businesses. Table 5-11 shows the distribution of businesses in each stratum.

Table 5-11 CAP C&I Sample Precision

Strata	*Population Count of businesses*	*Sample Count of businesses*	*Population Average Annual kWh usage*[44]	*Sample Average Annual kWh usage*
CEI 1	65,495	737	4,456,705,466	72,856,909
CEI 2	1,038	39	2,800,226,983	113,365,020
CEI 3	138	14	1,587,761,349	159,797,764
CEI 4	31	16	983,278,231	535,892,732
CEI 5	6	2	848,292,391	2,948,504,101
CEI 6	2	2	10,89,484,678	1,089,484,678
OE 1	94,174	945	6,189,819,452	71,196,330
OE 2	790	48	2,759,648,840	184,017,121
OE 3	129	4	1,871,638,592	52,390,685
OE 4	23	11	1,081,111,012	558,646,935
OE 5	9	4	907,972,483	341,584,446
OE 6	3	1	1,090,744,098	452,385,832
TE 1	27,544	847	2,033,482,939	57,488,765
TE 2	212	8	981,731,665	356,590,167
TE 3	23	1	479,007,437	14,669,628
TE 4	9	4	489,606,523	185,733,930
TE 5	4	1	581,062,244	123,160,796
Total	**189,631**	**2,684**	**30,749,369,073**	**4,343,180,999**
Relative Precision				**5.63%**

The breakdown of savings in the sample by operating company and measure are shown in Table 5-12. The overall sample annual energy savings are 10,076,106 kWh.

[44] Average Annual kWh usage: Average daily usage per customer for the 5-2014 to 5-2015 timespan, multiplied by 365 days.

Table 5-12 CAP C&I Sample Savings (kWh) Summary

Measure	*CEI*	*OE*	*TE*
Lighting	2,852,466	713,444	280,425
HVAC	9,637	13,084	151,761
Water Heating	0	13,045	324
Motors	819	688	0
Refrigeration	6394	903	5,679
Others	2,886,562	3,140,186	689
Total	**5,755,878**	**3,881,349**	**438,879**

Sample savings are broken down by percentage operating company savings in Table 5-13. Significant portions of the savings in the sample came from lighting projects as well as process improvements within CEI and OE.

Table 5-13 CAP C&I Sample Savings (kWh) Measure Breakdown

Measure	*CEI*	*OE*	*TE*
Lighting	49.56%	18.38%	63.90%
HVAC	0.17%	0.34%	34.58%
Refrigeration	0.00%	0.34%	0.07%
Water Heating	0.01%	0.02%	0.00%
Motors	0.11%	0.02%	1.29%
Others	50.15%	80.90%	0.16%

5.2.1.1 Verification of Commercial & Industrial Lighting

Out of the 124 sites with calculated energy savings in the sample, 108 included lighting measures. Lighting measures included retrofits, new construction, exterior, interior, and controls. Savings values ranged from 56 kWh per year to over 1,000,000 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-14.

Table 5-14: CAP C&I Sample Lighting Savings (kWh)

Operating Company	*Count (Sites with Savings)*	*Annual Energy Savings (kWh)*	*Summer coincident peak savings (kW)*
CEI	44	2,852,466	458.61
OE	39	713,444	129.51
TE	25	280,425	50.54
Total	**108**	**3,846,335**	**638.66**

Yearlong energy savings curves were developed for sample respondents that demonstrated lighting installations that resulted in annual energy savings greater than 10,000 kWh. These savings curves do not account for interactive effects from heating or cooling. An average daily curve was created for non-holiday weekdays during the summer coincident peak savings period of June through September. The percentage of annual energy savings by hour on an average day during the peak time period is shown in Figure 5-1.

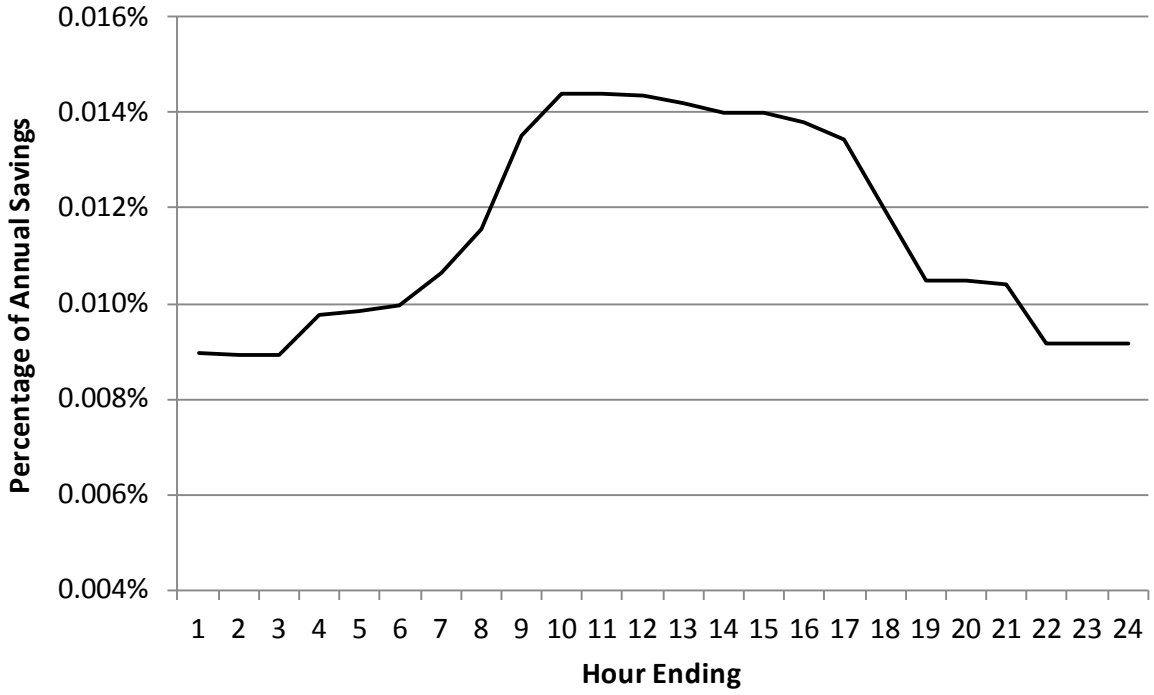

Figure 5-1: Average daily savings curve during summer coincidence peak period for lighting measures

5.2.1.2 Verification of Commercial & Industrial HVAC

Out of the 124 sites with calculated energy savings in the sample, 25 included HVAC measures. HVAC measures included small packaged AC units, unitary rooftop units, electric chillers, split units, and wall mounted units. Savings values ranged from 87 kWh per year to over 136,000 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-15.

Table 5-15: CAP C&I Sample HVAC Savings (kWh)

Operating Company	Count (Sites with Savings)	Annual Energy Savings (kWh)	Summer coincident peak savings (kW)
CEI	9	9,637	30.59
OE	6	11,084	10.62
TE	10	151,761	41.31
Total	**25**	**174,482**	**82.52**

5.2.1.3 Verification of Commercial & Industrial Refrigeration

Out of the 124 sites with calculated energy savings in the sample, 16 included refrigeration measures. Refrigeration measures consisted of various types of food storage refrigerators including solid door commercial refrigerators and glass door display refrigeration units. Savings values ranged from 248 kWh per year to 2,382 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-16.

Table 5-16: CAP C&I Sample Refrigeration Savings (kWh)

Operating Company	Count (Sites with Savings)	Annual Energy Savings (kWh)	Summer coincident peak savings (kW)
CEI	6	6,394	0.66
OE	5	903	0.11
TE	5	5,679	0.85
Total	**16**	**12,976**	**1.62**

5.2.1.4 Verification of Commercial & Industrial Water Heating

Out of the 124 sites with calculated energy savings in the sample, 10 included electric water heating measures. Water heating measures consisted of storage water heating units for uses ranging from hydronic floor heating systems to supplying hot water to restrooms. For this measure, care was taken to only apply savings to units that replaced old units (over 15 years old) with low energy factors. Savings values ranged from 47 kWh per year to over 10,000 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-17.

Table 5-17: CAP C&I Sample Water Heating Savings (kWh)

Operating Company	Count (Sites with Savings)	Annual Energy Savings (kWh)	Summer coincident peak savings (kW)
CEI	3	0	0.00
OE	3	13,045	0.00
TE	4	324	0.00
Total	**10**	**13,369**	**0.00**

5.2.1.5 Verification of Commercial & Industrial Motors

Out of the 124 sites with calculated energy savings in the sample, 5 included high efficiency motor installation. These measures consisted of low HP motors as small as 1 HP. Energy savings for all motor installations were determined by the Ohio TRM. Savings values ranged from 114 kWh per year to 819 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-18.

Table 5-18: CAP C&I Sample Motor Savings (kWh)

Operating Company	Count (Sites with Savings)	Annual Energy Savings (kWh)	Summer coincident peak savings (kW)
CEI	2	819	6.81
OE	3	688	0.22
TE	0	0	0.00
Total	**5**	**1,507**	**7.03**

5.2.1.6 Verification of Commercial & Industrial Process and other Measures

Out of the 124 sites with calculated energy savings in the sample, 7 included industrial process improvements or other custom energy efficiency equipment. These measures included industrial process improvements such as injection molding machines, and steel mill furnace improvements to heaters. Energy savings for these measures were based on engineering calculations from EM&V best practices. Savings values ranged from 689 kWh per year to 2,360,000 kWh per year. Annual energy savings and summer coincident peak savings by operating company are shown in Table 5-19.

Table 5-19: CAP C&I Sample Process and other Measure Savings (kWh)

Operating Company	*Count (Sites with Savings)*	*Annual Energy Savings (kWh)*	*Summer coincident peak savings (kW)*
CEI	4	2,884,186	43.60
OE	2	3,140,186	375.00
TE	1	689	0.03
Total	**7**	**6025061**	**418.63**

The total 2015 annual energy savings from the sampled sites are 10,076,106 kWh. The majority of the energy savings came from lighting projects and industrial process improvements. The sample energy savings generated annual energy reductions by strata that average 0.23% of average annual energy usage. Extrapolated to the population of 189,631 businesses, the total annual energy savings is 90,383,616 kWh. The extrapolated summer coincident peak savings and lifetime savings are 20,646.57 kW and 1,121,416,654 kWh. A summary of extrapolated energy savings, summer coincident peak savings, and lifetime energy savings is shown in Table 5-20.

Table 5-20: Energy Savings Extrapolation Summary

Strata	*Annual Energy Savings (kWh)*	*Summer coincident peak savings (kW)*	*Lifetime Savings (kWh)*
CE-GP	213,618	52.06	2,634,556
CE-GS	35,509,833	9,420.63	411,352,147
CE-GSU	3,036,339	592.00	39,267,688
CE-GT	4,698,011	301.27	73,620,710
CE-POLS	456,919	127.79	5,414,074
CEI Total	43,914,720	10,493.75	532,289,175
OE-GP	2,556,465	566.38	30,514,965
OE-GS	26,934,628	5,915.86	324,194,401
OE-GSU	2,606,920	520.98	26,930,526
OE-GT	5,406,647	823.27	65,718,768
OE-POLS	160,400	35.12	1,941,748
OE Total	37,665,060	7,861.61	449,300,408
TE-GP	3,033,325	722.95	55,970,211
TE-GS	5,036,417	1,425.76	71,821,723
TE-GSU	194,737	42.43	3,767,547
TE-GT	526,037	96.12	8,095,321
TE-POLS	13,322	3.95	172,271
TE Total	8,803,838	2,291.20	139,827,073
Total	**90,383,616**	**20,646.57**	**1,121,416,654**

6 Conclusions

This chapter reports the conclusions resulting from the impact evaluation of the 2015 CAP. The savings by EDC, sector, and rate class, are presented in Table 6-1.

Table 6-1: kWh by Operating Company

	CEI	OE	TE	Total
Residential Lighting	48,353,232	67,157,266	18,804,035	**134,314,532**
Residential Refrigerator	5,394,903	7,492,920	2,098,018	**14,985,840**
Residential HVAC	5,523,813	7,671,963	2,148,150	**15,343,925**
C&I	43,914,719	37,665,060	8,803,838	**90,383,616**
Total	**103,186,666**	**119,987,209**	**31,854,039**	**255,027,914**

Table 6-2: kW by Operating Company

	CEI	OE	TE	Total
Residential Lighting	6,604.99	9,173.59	2,568.61	**18,347.19**
Residential Refrigerator	944.72	1,312.12	367.39	**2,624.23**
Residential HVAC	5,837.45	8,107.57	2,270.12	**16,215.13**
C&I	10,493.75	7,861.61	2,291.20	**20,646.57**
Total	**18,217.49**	**18,589.03**	**5,294.88**	**42,101.39**

The residential portion of the CAP resulted in finding 134,314,532 kWh of annual energy savings and 18,347 kW reduction across the three operating Companies.

The C&I portion of the CAP resulted in finding 90,383,616 kWh of annual energy savings across the three operating companies.

7 Appendix A: Required Savings Tables

Tables showing measure-level participation counts and savings for the Program were provided in various locations throughout this report. This appendix provides additional tables summarizing savings results. Lifetime savings were calculated as shown in Equation 31: Calculation of Lifetime Savings.

Lifetime Savings = Measure Life x Annualized Savings

The annual energy savings from CAP 2015 for both residential and C&I is shown in Table 71. The lifetime energy savings from CAP 2015 for both residential and C&I is shown in Table 72.

Table 71: Annual kWh & KW Savings by Measure and Operating Company

Program	Company Code	Rate Code	Number of Participants	Annual kWh Savings	Annual kW Savings
Customer Action Program (CAP) C&I	CEI	GS	60,506	35,509,833	9,421
	CEI	POLS	5,580	456,919	128
	CEI	GP	83	213,618	52
	CEI	GSU	526	3,036,339	592
	CEI	GT	15	4,698,011	301
	CEI Total		66,710	43,914,719	10,494
	OE	GS	88,140	26,934,628	5,916
	OE	POLS	5,605	160,400	35
	OE	GP	1,133	2,556,465	566
	OE	GSU	92	2,606,920	521
	OE	GT	158	5,406,647	823
	OE Total		95,128	37,665,060	7,862
	TE	GS	26,162	5,036,417	1,426
	TE	POLS	1,119	13,322	4
	TE	GP	464	3,033,325	723
	TE	GSU	6	194,737	42
	TE	GT	42	526,037	96
	TE Total		27,793	8,803,838	2,291
C&I Total	Total		189,631	90,383,616	20,647
Customer Action Program (CAP) Residential	CEI	RS	660,634	5,523,813	5,837
HVAC	OE	RS	920,811	7,671,963	8,108
	TE	RS	272,320	2,148,150	2,270
	Total		1,853,765	15,343,925	16,215
Customer Action Program (CAP) Residential	CEI	RS	660,634	5,394,903	945

Refrigerator	*OE*	*RS*	*920,811*	*7,492,920*	*1,312*
	TE	*RS*	*272,320*	*2,098,018*	*367*
	Total		*1,853,765*	*14,985,840*	*2,624*
Customer Action Program (CAP) Residential	*CEI*	*RS*	*660,634*	*48,353,232*	*6,605*
Lighting	*OE*	*RS*	*920,811*	*67,157,266*	*9,174*
	TE	*RS*	*272,320*	*18,804,035*	*2,569*
	Total		*1,853,765*	*134,314,532*	*18,347*
Customer Action Program Total				*255,027,914*	*57,833*

Table 72: Lifetime kWh and kW Savings by Measure and Operating Company

Program	*Company Code*	*Rate Code*	*Number of Participants*	*Lifetime kWh Savings*
Customer Action Program (CAP) C&I	*CEI*	*GS*	*60,506*	*411352147*
	CEI	*POLS*	*5,580*	*5414074*
	CEI	*GP*	*83*	*2634556*
	CEI	*GSU*	*526*	*39267688*
	CEI	*GT*	*15*	*73620710*
	CEI Total		*66,710*	*532,289,174*
	OE	*GS*	*88,140*	*324194401*
	OE	*POLS*	*5,605*	*1941748*
	OE	*GP*	*1,133*	*30514965*
	OE	*GSU*	*92*	*26930526*
	OE	*GT*	*158*	*65718768*
	OE Total		*95,128*	*449,300,407*
	TE	*GS*	*26,162*	*71821723*
	TE	*POLS*	*1,119*	*172271*
	TE	*GP*	*464*	*55970211*
	TE	*GSU*	*6*	*3767547*
	TE	*GT*	*42*	*8095321*
	TE Total		*27,793*	*55,970,211*
C&I Total	*Total*		*189,631*	*1,121,416,654*
Customer Action Program (CAP) Residential	*CEI*	*RS*	*660,634*	*88,403,954*
HVAC	*OE*	*RS*	*920,811*	*122,783,270*
	TE	*RS*	*272,320*	*34,379,315*
	Total		*1,853,765*	*245,566,539*
Customer Action Program (CAP) Residential	*CEI*	*RS*	*660,634*	*91,713,344*
Refrigerator	*OE*	*RS*	*920,811*	*127,379,644*

	TE	***RS***	***272,320***	***35,666,300***
	Total		***1,853,765***	***254,759,288***
Customer Action Program (CAP) Residential	***CEI***	***RS***	***660,634***	***529,103,573***
Lighting	***OE***	***RS***	***920,811***	***734,866,074***
	TE	***RS***	***272,320***	***205,762,501***
	Total		***1,853,765***	***1,469,732,148***
Customer Action Program Total				***3,091,474,629***

8 Appendix B: Survey Instruments

1. Residential Survey Instruments

2015 FirstEnergy's Ohio utilities' Customer Action Program
Random Digit Dial Telephone Survey
[START]
Q1. Hello, my name is _____ and I'm calling from ADM Associates, an independent research firm, conducting a survey regarding household lighting and appliance purchases in Ohio on behalf of the FirstEnergy Ohio Electric Utility Companies. First I want to assure you that I'm not selling anything. I am calling to ask a few brief questions about any light bulbs or appliances you may have purchased for your home in 2015. The survey should only take about ten minutes, and your answers will be completely anonymous. We are offering a $5.00 Target gift card for your participation. May I please speak with an adult in the household who is responsible for purchasing the light bulbs or appliances for your home?

Yes, I purchase lights	01 [GO TO Q2]
Someone else does it	02 [ASK TO SPEAK WITH PERSON, REPEAT INTRODUCTION THEN GO TO Q2]
No	03 [TRY TO RESCHEDULE AND THEN TERMINATE]

Electric Utility and Location Information
Q2. First of all to ensure your eligibility to participate, we need to determine that you are a customer of the FirstEnergy Electric Utility Companies. What is the name of your electric utility? [DO NOT READ, LET PARTICIPANT ANSWER]

Ohio Edison	01
The Illuminating Company	02
Toledo Edison	03
Other	04 [RECORD ANSWER]

Q3. [SKIP IF Q2! =04] Based on your electric utility it does not appear you are eligible for this survey. Thank you for your time and have a nice day.

Q4. For our research purposes we need your approximate locale. Would you mind providing me with your zip code?

_____ [RECORD 5 DIGIT ZIP]

Don't know	98
Refused	99

Awareness of Bulb Types

Q5. I'd like to ask you a few questions about your awareness of different types of light bulbs. Before this call today, had you ever heard of compact fluorescent light bulbs, or CFLs?

Yes	01
No	02 [READ E1]
Don't know	98 [READ E1]
Refused	99 [READ E1]

E1. Here is a quick description: The most common type of CFL is made with a glass tube bent into a spiral. It generally looks like a corkscrew and uses less energy than a typical incandescent light bulb.

Q6. Before this call today, had you ever heard of light emitting diode light bulbs, or LEDs?

Yes	01
No	02 [READ E2]
Don't know	98 [READ E2]
Refused	99 [READ E2]

E2. Here is a quick description: LED light bulbs are a newer light bulb technology that fit in regular light bulb sockets, but have various different appearances. LED bulbs are typically a lot heavier than incandescent bulbs. They use less energy and last much longer than typical incandescent light bulbs.

Q7. Before this call today, had you ever heard of increased efficiency incandescent bulbs, or halogens?

Yes	01
No	02 [READ E3]
Don't know	98 [READ E3]
Refused	99 [READ E3]

E3. Here is a quick description: In 2012 the federal government began enforcing a law that required regular light bulbs to use less energy but produce the same amount of light. The technology in these increased efficiency incandescent light bulbs changed from filament style to halogen bulbs. The halogen bulbs are typically marketed using wattage equivalents, which are designed to show the increased energy efficiency of the halogen bulbs compared to the standard incandescent bulbs. For example, the 72 Watt halogen bulb packaging will show a lighting equivalent of a 100 Watt standard incandescent bulb.

Q8. Conventional light bulbs are known as incandescent light bulbs. Do you feel you could correctly identify a typical incandescent light bulb, CFL light bulb, and LED light bulb, and a halogen light bulb if all four were placed in front of you?

Yes	01
No	02
Don't know	98
Refused	99

Q9. Would you say you are very familiar, somewhat familiar, not too familiar, or not at all familiar with these currently available household light bulb technologies?

Very familiar	01
Somewhat familiar	02
Not too familiar	03
Not at all familiar	04
Don't know	98
Refused	99

Recent Light Bulb Purchases

Q10. I'd like to ask you a few questions about your prior light bulb purchases. In 2015, have you purchased any light bulbs?

Yes	01
No	02 [SKIP TO Q28]
Don't know	98 [SKIP TO Q28]
Refused	99 [SKIP TO Q28]

Q11. During 2015, how many light bulbs would you say you have purchased? [READ ANSWERS] [If respondent unsure, say "Your best estimate is OK."]

0-5	01
6-10	02
11-15	03
16-20	04
21-25	05
25-30	06
More than 30	Record exact respondent estimate
Don't know	998
Refused	999

Q12. Have you purchased any compact fluorescent light bulbs, also known as CFLs, during 2015?

Yes	01
No	02
Don't know	98
Refused	99

Q13. Have you purchased any light emitting diode bulbs, also known as LEDs, during 2015?

Yes	01
No	02
Don't know	98
Refused	99

Q14. Have you purchased any increased efficiency incandescent bulbs, also known as halogens, during 2015?

Yes	01
No	02
Don't know	98
Refused	99

Q15. [SKIP IF Q12=02, 98, or 99 AND Q13=02, 98, or 99 AND Q14=02, 98, or 99] I'd like to ask you about the number of different bulb types you have purchased in 2015. You mentioned earlier that you have purchased [ANSWER FROM Q8] light bulbs in 2015. How many of those bulbs were CFLs, LEDs, or halogen bulbs? An example would be 5 CFLs, 5 LEDs, and 5 halogens. [If respondent unsure, say "again, your best estimate is OK."] [IF RESPONDENT INDICATES BELOW/ABOVE [ANSWER TO Q6] TOTAL, PROMPT TO GIVE [ANSWER TO Q6] TOTAL]

_____ Record number of CFLs
_____ Record number of LEDs
_____ Record number of halogens

Don't know	98
Refused	99

Q16. [SKIP IF Q12=02, 98, or 99 AND Q13=02, 98 or 99, AND Q14=02, 98, or 99] Were any of the CFLs, LEDs or halogen bulbs you purchased in 2015 installed in a business or commercial building?

Yes	01 [READ Q13A]
No	02
Don't know	98
Refused	99

Q16A. [ASK IF Q13 = 01] Approximately how many of the [Number of CFLs + LEDs + Halogen from Q12] CFLs, LEDs or Halogens you said you purchased were installed in a business or commercial building?

_____ CFLs [RECORD NUMBER, 0 – 97]
_____ LEDs [RECORD NUMBER, 0 – 97]
_____ Halogens [RECORD NUMBER, 0 – 97]

Don't recall	98
Refused	99

Prior Purchases

Q17. Prior to 2015, had you ever purchased CFL light bulbs?

Yes	01
No	02
Don't know	98
Refused	99

Q18. Prior to 2015, had you ever purchased LED light bulbs?

Yes	01
No	02

Don't know 98
Refused 99

Q19. Prior to 2015, had you ever purchased halogen light bulbs?

Yes 01
No 02
Don't know 98
Refused 99

In-Service Rate

Q20. [SKIP IF Q10 <> 01 OR (Q12=02 AND Q13=02 AND Q14=02)] Again, you said you purchased [Number of CFLs + LEDs + Halogen from Q12] in 2015. How many of those CFLs, LEDs or halogens would you estimate you installed ***within one week of purchase***?

_____ [RECORD NUMBER, 0 – 97. IF RESPONDENT SAYS "100%" or "ALL", THEN SKIP TO Q18]
Don't recall 98
Refused 99

Q20A. [SKIP IF Q10 <> 01 OR (Q12=02 AND Q13=02 AND Q14=02)] How many of those CFLs, LEDs or Halogens purchased did you save to install at a later date?

_____ [RECORD NUMBER, 0 – 97. IF RESPONDENT SAYS "100%" or "ALL", THEN SKIP TO Q18]
Don't recall 98
Refused 99

Q20B. Approximately how many of the light bulbs you purchased have you not installed? [If respond is unsure, say "Your best estimate is okay."]

_____ CFLs [RECORD NUMBER, 0 – 97.]
_____ LEDs [RECORD NUMBER, 0 – 97.]
_____ Halogens [RECORD NUMBER, 0 – 97.]
Don't recall 98
Refused 99

Purchase Reasoning

Q21. [ASK IF Q12 = 01] You mentioned you have purchased CFL light bulbs in 2015. When you purchased these CFLs, why did you make the purchase?

[DO NOT READ RESPONSES. RECORD ALL RESPONSES. IF respondent says "I needed bulbs" or similar, PROMPT for more detailed explanation.]

Replaced burned out bulbs	01
Replace working bulbs, wanted to lower energy usage	02
Installed in a new light fixture or lamp socket	03
Improve lighting quality/brighten a room	04
Replaced burned out bulbs & working bulbs at same time	05
Stock up on bulbs	06
Good deal prompted purchase	07
Other (describe) _____	
Don't recall	98
Refused	99

Q22. [ASK IF Q13 = 01] You mentioned you have purchased LED light bulbs in 2015. When you purchased these LEDs, why did you make the purchase?
[DO NOT READ RESPONSES. RECORD ALL RESPONSES. IF respondent says "I needed bulbs" or similar, PROMPT for more detailed explanation.]

Replaced burned out bulbs	01
Replace working bulbs, wanted to lower energy usage	02
Installed in a new light fixture or lamp socket	03
Improve lighting quality/brighten a room	04
Replaced burned out bulbs & working bulbs at same time	05
Stock up on bulbs	06
Good deal prompted purchase	07
Other (describe) _____	
Don't recall	98
Refused	99

Q23. [ASK IF Q14 = 01] You mentioned you have purchased halogen light bulbs in 2015. When you purchased these halogens, why did you make the purchase?
[DO NOT READ RESPONSES. RECORD ALL RESPONSES. IF respondent says "I needed bulbs" or similar, PROMPT for more detailed explanation.]

Replaced burned out bulbs	01
Replace working bulbs, wanted to lower energy usage	02
Installed in a new light fixture or lamp socket	03
Improve lighting quality/brighten a room	04
Replaced burned out bulbs & working bulbs at same time	05
Stock up on bulbs	06
Good deal prompted purchase	07
Other (describe) _____	
Don't recall	98
Refused	99

Bulb Types Replaced

Q24. [ASK IF Q12 = 01 ELSE SKIP TO Q25] Again, you said you purchased [Number of CFLs from Q15] CFLs in 2015. In which of the following locations do you install the CFLs?

Bedrooms	01
Bathrooms	02
Living Room	03
Kitchen	04
Entry Way	05
Dining Room	06
Garage	07
Basement	08
Den	09
Stairway	10
Office	11
Hallway	12
Outdoor	13
Other Room/Location	14
Store for later installation	15
Don’t know	98
Refused	99

Q24A. Thinking about the new CFLs in your home, how many were installed?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q24B. How many of the new CFLs replaced standard incandescent bulbs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q24C. How many of the new CFLs replaced halogens?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q24D. How many of the new CFLs replaced old CFLs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q24E. How many of the new CFLs replaced LEDs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q25. [ASK IF Q13 = 01 ELSE SKIP TO Q26] Again, you said you purchased [Number of LEDs from Q15] LEDs in 2015. In which of the following locations do you install the LEDs?

Bedrooms	01
Bathrooms	02
Living Room	03
Kitchen	04
Entry Way	05
Dining Room	06
Garage	07
Basement	08
Den	09
Stairway	10
Office	11
Hallway	12
Outdoors	13
Other Room/Location	14
Store for later installation	15
Don’t know	98
Refused	99

Q25A. Thinking about the new LEDs in your home, how many were installed?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q25B. How many of the new LEDs replaced standard incandescent bulbs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q25C. How many of the new LEDs replaced halogens?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q25D. How many of the new LEDs replaced CFLs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q25E. How many of the new LEDs replaced old LEDs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q26. [ASK IF Q14 = 01 ELSE SKIP TO Q27] Again, you said you purchased [Number of Halogens from Q15] Halogens in 2015. In which of the following locations do you install the Halogens?

Bedrooms	01
Bathrooms	02
Living Room	03
Kitchen	04
Entry Way	05
Dining Room	06
Garage	07
Basement	08
Den	09
Stairway	10
Office	11
Hallway	12
Outdoors	13
Other Room/Location	14
Store for later installation	15
Don’t know	98
Refused	99

Q26A. Thinking about the new Halogens in your home, how many were installed?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q26B. How many of the new Halogens replaced standard incandescent bulbs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q26C. How many of the new Halogens replaced old Halogens?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q26D. How many of the new Halogens replaced CFLs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q26E. How many of the new Halogens replaced LEDs?

_____ [RECORD NUMBER, 0 – 97]

Don't recall 98

Refused 99

Q27. [SKIP IF (Q12=02 AND Q13=02 AND Q14=02)] Of the light bulbs you purchased in 2015, were any of them purchased through any of the following retail stores: [READ LIST, CHECK ALL THAT APPLY]

The Home Depot	01
Lowes Home Improvement	02
Sam's Club	03
Walmart	04
Costco	05
Big Lots	06
Hartville Hardware	07
None of these retailers	08
Don't know	98
Refused	99

Appliance Basics

Q28. Since January 1, 2015, have you purchased or had installed ANY of the following items in your home/residence: Refrigerator, Room Air Conditioner, High-Efficiency Central Air Conditioner, Air-to-Air Heat Pump or Mini-Split Heat Pump?

Q.	Appliance	Yes	No	DK	REF
28.A	Refrigerator				
28.B	Room Air Conditioner				

28.C	Central AC				
28.D	Air-to-Air Heat Pump				
28.E	Mini-Split Heat Pump				

Refrigerator

[ASK Q26-Q30 IF Q25.A = Y]

Q29. What kind of Refrigerator model did you purchase? [READ ANSWERS]

Top-freezer refrigerator model	01
Bottom-freezer refrigerator model	02
Side-by-side refrigerator model	03
Don't know	98
Refused	99

Q29.A. Was the refrigerator you purchased Energy Star qualified?

Yes	01
No	02
Don't know	98
Refused	99

Q30. Do you remember the month in 2015 when you purchased the refrigerator?

_____ [ENTER MONTH]

Don't recall 98

Refused 99

Q31. Was this refrigerator purchased: [READ ANSWERS AND RECORD RESPONSE]

To replace a functioning unit 01 [SKIP TO Q34]

To replace a broken unit 02

Not a replacement 03 [SKIP TO Q35]

Don't recall 98

Refused 99

Q32. [ASK IF Q29 = 02] Why didn't you repair the broken unit?

Too costly 01

Too much time involved 02

Wanted to change style 03

Don't recall 98

Refused 99

Q33. What did you do with your old unit?

Still have it, not in use	01
Recycled the unit	02
Took it to the dump	03
Sold it for scrap metal	04
Sold for parts	05
Sold or gifted unit to an individual	06
Sold or donated to an organization/company.	07
Company name: _____	
Don't know	98
Refused	99

Room Air Conditioner

[ASK Q34-Q40 IF Q28B = Y]

Q34. What was the make or manufacturer of the room air conditioner you purchased? The make or manufacturer should be listed on the unit.

_____ [RECORD ANSWER]

Don't know	98 [PROMPT TO LOOK AT THE UNIT]
Refused	99

Q35. What is the capacity of the unit in BTUs?

_____ [RECORD ANSWER]

Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

Q36. Was the room AC you purchased Energy Star qualified?

Yes	01
No	02
Don't know	98
Refused	99

Q37. Which month in 2015 was the air conditioner installed?

_____ [RECORD ANSWER]

Don't know	98
Refused	99

Q38. Was this air conditioner purchased: [READ ANSWERS AND RECORD RESPONSE]

To replace a functioning unit	01 [SKIP TO Q38]
To replace a broken unit	02
Not a replacement	03 [SKIP TO Q44]

Don’t recall	98
Refused	99

Q39. [ASK IF Q38 = 02] Why didn’t you repair the broken unit?

Too costly	01
Too much time involved	02
Wanted to change style	03
Don’t recall	98
Refused	99

Q40. What did you do with your old unit?

Still have it, not in use	01
Recycled the unit	02
Took it to the dump	03
Sold it for scrap metal	04
Sold for parts	05
Sold or gifted unit to an individual	06
Sold or donated to an organization/company.	07
Company name: _____	
Don't know	98
Refused	99

High-Efficiency Central Air Conditioner

[ASK Q41 THROUGH Q49 IF Q28C = Y]

Q41. Which month in 2015 did you purchase the central air conditioning system?

_____ [ENTER MONTH PRODUCT WAS PURCHASED]

Don't recall	98
Refused	99

Q42. Can you tell me the make or manufacturer of the central air conditioning system you purchased? The make or manufacturer should be listed on the outdoor unit.

_____ [ENTER MANUFACTURER OF UNIT]

Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

Q42.A. Was the central air conditioning system you purchased Energy Star qualified?

Yes	01
No	02
Don't know	98
Refused	99

Q43. What is the capacity of the unit in BTU/hr.?

_____ [RECORD CAPACITY]

Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

Q44. What is the SEER rating of the NEW unit?

_____ [RECORD SEER]

Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

Q45. Do you recall the SEER rating of the OLD unit?

_____ [RECORD SEER]

Don't know	98
Refused	99

Q46. Can you tell me the name of the contractor who installed the new unit?

_____ [RECORD CONTRACTOR NAME]

Did not use contractor	01
Don't know	98
Refused	99

Q47. Was this air conditioner purchased: [READ ANSWERS AND RECORD RESPONSE]

To replace a functioning unit	01	[GO TO Q55]
To replace a broken unit	02	
Not a replacement	03	
Don't recall	98	
Refused	99	

Q48. [ASK IF Q49 = 02] Why didn't you repair the broken unit?

Too costly	01
Too much time involved	02
Wanted to change style	03
Don't recall	98
Refused	99

Q49. What did you do with your old unit?

Still have it, not in use	01
Recycled the Unit	02
Took it to the dump	03
Sold it for scrap metal	04
Sold for parts	05
Sold or gifted unit to an individual	06
Sold or donated to an organization/company.	07
Company name: _____	
Don't know	98
Refused	99

Air-to-Air Heat Pump

[ASK Q50 - Q53 IF Q28.D = Y]

Q50. Which month in 2015 did you purchase the air-to-air heat pump?

_____ [ENTER MONTH PRODUCT WAS PURCHASED]

Don't recall 98

Refused 99

Q51. Can you tell me the make or manufacturer of the air-to-air heat pump you purchased?

_____ [ENTER MANUFACTURER OF UNIT]

Don't know 98 [PROMPT TO LOOK AT THE UNIT]

Refused 99

Q51.A. Was the Heat Pump you purchased Energy Star qualified?

Yes 01
No 02
Don't know 98
Refused 99

Q52. Can you tell me the name of the contractor who installed the new unit?

_____ [RECORD CONTRACTOR NAME]

Did not use contractor 01

Don't know 98

Refused 99

Q53. Was this Heat Pump purchased: [READ ANSWERS AND RECORD RESPONSE]

To replace a functioning unit 01 [GO TO Q53]

To replace a broken unit	02
Not a replacement	03
Don't recall	98
Refused	99

Mini-Split Heat Pump

[ASK Q54 - Q57 IF Q28.E = Y]

Q54. Which month in 2015 did you purchase the mini-split heat pump?

_____	[ENTER MONTH PRODUCT WAS PURCHASED]
Don't recall	98
Refused	99

Q55. Can you tell me the make or manufacturer of the mini-split heat pump you purchased?

_____	[ENTER MANUFACTURER OF UNIT]	
Don't know	98	[PROMPT TO LOOK AT THE UNIT]
Refused	99	

Q55.A. Was the Heat Pump you purchased Energy Star qualified?

Yes	01
No	02
Don't know	98
Refused	99

Q56. Can you tell me the name of the contractor who installed the new unit?

_____ [RECORD CONTRACTOR NAME]

Did not use contractor	01
Don't know	98
Refused	99

Q57. Was this Heat Pump purchased: [READ ANSWERS AND RECORD RESPONSE]

To replace a functioning unit	01	[GO TO Q53]
To replace a broken unit	02	
Not a replacement	03	
Don't recall	98	
Refused	99	

Household Characteristics / Demographics

Q58. Which of the following best describes your home/residence?

Single Family Home, detached construction	01
Single Family Home, factory manufactured/modular	02
Single family, mobile home	03
Condominium	04
Apartment	05
Other (specify)	06
Don't know	98
Refused	99

Q59. Do you own or rent this residence?

Own	01
Rent	02
Don't know	98
Refused	99

Q60. Approximately when was your home constructed? [DO NOT READ]

Before 1960	01
1960-1969	02
1970-1979	03
1980-1989	04
1990-1999	05
2000-2010	06
2011 or later	07
Don't know	98
Refused	99

Q61. Approximately how many square feet is your home?

_____ Record Number [100-99999]

Don't know	98
Refused	99

Q62. How many individuals currently live in your home?

_____ Record Number [1-97]

Don't know	98
Refused	99

Q63. What is your approximate total household income? [PROVIDE BINS]

Less than $10,000	01
$10,000 to $29,999	02
$30,000 to $49,999	03
$50,000 to $69,999	04
$70,000 to $89,999	05
$90,000 to $99,999	06
$100,000 to $149,999	07
$150,000 or more	08
Don't know	98
Refused	99

Customer Information:

Q64. Thank you for your time in answering questions regarding lighting and appliance purchases in Ohio. We have finished with the questions we have for this survey. Upon FirstEnergy's verification that you are a customer, we would like to mail you a $5.00 Target gift card for your participation. To do that I'll need your mailing information at this time. You can expect to receive the gift card in 4-6 weeks.

Are you willing to provide your name and the address so we can mail the gift card?

Name:

Address:

If you have any questions regarding this survey or would like to check on the status of your $5.00 gift card, please call 775-345-3031. Once again thank you for participating in this survey regarding household lighting and appliance purchases in Ohio. Have a great day.

2. Commercial & Industrial Survey Instruments

FirstEnergy Ohio CAP C&I Participant Survey 3.0

Admin

1) Stratum*

_____

2) ID*

_____

3) Utility name*

_____

4) Address*

_____

5) NAICS Group*
_____

Interviewer Name and Interview Date

6) Interviewer name*
_____

Write-in Responses Note

Telephone Introduction

Please correct as necessary.
7) Company name [FOR REFERENCE]*
_____

8) [GREETING] Hello, my name is [question("value"), id="3"] and I am calling for ADM Associates. We are conducting a market research study on behalf of [question("value"), id="6"] regarding lighting and equipment purchases in the state of Ohio. Your business will be compensated if you qualify to participate in this study. May I speak with someone who is familiar with equipment purchases made for the facility at [question("value"), id="438"]?*

*
[SEE TEXT INSTRUCTIONS BELOW COMMENT BOX]
( ) Yes, you are speaking with the correct person.
( ) Yes. [WHEN REFERRED TO A NEW CONTACT, RECORD CONTACT INFO IN COMMENT BOX, THEN REPEAT THIS QUESTION WITH NEW CONTACT. REPEAT THIS PROCESS UNTIL APPROPRIATE CONTACT HAS BEEN REACHED]
( ) No [MARK AS REFUSAL]
Comments:

9) Contact name*
_____

Measures

10) I would like to start by asking if your company has installed, or plans to install any of the following energy measures in 2015: lighting, refrigeration unit (including ice makers and freezers), HVAC systems or components, boilers, hot water heaters, electric motors, or clothes washers. [Select all that apply]*
[ ] Yes, have installed
[ ] Yes, plan to install
[ ] No, I'm not planning on installing any equipment
[ ] No, I don't want to take the survey

Planned Measure Installation

11) What is/are the measures that you plan to install in 2015? [IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURES FROM LIST. IF NECESSARY, LIST THE POSSIBLE CATEGORIES BELOW] [Select all that apply]*
[ ] Lighting
[ ] HVAC: Packaged air conditioners, heat pumps, or heaters
[ ] Refrigeration and Freezers
[ ] Boiler & Water Heater
[ ] Clothes washers or refrigerated vending machines
[ ] Motors
[ ] Other - Write In (Required): _____*
[ ] Doesn't plan to install any measures
[ ] Don't know
[ ] Refused

12) When are you planning to install the equipment? *
If more than one piece of equipment will be installed, enter earliest date only.
_____

Purchase and/or Installation of New Equipment
13) Great, would you be willing to answer a few questions with regard to your company's experience purchasing or installing new equipment? This survey should take approximately 10 minutes of your time and we would like to provide compensation in exchange for information and documentation in regards to the equipment you have installed. We are offering participants compensation in part based on verified energy savings generated by the installations we have discussed. Verified energy savings will be determined based on the information and documentation that you have provided, and possibly a visit to your facility to verify the installation. We will provide $50 for completion of the survey including providing any required follow-up data, and may also provide a payment depending on the type of equipment installed. The payment will be paid on verified KWh calculated using information, and back up documentation you provide. The range for completed surveys would be from $50 to a maximum payment level is $1,000.*
( ) Yes
( ) No

14) What is the approximate area of your building or buildings? *
Text: _____
Units
( ) Sqft
( ) Acres
( ) Other [SPECIFY IN COMMENTS]
Comments:

15) What percentage of that space are you responsible for?*
_____

16) What are your normal operating hours? [Check all that apply]
Select days of operation and note operating hours in the comment boxes.*
Monday: _____
Tuesday: _____
Wednesday: _____
Thursday: _____
Friday: _____
Saturday: _____
Sunday: _____
Don't know: _____
Refused: _____

17) Are there any holidays when your facility is closed? [Check all that apply]*
[ ] New Year's Day
[ ] Martin Luther King Jr. Birthday
[ ] President's Day
[ ] Memorial Day
[ ] Independence Day
[ ] Labor Day
[ ] Columbus Day
[ ] Veterans' Day
[ ] Thanksgiving Day
[ ] Rosa Parks Day
[ ] Christmas Day
[ ] Other 1 - Write In (Required): _____*
[ ] Other 2 - Write In (Required): _____*
[ ] Don't know
[ ] Refused

18) Are there any months when your business is closed? [Check all that apply]
Note any seasonal closures in the comments boxes. [IF NONE, MARK "0" IN NONE BOX]
*
January: _____
February: _____

March: _____
April: _____
May: _____
June: _____
July: _____
August: _____
September: _____
October: _____
November: _____
December: _____
None: _____
Don't know: _____
Refused: _____

19) Please classify your facility type as one of the following*
( ) Food Sales
( ) Food Service
( ) Health Care
( ) Hotel/Motel
( ) Office
( ) Public Assembly
( ) Public Services (non-food)
( ) Retail
( ) Warehouse
( ) School
( ) College
( ) Industrial
( ) Garage
( ) Other (Specify): _____

Installed Measures
20) What is/are the measures that you have installed in 2015? [IF RESPONSE IS GENERAL, E.G., “LIGHTING EQUIPMENT”, PROBE FOR SPECIFIC MEASURES FROM LIST. IF NECESSARY, LIST THE POSSIBLE CATEGORIES BELOW] [Select all that apply]*
[ ] Lighting
[ ] HVAC: Packaged air conditioners, heat pumps, or heaters
[ ] Refrigeration and Freezers
[ ] Boiler & Water Heater
[ ] Clothes washers or refrigerated vending machines
[ ] Motors
[ ] Other: _____
[ ] Didn't implement any measures
[ ] Don't know
[ ] Refused

Measure Installation Order

21) In what order did you install the measures that you implemented during 2015?*

If the respondent only installed one measure, than that measure is ranked as installed first.

Lighting Verification

22) What types of lighting upgrades did you implement? (Read options)
[ALLOW UP TO 5 RESPONSES] *
[ ] Linear fluorescent light fixtures (for example T8 or T12 fluorescent lamps)
[ ] Compact fluorescent lamps (CFLs)
[ ] LED light fixtures
[ ] Metal Halide Lamps
[ ] Ceiling Fan Light Kits
[ ] High Intensity Discharge Lamps
[ ] LED exit signs
[ ] Incandescent Reflector Lamps
[ ] Other , specify: _____
[ ] Didn't install any lighting equipment
[ ] Don't know
[ ] Refused

Linear Fluorescents

23) How many linear fluorescents, for example T5s or T8s, did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

24) What is the wattage of the linear fluorescents you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

25) And are these linear fluorescents installed inside, outside, or in a refrigerated space?
*
( ) Inside
( ) Outside
( ) Refrigerated space
( ) (Other, specify): _____
( ) (Don't know)
( ) (Refused)

26) Is the inside space heated, cooled, or both?
*
( ) Heated
( ) Cooled

( ) Both
( ) (Don't know)
( ) (Refused)

27) Did the linear fluorescents replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

28) What equipment did the linear fluorescents replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

29) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

30) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

31) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

32) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

33) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

34) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

35) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

36) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

37) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

38) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Linear Fluorescent Replace Other
39) How many [question("option value"), id="35", option="10130"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

40) What is the wattage of the [question("option value"), id="35", option="10130"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Compact Fluorescent Lamps (CFLs)
41) How many compact fluorescent lamps also known as CFLs did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

42) What is the wattage of the CFLs you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

43) And are these CFLs installed inside, outside, or in a refrigerated space?
*
( ) Inside
( ) Outside
( ) Refrigerated space
( ) (Other, specify): _____
( ) (Don't know)
( ) (Refused)

44) Is the inside space heated, cooled, or both?
*
( ) Heated
( ) Cooled
( ) Both
( ) (Don't know)
( ) (Refused)

45) Did the CFLs replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

46) What equipment did the CFLs replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

47) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

48) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

49) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

50) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

51) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

52) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

53) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

54) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

55) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

56) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

CFLs Replace Other
57) How many [question("option value"), id="55", option="10158"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

58) What is the wattage of the [question("option value"), id="55", option="10158"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

LED light fixtures
59) How many light emitting diode fixtures also known as LEDs did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

60) What is the wattage of the LEDs you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

61) And are these LEDs installed inside, outside, or in a refrigerated space?
*
( ) Inside
( ) Outside
( ) Refrigerated space

( ) (Other, specify): _____
( ) (Don't know)
( ) (Refused)

62) Is the inside space heated, cooled, or both?
*
( ) Heated
( ) Cooled
( ) Both
( ) (Don't know)
( ) (Refused)

63) Did the LEDs replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

64) What equipment did the LEDs replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

65) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

66) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

67) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

68) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

69) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

70) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

71) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

72) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

73) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

74) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

LEDs Replace Other
75) How many [question("option value"), id="73", option="10181"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

76) What is the wattage of the [question("option value"), id="73", option="10181"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

Metal Halide Lamps
77) How many metal halide(s) did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

78) What is the wattage of the metal halide(s) you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

79) And are these metal halide(s) installed inside, outside, or in a refrigerated space?
*
( ) Inside
( ) Outside
( ) Refrigerated space
( ) (Other, specify): _____
( ) (Don't know)
( ) (Refused)

80) Is the inside space heated, cooled, or both?
*
( ) Heated
( ) Cooled
( ) Both
( ) (Don't know)
( ) (Refused)

81) Did the metal halide(s) replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

82) What equipment did the metal halide(s) replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

83) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

84) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

85) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

86) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

87) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

88) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

89) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

90) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

91) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

92) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Metal Halide Replace Other
93) How many [question("option value"), id="91", option="10204"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

94) What is the wattage of the [question("option value"), id="91", option="10204"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Incandescent Reflector Lamps
95) How many incandescent reflector lamps did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

96) What is the wattage of the incandescent reflector lamps you installed? [NUMERIC OPEN END: 1-5000; 9998=DON’T KNOW; 9999=REFUSED]*

_____

97) And are these incandescent reflector lamps installed inside, outside, or in a refrigerated space?
*

( ) Inside
( ) Outside
( ) Refrigerated space
( ) (Other, specify): _____
( ) (Don't know)
( ) (Refused)

98) Is the inside space heated, cooled, or both?
*

( ) Heated
( ) Cooled
( ) Both
( ) (Don't know)
( ) (Refused)

99) Did the incandescent reflector lamps replace existing equipment?
*

( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

100) What equipment did the incandescent reflector lamps replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

101) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON’T KNOW; 9999=REFUSED]*

_____

102) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON’T KNOW; 9999=REFUSED]*

_____

103) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

104) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

105) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

106) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

107) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

108) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

109) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

110) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Incandescent Reflector Lamps Other
111) How many [question("option value"), id="163", option="10293"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

112) What is the wattage of the [question("option value"), id="163", option="10293"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Ceiling Fan Lights

113) How many ceiling fan lights did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

114) What is the wattage of the ceiling fan lights you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

115) Did the ceiling fan lights replace existing equipment?
*

( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

116) What equipment did the ceiling fan lights replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

117) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

118) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

119) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

120) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

121) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

122) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

123) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

124) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

125) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

126) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Ceiling Fan Replace Other
127) How many [question("option value"), id="145", option="10270"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

128) What is the wattage of the [question("option value"), id="145", option="10270"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

High Intensity Discharge Lamps
129) How many high intensity discharge lamps, also known as HID, did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

130) What is the wattage of the HID you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

131) Did the HID replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)

( ) (Refused)

132) What equipment did the HID replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

133) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

134) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

135) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

136) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

137) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

138) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

139) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

140) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

141) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

142) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

HID Replace Other
143) How many [question("option value"), id="129", option="10258"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

144) What is the wattage of the [question("option value"), id="129", option="10258"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

LED Exit Signs
145) Were the LED exit signs single sided, double sided, or a combination of the two sign types?*
( ) Single sided
( ) Double sided
( ) Some single and some double sided
( ) Other (Specify): _____
( ) Don't know
( ) Refused

Other Energy Saving Lighting Measures
146) How many [question("option value"), id="28", option="10080"] did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

147) What is the wattage of the [question("option value"), id="28", option="10080"] you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*

_____

148) And are these [question("option value"), id="28", option="10080"] installed inside, outside, or in a refrigerated space?
*
( ) Inside
( ) Outside
( ) Refrigerated space
( ) (Other, specify): _____
( ) (Don't know)

( ) (Refused)

149) Is the inside space heated, cooled, or both?
*
( ) Heated
( ) Cooled
( ) Both
( ) (Don't know)
( ) (Refused)

150) Did the [question("option value"), id="28", option="10080"] replace existing equipment?
*
( ) Yes
( ) No
( ) (Don't know)
( ) (Refused)

151) What equipment did the [question("option value"), id="28", option="10080"] replace?*
[ ] Linear fluorescent light T12
[ ] Linear fluorescent light T8
[ ] Incandescent
[ ] CFL
[ ] Metal Halide
[ ] Other , specify: _____
[ ] Don't know
[ ] Refused

152) How many T12s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

153) What is the wattage of the T12s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

154) How many T8s did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

155) What is the wattage of the T8s that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

156) How many incandescents did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

157) What is the wattage of the incandescents that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

158) How many CFLs did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

159) What is the wattage of the CFLs that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

160) How many metal halides did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

161) What is the wattage of the metal halides that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

Other Lighting Measures Replace Other
162) How many [question("option value"), id="109", option="10227"] did you remove?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

163) What is the wattage of the [question("option value"), id="109", option="10227"] that you removed?
[NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]*
_____

HVAC Verification
164) What types of equipment did you install as part of the HVAC project? [Check all that apply]*
[ ] SPLIT Air Conditioning System
[ ] PACKAGED Air Conditioning System
[ ] Air Source Heat Pump
[ ] AIR Cooled Chiller
[ ] WATER Cooled Chiller
[ ] Ground Source Heat Pump
[ ] Unit Heater
[ ] Other (Specify)
[ ] Didn't install any HVAC equipment
[ ] Don't know

[ ] Refused

Split Air Conditioning System
165) What is the capacity of the split air conditioning system? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

166) How many square feet does the split air conditioning system serve?*
Note any units or comments in the Comments Box.
_____
Comments:

167) What is the SEER of the split air conditioning system?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

168) What is the EER of the split air conditioning system?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

169) Did the split air conditioning system replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

170) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)

( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

171) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

172) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Packaged Air Conditioning System
173) What is the capacity of the packaged air conditioning system? (Capture either in tons or in Btu/hr)
*
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused

174) How many square feet does the packaged air conditioning system serve?*
_____

175) What is the SEER of the packaged air conditioning system?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

176) What is the EER of the packaged air conditioning system?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

177) Did the packaged air conditioning system replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

178) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

179) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

180) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Air Source Heat Pump
181) What is the capacity of the air source heat pump? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.

( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

182) How many square feet does the air source heat pump serve?*
Note any units or comments in the Comments Box.
_____
Comments:

183) What is the SEER of the air source heat pump?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

184) What is the EER of the air source heat pump?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

185) Did the air source heat pump replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

186) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

187) What is the primary fuel source for heating? [Do not read list]
*

( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

188) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Air Cooled Chiller
189) What is the capacity of the air cooled chiller? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

190) How many square feet does the air cooled chiller serve?*
Note any units or comments in the Comments Box.
_____
Comments:

191) What is the efficiency of the new air cooled chiller, in kilowatts per ton?
*
Note any units or comments in the Comments Box.
( ) Efficiency in kilowatts per ton: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

192) Did the air cooled chiller replace old equipment?*

( ) Yes
( ) No
( ) Don't know
( ) Refused

193) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

194) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

195) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Water Cooled Chiller
196) What is the capacity of the water cooled chiller? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

197) How many square feet does the water cooled chiller serve?*
Note any units or comments in the Comments Box.
_____
Comments:

198) What is the efficiency of the new water cooled chiller, in kilowatts per ton?
*
Note any units or comments in the Comments Box.
( ) Efficiency in kilowatts per ton: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

199) Did the water cooled chiller replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

200) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

201) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

202) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____

( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Ground Source Heat Pump
203) What is the capacity of the ground source heat pump? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

204) How many square feet does the ground source heat pump serve?*
Note any units or comments in the Comments Box.
_____
Comments:

205) What is the SEER of the ground source heat pump?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

206) What is the EER of the ground source heat pump?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

207) Did the ground source heat pump replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

208) How old was the replaced equipment?
*
( ) (0-4 years)

( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

209) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

210) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Unit Heater
211) What is the capacity of the unit heater? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Watts: _____
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

212) How many square feet does the unit heater serve?*
Note any units or comments in the Comments Box.
_____
Comments:

213) Did the unit heater replace old equipment?*

( ) Yes
( ) No
( ) Don't know
( ) Refused

214) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

215) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

216) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Other HVAC
217) What is the capacity of the [question("option value"), id="179", option="10303"]? (Capture either in tons or in Btu/hr)
*
Note any units or comments in the Comments Box.
( ) Tons: _____
( ) Btu/hr: _____
( ) Not applicable
( ) Don't know
( ) Refused
Comments:

218) How many square feet does the [question("option value"), id="179", option="10303"] serve?*
_____

219) What is the SEER of the [question("option value"), id="179", option="10303"]?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

220) What is the EER of the [question("option value"), id="179", option="10303"]?
*
( ) SEER: _____
( ) Not applicable
( ) Don't know
( ) Refused

221) Did the [question("option value"), id="179", option="10303"] replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

222) How old was the replaced equipment?
*
( ) (0-4 years)
( ) (5-9 years)
( ) (10-14 years)
( ) (15-19 years)
( ) (20 years or older)
( ) Don't know
( ) Refused

223) What is the primary fuel source for heating? [Do not read list]
*
( ) Electric
( ) Gas
( ) Oil
( ) Purchased steam
( ) Don't know
( ) Refused

224) What is the temperature set-point of the conditioned space?*
( ) Farenheit: _____

( ) Celsius: _____
( ) Don't know
( ) Refused

225) What is the temperature set-point of the conditioned space for cooling and heating?*
Record response in units indicated by the respondent.
( ) Heating set-point Farenheit: _____
( ) Heating set-point Celsius: _____
( ) Cooling set-point Farenheit: _____
( ) Cooling set-point Celsius: _____
( ) Don't know
( ) Refused

Refrigeration Verification

226) The next few questions will be about the refrigeration equipment that you installed or replaced.*
[ ] Energy Star Refrigerator
[ ] Energy Star Freezer
[ ] Walk-in Cooler or Freezer
[ ] Display Case
[ ] Energy Star Refrigerated Beverage Vending Machine
[ ] Automatic Commercial Ice Maker
[ ] Other (Specify): _____
[ ] Don't know
[ ] Refused

ENERGY STAR Refrigerator
227) How many ENERGY STAR refrigerator(s) did you install?*
_____

228) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

229) Did the ENERGY STAR refrigerator(s) replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

230) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

ENERGY STAR Freezer
231) How many ENERGY STAR freezer(s) did you install?*
_____

232) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

233) Did the ENERGY STAR freezer(s) replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

234) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

Walk-in Cooler or Freezer

235) How many walk-in cooler(s) or freezer(s) did you install?*

_____

236) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

237) Did the walk-in cooler(s) or freezer(s) replace old equipment?*

( ) Yes
( ) No
( ) Don't know
( ) Refused

238) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

Display Case

239) How many display case(s) did you install?*

_____

240) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

241) Did the display case(s) replace old equipment?*

( ) Yes
( ) No
( ) Don't know
( ) Refused

242) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

ENERGY STAR Refrigerated Beverage Vending Machine

243) How many ENERGY STAR refrigerated beverage vending machine(s) did you install?*

_____

244) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*

[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

245) Did the refrigerated beverage vending machine(s) replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

246) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

Automatic Commercial Ice Maker
247) How many automatic commercial ice maker(s) did you install?*
_____

248) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

249) Did the automatic commercial ice maker(s) replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

250) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

Other Refrigeration Measure
251) How many [question("option value"), id="250", option="10602"] did you install?*
_____

252) Would you please describe the new equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

253) Did the [question("option value"), id="250", option="10602"] replace old equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

254) Would you please describe the old equipment, using as much detail as possible such as make, model, (e.g. ENERGY STAR vs. standard efficiency), set-point, etc.?
*
[ ] Make: _____
[ ] Model: _____
[ ] Set-point Farenheit: _____
[ ] Set-point Celsius: _____
[ ] ENERGY STAR or other energy efficient option
[ ] Standard efficiency
[ ] Additional information: _____
[ ] Don't know
[ ] Refused

Boiler and Water Heater Verification
255) What types of boiler or water heating upgrades did you install?*
[ ] Storage water heater
[ ] Low flow faucet aerators
[ ] Hot Water Pre-rinse Spray Valves
[ ] Low flow showerheads
[ ] Tankless water heater
[ ] Boiler
[ ] Other (Specify): _____
[ ] Didn't install any boiler or water heating equipment
[ ] Don't know
[ ] Refused

Storage Water Heater
256) How many storage water heater(s) did you install?*
_____

257) What is the fuel source for the storage water heater(s)?*
( ) Gas
( ) Electric
( ) Multiple Units, some gas, some electric
( ) Don't know
( ) Refused

258) How many of the storage water heaters are gas units, and how many are electric?*
( ) Gas: _____
( ) Electric: _____
( ) Don't know
( ) Refused

259) What is the heating capacity and thermal efficiency of the gas storage water heater(s) you installed? *
Note any units or comments in the Comments Box.
[ ] Heating capacity: _____
[ ] Thermal efficiency: _____
[ ] Don't know
[ ] Refused
Comments:

260) What is the heating capacity and thermal efficiency of the electric storage water heater(s) you installed? *
Note any units or comments in the Comments Box.
[ ] Heating capacity: _____
[ ] Thermal efficiency: _____
[ ] Don't know
[ ] Refused
Comments:

261) Are the electric storage water heaters GAMA/AHRI efficiency rating certified?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

262) Did the storage water heater(s) replace existing equipment?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

263) What was the heating capacity and thermal efficiency of the old gas fueled storage water heater? *
Note any units or comments in the Comments Box.
[ ] Heating capacity: _____
[ ] Thermal efficiency: _____
[ ] Don't know
[ ] Refused
Comments:

264) What was the heating capacity and thermal efficiency of the old electric fueled storage water heater? *
Note any units or comments in the Comments Box.
[ ] Heating capacity: _____

[ ] Thermal efficiency: _____
[ ] Don't know
[ ] Refused
Comments:

265) What was the gallon capacity of the old storage water heater? *
( ) Gallon capacity: _____
( ) Don't know
( ) Refused

Low Flow Faucet Aerators
266) How many low flow faucet aerator(s) did you install?*
_____

267) Are the faucet aerators connected to fixtures that use electric or gas water heating?*
( ) Gas
( ) Electric
( ) Multiple units, some gas, some electric
( ) Don't know
( ) Refused

268) How many faucet aerators are connected to fixtures that use gas water heaters and electric water heaters?*
[ ] Gas: _____
[ ] Electric: _____
[ ] Don't know
[ ] Refused

Hot Water Pre-rinse Spray Valves
269) How many hot water pre-rinse spray valves(s) did you install?*
_____

270) Are the pre-rinse spray valves(s) connected to fixtures that use electric or gas water heating?*
( ) Gas
( ) Electric
( ) Multiple Units, some gas, some electric
( ) Don't know
( ) Refused

271) How many pre-rinse spray valves are connected to fixtures that use gas water heaters and electric water heaters?*
[ ] Gas: _____

[ ] Electric: _____
[ ] Don't know
[ ] Refused

272) What is the reduction in daily water consumption through the pre-rinse spray valves(s)?*
( ) Quantity (Specify Units)
( ) Don't know
( ) Refused

Low-Flow Shower Heads
273) How many low-flow shower heads did you install?*
_____

274) Are the low-flow shower heads connected to fixtures that use electric or gas water heating?*
( ) Gas
( ) Electric
( ) Multiple Units, some gas, some electric
( ) Don't know
( ) Refused

275) How many low-flow shower heads are connected to fixtures that use gas water heaters and electric water heaters?*
[ ] Gas: _____
[ ] Electric: _____
[ ] Don't know
[ ] Refused

276) On average, how many showers are taken per day using one of the low flow showerheads you installed?*
( ) Quantity (Specify Units)
( ) Don't know
( ) Refused

Tank-less Water Heater
277) How many tank-less water heater(s) did you install?*
_____

278) What is the fuel source for the tank-less water heater(s) you installed?*
( ) Gas
( ) Electric
( ) Multiple Units, some gas, some electric
( ) Don't know
( ) Refused

279) How many of the tank-less water heaters are gas units, and how many are electric?*
[ ] Gas: _____
[ ] Electric: _____
[ ] Don't know
[ ] Refused

280) What is the size of the tank-less water heater(s) you installed, in Btu/hr?*
( ) Less than 75,000 Btu/hr
( ) Greater than 75,000 Btu/hr but less than or equal to 155,000 Btu/hr
( ) Greater than 155,000 Btu/hr
( ) Don't know
( ) Refused

281) What is the output capacity of the tankless water heater(s) you installed, in gallons per minute (GPM)?*
( ) Output Capacity (GPM): _____
( ) Don't know
( ) Refused

282) Did the tank-less water heater(s) replace existing units?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

283) What was the energy factor of the existing water heater(s) that you replaced?*
Note any units or comments in the Comments Box.
( ) Energy Factor: _____
( ) Don't know
( ) Refused
Comments:

284) What was the size of the water heater(s) you REPLACED, in BTU/hr?*
( ) Less than 75,000 Btu/hr
( ) Greater than 75,000 Btu/hr but less than or equal to 155,000 Btu/hr
( ) Greater than 155,000 Btu/hr
( ) Don't know
( ) Refused

285) What was the capacity of the water heater(s) you REPLACED, in gallons (Gal)?*
( ) Capacity (Gal): _____
( ) Don't know
( ) Refused

Boiler
286) How many boiler(s) did you install?*
_____

287) What is the capacity of the new boiler(s)?*
Note any units or comments in the Comments Box.
( ) Capacity (Btu/hr): _____
( ) Don't know
( ) Refused
Comments:

288) How many fire rates do you have for your boiler?*
( ) One
( ) Two
( ) Three
( ) Four
( ) Don't know
( ) Refused

289) What is the percentage of oxygen in the exhaust gas and the flue gas temperature at the first fire rate.*
Note any units or comments in the Comments Box.
[ ] Percentage of oxygen at fire rate:
_____
[ ] Flue gas temperature at fire rate Farenheit:
_____
[ ] Flue gas temperature at fire rate Celsius:
_____
[ ] Don't know
[ ] Refused
Comments:

290) What is the percentage of oxygen in the exhaust gas and the flue gas temperature at the second fire rate.*
Note any units or comments in the Comments Box.
[ ] Percentage of oxygen at fire rate:
_____
[ ] Flue gas temperature at fire rate Farenheit:
_____
[ ] Flue gas temperature at fire rate Celsius
[ ] Don't know
[ ] Refused

Comments:

291) What is the percentage of oxygen in the exhaust gas and the flue gas temperature at the third fire rate.*
Note any units or comments in the Comments Box.
[ ] Percentage of oxygen at fire rate:
_____
[ ] Flue gas temperature at fire rate Farenheit:
_____
[ ] Flue gas temperature at fire rate Celsius:
_____
[ ] Don't know
[ ] Refused
Comments:

292) What is the percentage of oxygen in the exhaust gas and the flue gas temperature at the fourth fire rate.*
Note any units or comments in the Comments Box.
( ) Percentage of oxygen at fire rate:
_____
( ) Flue gas temperature at fire rate Farenheit:
_____
( ) Flue gas temperature at fire rate Celsius:
_____
( ) Don't know
( ) Refused
Comments:

293) What is the fuel source of the boiler(s)?*
( ) Electricity
( ) Gas
( ) Oil
( ) Don't know
( ) Refused

294) Did the boiler(s) replace existing units?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

295) What was the fuel source of the boiler(s) that you REPLACED?*
( ) Electricity

( ) Gas
( ) Oil
( ) Don't know
( ) Refused

296) What was the capacity of the boiler(s) that you REPLACED?*
Note any units or comments in the Comments Box.
( ) Capacity (Btu/hr): _____
( ) Don't know
( ) Refused
Comments:

Clothes Washer and Other Appliance Verification
297) Indicate which of the following clothes washers, or other appliances that you have installed? [Check all that apply]*
[ ] Clothes Washer: _____
[ ] Other Appliance 1 (Specify): _____
[ ] Other Appliance 2 (Specify): _____
[ ] Don't know
[ ] Refused

298) How many clothes washers did you install?*
( ) Clothes Washer: _____
( ) Refused
( ) Other - Write In

299) Did the new clothes washer replace an old clothes washer?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

300) How old was the existing clothes washer?*
( ) 0-4 years
( ) 5-9 years
( ) 10-14 years
( ) 15-19 years
( ) 20 years or older
( ) Don't know
( ) Refused

301) Was the existing clothes washer rated as energy efficient (e.g. was it ENERGY STAR equipment)?*
( ) Yes

( ) No
( ) Don't know
( ) Refused

Other Appliances 1
302) How many [question("option value"), id="303", option="10819"] did you install?*
( ) [question("option value"), id="303", option="10819"]:
_____
( ) Refused
( ) Other - Write In

303) Did the new [question("option value"), id="303", option="10819"] replace an old [question("option value"), id="303", option="10819"]?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

304) How old was the existing [question("option value"), id="303", option="10819"]?*
( ) 0-4 years
( ) 5-9 years
( ) 10-14 years
( ) 15-19 years
( ) 20 years or older
( ) Don't know
( ) Refused

305) Was the existing [question("option value"), id="303", option="10819"] rated as energy efficient (e.g. was it ENERGY STAR equipment)?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

Other Appliances 2
306) How many [question("option value"), id="303", option="10820"] did you install?*
( ) [question("option value"), id="303", option="10820"]:
_____
( ) Refused
( ) Other - Write In

307) Did the new [question("option value"), id="303", option="10820"] replace an old [question("option value"), id="303", option="10820"]?*
( ) Yes

( ) No
( ) Don't know
( ) Refused

308) How old was the existing [question("option value"), id="303", option="10820"]?*
( ) 0-4 years
( ) 5-9 years
( ) 10-14 years
( ) 15-19 years
( ) 20 years or older
( ) Don't know
( ) Refused

309) Was the existing [question("option value"), id="303", option="10820"] rated as energy efficient (e.g. was it ENERGY STAR equipment)?*
( ) Yes
( ) No
( ) Don't know
( ) Refused

Motor Verification
310) What changes did you make to your electric motors? Did you…
[ALLOW MULTIPLE RESPONSES, UP TO 2]
*
[ ] Install or replace a motor
[ ] Do something else (Specify): _____
[ ] Don't know
[ ] Refused

311) How many motors did you install?
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*
_____

312) What is the approximate average horsepower of the new motors? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*
_____

313) What is the approximate average efficiency of the new motors? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")

[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*

_____

314) On average, how many hours per day do the motors operate? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*

_____

315) Did the motors replace existing motors? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]*
( ) Yes
( ) No
( ) Don't know
( ) Refused

316) Approximately how old were the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]*
( ) 0-4 years
( ) 5-9 years
( ) 10-14 years
( ) 15-19 years
( ) 20 years or older
( ) Don't know
( ) Refused

317) What is the approximate average horsepower of the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*

_____

318) What is the approximate average efficiency of the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from [question("value"), id="6"]")
[NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]
*

_____

Installed Measures Contact Information

319) To receive your gift card and to allow ADM to follow up with you, please provide your contact information.*

Email address: _____

Telephone number: _____

Plan to Install Measures Contact Information

320) Lastly, would you please provide us with an email address and phone number to follow-up? *

Email address: _____

Telephone number: _____

Thank You!

9 Appendix C: Ancillary Documentation

Email Subject Line: ADM Associates Market Research Survey Follow-up

Dear Participant

Thank you for participating in the market research study being conducted by ADM Associates on behalf of First Energy Ohio. We would like to follow up with you at this time to gather the necessary information required for our engineer's to perform an annual energy savings calculation which will be used to determine compensation for your participation in this study.

Equipment installations that are eligible for this market research study include lighting, refrigeration units, Heating, Ventilation, and Air Conditioning (HVAC) systems, boilers, hot water heaters, electric motors, and clothes washers. Installations had to have occurred in the 2015 calendar year, and must be completed before an engineering analysis can be performed. In order to perform verified energy savings calculations, the following documents are required by ADM Associates:

1. All invoices for installations
2. Fill out project information form
3. The attached form with signature, verifying measure installation.
4. A filled out W-9 form (attached with this email)

Please submit these documents to ADM Associates via email to curtis.robbins@admenergy.com. If information cannot be obtained then we will gather the necessary information during the site visit. Once the information is received we will call to set up a site visit. You will receive payment based on annual energy savings calculations performed by ADM Associates Inc. The check will be mailed from ADM Associates corporate office in approximately 6-8 weeks after the analysis is complete.

On behalf of the entire team working on this market research study, we would like to once again thank you for your participation. If you have any questions in regards to this process, please feel free to reach out to me.