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KCP&L-MO Evaluation, Measurement, and Verification Report – Appendices

Program Year 2018

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KCP&L – Missouri Operations

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REPORT DEFINITIONS

Note: Definitions provided in this section are limited to terms that are critical to understanding the values presented in this report.

Reporting Periods

Cycle 1
Refers to programs implemented in the timeframe of program years 2013-2015 (PY2013-PY2015).

Cycle 2
Refers to programs implemented in the timeframe of program years 2016-2018 (PY2016-PY2018), which corresponds to April 2016-March 2019.

Savings Types

Gross Reported Savings
Savings reported in the Missouri Operations' (KCP&L-MO's) annual reports prior to any EM&V ex-post gross adjustments and net-to-gross (NTG) adjustments. In previous Navigant EM&V reports, gross reported savings were referred to as ex-ante gross savings.

Gross Verified Savings
Savings verified through Navigant's impact evaluation methods prior to NTG adjustments. In previous EM&V reports, gross verified savings were referred to as ex post gross savings.

Gross Realization Rates
The ratio of gross verified savings to gross reported savings.
Missouri Energy Efficiency Investment Act (MEEIA) Target
Three-year savings target approved by the Missouri Public Service Commission for a given program.

Net Verified Savings
Savings verified through Navigant's impact evaluation methods and inclusive of NTG adjustments.

Percentage of MEEIA Target Achieved
The ratio of net verified savings to the MEEIA target; reflects KCP&L-MO's overall achievement toward the MEEIA target.

Net-to-Gross Components

Free Ridership (FR)
The program savings attributable to free riders—i.e., program participants who would have implemented a program measure or practice in the absence of the program.

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Participant Spillover (PSO)
The additional energy savings achieved when a program participant—as a result of the program's influence—installs energy efficiency measures or practices outside the efficiency program after having participated.

Nonparticipant Spillover (NPSO)
The additional energy savings achieved when a nonparticipant implements energy efficiency measures or practices because of the program's influence (e.g., through exposure to the program) but is not accounted for in program's gross verified savings.

Net Sales Analysis Approach to NTG
Approaches to estimating NTG that rely on the effect of program activity on total sales, yielding a market-level estimate of NTG that take FR, PSO, and NPSO into account. This involves establishing the sales with the program and estimating sales in the absence of the program, often based on expert opinions (e.g., the input of trade allies), stated participant and nonparticipant actions in the absence of the program (e.g., in-store intercept surveys), quasi-experimental designs (e.g., the use of comparison areas), or statistical modeling (e.g., modeling the impact of program activity on sales), thereby identifying the overall lift associated with program activity. Note that in some cases, such as the Home Lighting Rebate (HLR) program, sales data is limited to program bulbs only. Regression analysis of this subset of sales facilitates FR estimation, but not SO estimation. For lighting specifically, net savings are based on a combination of methods (shopper responses to in-store intercepts and regression analysis) to make certain the estimation reflects both FR and SO.

Billing Analysis Approach to NTG
Approaches to estimating NTG that rely on the use of control groups, either through randomized control trials (RCT) or quasi-experimental designs (e.g., the use of matching techniques to develop relevant nonparticipant comparison groups), and billing analysis to model participant net savings.

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KEY REPORT SOURCES

Below is a list of the most commonly referenced documents that the evaluation team used for this year's analysis.

Illinois Technical Reference Manual Version 5.0. (IL TRM v5)
http://www.ilsag.info/il_trm_version_5.html

Illinois Technical Reference Manual Version 6.0. (IL TRM v6)
http://www.ilsag.info/il_trm_version_6.html

Illinois Technical Reference Manual Version 7.0. (IL TRM v7)
http://www.ilsag.info/il_trm_version_7.html

Missouri Energy Efficiency Investment Act (MEEIA) Rules and the Stipulation and Agreement approved April 6, 2016, by Great Plains Energy Services Incorporated (GPES)

Missouri Code of State Regulations 4 CSR 240-22.070 (8)

California Public Utilities Commission. *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.* October 2001. http://www.cpuc.ca.gov/NR/rdonlyres/004ABF9D-027C-4BE1-9AE1-CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf.

Daniel M. Violette and Pamela Rathbun. "Estimating Net Savings: Common Practices," Chapter 23 in *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*. 2014. http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf.

Jane Peters and Ryan Bliss. *Common Approach for Measuring Free Riders for Downstream Programs.* Research Into Action. October 4, 2013.

California Public Utilities Commission. "2007 SPM Clarification Memo." 2007.
http://www.cpuc.ca.gov/NR/rdonlyres/004ABF9D-027C-4BE1-9AE1-CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf.

Evaluation, Measurement, and Verification Plan: KCP&L-MO Energy Efficiency and Demand Response Program 2013-2015 prepared by Navigant. October 2013.

Rachel Brailove, John Plunkett, and Jonathan Wallach. *Retrofit Economics 201: Correcting Commons Errors in Demand-Side Management Benefit-cost Analysis.* Resource Insight, Inc. Circa 1990.

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ACRONYMS AND ABBREVIATIONS

ACUR	Air Conditioning Upgrade Rebate
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
BOEA	Business Online Energy Analyzer
Btu	British Thermal Unit
C&I	Commercial & Industrial
CAP	Community Action Program
CBL	Customer Baseline
CET	Customer Engagement Tracker
CF	Coincident Factor
CFL	Compact Fluorescent Lamp
DEM	Demand Elasticity Modeling
DID	Difference-in-Difference
DIY	Do It Yourself
DLC	Direct Load Control
DR	Demand Response
DRI	Demand Response Incentive
EER	Energy Efficiency Rebate
EM&V	Evaluation, Measurement, and Verification
ETO	Energy Trust of Oregon
FR	Free Rider(ship)
GMO	Greater Missouri Operations
GPES	Great Plains Energy Services
HER	Home Energy Report
HLR	Home Lighting Rebate
HOEA	Home Online Energy Analyzer
HOU	Hours of Use
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilation, and Air Conditioning
ICF	ICF is the residential program implementation contractor
IEMF	Income-Eligible Multifamily
IEW	Income-Eligible Weatherization
ISR	In-Service Rate
KCP&L	Kansas City Power and Light
KCP&L-MO	KCP&L Missouri Operations Company
kW	Kilowatt
kWh	Kilowatt-Hour
LED	Light-Emitting Diode
LFER	Linear Fixed-Effects Regression

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MEEIA	Missouri Energy Efficiency Investment Act
NPSO	Nonparticipant Spillover
NTG	Net-to-Gross
OLS	Ordinary Least Squares
ORNL	Oak Ridge National Lab
PA	Pennsylvania
PCT	Participant Cost Test
PITA	Program Influence on Trade Ally
POD	Post-Only Difference
PPR	Post-Period Regression
PT	Programmable Thermostat
RCT	Randomized Control Trial
RFP	Request for Proposal
RIM	Ratepayer Impact Measure
RUL	Remaining Useful Life
SBL	Small Business Lighting
SCT	Societal Cost Test
SEM	Strategic Energy Management
SEER	Seasonal Energy Efficiency Ratio
SO	Spillover
SPM	Standard Practice Manual
TRC	Total Resource Cost
TRM	Technical Reference Manual
UCT	Utility Cost Test
WACC	Weighted Average Cost of Capital
WHE	Whole House Efficiency
WHF	Waste Heat Factor
WUM	What Uses Most

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APPENDIX A. SURVEY INSTRUMENTS

A.1 Participant Survey and Interview Guides

A.1.1 Business EER Standard and SBL Participant Online Survey

Sample Variables

Note: throughout this survey, these sample variables will appear in brackets like this: <MEASURECAT>. These are data points that will be piped into the survey to customize the language and skip patterns for each respondent based on their type of participation in the program.
PROGRAM: *Business Energy Efficiency Rebates* or *Small Business Lighting*
MEASURE: Rebated measure, using simplified measure name; pluralized if quantity is more than 1
MEASURECAT: General name for measure category (e.g., "lighting and controls", "air conditioning," "heat pumps", "advanced rooftop unit controls", "pumps/fans", "water heating", "refrigeration", "pool pumps/drives", "manufacturing")
REBATE: The dollar value of the rebate the participant received for the measure
MEASUREQTY: The quantity of measures installed
COMPANY: The name of the customer's company
SERVICE ADDRESS: The address where the rebated measures were installed

Screening Questions

S1. Our records show that your organization received KCP&L <PROGRAM> program incentives to install energy efficient equipment at <SERVICE ADDRESS>. Is this correct?

1. Yes [CONTINUE TO S2]
2. No [SKIP TO S3]

98. Don't know [SKIP S3]

S2. Were you directly involved in the decision to purchase and install the new <MEASURE> at <SERVICE ADDRESS>? (Note that you may have installed other energy efficient equipment but this survey will focus on <MEASURE>.)

1. Yes [SKIP TO S4]
2. No [CONTINUE TO S3]

98. Don't know [CONTINUE TO S3]

S3. Is there someone else at your organization who might be more familiar with the energy efficiency upgrade project? If so, would you please provide us with their email address?

1. Yes [ENTER EMAIL] [SKIP TO TERMINATE]
2. No [SKIP TO TERMINATE]

98. Don't know [SKIP TO TERMINATE]

S4. Are you an employee of <COMPANY> or were you involved in the project in some other capacity (e.g., as an installation contractor or energy services provider)?

1. Employed at <COMPANY> [SKIP TO A1]

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2. Employed by another organization [CONTINUE TO S5]
98. Don't know [SKIP TO TERMINATE]

S5. We are looking to speak with the decision-maker at <COMPANY> who made the purchase decision to install <MEASURE>. Could you provide us with the name and email address of the project decision-maker at <COMPANY> that you worked with?
[ENTER NAME/EMAIL]

98. Don't know

[Read if S3=2 or 98 or S4=2 or 98
Terminate Message: Those are all the questions we have for you. Thank you for your time.

Awareness and Participant Journey

A1. How did you first learn about the <PROGRAM> Program?
1. KCP&L newsletter
2. KCP&L bill insert
3. Other mailing from KCP&L
4. KCP&L community event
5. KCP&L website
6. Newspaper, magazine, or other print media advertisement
7. Radio advertisement
8. Family, friend, or word of mouth
9. Contractor, Vendor, or Equipment Installer
10. KCP&L call center
11. KCP&L information received after participating in another KCP&L program
12. Other, Please Describe
98. Don't know

A2. Is there another method of learning about the program that would have worked better for you?
1. Yes; please specify [OPEN ENDED]
2. No

98. Don't know

A3. What made your company first decide to purchase the new <MEASURECAT> equipment?
1. Recommended by contractor
2. Old equipment stopped working
3. Old equipment needed too many repairs
4. Was paying high utility bills and wanted to save money
5. Wanted to improve our work environment
6. Wanted to make our company more "green"
7. Learned about the availability of a rebate from KCP&L
8. Other, Please Describe
98. Don't know

A4. What was the status of your old equipment when you decided to buy the new <MEASURECAT> equipment? [SELECT ONE]
1. It was working and did not need any repairs beyond regular maintenance

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2. It was working but needed minor repairs
3. It was working but needed major repairs
4. It was not working but was repairable
5. It was not working and could not be repaired
6. Not applicable, rebated <MEASURE> was new equipment
7. Other, please describe
98. Don't know

[ASK IF <PROGRAM>=SBL]
A5. Did your contractor suggest you install additional energy efficiency equipment other than lighting?
1. Yes
2. No
98. Don't know

[ASK IF A5=1]
A6. What other energy efficiency equipment did your contractor suggest you install?
[OPEN ENDED]

98. Don't know

Participant Free Ridership

FR1. Had you selected the specific <MEASURE> to install prior to learning about the <PROGRAM> Program?
1. Yes
2. No
98. Don't know

[Ask if FR1=1, else skip to FR3]
FR2. Did you have a budget to cover the total cost of the <MEASURE> prior to learning about the <PROGRAM> Program?
1. Yes
2. No
98. Don't know

FR3. Which of the following statements best describe what you would have done if the program incentive had not been available? [ROTATE; ALLOW ONE RESPONSE]

1. Would not have purchased any equipment
2. Would have postponed the purchase for more than one year
3. Would have purchased exactly the same <MEASURE>
4. Would have purchased less efficient <MEASURECAT>
5. [IF MEASUREQTY>1] Would have purchased fewer <MEASURE> of the same efficiency level
98. Don't know

[Ask if FR3 = 4]
FR3a. How much less efficient would the <MEASURE> you would have purchased instead been?

1. Almost as efficient
2. Somewhat less efficient

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3. Much less efficient (minimal efficiency level available)
98. Don't know

[Ask if FR3 = 5]
FR3b. How many fewer <MEASURE> would you have purchased?

1. Most of them (approximately two-thirds of the <MEASURES> or more)
2. Some of them
3. Few of them (approximately one-third of the <MEASURES> or fewer)
98. Don't know

[Ask if FR3 = 3]
FR3c. Does that mean your business would have paid an additional <REBATE> to cover the entire cost of the <MEASURE>?

1. Yes
2. No
98. Don't know

FR4. On a scale of 1 to 5, where 1 is "not at all influential" and 5 is "very influential," how influential were the following elements on your decision to purchase the <MEASURE>?
[For FR4a – FR4b, record responses 1 through 5, DK]

a. Program incentive
b. Information from the KCP&L <PROGRAM> program
c. Installation Contractor/Trade Ally
d. KCP&L <PROGRAM> program staff

Participant Spillover

SO1. Since participating in the program, did you install any *additional* energy efficient equipment or make any additional energy efficiency upgrades at the same facility or at any other facility within KCP&L's Missouri service territory?

1. Yes
2. No
98. Don't know

[Ask if SO1 = 1, else skip to PS1]
SO2. Did you apply for an incentive from KCP&L for the additional energy efficient equipment or upgrade?

1. Yes, and I received an incentive from KCP&L
2. Yes, but I did not receive an incentive from KCP&L
3. No
99. Don't know

[Ask if SO2=2]
SO3. Do you know why you did not receive an incentive from KCP&L for the additional energy efficient equipment or upgrade?
[OPEN ENDED]

98. Don't know

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[Ask if SO2=3]
SO4. Why didn't you apply for an incentive from KCP&L for the additional energy efficient equipment or upgrade?
[OPEN ENDED]
98. Don't know

[Ask if SO2 = 2, 3, or 98, else skip to PS1]
SO5. How influential was KCP&L's <PROGRAM> program was on your decision to install the *additional* energy efficient equipment? Please rate on a 5-point scale in which 5 means "very influential" and 1 means "not at all influential."
[1-5, DK]

[Ask if SO5=3, 4, or 5, else skip to PS1]
SO6a. Please describe the energy efficient equipment that was installed without incentives:
a. Enter description:
b. Enter quantity:
c. Enter approximate installation date

SO6b. To the best of your knowledge, did this new equipment save more energy, about the same amount of energy, or less energy than the equipment that was rebated by the <PROGRAM> program?
1. More energy savings
2. Less energy savings
3. Same energy savings
4. Don't know

Participant Satisfaction

PS1. How would you rate your satisfaction with the following aspects of the KCP&L <PROGRAM> program? Please rate on a 5-point scale in which 5 means "very satisfied."
[1-5, DK]
a. Amount of rebate
b. Time it took to receive the rebate
c. Requirements to participate in the program
d. Application process
e. Your installation contractor
f. [Ask if <PROGRAM> = "Small Business Lighting"] Your contractor's lighting specifications proposal
g. Overall satisfaction with the program

[Ask PS2 for each aspect from PS1a-PS1i where the response was < 3]
PS2. Why did you provide this rating?
[OPEN ENDED]

PS3. How many visits were necessary for the contractor to complete the <MEASURECAT> project plan?
[NUMERIC OPEN ENDED]

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[Ask if PS3>1, else skip to PS5]
PS4. Do you know why the contractor wasn't able to complete the plan in one visit?
[OPEN ENDED, RECORD VERBATIM]

[Ask PS5 if <PROGRAM> = "Business Energy Efficiency Rebates" & <MEASURECAT> = "Lighting"]
PS5. Upon completion of your project plan, did the contractor provide you with a detailed lighting specification proposal?

1. Yes
2. No
98. Don't Know

[Ask PS6 – PS7 if <PROGRAM> = "Small Business Lighting", or if PS5 = 1]

PS6. How useful was the lighting specification proposal you received from your contractor in helping you decide whether to move forward with the lighting project? Please rate on a 5-point scale in which 5 is very useful and 1 is not at all useful.
[Record responses 1 through 5, DK]

[ASK IF PS6=1 or 2]
PS7. Why wasn't the lighting specification proposal useful to you?
[OPEN ENDED]

[ASK IF PS6=3, 4, OR 5]
PS8. In your own words, please describe how the lighting specification proposal helped you decide to move forward with the rebated lighting project.
[OPEN ENDED]

[Ask all]
PS9. How likely you would be to participate in KCP&L rebate programs again? Please rate on a 5-point scale in which 5 is "very likely" and 1 is "not at all likely."
[For PS9a-PS9c, Record responses 1 through 5, DK]

a. The <PROGRAM> program
b. Other KCP&L commercial rebate programs
c. Other KCP&L residential rebate programs

PS10. Have you recommended the KCP&L <PROGRAM> to colleagues or friends?

1. Yes
2. No
98. Don't Know

PS11. Are there any energy-saving equipment types or upgrades that you would like to see KCP&L add to their programs?
[OPEN ENDED]

PS12. Please share any suggestions you may have for improving the KCP&L <PROGRAM> program.
[OPEN ENDED]

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PS13. Based on your overall experience as a customer of KCP&L, how would you rate your satisfaction with the company on a scale of 1 to 5, where 1 is not at all satisfied and 5 is very satisfied?

[Ask if PS13<3, else skip to F1]
PS14. What were the reasons that you give it that rating?
[OPEN-ENDED]

Firmographics

Just a few questions left.

F1. What is the approximate square footage of your facility at <SERVICE ADDRESS>?
[NUMERIC OPEN ENDED, DK]

F2. What type of organization is <COMPANY>?
1. Office
2. Retail
3. Convenience Store
4. Grocery
5. Restaurant
6. Industrial
7. Light Manufacturing
8. Warehouse
9. Church
10. K-12 School
11. College/University
12. Government Building
13. Other (SPECIFY)
14. Don't know

F3. How old is the facility at which the <MEASURE> was installed?
1. Less than 2 years
2. 2-5 years
3. 5-10 years
4. 10-20 years
5. More than 20 years
98. Don't Know

F4. Approximately how many employees are at the facility?
1. Fewer than 10
2. 10 to 50
3. 50 to 100
4. 100 to 250
5. 250 to 500
98. Don't Know

F5. Which of the following descriptions best fits the facility at <SERVICE ADDRESS>?
1. Your organization's only location

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2. One of several locations within KCP&L service territory
3. One of several locations both within and outside of KCP&L service territory
4. Your organization's headquarters, with several locations within KCP&L service territory
5. Your organization's headquarters, with several locations both within and outside of KCP&L service territory
6. Other, please describe (SPECIFY)
98. Don't Know

Thank you for your time in completing this survey. Your responses will help KCP&L improve their programs to better serve customers like you!

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A.1.2 Business EER Custom Participant Online Survey Guide

Sample Variables

<MEASURE>: Rebated measure, using simplified measure name; pluralized if quantity is more than 1
<MEASURECAT>: "Lighting", "Building Optimization", "Compressed Air", "Variable Speed Drive for Pump or Fan", "Misc. Custom", "New Construction", "Air Optimization/Balancing", "Refrigeration", "Custom Packaged RTU", "Chiller Plant Optimization", "Energy Management System", "Economizers", "Constant Volume to Variable Volume Air Volume Conversion"
<REBATE>: The dollar value of the rebate the participant received for the measure
<MEASUREQTY>: The quantity of measures installed
<COMPANY>: The name of the customer's company
<SERVICE ADDRESS>: The address where the rebated measures were installed.

Screening Questions

S1. Our records show that your organization received KCP&L Business Energy Efficiency Rebates Custom program incentives to install energy efficient equipment at <SERVICE ADDRESS>. Is this correct?

1. Yes [CONTINUE TO S2]
2. No [SKIP TO S6]
98. Don't know [SKIP S6]

[ASK IF S1=Yes]
S2. Were you directly involved in the decision to purchase and install the new <MEASURE> at <SERVICE ADDRESS>? (Note that you may have installed other energy efficient equipment but this survey will focus on <MEASURE>.)

1. Yes [CONTINUE TO S3]
2. No [SKIP TO S4]
98. Don't know [SKIP TO TERMINATE]

[ASK IF S2=Yes]
S3. Are you an employee of <COMPANY> or the property manager at <SERVICE ADDRESS>, or were you involved in the project in some other capacity (e.g., as an installation contractor or energy services provider)?

1. Employed at <COMPANY> or owner/property manager at <SERVICE ADDRESS> [SKIP TO S5]
2. Employed by another organization [CONTINUE TO S4]
98. Don't know [SKIP TO TERMINATE]

[ASK IF S2=No or S3=Employed by another organization]
S4. We are looking to survey the decision-maker at <COMPANY> who made the purchase decision to install <MEASURE>. Could you provide us with the name and email address of the project decision-maker at <COMPANY> that you worked with?

[ENTER NAME/EMAIL]
98. Don't know [SKIP TO TERMINATE]

[ASK IF S3=Employed at <COMPANY> or owner]

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S5. Could you please verify your name and email address? (Note: this information is requested for survey management purposes only; your responses will remain anonymous and will not be linked with any of your contact information.)

[ENTER NAME/EMAIL]
[SKIP TO S5]

[ASK IF S1=No/Don't know]
S6. Is there someone else at your organization who might be more familiar with the energy efficiency upgrade project? If so, would you please provide us with their email address?

1. Yes [ENTER EMAIL] [SKIP TO TERMINATE]
2. No [SKIP TO TERMINATE]
98. Don't know [SKIP TO TERMINATE]

[Display if S2=2 or 98 or S5=2 or 98]
Terminate Message: Those are all the questions we have for you. Thank you for your time.

Awareness and Participant Journey

A1. How did you first learn about the Business Energy Efficiency Rebates Custom Program?
[ROTATE 1-13]

1. KCP&L newsletter
2. KCP&L bill insert
3. Other mailing from KCP&L
4. KCP&L community event
5. KCP&L website
6. Newspaper, magazine, or other print media advertisement
7. Radio advertisement
8. Family, friend, or word of mouth
9. Contractor, Vendor, or Equipment Installer
10. KCP&L call center
11. KCP&L information received after participating in another KCP&L program
12. Social Media Ad
13. Other KCP&L emails
14. Other, Please Describe
98. Don't know

A2. Is there another method of learning about the program that would have worked better for you?

1. Yes; please specify [OPEN ENDED]
2. No
98. Don't know

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A3. What made your company first decide to purchase the new <MEASURECAT> equipment? [SELECT ALL THAT APPLY; ROTATE 1-9]

1. Recommended by contractor
2. Old equipment stopped working
3. Old equipment needed too many repairs
4. Was paying high utility bills and wanted to save money
5. Wanted to improve our work environment
6. Wanted to make our company more “green”/reduce greenhouse gas emissions
7. Wanted to improve the property value
8. Wanted to reduce operation and maintenance costs
9. Learned about the availability of a rebate from KCP&L
10. Other, Please Describe
98. Don’t know

A4. What was the status of your old equipment when you decided to buy the new <MEASURECAT> equipment? [SELECT ONE]

1. It was working and did not need any repairs beyond regular maintenance
2. It was working but needed minor repairs
3. It was working but needed major repairs
4. It was not working but was repairable
5. It was not working and could not be repaired
6. Not applicable, rebated <MEASURE> was new equipment
7. Other, please describe
98. Don’t know

A5. On a scale of 1 to 5, where 5 is “extremely easy” and 1 is “not at all easy”, how easy was it to find a KCP&L Authorized Trade Ally for your Business Energy Efficiency Rebates Custom Rebate project?
[Record 1-5, DK, Refused]

99. N/A: Self-directed project and did not use a Trade Ally [Skip to A7]

A6. [Ask if A5 = 99] **Which of the following describes how you found the KCP&L Authorized Trade Ally used for your Business Energy Efficiency Rebates Custom Rebate project?** [ROTATE; Multiple Response]

1. KCP&L website
2. Knew the Trade Ally from a previous project
3. Someone referred the Trade Ally
4. Other, please specify [Open end; record verbatim]
98. Don’t know

A7. Who submitted the pre-approval application for your Custom project? [ROTATE; Single Response]

1. A KCP&L authorized Trade Ally
2. Myself
3. Another company employee
4. Other, please specify [Open end; record verbatim]
98. Don’t know

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A8. [Ask if A7= 2; else skip to A9] **On a scale of 1 to 5, where 5 is "extremely easy" and 1 is "not at all easy", how easy was it to complete your Custom project pre-approval application?** [Record 1-5, DK, Refused]

A9. [Ask if A5= 99] **How would you rate your satisfaction with the following aspects of the Trade Ally's project recommendations? Please rate these on a 5-point scale where 5 means "extremely satisfied" and 1 means "not at all satisfied"** [Record 1-5, DK, Refused for each].

a. The number of measure options the Trade Ally recommended
b. The attractiveness of the measure options the Trade Ally recommended
c. The Trade Ally's explanation of the measure options recommended

A10. [Ask for each aspect from A9a-A9c where the response was < 3] **Why did you provide this rating?** [OPEN ENDED; Record verbatim]

A11. [Ask if A5 = 99 and SP5 =3] **Of the Trade Ally's recommended Business Energy Efficiency Rebates Custom measures, approximately how many of those did you include in your Business Energy Efficiency Rebates Custom project?**

1. None of them
2. A few of them
3. About half of them
4. Most of them
5. All of them

A12. [Ask if A11 = 2, 3, or 4; else skip to A13] **Which of the following reasons best describes why you did not implement all of the Trade Ally's recommended Business Energy Efficiency Rebates Custom measures? Rank up to three reasons, with 1 being the most influential reason.** [UP TO THREE RESPONSES, RANKED]

1. Unable to get financing
2. Didn't see the value of certain recommendations
3. Rebate incentive was insufficient
4. Didn't understand some of the recommendations
5. Other, please specify [Open end; record verbatim]
98. Don't know

A13. [Ask if A5 = 99] **Did the Trade Ally discuss any of the following benefits of upgrading your equipment with you?** [ROTATE]

1. Lower utility bills
2. Improved work environment
3. Chance to make the company more "green"/reduce carbon emissions
4. Increased property value
5. Lower operating and maintenance cost
6. Quick payback period
7. Increased profitability
8. The Trade Ally did not discuss any of these benefits with me

A14. How did you finance your Business Energy Efficiency Rebates Custom Rebate project? [ROTATE; MULTIPLE RESPONSE]

1. Already included in budget
2. Through existing lines of credit
3. PACE financing
4. Other financing, please specify [Open end; record verbatim]
5. [Display if SP5=3] We are still securing project financing

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98. Don't know

A15. [Ask if A14 = 3 or 4, else skip to FR1] **How did you find financing for your Business Energy Efficiency Rebates Custom energy efficiency upgrades?**
1. Trade Ally
2. KCP&L website
3. Other, please specify [Open ended; record verbatim]
98. Don't know

Participant Free Ridership

FR1. Had you selected the specific <MEASURE> to install prior to learning about the Business Energy Efficiency Rebates Custom Program?
1. Yes
2. No
98. Don't know

[Ask if FR1=1, else skip to FR3]
FR2. Did you have a budget to cover the total cost of the <MEASURE> prior to learning about the Business Energy Efficiency Rebates Custom Program?
1. Yes
2. No
98. Don't know

FR3. Which of the following statements best describe what you would have done if the program incentive had not been available? [ROTATE; ALLOW ONE RESPONSE]
1. Would not have purchased any equipment
2. Would have postponed the purchase for more than one year
3. Would have purchased exactly the same <MEASURE>
4. Would have purchased less efficient <MEASURECAT>
5. [IF MEASUREQTY>1] Would have purchased fewer <MEASURE> of the same efficiency level
98. Don't know

[Ask if FR3 = 3]
FR3c. Does that mean your business would have paid an additional <REBATE> to cover the entire cost of the <MEASURE>?
1. Yes
2. No
98. Don't know

[Ask if FR3 = 4]
FR3a. How much less efficient would the <MEASURE> you would have purchased instead been?
1. Almost as efficient
2. Somewhat less efficient
3. Much less efficient (minimal efficiency level available)
98. Don't know

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[Ask if FR3 = 5]
FR3b. How many fewer <MEASURE> would you have purchased?

1. Most of them (approximately two-thirds of the <MEASURES> or more)
2. Some of them
3. Few of them (approximately one-third of the <MEASURES> or fewer)
98. Don't know

FR4. On a scale of 1 to 5, where 5 is "very influential" and 1 is "not at all influential," how influential were the following elements on your decision to purchase the <MEASURE>?

[For FR4a – FR4b, record responses 1 through 5, DK]

1. Program incentive
2. Information from a KCP&L program
3. Installation Contractor/Trade Ally
4. KCP&L Business Energy Efficiency Rebates Custom program staff

Participant Spillover

SO1. Since participating in the program, did you install any *additional* energy efficient equipment or make any additional energy efficiency upgrades at the same facility or at any other facility within KCP&L's Missouri service territory?

1. Yes
2. No
98. Don't know

[Ask if SO1 = 1, else skip to PS1]
SO2. Did you apply for an incentive from KCP&L for the additional energy-efficient equipment or upgrade?

1. Yes, and I received an incentive from KCP&L
2. Yes, but I did not receive an incentive from KCP&L
3. No
98. Don't know

[Ask if SO2=2]
SO3. Do you know why you did not receive an incentive from KCP&L for the additional energy-efficient equipment or upgrade?
[OPEN ENDED]

98. Don't know

[Ask if SO2=3]
SO4. Why didn't you apply for an incentive from KCP&L for the additional energy-efficient equipment or upgrade?
[OPEN ENDED]

98. Don't know

[Ask if SO2 = 2 or 3, else skip to PS1]
SO5. How influential was KCP&L's Business Energy Efficiency Rebates Custom program on your decision to install the *additional* energy efficient equipment? Please rate on a 5-point scale in which 5 means "very influential" and 1 means "not at all influential."
[1-5, DK]

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[Ask if SO5=3, 4, or 5, else skip to PS1]
SO6a. Please describe the energy efficient equipment that was installed without incentives:

a. Enter description:
b. Enter quantity: [NUMERIC]
c. Enter approximate installation date [DATE]

SO6b. To the best of your knowledge, did this new equipment save more energy, about the same amount of energy, or less energy than the equipment that was rebated by the Business Energy Efficiency Rebates Custom program?

1. More energy savings
2. Same energy savings
3. Less energy savings
98. Don't know

Participant Satisfaction

PS1. How would you rate your satisfaction with the following aspects of the KCP&L Business Energy Efficiency Rebates Custom program? Please rate on a 5-point scale in which 5 means "very satisfied" and 1 means "not at all satisfied."

[ROTATE a-f, RECORD 1-5, DK]

a. Amount of rebate
b. Time it took to receive the rebate
c. Program communications about eligibility requirements and application process
d. Requirements to participate in the program
e. [ASK IF A7 = 2] Application process
f. [ASK IF A7 = 2] Pre-approval application process
g. [ASK IF A7 = 2] Final approval application process
h. Your installation contractor
i. Overall satisfaction with the program

[Ask PS2 for each aspect from PS1a-PS1i where the response was < 3]
PS2. Why did you provide this rating?
[OPEN ENDED]

[ASK ALL]
PS3. How likely you would be to participate in KCP&L rebate programs again? Please rate on a 5-point scale in which 5 is "very likely" and 1 is "not at all likely."
[For PS9a-PS9c, Record responses 1 through 5, DK]

a. The Business Energy Efficiency Rebates Custom program
b. Other KCP&L commercial rebate programs

PS4. Have you recommended the KCP&L Business Energy Efficiency Rebates Custom to colleagues or friends?

1. Yes
2. No
98. Don't Know

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PS5. Were there any other types of energy saving equipment or upgrades that you wanted to install but that KCP&L did not approve?
[OPEN ENDED, None]

PS6. Please share any suggestions you may have for improving the KCP&L Business Energy Efficiency Rebates Custom program.
[OPEN ENDED, None]

PS7. Based on your overall experience as a customer of KCP&L, how would you rate your satisfaction with the company on a scale of 1 to 5, where 5 is very satisfied and 1 is not at all satisfied?
[1-5, DK]

[Ask if PS7<3, else skip to PI1]
PS8. What were the reasons that you give it that rating?
[OPEN-ENDED]

Program Interactions

PI1. The previous questions have focused on the <ProgramName> program. This question is about the <AltProgram> and Standard programs. Have you ever applied for rebates through either of these programs? If yes, did you receive rebates through the program?
Matrix-style question; rows are <AltProgram> and Standard programs, columns are as follows:

1. Yes, applied for and received rebates
2. Yes, applied unsuccessfully
3. No
4. Don't know
5. Never heard of this program

Firmographics

Just a few questions left.

F1. What type of organization is <COMPANY>?
[ROTATE]

1. Office
2. Retail
3. Convenience Store
4. Grocery
5. Restaurant
6. Industrial
7. Light Manufacturing
8. Warehouse
9. Church
10. K-12 School
11. College/University
12. Government Building
13. Other (SPECIFY)
98. Don't know

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F2. What is the approximate square footage of your facility at <SERVICE ADDRESS>?
[NUMERIC OPEN ENDED, DK]

F3. How old is the facility at which the <MEASURE> was installed?
1. Less than 2 years
2. 2-5 years
3. 5-10 years
4. 10-20 years
5. More than 20 years
98. Don't Know

F4. Approximately how many employees are at the facility?
1. Fewer than 10
2. 10 to 50
3. 50 to 100
4. 100 to 250
5. 250 to 500
98. Don't Know

F5. Which of the following descriptions best fits the facility at <SERVICE ADDRESS>?
1. Your organization's only location
2. One of several locations within KCP&L service territory
3. One of several locations both within and outside of KCP&L service territory
4. Your organization's headquarters, with several locations within KCP&L service territory
5. Your organization's headquarters, with several locations both within and outside of KCP&L service territory
6. Other, please describe (SPECIFY)
98. Don't Know

F6. Would you be willing to participate in a follow-up phone interview about your experience with the Business Energy Efficiency Rebates Custom program?
1. Yes
2. No

[ASK IF F10 = 1]
F7. Please provide your phone number (this will only be used for the follow-up phone interview).
[NUMERIC PHONE NUMBER ENTRY]

Thank you for your time in completing this survey. Your responses will help KCP&L improve their programs to better serve customers like you!

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A.1.3 Business EER Block Bidding Participant In-Depth Interview Guide

The Interview Guide is a tool to guide process evaluation interviews and helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in their project's design and operation, i.e., where they have significant experiences for meaningful responses.

Topic Area	Topic Objective
Roles and Responsibilities	Understand participant's role in the organization and project
Project Information	Gather details on the type of project completed
Participant Awareness	How did the participant first learn about the program?
Participant Journey and Experience	What steps were involved in the program and how did the participant perceive it?
Participant Satisfaction	Did the customer feel the program was worthwhile?
Program Influence	Develop a NTG ratio for the program

Roles and Responsibilities

Objective: Understand who we are talking to, their role in the organization and in the project

1. Could you please briefly summarize your role in your organization?

2. What role did you play in implementing the project that received the Block Bidding rebate?

3. Have you been involved in any other projects that received a KCP&L rebate (can be any program)?

4. Was there anyone else involved with the rebate process?

5. Prior to this project, had you participated in any other KCP&L rebate programs before?

Project Information

Objective: Gather details on the type of project completed

6. It is our understanding that the project receiving the Block Bidding funding was for a lighting upgrade project in a single facility. Is this correct?

7. Was this lighting project part of a larger initiative such as lighting upgrades in other city facilities, or other work on this facility?

8. Program records indicate that this was a self-installation project. Were you involved in the actual installation of the lighting upgrade?

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9. What is the current status of the project- if it's not completed, when are you planning on having it completed?

Participant Awareness

Objective: How did the participant first learn about the program?

10. What made you first decide to complete the lighting upgrade in this facility?

11. How did you first learn about the KCP&L Block Bidding program?
    a. Did you seek it out or did KCP&L approach you?
        i. *If KCP&L approached them:* Did you know about the BB program before this?

12. Is there another way that KCP&L could have better introduced this program to you?

13. Which rebate program did you exceed your cap on that caused you to go to the Block Bidding program [*Standard or Custom*]?
    a. Was this due to other projects that the city had completed in different facilities?

Participant Journey and Experience

Objective: What steps were involved in the program and how did the participant perceive it?

14. Can you describe the rebate process from start to finish for me?

15. [*If not answered already*] Who did you interact with at KCP&L throughout the rebate process?

16. How was the transition from [*previous program*]?

17. Do you feel you were provided the support you needed? What did this support entail?

    a. How often did you communicate with KCP&L?
    b. How was the program explained to you?

18. How did you and KCP&L decide on the incentive rate and rebate amount?

    a. Did KCP&L set it? Was there any negotiation?

19. What components of the process or the program were you happy with?

20. What parts of the process or program need improvement?

    a. Do they feel that participating in the BB rebate program was worth the amount of incentive they received ($3k)?

SKIP IF SHORT ON TIME

21. Were you aware that there was an auction component to the Block Bidding program?

    If YES:
    a. Why did you use the Buy-Now option instead of participating in the auction?

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i. Did you miss the RFQ, training, or auction deadline? Did you not want to deal with the steps required of the auction? Did you not qualify for the auction for some reason?

b. What is your understanding of the Block Bidding auction process?
   i. Were you aware of important dates for the program- trainings, RFQ, auction?

c. Have you interacted with the auction component at all?
   i. Did you attend any trainings? Have you seen or submitted an RFQ?

If NO:

d. Explain what the action process is.

22. Is participating in the auction process in the future something that is appealing to you? Why or why not?

Participant Satisfaction

Objective: Did the customer feel the program was worthwhile?

23. On a scale from 1-5, with 1 being not at all satisfied and 5 being extremely satisfied, how would you rate your overall experience with the Block Bidding program?

24. How does your experience compare to your experience with other KCP&L programs?

Program Influence

Objective: Develop a NTG for the program

25. Did the BB rebate program help you to:
    a. Install more efficient lighting than you would have otherwise?
    b. Install a greater number of efficient lights than you would have otherwise?
    c. Install a higher efficiency lighting option than you would have otherwise?
    d. Install the efficient lights sooner than you would have otherwise?

26. Do the KCP&L rebate programs (in general, not just BB) provide the support necessary to complete more energy efficiency installations or upgrades than you would be able to otherwise?

27. How would the City handle energy efficiency upgrades differently if KCP&L's rebate programs didn't exist?

    a. How would their approach to EE be different?

Summary

28. Is there anything about your experience with the Block Bid program we haven't discussed that you would like to share?

Thank you. That is all we have for you today. We appreciate you taking the time to talk with us and your feedback will help to improve the Block Bidding program so it can better serve customers like you going forward.

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A.1.4 HLR In-Store Intercept Survey

Introductory Questions

Q1. Hello, I'm with NMR Group, an independent research firm, and we're conducting a short survey of customers purchasing light bulbs today to help KCP&L, the local electric utility, learn more about how customers like you shop for light bulbs in this area. Would you be willing to take a few minutes to answer some questions? You will receive a ten dollar gift card to this store for your time. I am not selling anything or asking you to change your purchase.

1. Yes (Intercept)
2. No (Refused) [END INTERVIEW]

Great. Thank you.

Q2. Are you a KCP&L (or Kansas City Power & Light) electric customer?

1. Yes
2. No
98. Don't Know
99. Refused

Q3. [IF Q2 = "NO"] Who is your electric utility?
[DO NOT READ LIST. CATEGORIZE RESPONSE AS APPROPRIATE.]

1. Ameren MO
2. Westar Energy
3. Aquila – Black Hills Energy
4. Independence Power & Light
5. Board of Public Utilities
6. Other (Specify) _____

Q4. Were you planning to purchase light bulbs when you entered the store today?

1. Yes
2. No [SKIP TO Q6]
3. Don't Know [SKIP TO Q6]
4. Refused [SKIP TO Q6]

Q5. [IF Q4 = YES] What type (or types) of bulbs were you planning to buy? [SURVEYOR WILL NOT READ RESPONSE OPTION. WILL SHOW IPAD INTERFACE AND HAVE THEM SELECT FROM IMAGES THAT INCLUDE:

1. Incandescent
2. Halogen
3. CFLs
4. LED
5. Candle shape
6. PAR Reflector

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7. BR Reflector
8. Globe
9. A-line
10. None of these
11. Don't Know
12. Refused

Q6. Thinking about the bulbs you decided to buy, why did these bulbs catch your attention?
[DO NOT READ LIST. CATEGORIZE RESPONSE AS APPROPRIATE.]

1. Saw them prominently displayed in a special location in the store
2. They were discounted
3. Saw other signage that convinced you to purchase them
4. Received information from a staff person that convinced you to purchase them
5. Saw a demonstration of the bulbs in the store
6. Within price range wanting to spend
7. Cheapest option
8. Specific feature (dimmability, size, shape, light color, etc.)
9. It's the same bulb type as the bulb I'm replacing
10. Other: _____
98. Don't Know
99. Refused

Q7. Here is a list of features that some people consider when buying lighting bulbs. Thinking JUST about the bulbs that you are purchasing TODAY, can you to tell me which was the MOST IMPORTANT feature and which was the SECOND MOST IMPORTANT feature.
[RANDOMIZE, RECORD SELECTION]

A. Energy used/energy savings
B. Purchase price
C. Bulb lifetime
D. Shape
E. Environmental benefits
F. It is dimmable
G. Three-way capability
H. How bright it is
I. Warm or cool light color
J. Other [record]

Q8. Now I need to record the types of bulbs you are buying today. [REVIEW BULBS IN CART OR HAND AND COMPLETE THE FOLLOWING TABLE.]

[SURVEYOR WILL RECORD MANUFACTURER, MODEL NUMBERS AND BULB TYPE AND NUMBER OF PACKAGES PURCHASED (FOR QC PURPOSES) FOR ALL BULBS IN BASKET INTO TABLET, WHICH WILL BE PROGRAMMED TO TELL SURVEYOR WHICH BULBS ARE CURRENTLY DISCOUNTED.]
Manufacturer:
Model Number:

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Bulb Type:
Number of Packages Purchased:
Number of Bulbs Per Package:

[CALCULATE TOTAL NUMBER OF BULBS FOR THE FIRST MODEL ENTERED FOR POPULATING THE SURVEY.]

[DEFINE "BULB CLASS"]

[BASED ON THE PURCHASES, SURVEY PROGRAMMING WILL SPECIFY WHICH CATEGORY R FALLS INTO AND WILL AUTO-POPULATE WITH APPROPRIATE QUESTIONS AND SKIP PATTERNS.

1. DISCOUNT STANDARD LED: SELECTION INCLUDES DISCOUNTED STANDARD LEDs [READ TO RESPONDENT AS "LEDs"]
2. DISCOUNT SPECIALTY LED: SELECTION EXCLUDES DISCOUNTED STANDARD LEDs, AND INCLUDES DISCOUNTED SPECIALTY LEDs. [READ TO RESPONDENT AS "LEDs"]
3. NON-DISCOUNT LED: SELECTION EXCLUDES ALL DISCOUNTED BULB TYPES AND NON-DISCOUNTED STANDARD OR SPECIALTY CFLS BUT INCLUDES NON-DISCOUNTED LEDS. [READ TO RESPONDENT AS "LEDS"]
4. OTHER: SELECTION INCLUDES ONLY INCANDESCENT, HALOGEN, CFL OR OTHER NON-LED BULBS

[IF NEEDED] THIS IS THE BULB [HOLD UP PACKAGE] I WANT YOU TO THINK ABOUT WHEN YOU ANSWER THE QUESTIONS IN THE SURVEY. SOME OF THE QUESTIONS ASK YOU ABOUT PACKAGES AND OTHER ABOUT BULBS. YOU ARE BUYING X OF THESE PACKAGES [NUMER OF PACKAGES] FOR A TOTAL OF X OF THESE BULBS [PACKSIZE X NUMBER OF PACKAGES].]

Discount Effect

[ASK ONLY IF BULB CLASS = 1 OR 2. IF BULB CLASS = 1, ASK ONLY ABOUT STANDARD LEDs, IF BULB CLASS = 2, ASK ONLY ABOUT SPECIALTY LEDs. IF R PURCHASED MORE THAN ONE DISCOUNTED MODEL OF LED, GO THROUGH THE SERIES TWICE. IF R IS BUYING 3 OR MORE THAT ARE A MIXTURE OF STANDARD AND SPECIALTY, PRIORITIZE AS FOLLOWS:

1. STANDARD + SPECIALTY
2. SPECIALTY + SPECIALTY

This first series of questions asks you about the package.

Q9. Did you know, before I stopped you, that the LED(s) you are buying today is/are discounted?

1. Yes
2. No
98. Don't Know
99. Refused

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Q10. If the ["bulb" or "package of bulbs"] you are purchasing cost [$X, specific discount amount for bulb/package] more do you think you would have: [READ RESPONSES, ROTATING ORDER]

1. Selected the same number of [this/these] [bulb(s)/package(s)]
2. Selected fewer of [this/these] [bulb/package]
3. Selected no bulbs
4. Selected a different type of bulb
98. Don't know
99. Refused

Q11. [IF Q10 = 2] How many [bulbs/packages] would you have purchased?

[record quantity] _____

Cross Sector Sales – Program Discounted Bulbs

[ASK IF BULB CLASS = 1 OR 2, IF BUYING PACKAGES OF BULBS, DISCUSS IN TERMS OF TOTAL NUMBER OF BULBS (E.G., # OF PACKAGES X BULBS PER PACKAGE).]

The next questions ask about the number of bulbs. As a reminder, you are buying x of bulbs I'm interested in.

Q12. How many of these LED bulbs you are buying today do you plan to install in a home or business? [TOTAL MUST NOT EXCEED NUMBER OF BULBS]

A. Home: RECORD NUMBER OR "ALL"
B. Business/Other: RECORD NUMBER OR "ALL"
98. Don't know
99. Refused

Q13. [ASK IF Q12B>0 or "All"] In what type of business do you plan to install these bulbs?

1. Office
2. Retail
3. Restaurant
4. Grocery
5. Hotel/Motel/Lodging
6. K-12 School
7. College/University
8. Hospital/Nursing
9. Manufacturing/Industrial
10. Warehouse
11. Other (specify): _____
98. Don't Know
99. Refused

Cross Sector Sales – Possible Spillover

[ASK IF BULB CLASS = 3]

The next questions ask about the number of bulbs. As a reminder, you are buying x of the bulbs I'm interested in.

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Q14. How many of these LEDs you are buying today do you plan to install in a home vs. a business location?

A. Home: RECORD NUMBER OR "ALL"
B. Business/Other: RECORD NUMBER OR "ALL"
98. Don't know
99. Refused

Q15. [ASK IF Q14B>0 or "All"] In what type of business do you plan to install these bulbs?

1. Office
2. Retail
3. Restaurant
4. Grocery
5. Hotel/Motel/Lodging
6. K-12 School
7. College/University
8. Hospital/Nursing
9. Manufacturing/Industrial
10. Warehouse
11. Other (specify): _____
98. Don't Know
99. Refused

Awareness of Discount

[ASK OF ALL RESPONDENTS]

Q16. [IF Q9 <> "YES" OR BULB CLASS = 3 OR 4] Did you know, before I stopped you, that KCP&L provides a discount for the purchase of some LED bulbs?

1. Yes
2. No
98. Don't Know
99. Refused

Q17. [IF Q9 = "YES"] Earlier you mentioned that you were aware that there were discounted LEDs sold in this store. Did you know, before I stopped you, that some of those discounts are provided by KCP&L?

1. Yes
2. No
98. Don't Know
99. Refused

Q18. [ASK IF Q16 OR Q17 = YES] How did you first find out about KCP&L's discounts on LEDs? [DO NOT READ RESPONSE OPTIONS. CATEGORIZE RESPONDENT ANSWER AS APPROPRIATE.]

1. Saw KCP&L signage in the store
2. Learned about it in newspaper/tv/radio
3. Store employee made me aware of the discount

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4. Saw a lighting demonstration in the store
5. Heard about it from a friend
6. Saw it on KCP&L's website
7. Saw it on KCP&L bill
8. Other (specify): _____
98. Don't know
99. Refused

Q19. [IF BULB CLASS = 1 OR 2 AND Q16 OR Q17 = YES] Using a scale of 1 to 5 where 1 means not at all influential and 5 means very influential, how influential was knowing about the program discounts on your decision to buy LEDs today?

[RECORD ON SCALE OF 1 TO 5]

98. Don't Know
99. Refused

ENERGY STAR

Q20. [ASK ALL"] Have you ever noticed this ENERGY STAR label [SHOW IMAGE OF ENERGY STAR LABEL] on light bulb packages?

1. Yes, I noticed this label before today
2. Yes, I noticed this label FOR THE FIRST TIME today
3. No
98. Don't Know
99. Refused

Q21. [IF Q20 = 1 OR 2] Using a scale of 1 to 5 where 1 means not at all important and 5 means very important, how important was the ENERGY STAR label in your decision on which light bulbs to buy today?

[RECORD ON SCALE OF 1 TO 5]

98. Don't Know
99. Refused

Event/Information Effect

Q22. [IF EventDay = 1] While you were in the store today, did you see a demonstration of energy-efficient light bulbs or hear a lighting expert talk about LEDs?

1. Yes
2. No
98. Don't Know
99. Refused

Q23. [IF Q22 = "YES" AND BULB CLASS = 1 OR 2] Using a scale of 1 to 5 where 1 means not at all influential and 5 means very influential, how influential was the demonstration in your decision to buy LEDs?

[RECORD ON SCALE OF 1 TO 5]

98. Don't Know

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99. Refused

Q24. [IF EventDay = 0 and BULB CLASS = 1 OR 2] Did you see any in-store information such as signs or displays about LEDs in this store?

1. Yes
2. No
98. Don't Know
99. Refused

Q25. [IF Q24 = YES] Using a scale of 1 to 5 where 1 means not at all influential and 5 means very influential, how influential was the in-store information in your decision to buy LED bulbs? [RECORD ON SCALE OF 1 TO 5]

98. Don't Know
99. Refused

Q26. [IF Q20 = 1 or 2] Without looking back at it, do you recall if the in-store information talked about the ENERGY STAR label?

1. Yes, I recall seeing something about ENERGY STAR
2. No, I do not recall seeing something about ENERGY STAR
98. Don't Know
99. Refused

Q27. [IF BULB CLASS = 1 OR 2] Is this the first time that you've purchased LED bulbs?

1. Yes
2. No
98. Don't Know
99. Refused

Non-LED Bulb Questions

[IF BULB CLASS = 3]

Q28. Did you consider buying LEDs today?

1. Yes
2. No
98. Don't Know
99. Refused

Q29. [IF Q28 = YES] Why did you choose not to purchase any LEDs today? [DO NOT READ LIST. CATEGORIZE RESPONSE AS APPROPRIATE.]

1. Too expensive
2. Don't know enough about them
3. Have never tried them before
4. Someone requested that I purchase this bulb type
5. Couldn't find a LED in the size/shape needed
6. Don't like the light quality
7. Other (specify): _____

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Closing

[ASK OF ALL RESPONDENTS]

Q30. [IF Q2 = "YES"] Based on your overall experience as a customer of KCP&L, how would you rate the company on a 1 to 5 scale, where 1 is not at all satisfied and 5 is very satisfied?

[RECORD ON SCALE OF 1 TO 5]

98. Don't Know
99. Refused

Thank you for your assistance and time today. Please accept this gift card from KCP&L in appreciation of your time. You may use this card today.

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A.1.5 HER Participant Online Survey

Hello, my name is [INTERVIEWER NAME] and I am calling from LEEDE Research on behalf of KCP&L. This is not a sales call or billing call. We are conducting a short survey to learn about your experiences with KCP&L and the various programs that they provide to customers. This survey will only take a few minutes of your time.

May I speak to an adult 18 years or older in the household?

Screeners and Identification (all questions & all customers)

S1. Did I reach you on a cell phone?

1. Yes
2. No [SKIP TO S4]

S2. Are you driving a vehicle or using any equipment that requires your undivided attention?

1. Yes
2. No [SKIP TO S4]

S3. Is there a more convenient time to reach you?

1. Yes [SCHEDULE CALLBACK]
2. Yes, and please call this alternate number -- [SCHEDULE CALLBACK]
3. No, I don't wish to participate -- [TERMINATE]

S4. Are you the person in your household who typically pays your energy bill?

1. Yes [SKIP TO S7]
2. No

S5. Is the person responsible for paying your energy bill available?

1. Yes [TRANSFER TO THIS PERSON IF AVAILABLE, RE-READ INTRO, THEN BEGIN AT S7]
2. No

S6. Is there a better time for me to call them back and reach them?

1. Yes [SCHEDULE CALL BACK]
2. No [THANK AND TERMINATE]

S7. Do you or any member of your household work for Kansas City Power & Light?

1. Yes [THANK and TERMINATE]
2. No

Overall Satisfaction and Engagement (all questions & all customers)

O1. Overall, how satisfied are you with Kansas City Power & Light? Please use a one-to-ten scale where one means "Extremely Dissatisfied" and ten means "Extremely Satisfied." You can use any number from 1 to 10. [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

O2. Based on your experiences with Kansas City Power & Light, how likely would you be to recommend KCP&L to a friend assuming they had a choice in their utility service? Please use

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a one-to-ten scale where one means "extremely unlikely" and ten means "extremely likely". You can use any number from 1 to 10. [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

Energy Efficiency Attitudes and Engagement (all questions & all customers)

EE1. How familiar are you with energy efficiency or conservation programs from Kansas City Power & Light that help you with ways to use less energy?

1. Not at all familiar [SKIP TO EE3]
2. Not very familiar
3. Somewhat familiar
4. Very familiar
5. [NOT SURE]
6. [REFUSED]

EE2. Which Kansas City Power & Light energy efficiency or conservation programs have you heard of? [Do Not Read; Select All]

1. Rebates on air conditioners and heat pumps
2. Discounts on LED lightbulbs
3. Discounts or rebates on thermostats
4. Weatherization and Home Improvement Program
5. Other (specify)
6. [NOT SURE]
7. [REFUSED]

EE3. What actions have you taken in the past year to save energy in your home? [Do Not Read; Select all]

1. None
2. Hang clothes outside
3. Added insulation to home
4. Replaced windows or doors
5. Air sealed or weather-stripped around home
6. Installed a programmable or smart thermostat
7. Installed CFL or LED lighting
8. Purchased a new appliance (For example, refrigerator, freezer, clothes washer/dryer, dishwasher)
9. Set back your thermostat
10. Turned off lights more often
11. Unplugged appliances or electronic devices when not in use
12. Reduced your water heater's temperature
13. Gotten a home energy assessment/audit
14. Purchased a new water heater
15. Removed an extra refrigerator
16. Replaced air conditioner
17. Used the Energy Analyzer tool
18. Taken other actions: Specify [ANCHOR]
19. [NOT SURE]
20. [REFUSED]

EE4. [If EE3=1] Why have you not taken any energy saving actions? [RECORD VERBATIM]

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EE5. Kansas City Power & Light's provides customers with different types of tips on how to save energy or money in their homes. What types of energy-saving tips or recommendations would be most useful to you? [MULTIPLE RESPONSE; RANDOMIZE order of options 1-4] Select all that apply.

1. Do-it-yourself projects to save energy
2. No-cost actions you can take in your home to save energy
3. Products you can purchase to save energy
4. KCP&L program or rebate opportunities
5. Something else [SPECIFY:_____]
6. I am not interested in any energy-saving tips or recommendations
7. [NOT SURE]
8. [REFUSED]

Web & Email Engagement & Reception – All Customers

WE1. The Energy Analyzer is a tab on Kansas City Power & Light's My Account portal. The Energy Analyzer provides a breakdown of your energy use, has customizable energy saving tips, and lets you set energy goals.

Have you ever used the Energy Analyzer tool on Kansas City Power & Light's website?

1. Yes
2. No
3. [NOT SURE]
4. [REFUSED]

WE2. [IF WE1= 1. Yes] What page of the Energy Analyzer tool have you found most useful?

1. Breakdown of your energy use compared to your neighbors
2. Energy saving tips
3. Setting goals to reduce energy use
4. Creating a plan to save energy
5. Being able to add or change information about your home
6. Breakdown of what uses the most energy in your home
7. [NOT SURE]
8. [REFUSED]

WE3. [IF WE1=1.Yes] Have you taken any energy saving actions after using the Energy Analyzer tool?

1. Yes
2. No
3. [NOT SURE]
4. [REFUSED]

WE4. [IF WE1=1.Yes and WE3=1. Yes] What actions have you taken? [RECORD VERBATIM]

WE5. [IF TREATMENT GROUP=1] There are many ways that KCP&L could deliver the information in the Home Energy Reports to you. Please rank your first and second choices for how you'd like to receive this type of information.
[ROTATE A-D when read (anchor other); allow ranking, with values 1-2]

1. Paper (by mail)

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2. Email
3. Online (through KCP&L My Account portal
4. Text/SMS
5. Other (specify)
6. [NOT SURE]
7. [REFUSED]

WE6. [IF TREATMENT GROUP=1 and WE5 Email = 1 or 2] How often would you prefer to receive email reports?

1. Once per month
2. Every other month/six times per year
3. Quarterly/four times per year
4. Once or twice per year
5. Other (specify)
6. [NOT SURE]
7. [REFUSED]

Home Energy Report Recall [TREATMENT GROUP=1 only]

HERR1. In the past three months, do you remember receiving a Home Energy Report from Kansas City Power & Light about your in-home energy use?

1. Yes
2. No
3. [NOT SURE]
4. [REFUSED]

HERR2. The Home Energy Report is a printed report sent by mail, separate from your bill. It includes a breakdown of your energy use and that of similar homes in the area. The report also includes tips on how to save energy and money, as well as information about KCP&L's other offerings.

HERR3. [IF HERR1=Not Sure, Refused, or No] Did you receive this Home Energy Report?

1. Yes
2. No [SKIP TO DEMO]
3. Don't know [SKIP TO DEMO]
4. Refused [SKIP TO DEMO]

HERR4. [IF HERR1=Yes] Does this describe what you received?

1. Yes
2. No [SKIP TO DEMO]
3. Don't know [SKIP TO DEMO]
4. Refused [SKIP TO DEMO]

[generate "RECALL" variable RECALL = 1 IF HERR3=1 or HERR4=1 else RECALL = 0]

HERR5. [IF RECALL = 1] Which section of the report do you most vividly remember seeing?

1. Breakdown of your energy use
2. Comparison of energy use to that of neighbors in the area.
3. Tips on how to save energy and money
4. Information about KCP&L's other offerings

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5. FAQ section
6. Other (specify)
7. [NOT SURE]
8. [REFUSED]

HER Interaction – Recall Participants [RECALL=1] Only

HERI1. Which of the following statements best describes what you did with the last home energy report you received?

1. I read the report in detail
2. I skimmed the report
3. I glanced at the report, but didn't skim the whole thing
4. I did not read the report
5. [NOT SURE]
6. [REFUSED]

HERI2. [If HERI1=4] What prevented you from reading the report? [ROTATE; MULTIPLE RESPONSE] Select all that apply.

1. Too busy
2. Not interested in energy bills
3. Someone else in the household read it before me
4. It looked like junk mail
5. I read a previous report
6. Didn't think the information looked useful

HERI3. In thinking about the last report that you received, did you do any of the following? [ROTATE; MULTIPLE RESPONSE]

1. Discussed the report with members of your household
2. Discussed the report with people outside your household
3. Saved the report for future reference
4. Threw it away or recycled it
5. Other (specify)
6. [NOT SURE]
7. [REFUSED]

[IF HERI1=4, SKIP to DEMO]

HERI4. The Home Energy Report compares your home's energy usage to that of neighbors' in your area. Do you remember seeing this comparison?

1. Yes
2. No [SKIP to HERI8]

HERI5. [IF HERI4=1] On the most recent report, how did your energy use compare to average neighbors in your area?

1. My home used more than average neighbors
2. My home used about the same as average neighbors
3. My home used less than average neighbors
4. I don't remember
5. [REFUSED]

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HERI6. [IF HERI4=1] In your opinion, how useful is the neighbor comparison in helping you understand your home's energy usage? Use a scale of 1 to 10 where 1 is "not at all useful" and 10 is "extremely useful". [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

HERI7. [IF HERI4=1] In what ways could the neighbor comparison be made more useful? [OPEN END, RECORD VERBATIM]

HERI8. The Home Energy Reports provide recommendations for Kansas City Power & Light programs or rebates that could help you save energy in your home. Do you remember seeing program recommendations in the Home Energy Reports?

1. Yes
2. No [SKIP to HERI11]

HERI9. [IF HERI8=1] In your opinion, how useful are the Kansas City Power & Light program recommendations you've seen in your Home Energy Reports? Use a scale of 1 to 10 where 1 is "not at all useful" and 10 is "extremely useful". [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

HERI10. [IF HERI8=1] In what ways could the program recommendations be made more useful? [OPEN END, RECORD VERBATIM]

HERI11. The Home Energy Reports also provide energy-saving tips. Do you remember seeing energy-saving tips on the Home Energy Reports?

1. Yes
2. No [SKIP to HERI17]
3. [NOT SURE]
4. [REFUSED]

HERI12. [IF HERI11=1] Which tips do you remember most vividly? [OPEN END, RECORD VERBATIM]

HERI13. [IF HERI11=1] Did you do any of the tips from the reports?

1. Yes
2. No [SKIP to HERI15]
3. [NOT SURE]
4. [REFUSED]

HERI14. [IF HERI11=1 and HERI13=1] Which tips did you do? [OPEN END, RECORD VERBATIM]

HERI15. [If HERI11=1] In your opinion, how useful are the energy-saving tips you've seen in your Home Energy Reports? Use a scale of 1 to 10 where 1 is "not at all useful" and 10 is "extremely useful". [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

HERI16. [if HERI11=1] In what ways could the energy savings tips be made more useful? [OPEN END, RECORD VERBATIM]

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HERI17. On a scale of 1 to 10, with 1 being "unacceptable" and 10 being "outstanding", how would you rate Home Energy Reports overall? [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

HERI18. Based on your experiences with the Home Energy Reports, how likely would you be to recommend the reports to a friend? Use a scale of 1-10 where 1 is "extremely unlikely" and 10 is "extremely likely" [RECORD NUMBER 1-10; 97=Not sure; 98= Refused]

Demographics (all question & all customers)

The final following questions are optional and will help us make sure we are talking to lots of different people. It is okay if you prefer not to answer.

DEMO1. What type of residence do you live in?
[READ CATEGORIES] [ROTATE]

1. Single-family
2. Duplex or two-family
3. Apartment/condo in a 2-4-unit building
4. Apartment/condo in a 5+ unit building
5. Townhouse or row house (shared/adjacent walls to another house)
6. Mobile home, house trailer
7. [NOT SURE]
8. [REFUSED]

DEMO2. What is your primary language (That is, the one you speak most of the time?)

1. Japanese
2. English
3. German
4. Danish
5. Italian
6. Portuguese
7. Norwegian
8. Korean
9. Chinese
10. Russian
11. French
12. Spanish
13. Dutch
14. Greek
15. Hebrew
16. Swedish
17. Other
18. [REFUSED]

DEMO3. Do you rent or own your home?

1. Rent
2. Own
3. [NOT SURE]
4. [REFUSED]

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DEMO4. How many years have you lived in your current home?

1. One year or less
2. 2-3 years
3. 4-5 years
4. 6-10 years
5. More than 10 years
6. [NOT SURE]
7. [REFUSED]

DEMO5. When was your home built?

1. Before 1900
2. 1900 to 1939
3. 1940 to 1959
4. 1960 to 1979
5. 1980 to 1989
6. 1990 to 1999
7. 2000 to 2004
8. 2005 or later
9. [NOT SURE]
10. [REFUSED]

DEMO6. Including you, how many people are currently living in your home year-round? Include all members of your household whether or not they are related to you, but do not include anyone who is just visiting, or children who may be away at college or in the military. [RECORD ANSWER; 97-NOT SURE; 98=REFUSED]

DEMO7. Which of the following categories includes your age? Please tell me when I get to your range.

1. 18 to 24 years
2. 25 to 44 years
3. 45 to 64 years
4. 65 years and over
5. [NOT SURE]
6. [REFUSED]

DEMO8. Do you or any member or your household own any of the following? [Select all that apply]

1. Smartphone
2. Wearable technology (e.g. smartwatch or fitness tracker)
3. Smart thermostat
4. Programmable thermostat (not smart)
5. Smart bulbs
6. Smart appliances
7. Smart home security system
8. Voice-enabled home assistant
9. None
10. [NOT SURE]
11. [REFUSED]

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DEMO9. Which of the following categories best represents your total annual household income before taxes? Please tell me when I get to your range.

1. Less than $25,000
2. $25,000 to less than $50,000
3. $50,000 to less than $75,000
4. $75,000 to less than $100,000
5. $100,000 to less than $150,000
6. $150,000 or over
7. [NOT SURE]
8. [REFUSED]

Early termination script (screened out customers – Thank and dismiss)

Based on your responses you are not eligible to participate in this survey.

We appreciate your time and willingness to participate. On behalf of Kansas City Power & Light, we thank you.

Closing – all customers

This concludes the survey. Thank you very much for your time!

Your input is very valuable and will allow us to improve your experience as a customer with Kansas City Power & Light.

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A.1.6 Strategic Energy Management Participant Interview Guide

This interview guide is a tool to guide process evaluation interviews with program participants. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in their project's design and operation (i.e., where they have significant experiences for meaningful responses).
The purpose of this interview guide is to drive the discussion with program participants regarding the strengths and opportunities for improvement of KCP&L's SEM Program. This interview will be conducted via telephone and will be recorded and transcribed as needed for the purposes of this evaluation.

Research Objective	Interview Question Numbers
Is the **target market** segment appropriately defined, or should it be further subdivided or merged with other market segments?	6 - 8
What are the primary **market imperfections** that are common to the target market segment?	7
Does the **mix of end-use measures** included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	9, 10, 11, 13, 14
Are the **communication channels and delivery mechanisms** appropriate for the target market segment?	1, 8
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	1 – 5, 18 - 22

Name: _____ Date: _____
Title: _____ Company: _____

[INTRODUCTION SCRIPT] Thank you for your time today. The primary goal of our discussion today is to help me understand how the SEM Program is:

- currently operating,
- If and how the process has changed over the past two years and the effect of those changes on the program and participants,
- and identify ways we can help you improve the program.

Just a reminder that I am recording this call so I can focus on the discussion, rather than notetaking. I will not share this recording beyond my immediate Navigant team and will only use it to clarify my notes after the call.

Before we begin, do you have any questions for me?

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Introduction

We are interested in asking you some questions about the program so we can understand the Strategic Energy Management (SEM) program elements and get a sense of program successes and challenges, from your perspective.

1. I have a couple general questions. Have you been the Energy Champion for the past two years?

    a. [IF Not] How was the knowledge of the program and your company's experience with it transferred to you?

2. Do you think you have enough support within your company and from CLEAResult, the implementation contractor, to be successful in the SEM program?

3. What percent of your working time is spent on energy management?

4. Are there other colleagues at your company who also work on these issues?

5. Have you (and your colleagues if applicable) increased the share of time you spend on energy management related tasks since participating in the program? [Probe for description of how their role has changed since participating.]

Program Structure

6. In the first year of the program, what were your company's goals in pursuing SEM?

1	Rebate/ incentive	
2	Lower utility bill	
3	Help to justify investment	
4	Able to make improvements sooner	
5	Energy savings	
6	Training for your staff	
7	Identify opportunities	
8	Employee awareness	
9	Company culture changes	
10	Other	

    b. How did you perform against your goals in the first year?

    c. Did your goals remain the same in the second year, and how did you perform against your goals in the second year?

7. Do you think you will continue participating in the SEM program?

8. If no, how will you continue to maintain the behavioral changes made?

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SEM Influenced Site Changes

9. What behavioral changes has your facility undertaken because of the SEM Program?

10. What capital measures have you installed at your facility during your participation in the SEM program?

    a. [If yes] Can you estimate the energy savings the facility realized?
    b. Did you receive a rebate for this/these measures?
    c. [If yes] Which ones?
    d. Did you explore other KCP&L business energy efficiency programs when installing these measures?
    e. [Potential if needed] Would you have done these capital projects without this program?

11. Using a scale of 0-10 where 0 is not influential and 10 is very influential, how influential was the SEM program in your facility's decision to install these measures?

12. Do you feel the SEM program added value to your site(s) beyond the energy savings?

    a. [If yes] Can you explain further?

13. Have you increased your participation in other KCP&L Standard (Prescriptive) or Custom Programs over the past two years compared to years past?

14. Are the SEM changes you made in the first year still in place?

    a. How do you track the persistence of these savings?

15. Since you began participating in this program, has your facility had any significant change in hours of operation?

    a. Did the SEM program influence these changes in operating hours?

16. Since you began participating in this program, has your facility had any significant change in the number of employees?

    a. Did the SEM program influence these changes in production?

17. Since you began participating in this program, has your facility had any significant change in production volume?

    a. Did the SEM program influence these changes in production volume?

Training Workshops

18. Did you receive additional SEM training during the second year?

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[If yes continue, otherwise skip to section E]

19. On a scale of 0-10, where 0 is not at all satisfied and 10 is very satisfied, how satisfied are you with the frequency of this training?

    a. [If <6] What are the reasons that you are less than satisfied with the frequency of the training?

20. On a scale of 0-10, where 0 is not at all satisfied and 10 is very satisfied, how satisfied are you with the content of this training?

    a. [If <6] What are the reasons that you are less than satisfied with the content of this training?

21. In particular, what major benefits have you gotten from the training?

22. In regard to your interaction with CLEAResult:

    a. What were some of the activities, either through the workshops or onsite visits, that were beneficial to you?

    b. Were there activities/support that you were hoping to get out of this program that you did not?

Site Specific Question

This will be determined by the initial impact evaluation of a specific customer.

Participant Satisfaction

23. On a scale of 0-10, where 0 is not at all satisfied and 10 is very satisfied, how satisfied are you with the program, overall?

24. Is there anything KCP&L could do to increase your satisfaction with the program, overall?

Closing

25. Do you have any other comments, concerns or suggestions about the program that we did not discuss that you would like to make sure I know about?

Thank you very much for taking the time in assisting us with this evaluation. If I come up with any additional questions that come from this interview, do you mind if I send you an email or give you a quick call?

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A.1.7 Residential and Business Thermostat Program Post-Event Survey Guide

Event Participation and Awareness

1. **Did you or another member of your [household/business] notice a change in the temperature in your [home/business] at any point on [DATE]?**
   a. Yes
   b. No
   c. Don't Know

2. **Rush Hour Rewards helps you earn rewards from KCP&L for saving energy during peak demand periods (aka "Rush Hours"), while still keeping you comfortable.**

   During a Rush Hour Event, Nest has the ability to adjust the cooling of your central air conditioner by sending a signal to your Nest Thermostat and adjusting the setpoint by a maximum of 3 degrees.

   Were you aware that an event occurred on [DATE]?
   a. Yes
   b. No [Skip to Q6]
   c. Don't know [Skip to Q6]

3. **How did you become aware of the Rush Hour Rewards event occurring on [DATE]? Please check all that apply.**
   a. I saw the notification on the Nest Thermostat
   b. I received a text
   c. I received an email
   d. I checked the KCP&L website
   e. Someone else in my household told me
   f. I assumed it was an event because it was hot
   g. Other; please describe [OPEN ENDED]

4. **How satisfied were you with the notification you received about the Rush Hour Event that was set to occur? Please rate on a scale of 1 to 5, where 1 means "very dissatisfied" and 5 means "very satisfied."**

a. Very Dissatisfied	b.	c.	d.	e. Very Satisfied	f. Did not receive a notification	g. Don't Know
1	2	3	4	5		

[IF Q4 = a-d, f, or g, CONTINUE. OTHERWISE SKIP]

5. **How could the Rush Hour Event notifications be improved? [OPEN-END, OPTIONAL]**

6. **How many Rush Hour Events do you recall happening so far this summer? If you're not sure, please take your best guess.**
   [NUMERIC-OPEN END, RANGE 0-50, DK]

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7. **KCP&L called a Rush Hour Event on [DATE], starting at [INSERT EVENT_STARTTIME] and ending at [INSERT EVENT_ENDTIME].**

   Which of the following statements best characterizes your presence during this Rush Hour Event? (Select only one)
   a. I was at my [home/business] during this entire period.
   b. I was at my [home/business] for only part of this period (*please note which hours you were home*).
   c. I was not at my [home/business] during any of this period and was not monitoring my Nest Thermostat or Nest App.
   d. I was not at my [home/business] during any of this period, but I was monitoring my Nest Thermostat or Nest App.
   e. Don't Know

[IF Q7 = d OR c, CONTINUE. OTHERWISE SKIP TO Q9]

8. **Was another member of your household at home on [DATE], between [INSERT EVENT_STARTTIME] and [INSERT EVENT_ENDTIME]?** (Select only one)
   a. At least one other member of my [household/business] was at our [home/business] for this entire period.
   b. At least one other member of my household was at our [home/business], but for only part of this period (*please note which hours the* [home/business] *was occupied*).
   c. No one was at our [home/business].
   d. Don't Know

Impact on Comfort Level

[IF Q7 = a OR b, OR IF Q8 = A OR b, CONTINUE. ELSE SKIP to NEXT SECTION - Q12]

9. **How would you describe the comfort level of your [home/business] during the following time periods on [DATE] compared to a typical day with similar outside temperatures?**

	Much Less Comfortable (1)	Less Comfortable (2)	No Change (3)	More Comfortable (4)	Much More Comfortable (5)	Don't Know
Q9a. [PRE-COOL_STARTTIME] to [EVENT_STARTTIME]						
Q9b. [EVENT_STARTTIME] to [EVENT_ENDTIME]						

[IF Q9a = 1-2, CONTINUE. OTHERWISE SKIP TO Q11]

10. **What caused your discomfort from [PRE-COOL_STARTTIME] to [EVENT_STARTTIME] on [DATE]? Please check all that apply.**
    a. Too cold
    b. Too warm
    c. Too humid

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d. Too dry
e. Other (*Please specify*)
f. Don't know

[IF Q9b = 1-2, CONTINUE. OTHERWISE SKIP TO Q12]

11. What caused your discomfort from [EVENT_STARTTIME] to [EVENT_ENDTIME] on [DATE]? Please check all that apply.

a. Too cold
b. Too warm
c. Too humid
d. Too dry
e. Other (*Please specify*)
f. Don't know

Thermostat Adjustment

[IF Q7 = a, b, OR d, OR IF Q8 = a OR b, CONTINUE. ELSE SKIP to Q15]

12. At any point <u>before</u> or <u>during</u> the hours of [INSERT HOURS OF EVENT] on [DATE], did you or any other member of your [household/business] adjust your thermostat? Please check all that apply.

a. Yes, adjusted thermostat <u>before</u> [EVENT_STARTTIME]
b. Yes, adjusted thermostat <u>during</u> the hours of [INSERT HOURS OF EVENT]
c. No
d. Don't Know

[IF Q12 ANSWER INCLUDES a, CONTINUE. OTHERWISE SKIP TO Q14]

13. Why did you or another member of your [household/business] adjust your thermostat <u>before</u> the [EVENT_STARTTIME] on [DATE]? Please check all that apply.

a. [Home/Business] was too cool
b. [Home/Business] was too warm
c. Did not want [home/business] to get too warm/uncomfortable later on
d. Someone needed the temperature adjusted for health reasons
e. [ONLY IF Q1=a] Was too uncomfortable during previous Rush Hour Events
f. [ONLY IF Sector=Residential] Had guests/visitors over on [DATE]
g. Other (*Please specify*)
h. Don't Know

[IF Q12 ANSWER INCLUDES b, CONTINUE. OTHERWISE SKIP TO Q15]

14. Why did you or another member of your [household/business] adjust your thermostat <u>during</u> the hours of [INSERT HOURS OF EVENT] on [DATE]? (select all that apply)

a. [Home/Business] was too cool
b. [Home/Business] was too warm
c. Did not want [home/business] to get too warm/uncomfortable
d. Someone needed the temperature adjusted for health reasons
e. [ONLY IF Q1=a] Was too uncomfortable during previous Rush Hour Events
f. [ONLY IF Sector=Residential] Had guests/visitors over on [DATE]
g. Other (*Please specify*)
h. Don't Know

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Behavioral Impacts (1-2 questions; 0 if not home during event)

[IF Q7 = a OR b, OR IF Q8 = a OR b, CONTINUE. ELSE SKIP TO NEXT SECTION - Q17]

15. **During the high temperatures on [DATE], what did you or other members of your [household/business] do to keep cool?** (select all that apply)
    a. Continued normal activities/Didn't do anything different
    b. Did not notice a difference in temperature
    c. Turned on fans
    d. Turned on room/window air conditioners
    e. Closed blinds/shades
    f. Moved to a cooler part of the [home/business]
    g. Left the [home/business] and went somewhere cool
    h. Wore less clothing
    i. Drank more water/cool drinks
    j. Opened windows
    k. Other (*Please specify*)
    l. Don't know

[IF Q2 = a, CONTINUE. ELSE SKIP TO Q17]

16. **What actions, if any, did you take to reduce your electricity use on [DATE] when a Rush Hour Event occurred?** (choose all that apply)
    a. [ONLY IF Sector=Residential] Discussed energy conservation strategies with my family
    b. Sought activities outside of the [home/business]
    c. Did not use certain appliances
    d. Other (*Please specify*)
    e. None
    f. Unsure

General Satisfaction (5 questions; 2 open-ended)

17. **How satisfied are you with the Rush Hour Rewards program? Please rate on a scale of 1 to 5, where 1 means "very dissatisfied" and 5 means "very satisfied."** [1-5, Don't know]

18. **In future summers, would you continue to participate in Rush Hour Rewards?**
    a. Yes
    b. Maybe
    c. No

[IF Q18 = b OR c, CONTINUE. OTHERWISE SKIP TO Q20]

19. **What change(s) to the Rush Hour Rewards program would encourage you to continue participating?** [OPEN-END, OPTIONAL]

[IF Q18 = a, CONTINUE. OTHERWISE SKIP TO Q21]

20. **What recommendations would you make to help improve the Rush Hour Rewards program going forward?** [OPEN-END, OPTIONAL]

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Demographics

We have just a few more questions about your household. As a reminder, all of your responses are confidential and are used solely for statistical purposes.

D1. Do you own or rent your home?

1. Own
2. Rent

D2. Which of the following best describes your home? Is it…

1. Single-family
2. Twin, duplex or two-family unit
3. Apartment/condo in a 2-4 unit building
4. Apartment/condo in a >4 unit building
5. Townhouse or row house (adjacent walls to another house)
6. Mobile home, house trailer
7. Or something else (Specify)

98. DON'T KNOW

D3. What is the approximate square footage of your house?

_____sq. ft. [NUMERIC-OPEN END, RANGE 100-20,000, DK]

D4. How old is your home?

_____YEARS [Scale=1-300]

98. DON'T KNOW

D5. How many individuals live in your home?

_____ [NUMERIC-OPEN END]

D6. How many children live in your home?

_____ [NUMERIC-OPEN END]

D7. What is your age?

_____ YEARS [NUMERIC-OPEN END or Prefer not to answer]

D8. What is your total 2016 income before taxes for all members of your household?

1. Less than $30,000
2. $30,000 but under $50,000
3. $50,000 but under $75,000
4. $75,000 but under $100,000
5. $100,000 but under $150,000
6. $150,000 but under $200,000
7. $200,000 or more

99. Prefer not to answer

D9. What is the highest education level you have completed? [READ LIST]

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1. Some high school
2. High school graduate
3. Some college/vocational school
4. College degree
5. Graduate or professional degree
6. OTHER (SPECIFY) _____
99. Prefer not to answer

Closing Questions

The survey is nearly complete. Do you have any additional comments regarding the Rush Hour Rewards program? [OPEN-END, DK]

Those are all our questions for you. Thank you for your time! Please provide your name and your preferred email address so that we may send you a $5 Amazon gift card. If you would not like to receive the gift card, you may leave these fields blank.
Full Name:
Email:
[OPEN-END, OPTIONAL]

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A.1.8 Residential and Business Thermostat Program Post-Season Survey Guide

Screeners

1. **Our records show that you received a free Nest thermostat from KCP&L in <MonthYear>. Is that correct?**
    1. Yes
    2. No
    3. Don't know

    [Ask if Q1=2 or 3, else skip to Q2]
    1a. Do you have a Nest thermostat that you purchased elsewhere?
    1. Yes
    2. No [Thank and terminate]
    3. Don't know [Thank and terminate]

[Ask if <RHRflag>=Yes else skip to Q3]

2. **Our records also show that your [household/business] is a participant in the KCP&L Rush Hour Rewards program. [Link to program description: https://nest.com/energy-partners/kcpl/] Is that correct?**
    1. Yes
    2. No
    3. Don't know

    [Ask if Q2=2 or 3, else skip to Q3]
    2a. Is there anyone else in your [household/business] who might be more familiar with the KCP&L program?
    1. Yes [Collect email address and terminate]
    2. No [Thank and terminate]
    3. Don't know [Thank and terminate]

[Ask if <SSflag>=Yes else skip to Q4]

3. **Our records also show that your [household/business] is a participant in the KCP&L Seasonal Savings program, which helps to optimize your Nest thermostat to learn your schedule and save energy. [Link to program description: https://nest.com/support/article/What-is-Seasonal-Savings]** Is that correct?
    1. Yes
    2. No
    3. Don't know

    [Ask if Q3=2 or 3, else skip to Q4]
    3a. Is there anyone else in your [household/business] who might be more familiar with the KCP&L program?
    1. Yes [Collect email address and terminate]
    2. No
    3. Don't know

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[If 2=Yes or 3=Yes, proceed, else terminate the survey.]

Program Awareness and Installation Process

4. Did you install the Nest thermostat yourself or was it installed by a professional?

1. Installed myself or by someone in my [household/business]
2. Had a professional install it
3. Don't know

[Ask if Q4=2, else skip to Q5]

4a. Did you arrange the installation of your Nest thermostat through the KCP&L program?

1. Yes
2. No
3. Don't know

[Ask if Q2=Yes, else skip to Q6]

5. How did you become aware of the Rush Hour Rewards program? Please check all that apply. [Allow multiple responses]

1. Nest thermostat setup wizard
2. Email from KCP&L
3. Email from Nest
4. KCP&L website
5. Nest website
6. Mailing/bill insert
7. Word of mouth/friends/family/colleagues
8. Other; please describe [OPEN END]
9. Don't know

5a. What motivated you to enroll in Rush Hour Rewards?
[OPEN ENDED]

[Ask if Q3=Yes, else skip to Q7]

6. How did you become aware of the Seasonal Savings program? Please check all that apply. [Allow multiple responses]

1. Nest thermostat setup wizard
2. Email from KCP&L
3. Email from Nest
4. KCP&L website
5. Nest website
6. Mailing/bill insert
7. Word of mouth/friends/family
8. Other; please describe [OPEN END]
9. Don't know

6a. What motivated you to enroll in Seasonal Savings?
[OPEN ENDED]

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Event Awareness and Behaviors

7. **How often are you at your [home/business] during summer afternoons on weekdays (Monday through Friday)? Please think about your typical summer week, not exceptions to your usual routine (such as short vacations).**
    1. Zero afternoons per week
    2. 1-2 afternoons per week
    3. 3-4 afternoons per week
    4. 5 afternoons per week (Monday through Friday)
    5. Varies significantly week-to-week

[Ask if Q2=Yes, else skip to Q10]

8. **How many Rush Hour Rewards Events do you recall during summer 2017? If you're not sure, please just take your best guess.**
   [NUMERIC OPEN END]

   [Ask if Q8>0, else skip to Q10]
   8a. Which types of notifications do you recall receiving about the event that was set to occur? Please select all that apply.
    1. Notification on the Nest thermostat
    2. Notification on the Nest phone app
    3. Text message
    4. Email
    5. KCP&L website
    6. Other; please describe: [OPEN END]
    7. Don't know

   8b. Would you say that you overrode your thermostat settings on all, some, or none of the events?
    1. All
    2. Some
    3. None
    4. Don't know

   [Ask if Q8b=1 or 2, else skip to Q8d]
   8c. Why did you override the thermostat settings during Rush Hour Reward events?
   [OPEN END, DK]

   8d. Did you ever use the Nest phone app to monitor your home's temperature during an event?
    1. Yes
    2. No
    3. Don't know

9. **On hot days, what do you or other members of your [household/business] do to keep cool? Please select all that apply.** [Randomize options 2-9, allow multiple responses]
    1. Don't do anything different
    2. Set main air conditioner thermostat to a cooler setting

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3. Turn on fans
4. Turn on room/window air conditioners
5. Close blinds/shades
6. Move to a cooler part of the [home/business]
7. Leave the [home/business] to go somewhere cool
8. Wear less clothing
9. Drink more water/cool drinks
10. Open windows
11. Other; please specify: [OPEN END]
12. Don't know

10. On hot days, what actions, if any, do you or other members of your [household/business] take to reduce your electricity use?

1. [Only if <Sector>=Residential] Discuss energy conservation strategies with my family
2. Seek activities outside of the [home/business]
3. Avoid using certain appliances/equipment
4. Other; please specify: [OPEN END]
5. None (do not take any actions)
6. Don't know

Channeling

11. Since you received your Nest thermostat, have you participated in any other KCP&L energy efficiency programs?

1. Yes
2. No
3. Don't know

[Ask if Q11=Yes, else skip to Q12]

11a. Which ones? Please select all that apply.

1. Heating and Cooling Rebate program
2. Insulation and Air Sealing Rebate program
3. Energy Savings Kit home energy assessment program
4. Home Energy Reports
5. LED Discount Program
6. Home Online Energy Analyzer Program
7. Income Eligible Multifamily
8. Income Eligible Weatherization
9. Thermostat Program
10. Other; please specify: [OPEN END]
11. Don't know

11b. Did your experience with the <PROGRAMS> influence your decision to participate in these other KCP&L programs?

1. Yes
2. No
3. Don't know

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Satisfaction: General

12. **How would you have rated your satisfaction with your comfort on hot summer days before you installed the Nest thermostat? Please rate on a scale of 1 to 5 in which 1 means "very dissatisfied" and 5 means "very satisfied."**
[1-5, DK]

13. **How satisfied are you with each of the following elements of your program experience? Please rate on a scale of 1 to 5 in which 1 means "very dissatisfied" and 5 means "very satisfied."** [MATRIX STYLE QUESTION, 1-5, DK]
    - 13a. Program enrollment process
    - 13b. [If Q1=1] Receiving your Nest thermostat for free
    - 13c. The Nest thermostat installation process
    - 13d. The Nest thermostat itself
    - 13e. Your comfort level on hot summer days
    - 13f. [If <RHRflag>=Yes] Rush Hour Rewards event notifications
    - 13g. [If <RHRflag>=Yes] The number of Rush Hour Rewards events this summer
    - 13h. [If <RHRflag>=Yes] The length of the Rush Hour Rewards events
    - 13i. [If <RHRflag>=Yes] Your overall experience with the Rush Hour Rewards program
    - 13j. [If <SSflag>=Yes] The energy savings you achieved through participating in the Seasonal Savings program
    - 13k. [If <SSflag>=Yes] Your overall experience with the Seasonal Savings program

[Repeat for each response to Q13a-k that is less than 3]

14. **Why did you give [program element] that rating?**
[OPEN END]

Satisfaction: Rush Hour Rewards

[Ask if <RHRflag>=Yes, else skip to Q17]

15. **Do you plan to participate in the Rush Hour Rewards program next year?**
    1. Yes
    2. No
    3. Don't know

16. **Would you recommend the Rush Hour Rewards program to a friend?**
    1. Yes
    2. Maybe
    3. No

[Ask if Q15=Yes or Q16=Yes or Maybe, else skip to Q16b]

16a. In your own words, how would you describe the benefits of participating in the Rush Hour Rewards program?
[OPEN END]

[Ask if Q16=No or Don't Know or Q17=Maybe or No, else skip to Q17]

16b. From your perspective, what if anything could be done to improve the Rush Hour Rewards program?

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[OPEN END]

Satisfaction: Seasonal Savings

[Ask if <SSflag>=Yes, else skip to Q19]

17. Do you plan to participate in the Seasonal Savings program next year?

1. Yes
2. No
3. Don't know

18. Would you recommend the Seasonal Savings program to a friend?

1. Yes
2. Maybe
3. No

[Ask if Q17= Yes or Q18=Yes or Maybe, else skip to Q18b]

18a. In your own words, how would you describe the benefits of participating in the Seasonal Savings program?

[OPEN END]

[Ask if Q17=No or Don't Know or Q18=Maybe or No, else skip to Q19]

18b. From your perspective, what if anything could be done to improve the Seasonal Savings program?

[OPEN END]

Satisfaction: KCP&L

19. Based on your overall experience as a customer of KCP&L, how would you rate your satisfaction with the company? Please use a 5-point scale in which 5 is very satisfied and 1 is not at all satisfied. [1-5, DK]

[Ask if Q19a<3, else skip to Q20]

19a. What were the reasons that you give it that rating?

[OPEN END]

Demographics

20. Do you own or rent your home?

1. Own
2. Rent

21. Which of the following best describes your home? Is it…

1. Single-family
2. Twin, duplex or two-family unit
3. Apartment/condo in a 2-4 unit building
4. Apartment/condo in a >4 unit building
5. Townhouse or row house (adjacent walls to another house)
6. Mobile home, house trailer

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7. Or something else (Specify)
8. DON'T KNOW

22. What is the approximate square footage of your house?
[NUMERIC OPEN END, RANGE 100-20,000, DK]

23. How old is your home in years?
[NUMERIC OPEN END, RANGE 0-200, DK]

24. How many adults live in your home?
[NUMERIC OPEN END, RANGE 1-20]

25. How many children live in your home?
[NUMERIC OPEN END, RANGE 0-20]

26. What is your age?
[NUMERIC-OPEN END, RANGE 18-110]

27. What was your household's total 2016 income before taxes?

1. Less than $30,000
2. At least $30,000 but under $50,000
3. At least $50,000 but under $75,000
4. At least $75,000 but under $100,000
5. At least $100,000 but under $150,000
6. At least $150,000 but under $200,000
7. At least $200,000 or more
8. Prefer not to answer

28. What is the highest education level you have completed? [READ LIST]

1. Some high school
2. High school graduate
3. Some college/vocational school
4. College degree
5. Graduate or professional degree
6. OTHER (SPECIFY) _____
100. Prefer not to answer

Closing Questions

29. We have reached the end of the survey. Do you have any additional comments regarding the <ProgramName>?
[OPEN-END, NO, DK]

30. Please provide your name and your preferred email address so that we may send you a $5 Amazon gift card.
Full Name: [OPEN END]
Email: [OPEN END, LIMIT TO VALID EMAIL ADDRESSES]

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A.2 Trade Ally Survey Guides

A.2.1 C&I Standard and SBL Trade Ally Online Survey

Sample Variables

Note: throughout this survey, these sample variables will appear in brackets like this: <MEASURECAT>. These are data points that will be piped into the survey to customize the language and skip patterns for each respondent based on their type of participation in the program.
<Program>: *C&I Standard* or *Small Business Lighting*
<AltProgram>: *C&I Standard* or *Small Business Lighting* (the opposite of <PROGRAM>)
<DualFlag>: *Yes* (means trade allies participated in both SBL and Standard) or *No* (means trade allies participated only in one program)
<MeasureCat>: *Lighting*, *Compressed Air*, *HVAC*, *Refrigeration*, or *Motors, Drives & Compressors*
<Measure1>: Trade ally's highest saving measure
<Measure2>: Trade ally's second highest saving measure (if applicable)
<Measure3>: Trade ally's third highest saving measure (if applicable)
<Measure1qty>: Number of program-incented <Measure1> units in 2017
<Measure2qty>: Number of program-incented <Measure2> units in 2017 (if applicable)
<Measure3qty>: Number of program-incented <Measure3> units in 2017 (if applicable)

Intro & Screeners

Thank you for participating in the KCP&L <Program> Program Trade Ally Survey. This survey effort will provide KCP&L with valuable feedback to improve program offerings and ultimately help you better serve your customers. This survey is being administered by KCP&L's independent third-party evaluator, Navigant, and your responses will remain confidential and will be presented to KCP&L only in aggregate form.

In thanks for your time, KCP&L would like to offer you a $100 gift card for participation in the survey. You must complete the entire survey to receive the gift card. At the end of the survey, you will be asked to provide the mailing address at which you wish to receive the gift card.

[IF <DualFlag>=Yes]
Note: you may have participated in both the C&I Standard and the Small Business Lighting programs, but for the purposes of this survey, please focus on the Small Business Lighting program unless otherwise noted.

[Ask if <PROGRAM>="C&I Standard", else skip to S2]
S1. In what year did you first participate in KCP&L's <PROGRAM> program?
1. 2013 or earlier
2. 2014
3. 2015
4. 2016
5. 2017
98. Don't know

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[Create variable <2015Flag>. If S1=1, 2 or 3, <2015Flag> is "Yes"; all other respondents are "No" including SBL participants.]

S2. What type of role(s) do you play on efficiency projects that participate in KCP&L's <PROGRAM> program? Please check all that apply.

1. Making sales calls via phone
2. Making sales calls in person
3. Preparing project specifications/proposals for customers
4. [IF <PROGRAM>=Small Business Lighting] Entering data into the OPEN tool
5. Processing incentive applications
6. Installing equipment at customer sites
7. Other [Please describe _____]

98. Don't know

Program Influence on Trade Ally

PITA1. Have you participated in any program webinars, meetings, or training sessions, or received any educational materials from the program?

1. Yes
2. No

98. Don't Know

PITA2. Have you ever brought a KCP&L program staff member on sales calls to customer sites with you?

1. Yes
2. No

98. Don't Know

[IF PITA2=1, ASK PITA2a, ELSE SKIP TO PITA3]
PITA2a. About how many times have you brought a KCP&L program staff member on sales calls with you?
[NUMERIC OPEN ENDED]

98. Don't know

PITA2b. How helpful are those joint sales calls with KCP&L staff in selling high efficiency <MEASURECAT>?
[1-5 scale, endpoints labeled 1 "Not at all helpful" and 5 "Very helpful"]

98. Don't Know

PITA3. Have you received any marketing materials from the <PROGRAM> program for you to pass along to your customers?

1. Yes
2. No

98. Don't Know

[IF PITA3=1, ASK PITA3a, ELSE SKIP TO PITA4]
PITA3a. How much influence have those marketing materials had on your ability to market energy efficiency to your customers?
[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]

i. Don't Know

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PITA4. Since you started participating in the <PROGRAM>, have you changed the <MEASURECAT> equipment that you offer to your customers, especially regarding level of efficiency? For example, have you… [SELECT ALL]

1. Started offering higher efficiency equipment as the "default" recommendation
2. Added new high efficiency equipment to your offerings
3. Stopped carrying lower efficiency equipment
4. Other [SPECIFY]
5. None of the above

ii. Don't know

[IF PITA4=1, 2, or 3, ASK PITA4a, ELSE SKIP TO PITA5]

PITA4a. If the programs had never been available, what is the likelihood that you would have made those same changes in your offerings for high efficiency <MEASURECAT>?

[1-5 scale, endpoints labeled 1 "Not at all likely" and 5 "Very likely"]

98. Don't Know

PITA5. Have you observed an increase in your overall high efficiency <MeasureCat> sales since participating in the <PROGRAM> program?

1. Yes
2. No
98. Don't know

[IF PITA5=1, ASK PITA4a, ELSE SKIP TO PITA6]

PITA5a. Would you say that your overall <MeasureCat> sales have increased, a higher percentage of customers are choosing high efficiency <MeasureCat>, or both?

1. Overall sales have increased (including standard and high efficiency)
2. A higher percentage of customers are choosing high efficiency
3. Both
98. Don't know

[ASK IF PITA5a=2 or 3, ELSE SKIP TO PITA5d]

PITA5b. Making your best estimate, what was the percentage of customers who choose high efficiency options before you started participating in the program in <S1>?

RECORD NUMBER BETWEEN 0% and 100%

98. Don't Know

PITA5c. And, making your best estimate, what was the percentage of customers who chose high efficiency options in 2017?

RECORD NUMBER BETWEEN 0% and 100%

98. Don't Know

PITA5d. How influential do you think the <PROGRAM> program was on the increase in high efficiency sales?

[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]

98. Don't Know

PITA5e. Has the program's influence on your business enabled you to hire additional employees to meet the additional demand for high efficiency?

1. Yes
2. No
98. Don't know

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PITA6. If the <PROGRAM> program did not exist, how would your business be different (if at all)?
[OPEN ENDED]
98. Don't Know

Measure-Level Sales

ML1a. Our next set of questions focuses on your past and current sales of the three highest saving energy efficiency measures that you installed through the <PROGRAM> program in 2017. The following table summarizes those three measures based on your projects recorded in the program database. [IF <DualFlag>=Yes, add "Note that this table only includes measures sold through the Small Business Lighting program and not other KPC&L programs you may have participated in."]

Measure Name	Number of Units Rebated by KCP&L in 2017
<Measure1>	<Measure1qty>
<Measure2>	<Measure2qty>
<Measure3>	<Measure3qty>

Did you sell any more of these measures *without* KCP&L program rebates in 2017? Please consider only measures sold in KCP&L's Missouri territory to the extent possible (see map).
1. Yes [CONTINUE]
2. No [SKIP TO ML5]
98. Don't know [SKIP TO ML5]

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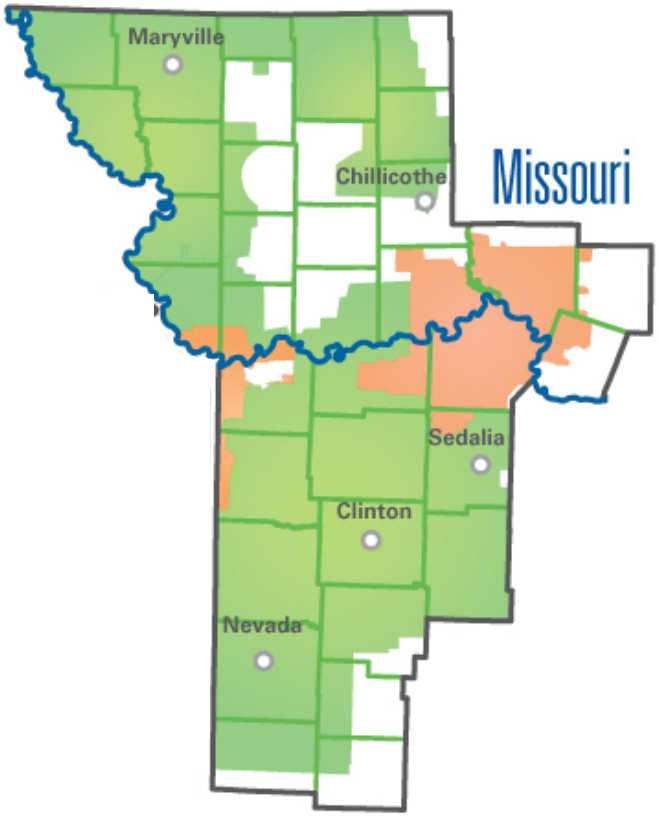

[IF ML1=1, ELSE SKIP TO ML5]

ML2. Approximately how many additional units did you sell in 2017 without rebates, in KCP&L's Missouri territory? An estimate is fine.

Measure Name	Number of Units Rebated by KCP&L in 2017	Number of Additional Units Sold <u>Without</u> Rebates in 2017
<Measure1>	<Measure1qty>	ML2a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>	ML2b. [NUMERIC OPEN END]
<Measure3>	<Measure3qty>	ML2c. [NUMERIC OPEN END]

ML3. How influential do you think the <PROGRAM> program was on these additional units sold without rebates?

[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]

98. Don't Know

ML4. Why didn't you seek KCP&L rebates for these additional units sold?

[OPEN ENDED]

98 Don't Know

ML5. Are there any *other* program-qualifying measures that you frequently install without any KPC&L program rebates in KCP&L's Missouri territory?

1. Yes [CONTINUE]
2. No [SKIP TO ML8]
98. Don't know [SKIP TO ML8]

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[IF ML5=1, CONTINUE, ELSE SKIP TO ML8]

[IF <MEASURECAT>=Lighting, else skip to ML6b]
ML6a. What are these other program-qualifying measures that you frequently install without any KCP&L program rebates? Please select all that apply.

1. Exterior LED <250W
2. Exterior LED >250W
3. Fluorescent High Bay T5
4. Fluorescent High Performance T8
5. Fluorescent Low Wattage T8
6. Fluorescent T8 Delamping
7. LED Exit Signs
8. LED Refrigerator Case Lights
9. LED Freezer Case Lights
10. LED Omnidirectional Bulb
11. LED Directional Bulb
12. LED Downlight or Retrofit Kit
13. LED High Bay (>110W)
14. LED High/Low Bay (70-110W)
15. LED Low Bay (<70W)
16. LED Linear 2' Replacing T12, T8, or T5
17. LED Linear 4' Replacing T12, T8, or T5
18. Occupancy Sensors
19. Other [SPECIFY]
98. Don't Know

[IF <MEASURECAT><>Lighting, else skip to ML7]
ML6b. What are these other program-qualifying measures that you frequently install without any KCP&L program rebates? Please select all that apply.

1. Advanced rooftop unit controls
2. Air source heat pump
3. Air sourced air conditioner <135 kBtuh
4. Air sourced air conditioner >135 kBtuh
5. High volume low speed fans
6. Strip curtains
7. Compressed air upgrade
8. ECM motors walk-in coolers & freezers
9. Pool pump VSD
10. Other [SPECIFY]
98. Don't Know

ML7. Why didn't you seek KCP&L rebates for these additional measures?
[OPEN ENDED]
98. Don't Know

ML8. Did you sell any of these top three energy efficiency measures (<Measure1>,<Measure2>,<Measure3>) prior to participating in the <PROGRAM> program?

1. Yes [CONTINUE]
2. No [SKIP TO ML11]
98. Don't know [SKIP TO ML11]

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[IF ML8=1, CONTINUE, ELSE SKIP TO ML11]

[IF <PROGRAM>=Small Business Lighting, ELSE SKIP TO ML10]

ML9. Approximately how many units did you sell last year in KCP&L's Missouri territory *without* KCP&L program rebates? An estimate is fine.

Measure Name	Total Number of Units Sold	Total Number of Units Sold
<Measure1>	<Measure1qty>+<ML2a>	ML5a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML5b. [NUMERIC OPEN END]
<Measure3>	<Measure3qty>+<ML2c>	ML5c. [NUMERIC OPEN END]

[IF <PROGRAM>=C&I Standard, ELSE SKIP TO ML11]

ML10. Earlier you indicated that the first year you participated in the KCP&L program was <S1>. Please think about the year before that – the last full year in which you did not participate in the program. Approximately how many units did you sell in KCP&L's Missouri territory in that year? An estimate is fine.

Measure Name	Total Number of Units Sold	Total Number of Units Sold in Last Year Before Participating
<Measure1>	<Measure1qty>+<ML2a>	ML5a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML5b. [NUMERIC OPEN END]
<Measure3>	<Measure3qty>+<ML2c>	ML5c. [NUMERIC OPEN END]

ML11. Given your experience in the market, how many of these measures do you think you would have sold if KCP&L had not offered the <PROGRAM> program? Please provide your best estimate.

Measure Name	Total Number of Units Sold	Best Estimate of Number Sold without Program
<Measure1>	<Measure1qty>+<ML2a>	ML11a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML11b. [NUMERIC OPEN END]
<Measure3>	<Measure3qty>+<ML2c>	ML11c. [NUMERIC OPEN END]

ML12. To better assess the influence of the program, we are looking for your views on lower and upper bounds on the number of rebated measures that were installed due to the influence of the KCP&L program. Please provide the smallest believable number (lower bound) and the largest believable number (upper bound) that were installed due to the influence of the program.

Measure Name	Total Number of Units Sold	Lower Bound	Upper Bound
<Measure1>	<Measure1qty>+<ML2a>	ML12a. [NUMERIC OPEN END]	ML12d. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML12b. [NUMERIC OPEN END]	ML12e. [NUMERIC OPEN END]
<Measure3>	<Measure3qty>+<ML2c>	ML12c. [NUMERIC OPEN END]	ML12f. [NUMERIC OPEN END]

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Program Experiences

PE1. How would you rate your satisfaction with the following aspects of the <PROGRAM> program?
[MATRIX – COLUMNS: Not at all satisfied (1), 2, 3, 4, "Very satisfied" (5), Don't know]

- PE1a. Marketing materials provided by the program
- PE1b. Amount and type of communication received from the program
- PE1c. Amount and type of training provided by the program
- PE1d. Project application process
- PE1e. Time to complete a project through the program
- PE1f. Onsite verification follow-up visits
- PE1g. The amount of the program incentives

[Ask if PE1a<3]
PE2a. Why did you rate your satisfaction with the marketing materials provided by the program like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1b<3]
PE2b. Why did you rate your satisfaction with the amount and type of communication received from the program like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1c<3]
PE2c. Why did you rate your satisfaction with the amount and type of training provided from the program like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1d<3]
PE2d. Why did you rate your satisfaction with project application process like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1e<3]
PE2e. Why did you rate your satisfaction with time to complete a project like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1f<3]
PE2f. Why did you rate your satisfaction with the onsite verification visits like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1g<3]
PE2g. Why did you rate your satisfaction with the amount of the program incentive like that?
[OPEN ENDED]
98. Don't Know

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[Ask if <2015Flag>=Yes, else skip to PE4]
PE3. Would you say that your satisfaction with the following elements increased, stayed the same, or decreased in 2017 relative to previous program years?
[MATRIX – COLUMNS: Increased, Stayed the Same, Decreased, Don't know]

PE3a. Marketing materials provided by KCP&L
PE3b. Amount and type of communication received from KCP&L
PE3c. Amount and type of training provided by KCP&L
PE3d. Project application process
PE3e. Time to complete a project through the program
PE3f. Onsite verification follow-up visits
PE3g. The amount of the program incentives

[ASK IF ANY RESPONSE TO PE3a-g is Increased or Decreased]
PE3h. What is driving that change in satisfaction from previous program years?
[OPEN ENDED]

98. Don't Know

PE4. How often do you want to receive information about the Program? [SELECT ONE]

1. WEEKLY
2. EVERY OTHER WEEK
3. MONTHLY
4. EVERY OTHER MONTH
5. QUARTERLY
6. OTHER -- [OPEN ENDED]
98. Don't Know

PE5. What is your preferred way to receive information about the program? [SELECT ONE]

1. EMAIL
2. PHONE
3. US MAIL
4. WEBINARS
5. MEETINGS
6. OTHER -- [OPEN ENDED]
98. Don't Know

PE6. Where do you think the <PROGRAM> program training falls in the following categories?
[BIPOLAR MATRIX TYPE QUESTION]

PE6a. Useless ←→ Informative
PE6b. Too short ←→ Too long
PE6c. Boring ←→ Interesting
PE6d. Limited ←→ Comprehensive
PE6e. Discouraging ←→ Motivating

PE7. Are there any topics that you would like to see covered in future trade ally trainings?
[OPEN ENDED]

1. None
98. Don't know

[IF <Program>=Small Business Lighting, else skip to PE15]
PE8. After the initial training, how confident were that you would be able to use the Open Field Tool to submit projects through the Small Business Lighting program?

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[1-5 scale, endpoints labeled 1 “Not at all confident” and 5 “Very confident”]
98. Don’t know

[IF PE8<4, ELSE SKIP TO PE10]
PE9. Did the program staff provide you with adequate follow-up assistance to learn how to use the tool effectively?
1. Yes
2. No
98. Don’t know

PE10. How confident are you *now* in using the Open Field Tool?
[1-5 scale, endpoints labeled 1 “Not at all confident” and 5 “Very confident”]
98. Don’t know

PE11. Where do you think the Open Field Tool falls in the following categories? [BIPOLAR MATRIX TYPE QUESTION]
PE6a. Steep learning curve ←→ Intuitive to learn
PE6b. Burdensome ←→ Beneficial
PE6c. Rigid ←→ Flexible

PE12. What, if anything, would you change about the Open Field Tool?
[OPEN ENDED]
1. Wouldn’t change anything
98. Don’t know

PE13. Approximately how long (in days) does it usually take to receive pre-approval of customer eligibility for the Small Business Lighting program?
[NUMERIC]
98. Don’t know

PE14. Is there anything you would change about that pre-approval process?
[OPEN ENDED]
1. No, wouldn’t change anything
98. Don’t know

[ASK OF ALL TRADE ALLIES]
PE15. Can you think of any other energy efficiency measures that the program should include in the future?
[OPEN ENDED]
1. None
98. Don’t know

PE16. How would you rate your overall satisfaction with the <PROGRAM> program?
[SCALE OF 1 to 5, ENDS LABELED “Not at all satisfied” (1) and “Very satisfied” (5)]
98. Don’t Know

PE17. Why did you provide that rating?
[OPEN ENDED]
98. Don’t Know

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Participant Insights

PA1. What types of customers do you typically market high efficiency <MeasureCat> to? Please select all that apply. [ALLOW MULTIPLE SELECTIONS]

1. Large/Medium Commercial: Offices
2. Large/Medium Commercial: Other (Non-Offices)
3. Large/Medium Industrial
4. Small Commercial: Churches
5. Small Commercial: Convenience Stores
6. Small Commercial: Independent Grocery Stores
7. Small Commercial: Light Manufacturing (<50,000 square feet)
8. Small Commercial: Offices (<50,000 square feet)
9. Small Commercial: Restaurants
10. Small Commercial: Retail
11. Small Commercial: Warehouse (<50,000 square feet)
12. Institutional: Colleges/Universities
13. Institutional: Government Buildings
14. Institutional: K-12 Schools
15. Warehouses
16. Other (SPECIFY)
98. Don't know

PA2. Of those customer types, which most frequently choose high efficiency over standard efficiency?
[LIST RESPONSES TO PA1; ALLOW MULTIPLE SELECTIONS]

98. Don't know

PA3. Are there any types of customers that you do not market high efficiency <MeasureCat> to?
[OPEN ENDED]

1. None
98. DON'T KNOW

PA4. Are there any types of customers that you think would particularly benefit from participating in KCP&L energy efficiency programs who aren't currently participating? Can you describe these customers (in terms of size, industry, building type, geography, etc.)?
[OPEN ENDED]

1. None
98. Don't Know

[SKIP IF PA4=1 or 98]
PA5. What would it take to engage these types of customers in KCP&L energy efficiency programs?
[OPEN ENDED]

98. Don't Know

Standard-SBL Program Interactions

SS1. The previous questions have focused on the <PROGRAM> program. The next few questions are about the <ALTPROGRAM> program. How familiar are you with KCP&L's <ALTPROGRAM> program?
[SCALE OF 1 to 5, ENDS LABELED "Not at all familiar" (1) and "Very familiar" (5)]

98. Don't know

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[IF SS1>1, ELSE SKIP TO NEXT SECTION]
SS2. Have you ever applied for rebates for energy efficiency projects through the <ALTPROGRAM>?
1. Yes
2. No
98. Don't know

[IF SS2=1, ASK SS3, ELSE SKIP TO SS8]
SS3. If a potential project qualifies for both the Small Business Lighting Program and the C&I Standard Program, how do you decide which program to apply to?
[OPEN ENDED]
98. Don't Know

SS4. Do you ever start a project on the Small Business Lighting track and then switch to the C&I Standard program?
1. Yes
2. No
98. Don't know

[IF SS4=1, ELSE SKIP TO NEXT SECTION]
SS5. For what reason(s) would you switch a project from Small Business Lighting to the C&I Standard program?
[OPEN ENDED]
98. Don't Know

SS6. Do you ever start a project on the C&I Standard track and then switch to the Small Business Lighting program?
1. Yes
2. No
98. Don't know

[IF SS6=1, ELSE SKIP TO NEXT SECTION]
SS7. For what reason(s) would you switch a project from the C&I Standard program to Small Business Lighting?
[OPEN ENDED]
98. Don't Know

[IF SS2=2, ELSE SKIP TO NEXT SECTION]
SS8. Why haven't you applied for any <ALTPROGRAM> rebates?
[OPEN ENDED]
98. Don't Know

Program Improvements

PI1. How can KCP&L help you complete more energy efficiency projects?
[OPEN ENDED]
98. Don't Know

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PI2. How can the KCP&L <PROGRAM> program be improved?
[ROTATE RESPONSES, ALLOW MULTIPLE RESPONSES]
1. Offer incentives for additional types of equipment [DESCRIBE]
2. More marketing directly to customers [DESCRIBE]
3. More marketing support for contractors and other trade allies [DESCRIBE]
4. More training/technical support for contractors and other trade allies [DESCRIBE]
5. More administrative support for contractors and other trade allies [DESCRIBE]
6. Target marketing to specific customer groups [DESCRIBE]
7. Other [DESCRIBE]
98. Don't Know

PI3. Are there other ways the program can be improved that weren't mentioned already?
[OPEN ENDED]
98. Don't Know

Firmographics

F1. In what year did your company start selling <MeasureCat> in the KCP&L area?
RECORD YEAR
98. Don't know

F2. How many branches or offices does your company have in the U.S.?
RECORD NUMBER
98. Don't know

[ASK IF F2>1, ELSE SKIP TO F4]
F3. How many branches or offices does your company have in the KCP&L area?
RECORD NUMBER
98. Don't know

F4. How many employees in the KCP&L area work on energy efficiency related projects?
RECORD NUMBER
98. Don't know

Closing Text

CT1. Those are all of our questions. We would like to offer you a $100 gift card in thanks for completing this survey. If you would like to receive this gift card, please enter your mailing address below, or check "No thanks."
[MAILING ADDRESS]
[CITY] [STATE] [ZIP]
99. No thanks – I do not wish to receive a $100 gift card.

Thank you for your time. Your input will help KCP&L improve the <PROGRAM> program.

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A.2.2 Business EER Custom Program Trade Ally Online Survey

Sample Variables

<MeasureCat>: "Lighting", "Building Optimization", "Compressed Air", "Variable Speed Drive for Pump or Fan", "Misc. Custom", "New Construction", "Air Optimization/Balancing", "Refrigeration", "Custom Packaged RTU", "Chiller Plant Optimization", "Energy Management System", "Economizers", "Constant Volume to Variable Volume Air Volume Conversion"
<Measure1>: Trade ally's highest saving measure
<Measure2>: Trade ally's second highest saving measure (if applicable)
<Measure3>: Trade ally's third highest saving measure (if applicable)
<Measure1qty>: Number of program-incented <Measure1> units in 2017
<Measure2qty>: Number of program-incented <Measure2> units in 2017 (if applicable)
<Measure3qty>: Number of program-incented <Measure3> units in 2017 (if applicable)

Screening Questions

Thank you for participating in the KCP&L C&I Custom Program Trade Ally Survey. This survey effort will provide KCP&L with valuable feedback to improve program offerings and ultimately help you better serve your customers. This survey is being administered by KCP&L's independent third-party evaluator, Navigant, and your responses will remain confidential and will be presented to KCP&L only in aggregate form.

In thanks for your time, KCP&L would like to offer you a $50 gift card for participation in the survey. You must complete the entire survey to receive the gift card. At the end of the survey, you will be asked to provide the mailing address at which you wish to receive the gift card.

S1. What type of role(s) do you play on efficiency projects that participate in KCP&L's C&I Custom program? Please check all that apply.

1. Making sales calls via phone
2. Making sales calls in person
3. Preparing project specifications/proposals for customers
4. Processing incentive applications
5. Installing equipment at customer sites
6. Other [Please describe _____]
97. Don't know

Program Influence on Trade Allies

PITA1. Have you participated in any program webinars, meetings, or training sessions, or received any educational materials from the program?

1. YES
2. NO
98. Don't Know

PITA2. Have you ever brought a KCP&L program staff member on sales calls to customer sites with you?

1. YES
2. NO
98. Don't Know

[IF PITA2=1, ASK PITA2a, ELSE SKIP TO PITA3]

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PITA2a. About how many times have you brought a KCP&L program staff member on sales calls with you?
[NUMERIC OPEN ENDED]
98. Don't know

PITA2b. How helpful are those joint sales calls with KCP&L staff in selling high efficiency <MEASURECAT>?
[1-5 scale, endpoints labeled 1 "Not at all helpful" and 5 "Very helpful"]
98. Don't Know

PITA3. Have you received any marketing materials from the C&I Custom program for you to pass along to your customers?
1. YES
2. NO
3. Don't Know

[IF PITA3=1, ASK PITA3a, ELSE SKIP TO PITA4]
PITA3a. How much influence have those marketing materials had on your ability to market energy efficiency to your customers?
[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98. Don't Know

PITA4. Since you started participating in the KCP&L commercial and industrial efficiency programs, have you changed the type of <MEASURECAT> project that you offer to your customers, especially regarding level of efficiency? For example, have you…
[ROTATE 1-3, MULTIPLE RESPONSES]
1. Started offering higher efficiency equipment as the "default" recommendation
2. Added new higher efficiency equipment to your offerings
3. Stopped carrying lower efficiency equipment
4. Other [SPECIFY]
5. None of the above
98. Don't know

[IF PITA4=1, 2, or 3, ASK PITA4a, ELSE SKIP TO PITA5]
PITA4a. If the programs had never been available, what is the likelihood that you would have made those same changes in your offerings for high efficiency <MeasureCat>?
[1-5 scale, endpoints labeled 1 "Not at all likely" and 5 "Very likely"]
98. Don't Know

PITA5. Have you observed an increase in your overall high efficiency <MeasureCat> sales since participating in the KCP&L commercial and industrial efficiency programs?
1. Yes
2. No
98. Don't know

[IF PITA5=1, ASK PITA4a, ELSE SKIP TO PITA6]
PITA5a. Would you say that your overall <MeasureCat> sales have increased, a higher percentage of customers are choosing high efficiency <MeasureCat>, or both?
1. Overall sales have increased (including standard and high efficiency)
2. A higher percentage of customers are choosing high efficiency
3. Both
98. Don't know

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[ASK IF PITA5a=2 or 3, ELSE SKIP TO PITA5d]
PITA5b. Making your best estimate, what was the percentage of customers who choose high efficiency options before you started participating in the programs?
RECORD NUMBER BETWEEN 0% and 100%
98. Don't Know

PITA5c. And, making your best estimate, what was the percentage of customers who chose high efficiency options in 2017?
RECORD NUMBER BETWEEN 0% and 100%
98. Don't Know

PITA5d. How influential do you think the C&I Custom program was on the increase in high efficiency sales?
[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98. Don't Know

PITA5e. Has the program's influence on your business enabled you to hire additional employees to meet the additional demand for high efficiency?
1. Yes; please describe: [OPEN ENDED]
2. No
98. Don't know

PITA6. Which of the following non-utility benefits do you typically discuss with customers when selling high efficiency <MeasureCat>? [ROTATE 1-6]
1. Lower utility bills
2. Improved work environment
3. Chance to make the company more "green"
4. Increased property value
5. Lower operating and maintenance cost
6. Quick payback period
7. Other; please describe [OPEN ENDED]
8. I do not discuss any of these benefits with customers

PITA7. If the C&I Custom program did not exist, how would your business be different (if at all)?
[OPEN ENDED]
98. Don't Know

Measure Level Sales

ML1a. Our next set of questions focuses on your past and current sales of the two highest-saving energy efficiency measures that you installed through the C&I Custom program in 2017. The following table summarizes those two measures based on your projects recorded in the program database.

Measure Name	Number of Projects Rebated by KCP&L in 2017
<Measure1>	<Measure1qty>
<Measure2>	<Measure2qty>

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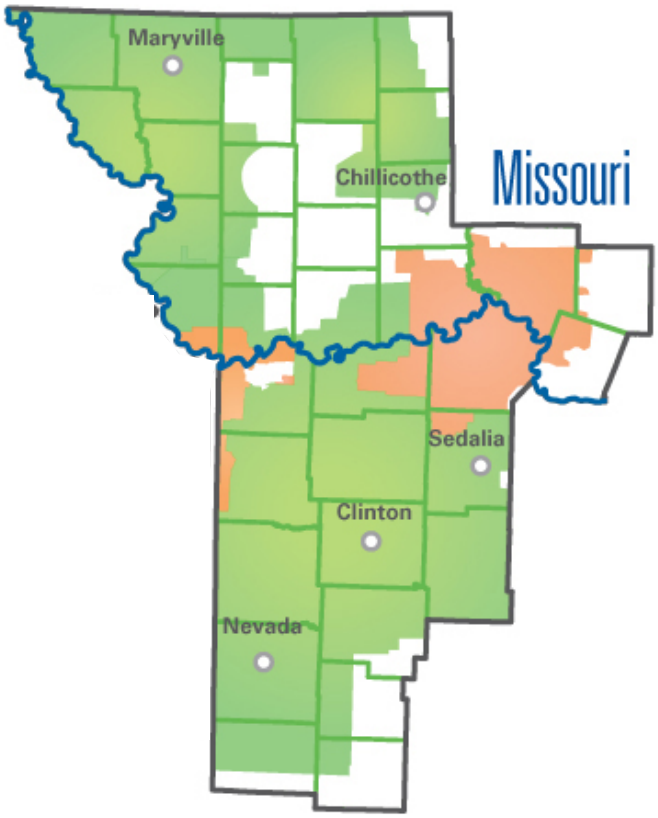
Did you sell any more of these measures *without* KCP&L program rebates in 2017? Please consider only measures sold in KCP&L's Missouri territory to the extent possible (see map).

1. Yes [CONTINUE]
2. No [SKIP TO ML5]
98. Don't know [SKIP TO ML5]



[IF ML1=1, ELSE SKIP TO ML5]

ML2. Approximately how many additional projects did you complete in 2017 without rebates, in KCP&L's Missouri territory? An estimate is fine.

Measure Name	Number of Projects Rebated by KCP&L in 2017	Number of Additional Projects Completed Without Rebates in 2017
<Measure1>	<Measure1qty>	ML2a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>	ML2b. [NUMERIC OPEN END]

ML3. How influential do you think the C&I Custom program was on these additional projects completed without rebates?

[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]

98. Don't Know

ML4. Why didn't you seek KCP&L rebates for these additional units sold?

[OPEN ENDED]

98. Don't Know

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ML5. Are there any *other* program-qualifying measures that you frequently install without any KPC&L program rebates in KCP&L's Missouri territory?

1. Yes [CONTINUE]
2. No [SKIP TO ML8]
98. Don't know [SKIP TO ML8]

[IF ML5=1, CONTINUE, ELSE SKIP TO ML8]

ML6. What are these other program-qualifying measures that you frequently install without any KCP&L program rebates? Please select all that apply. [ROTATE 1-30]

1. Lighting
2. Building Optimization
3. Compressed Air
4. Variable Speed Drive for Pump or Fan
5. Misc. Custom
6. New Construction
7. Air Optimization/Balancing
8. Refrigeration
9. Custom Packaged RTU
10. Chiller Plant Optimization
11. Energy Management System
12. Economizers
13. Constant Volume to Variable Air Volume Conversion
14. Other [SPECIFY]
98. Don't Know

ML7. Why didn't you seek KCP&L rebates for these additional measures?
[OPEN ENDED]

98. Don't Know

ML8. Given your experience in the market, how many of these measures do you think you would have sold if KCP&L had not offered the C&I Custom program? Please provide your best estimate.

Measure Name	Total Number of Projects Sold in 2017	Best Estimate of Number Sold without Program
<Measure1>	<Measure1qty>+<ML2a>	ML11a. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML11b. [NUMERIC OPEN END]

ML9. To better assess the influence of the program, we are looking for your views on lower and upper bounds on the number of rebated measures that were installed due to the influence of the KCP&L program. Please provide the smallest believable number (lower bound) and the largest believable number (upper bound) that were installed due to the influence of the program.

Measure Name	Total Number of Projects Sold in 2017	Lower Bound	Upper Bound
<Measure1>	<Measure1qty>+<ML2a>	ML12a. [NUMERIC OPEN END]	ML12d. [NUMERIC OPEN END]
<Measure2>	<Measure2qty>+<ML2b>	ML12b. [NUMERIC OPEN END]	ML12e. [NUMERIC OPEN END]

ML10. KCP&L is interested in increasing the number of participants in the following measures: chiller plant optimization, economizers, energy management system, and constant volume to

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variable air volume conversion. Do you have any insights into why there aren't more participants in those measures? Please select all that apply. [Randomize 1-7]

1. Incentives are too low
2. We don't have the expertise to implement these measures
3. The measures take a long time to implement
4. Equipment is used by few customers
5. Customers are not interested in these measures
6. Customers are not aware of the incentives
7. Customers are not aware of the measures
8. Other; please describe: [OPEN ENDED]

98. Don't know

Program Experiences

PE1. How would you rate your satisfaction with the following aspects of the C&I Custom program?
[MATRIX – COLUMNS: Not at all satisfied (1), 2, 3, 4, "Very satisfied" (5), Don't know]
[ROTATE a-i]

PE1a. Marketing materials provided by the program
PE1b. Amount and type of communication received from the program
PE1c. Amount and type of training provided by the program
PE1d. Project RFQ and application process
PE1h. Time to complete a project through the program
PE1i. The amount of the program incentives

[Ask if PE1a<3]
PE2a. Why did you rate your satisfaction with the marketing materials provided by the program like that?
[OPEN ENDED]

98. Don't Know

[Ask if PE1b<3]
PE2b. Why did you rate your satisfaction with the amount and type of communication received from the program like that?
[OPEN ENDED]

98. Don't Know

[Ask if PE1c<3]
PE2c. Why did you rate your satisfaction with the amount and type of training provided from the program like that?
[OPEN ENDED]

98. Don't Know

[Ask if PE1d<3]
PE2d. Why did you rate your satisfaction with project RFQ and application process like that?
[OPEN ENDED]

98. Don't Know

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[Ask if PE1f<3]
PE2h. Why did you rate your satisfaction with time to complete a project like that?
[OPEN ENDED]
98. Don't Know

[Ask if PE1h<3]
PE2i. Why did you rate your satisfaction with the amount of the program incentive like that?
[OPEN ENDED]
98. Don't Know

PE3. Would you say that your satisfaction with the following elements increased, stayed the same, or decreased in 2017 relative to previous program years?
[MATRIX – COLUMNS: Increased, Stayed the Same, Decreased, Don't know, Not Applicable]
[ROTATE a-i]
PE3a. Marketing materials provided by KCP&L
PE3b. Amount and type of communication received from KCP&L
PE3c. Amount and type of training provided by KCP&L
PE3d. Project RFQ and application process
PE3h. Time to complete a project through the program
PE3i. The amount of the program incentives

[ASK IF ANY RESPONSE TO PE3a-i is Increased or Decreased]
PE3j. What is driving that change in satisfaction from previous program years?
[OPEN ENDED]
98. Don't Know

PE4. How often do you want to receive information about the Program? [SELECT ONE]
1. WEEKLY
2. EVERY OTHER WEEK
3. MONTHLY
4. EVERY OTHER MONTH
5. QUARTERLY
6. OTHER -- [OPEN ENDED]
98. Don't Know

PE5. What is your preferred way to receive information about the program? [SELECT ONE]
[ROTATE 1-5]
1. EMAIL
2. PHONE
3. US MAIL
4. WEBINARS
5. MEETINGS
6. OTHER -- [OPEN ENDED]
98. Don't Know

PE13. Are there any other measures that you think should be eligible for the program that currently are not?
[OPEN ENDED]
1. No
98. Don't know

PE14. How would you rate your overall satisfaction with the C&I Custom program?
[SCALE OF 1 to 5, ENDS LABELED "Not at all satisfied" (1) and "Very satisfied" (5)]

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98. Don't Know

PE15. Why did you provide that rating?
[OPEN ENDED]

Participant Insights

PA1. What types of customers do you typically market high efficiency <MeasureCat> to?
Please select all that apply. [ALLOW MULTIPLE SELECTIONS]
[ROTATE 1-15]

1. Large/Medium Commercial: Offices
2. Large/Medium Commercial: Other (Non-Offices)
3. Large/Medium Industrial
4. Small Commercial: Churches
5. Small Commercial: Convenience Stores
6. Small Commercial: Independent Grocery Stores
7. Small Commercial: Light Manufacturing (<50,000 square feet)
8. Small Commercial: Offices (<50,000 square feet)
9. Small Commercial: Restaurants
10. Small Commercial: Retail
11. Small Commercial: Warehouse (<50,000 square feet)
12. Institutional: Colleges/Universities
13. Institutional: Government Buildings
14. Institutional: K-12 Schools
15. Warehouses
16. Other [SPECIFY]
98. Don't know

[SKIP IF PA41=98]
PA2. Of those customer types, which most frequently choose high efficiency over standard efficiency equipment?
[LIST RESPONSES TO PA1; ALLOW MULTIPLE SELECTIONS]

98. Don't know

PA3. Are there any types of customers that you do not market high efficiency <MeasureCat> to?
[OPEN ENDED]

1. None
98. DON'T KNOW

PA4. Are there any types of customers that you think would particularly benefit from participating in KCP&L energy efficiency programs who aren't currently participating? Can you describe these customers (in terms of size, industry, building type, geography, etc.)?
[OPEN ENDED]

1. None
98. Don't Know

[SKIP IF PA4=1 or 98]
PA5. What would it take to engage these types of customers in KCP&L energy efficiency programs?
[OPEN ENDED]

98. Don't Know

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PA6. Which of the following non-utility benefits do you feel might influence a customer's decision to choose high efficiency over standard efficiency equipment?
[ALLOW MULTIPLE SELECTIONS, ROTATE 1-6]

1. Lower utility bills
2. Improved work environment
3. Chance to make the company more "green"
4. Increased property value
5. Lower operating and maintenance cost
6. Quick payback period
7. None of these benefits influence a customer's decision

Program Interactions

PI1. The previous questions have focused on the C&I Custom program. The next questions are about the Block Bidding program and the C&I Standard program. How familiar are you with KCP&L's Block Bidding program?
[SCALE OF 1 to 5, ENDS LABELED "Not at all familiar" (1) and "Very familiar" (5)]

98. Don't know

[IF PI1>1, ELSE SKIP TO PI4]
PI2. Have you ever applied for rebates for energy efficiency projects through the Block Bidding program?

1. Yes
2. No
99. Don't know

[ASK IF PI2=2]
PI3. Why haven't you applied for any Block Bidding rebates?
[OPEN ENDED]

98. Don't know

PI4. How familiar are you with KCP&L's C&I Standard program?
[SCALE OF 1 to 5, ENDS LABELED "Not at all familiar" (1) and "Very familiar" (5)]

98. Don't know

[IF PI4>1, ELSE SKIP TO NEXT SECTION]
PI5. Have you ever applied for rebates for energy efficiency projects through the C&I Standard program?

1. Yes
2. No
98. Don't know

[IF PI5=2, ELSE SKIP TO NEXT SECTION]
PI6. Why haven't you applied for any C&I Standard rebates?
[OPEN ENDED]

98. Don't know

Program Improvements

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PIM1. How can KCP&L help you complete more energy efficiency projects?
[OPEN ENDED]
98. Don't Know

PIM2. How can the KCP&L C&I Custom program be improved?
[ROTATE RESPONSES, ALLOW MULTIPLE RESPONSES]
1. Offer incentives for additional types of equipment [DESCRIBE]
2. More marketing directly to customers [DESCRIBE]
3. More marketing support for contractors and other trade allies [DESCRIBE]
4. More training/technical support for contractors and other trade allies [DESCRIBE]
5. More administrative support for contractors and other trade allies [DESCRIBE]
6. Target marketing to specific customer groups [DESCRIBE]
7. Other [DESCRIBE]
98. Don't Know

Firmographics

F1. In what year did your company start selling <MeasureCat> in the KCP&L area?
RECORD YEAR
98. Don't know

F2. How many branches or offices does your company have in the U.S.?
RECORD NUMBER
98. Don't know

[ASK IF F2>1, ELSE SKIP TO F4]
F3. How many branches or offices does your company have in the KCP&L area?
RECORD NUMBER
98. Don't know

F4. How many employees in the KCP&L area work on energy efficiency related projects?
RECORD NUMBER
98. Don't know

Closing Text

CT1. Those are all of our questions. We would like to offer you a $50 gift card in thanks for completing this survey. If you would like to receive this gift card, please enter your mailing address below, or check "No thanks."
[MAILING ADDRESS]
[CITY] [STATE] [ZIP]
99. No thanks – I do not wish to receive a $100 gift card.

Thank you for your time. Your input will help KCP&L improve the C&I Custom program.

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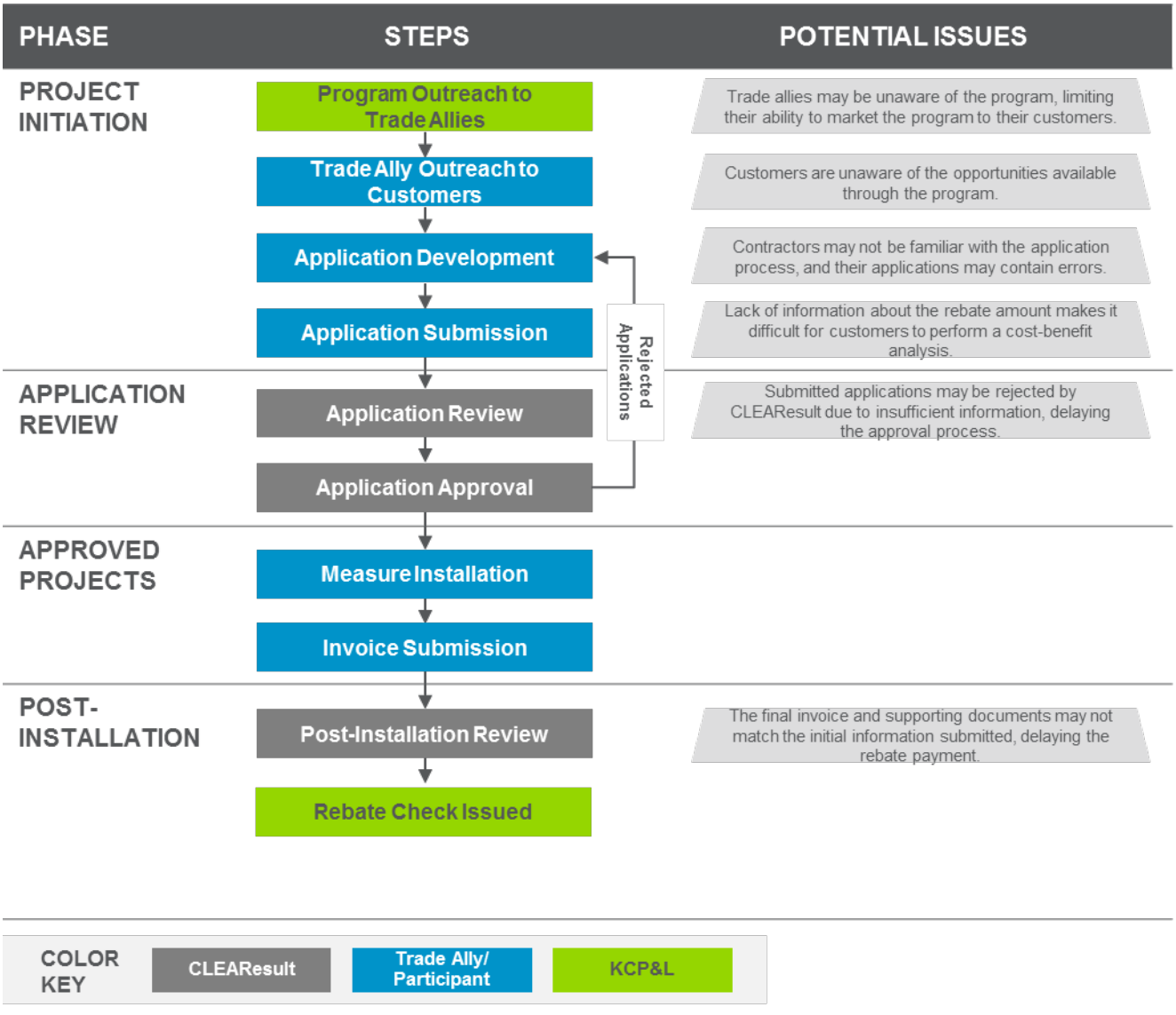
APPENDIX B. PROCESS FLOW DIAGRAMS

The following section includes high level process flow diagrams that provide an overview of how the programs operate from start/entrance to program through incentive payment. Navigant would like to note that these are not full customer journey maps; rather, they graphically show a quick summary of the key program activity points.

B.1 Commercial Energy Efficiency Programs

Figure B-1. Business EER – Standard Process Map



Source: Navigant

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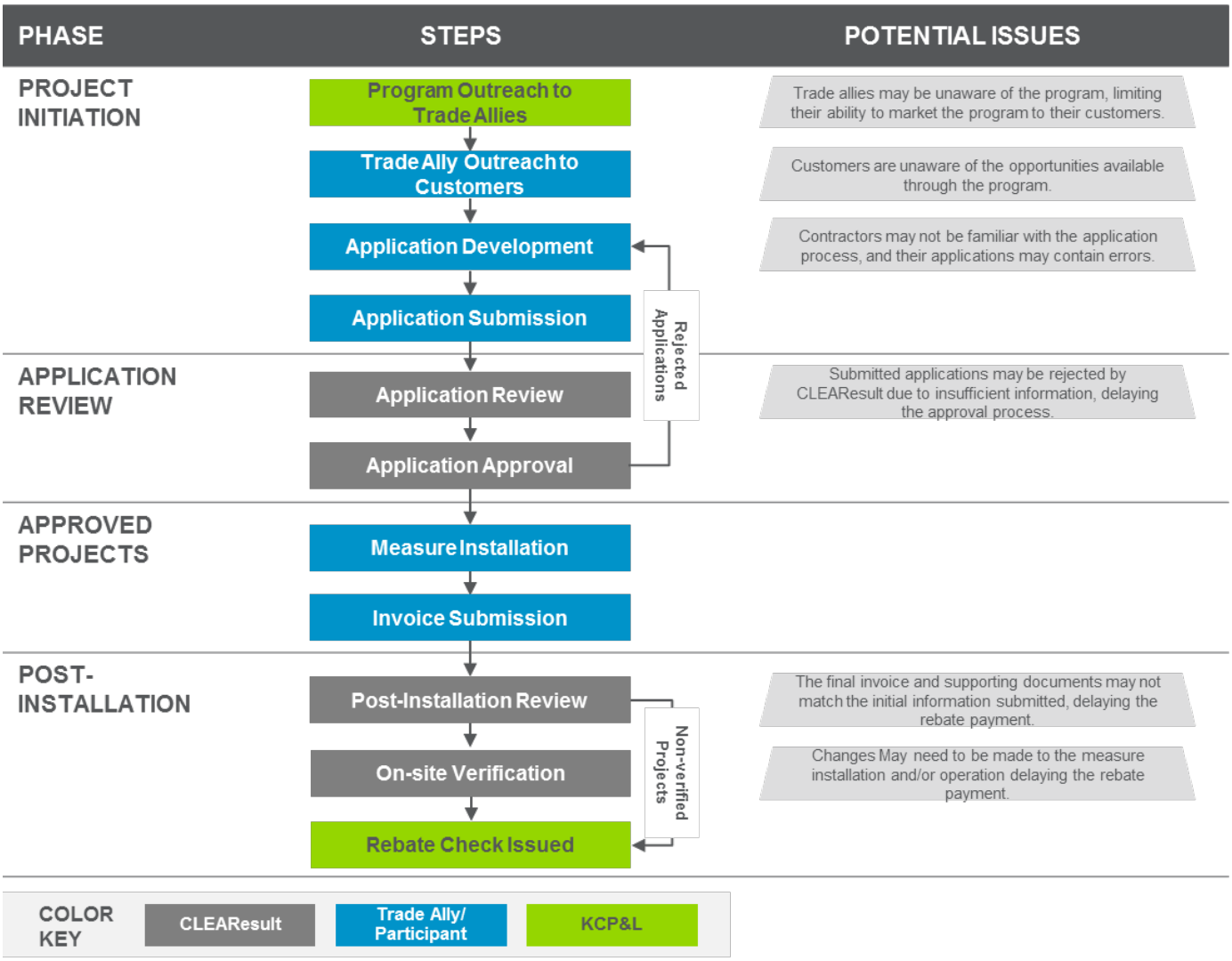
Figure B-2. Business EER – Custom Process Map



Source: Navigant

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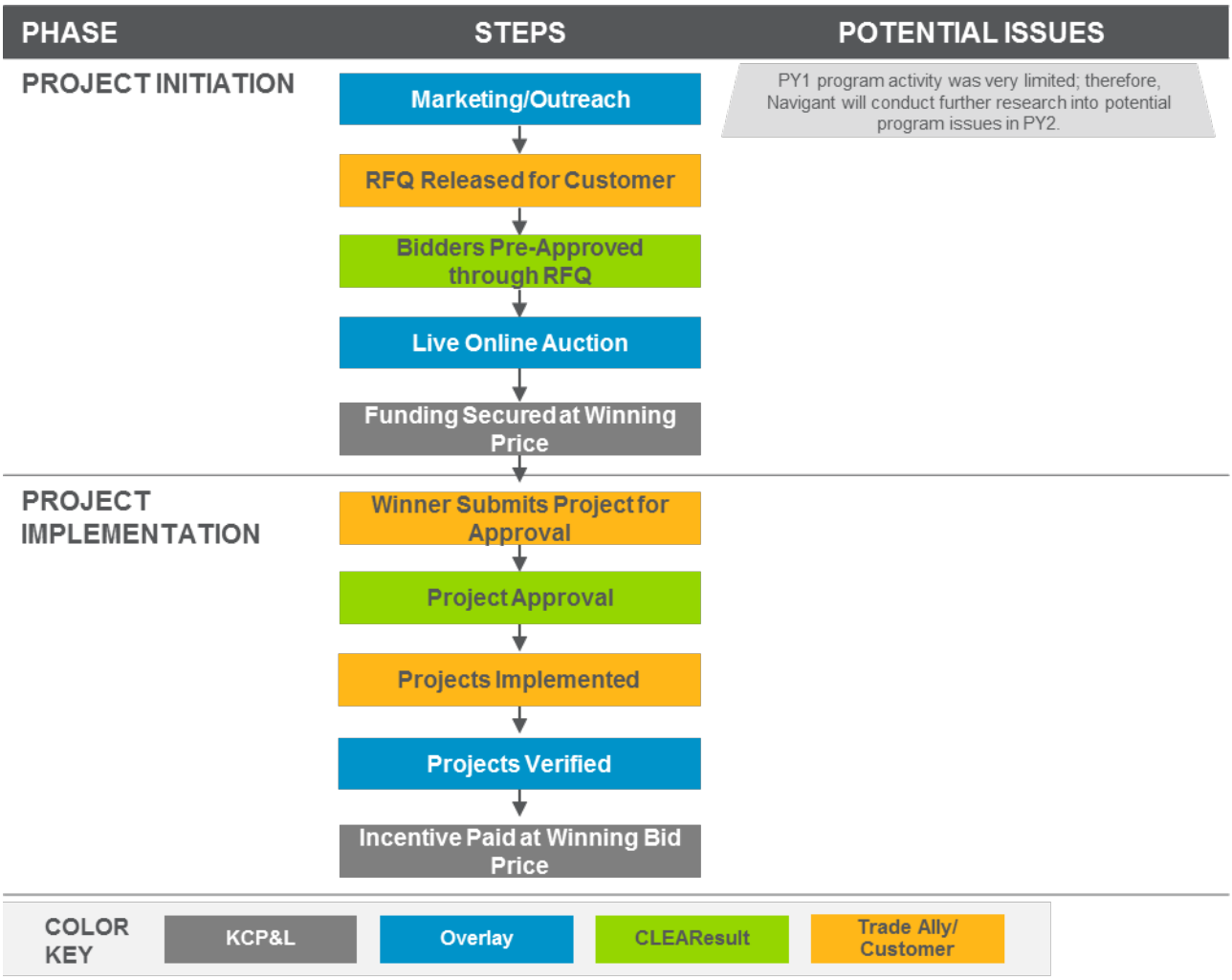
Figure B-3. Block Bidding Process Map



Source: Navigant

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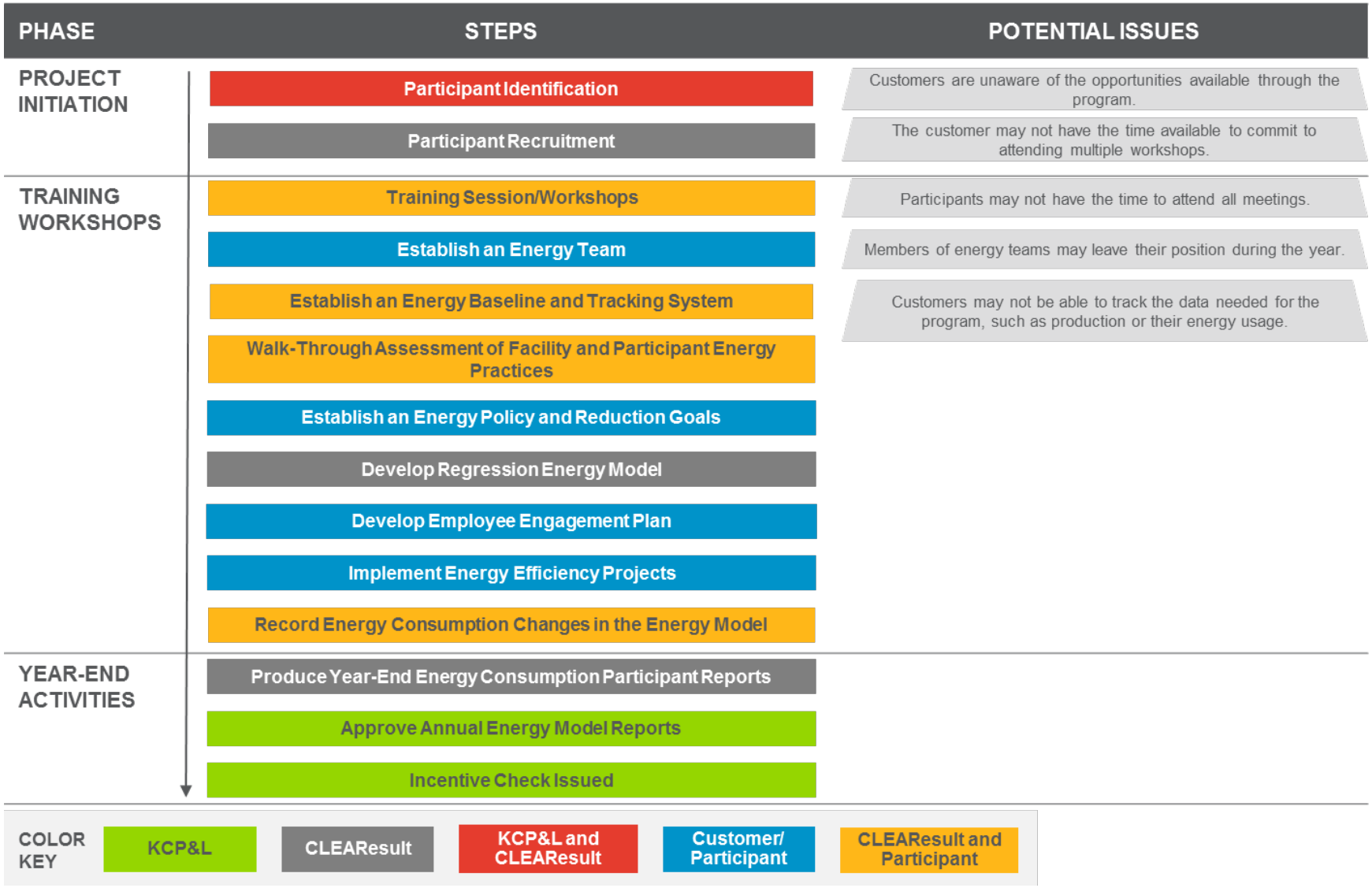
Figure B-4. Strategic Energy Management Process Map



Source: Navigant

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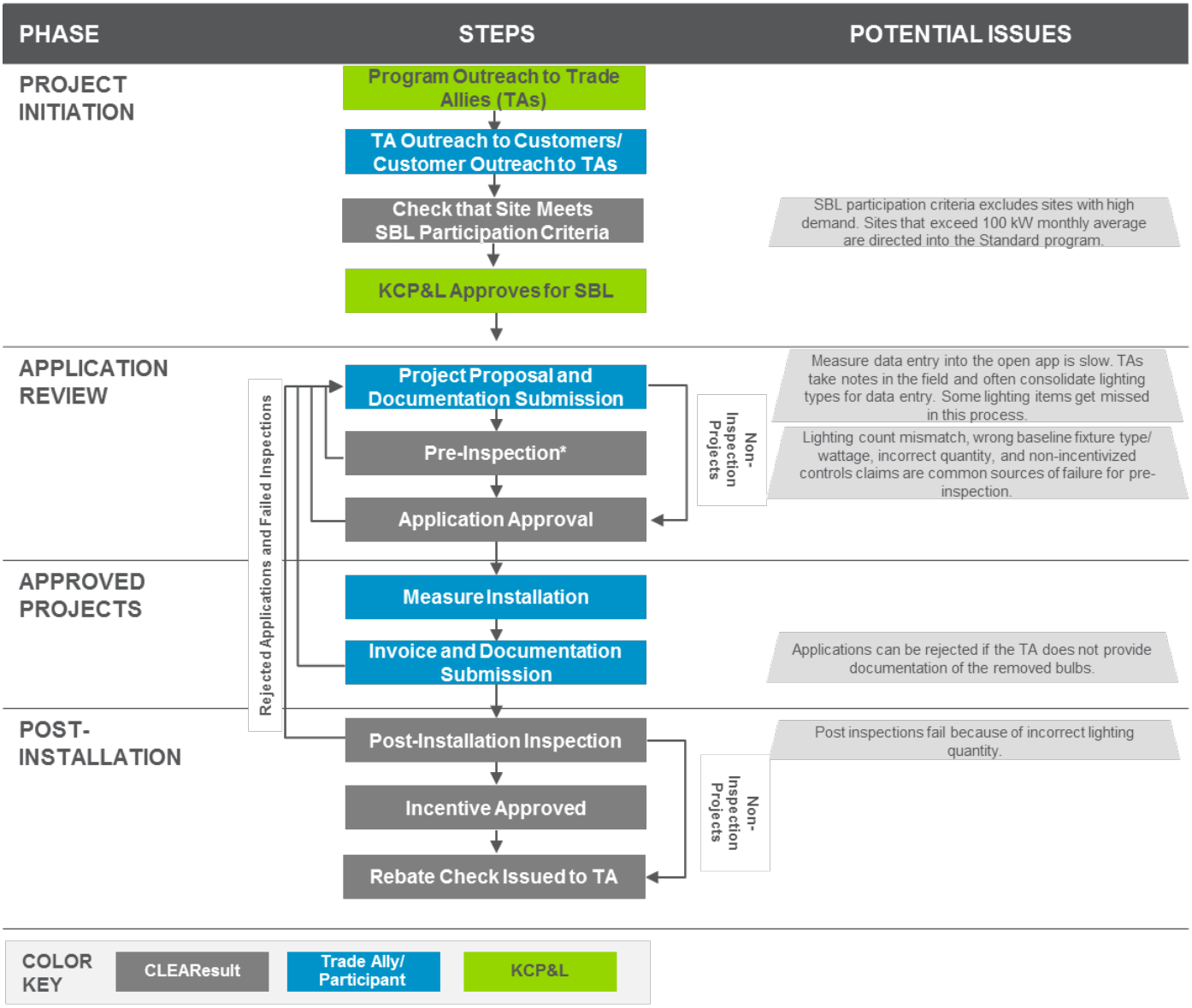
Figure B-5. Small Business Lighting Process Map



Source: Navigant

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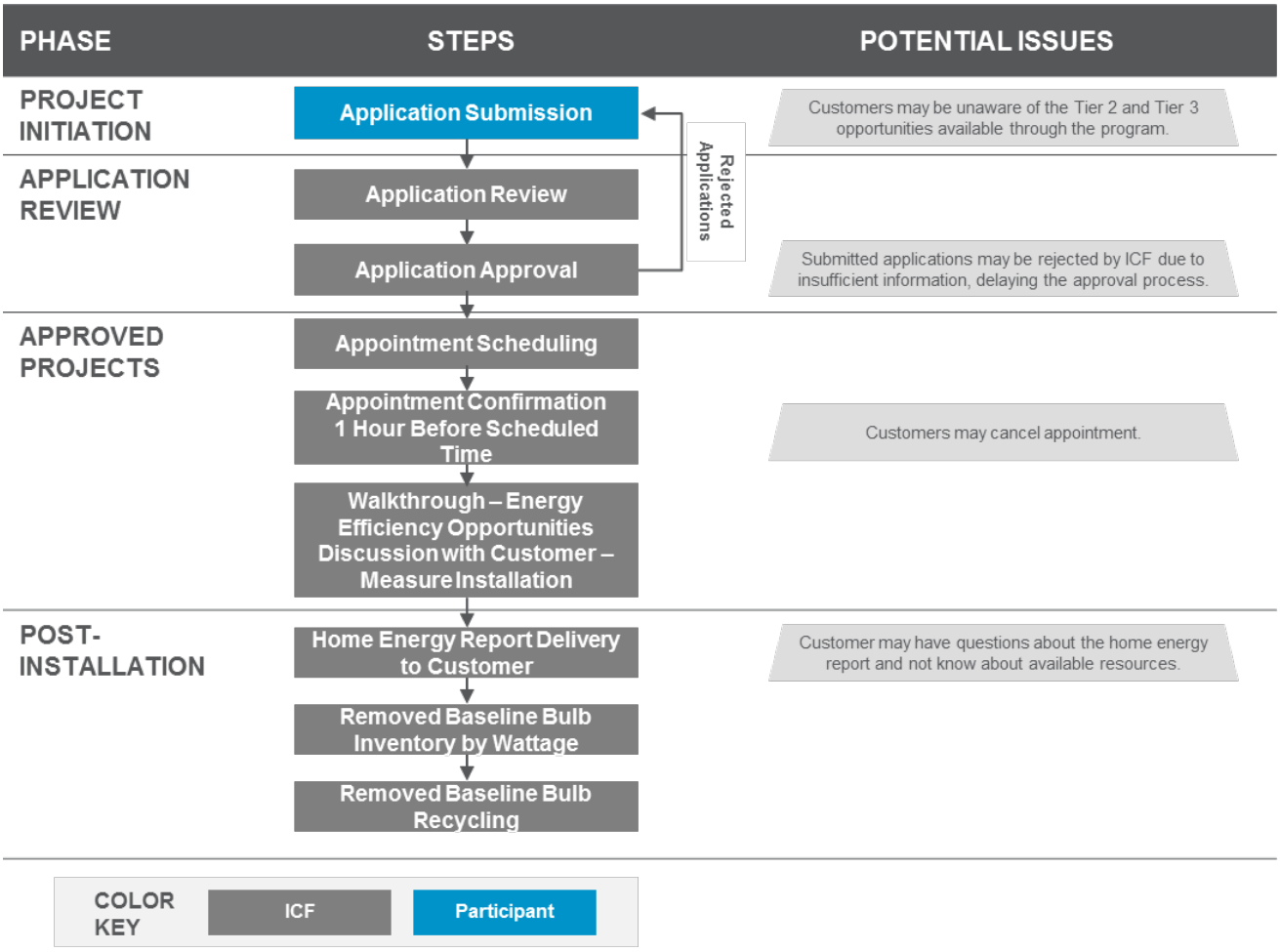
B.2 Residential Energy Efficiency Programs

Figure B-6. Whole House Efficiency Process Map – Tier 1 Energy Savings Kit and Walkthrough



Source: Navigant

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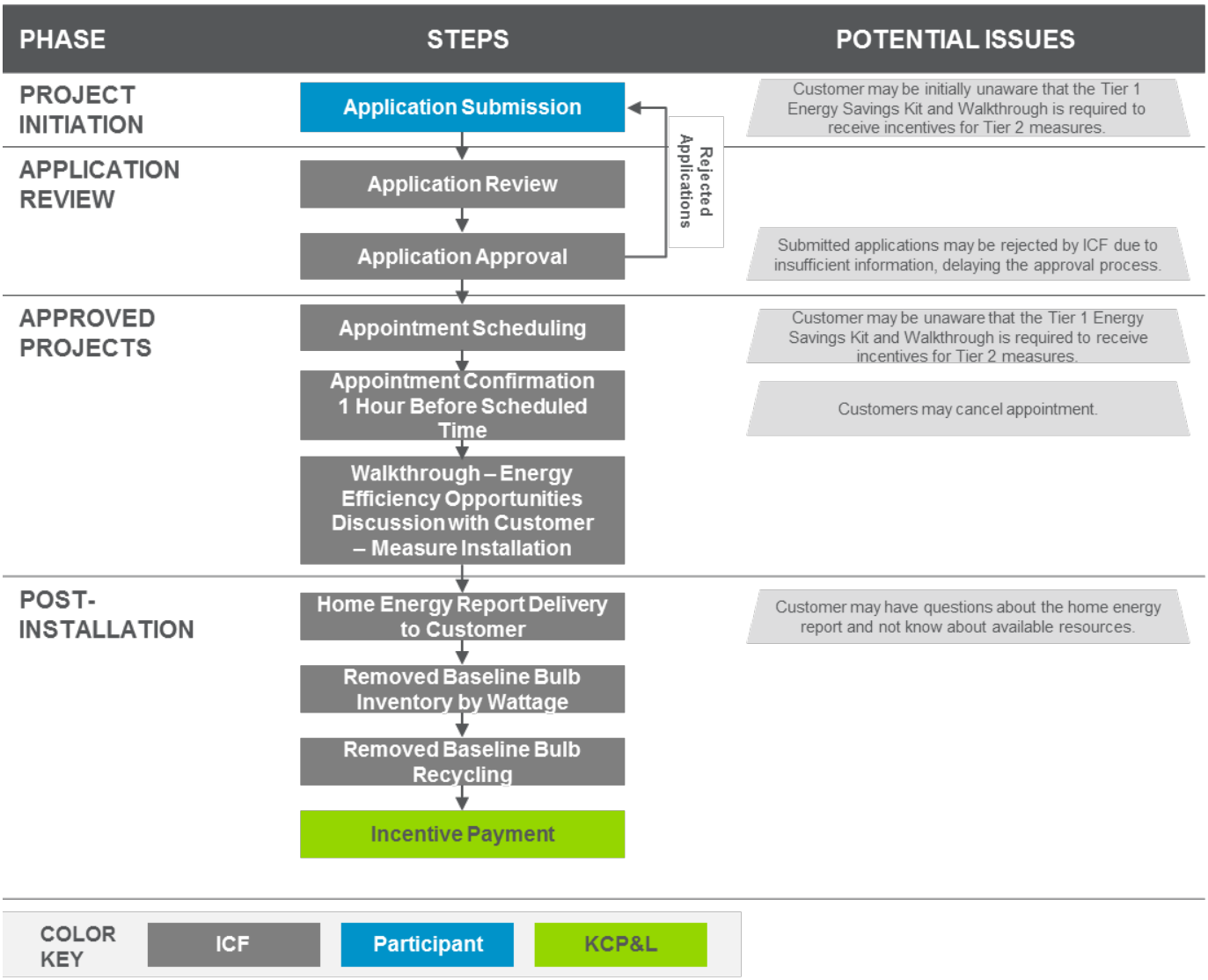
Figure B-7. Whole House Efficiency Process Map – Tier 2 Building Shell Measures



Source: Navigant

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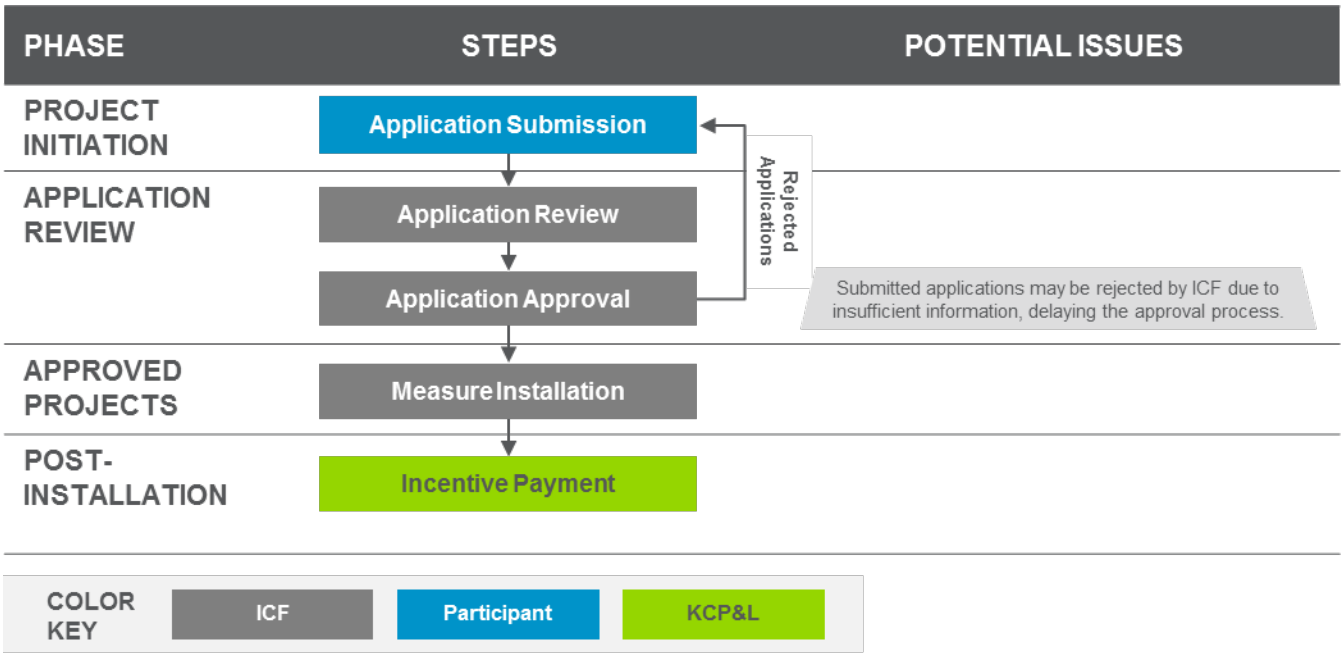
Figure B-8. Whole House Efficiency Process Map – Tier 3 HVAC Measures



Source: Navigant

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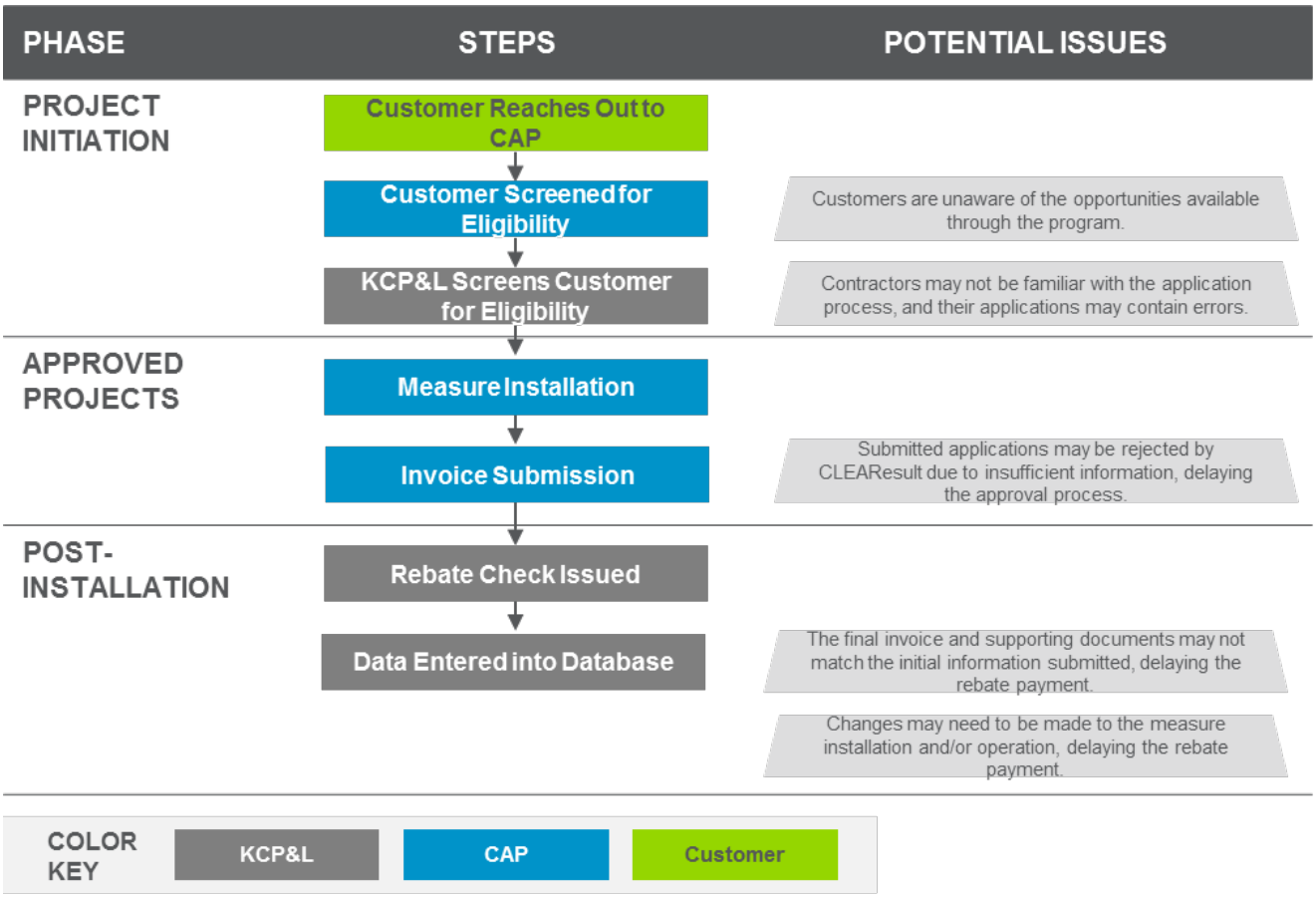
Figure B-9. Income-Eligible Multifamily Process Map



Source: Navigant

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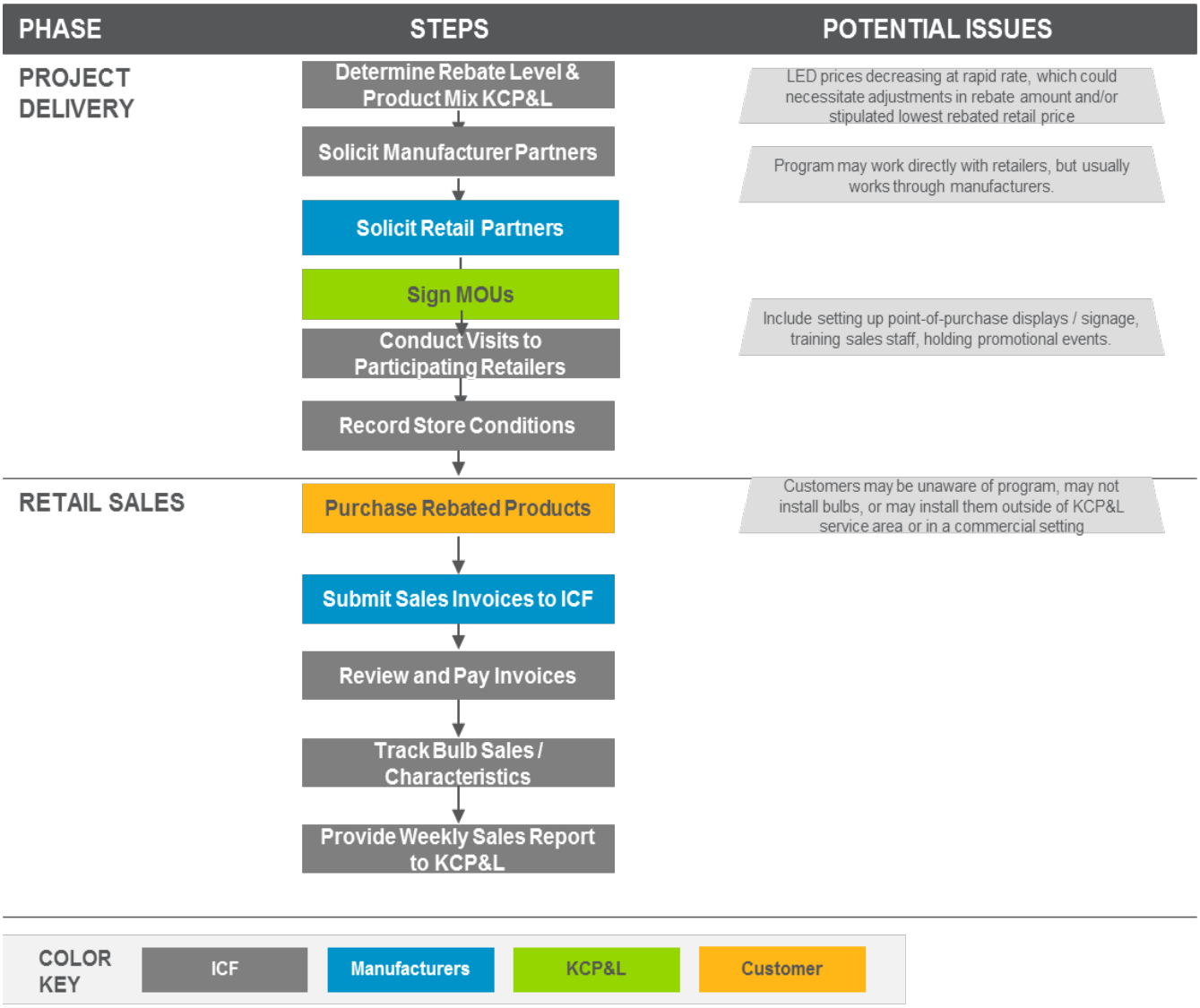
Figure B-10. Home Lighting Rebate Process Map



Source: Navigant

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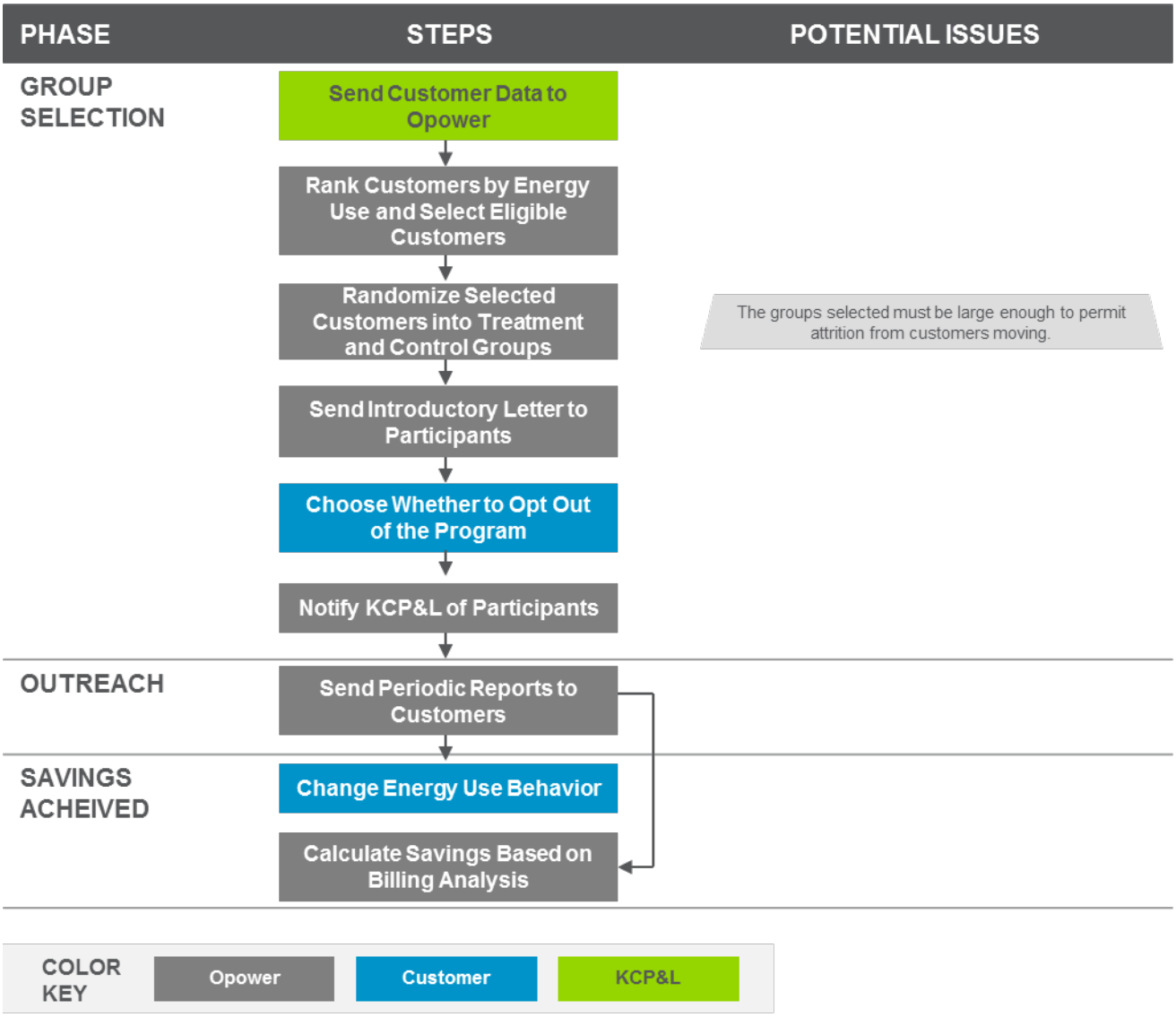
B.3 Educational Programs

Figure B-11. Home Energy Report and Income-Eligible Home Energy Report Process Map



Source: Navigant

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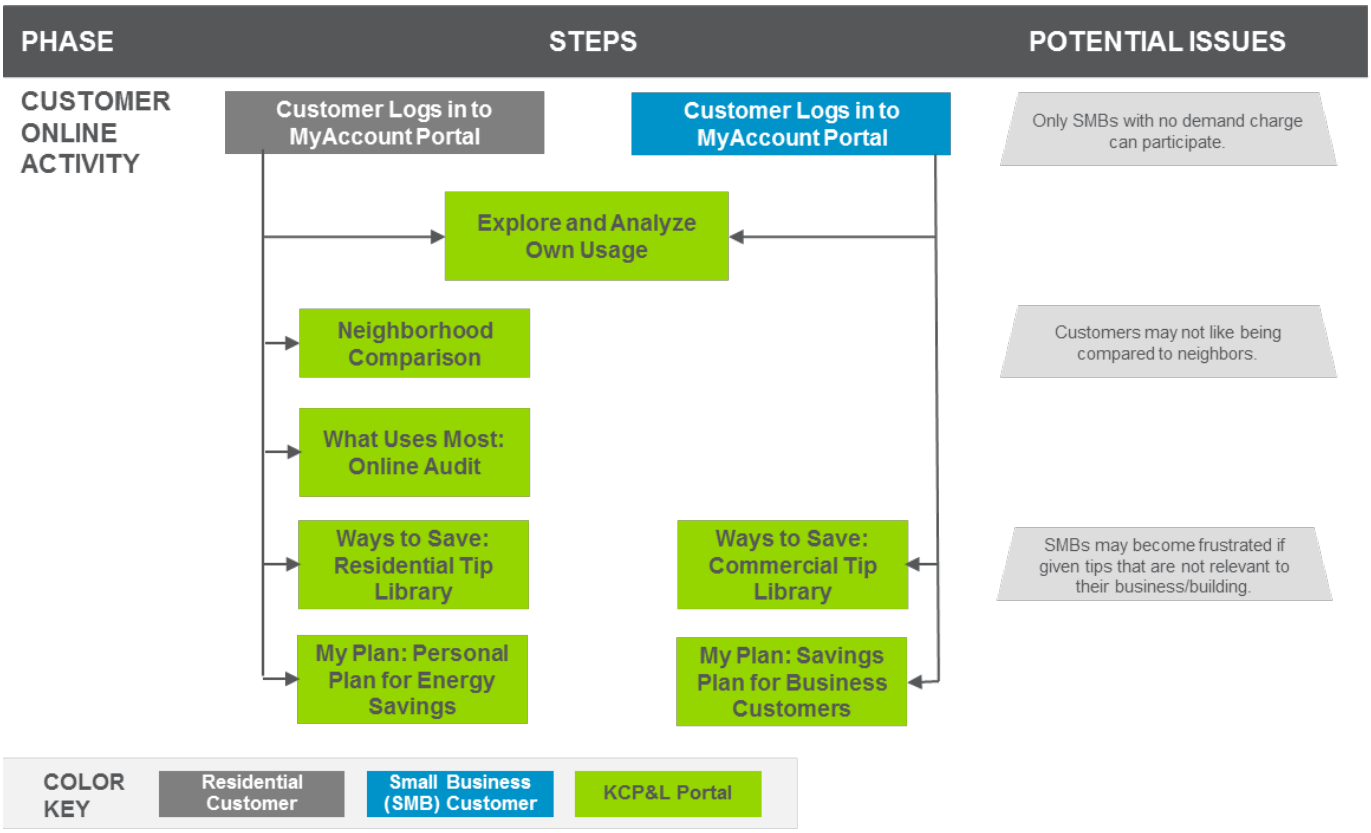
Figure B-12. Energy Analyzer and Small Business Energy Analyzer Process Map



Source: Navigant

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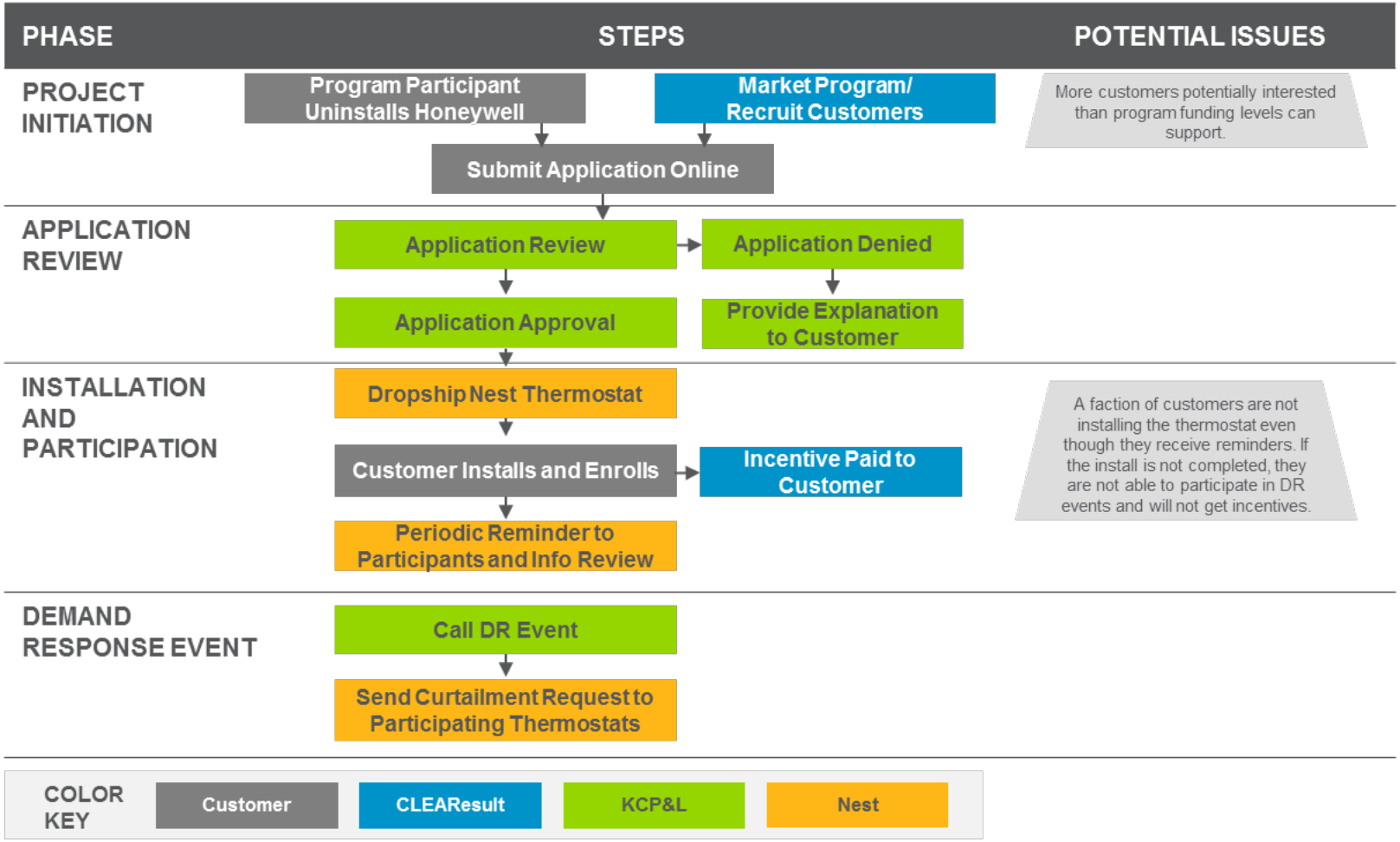
B.4 Demand Response Programs

Figure B-13. Residential and Business Programmable Thermostat Process Map – DIY



Source: Navigant

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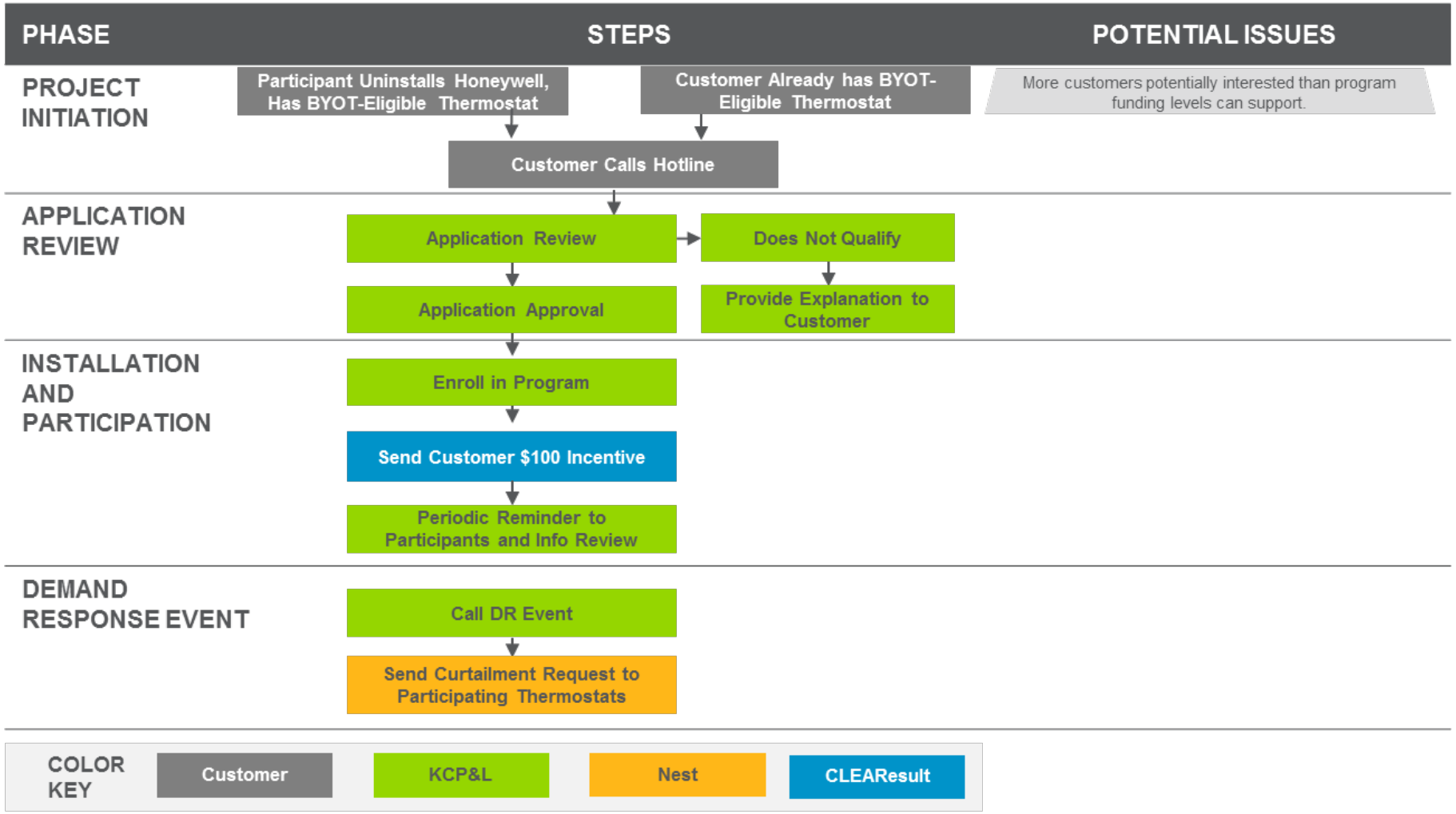
Figure B-14. Residential and Business Programmable Thermostat Process Map – BYOT



Source: Navigant

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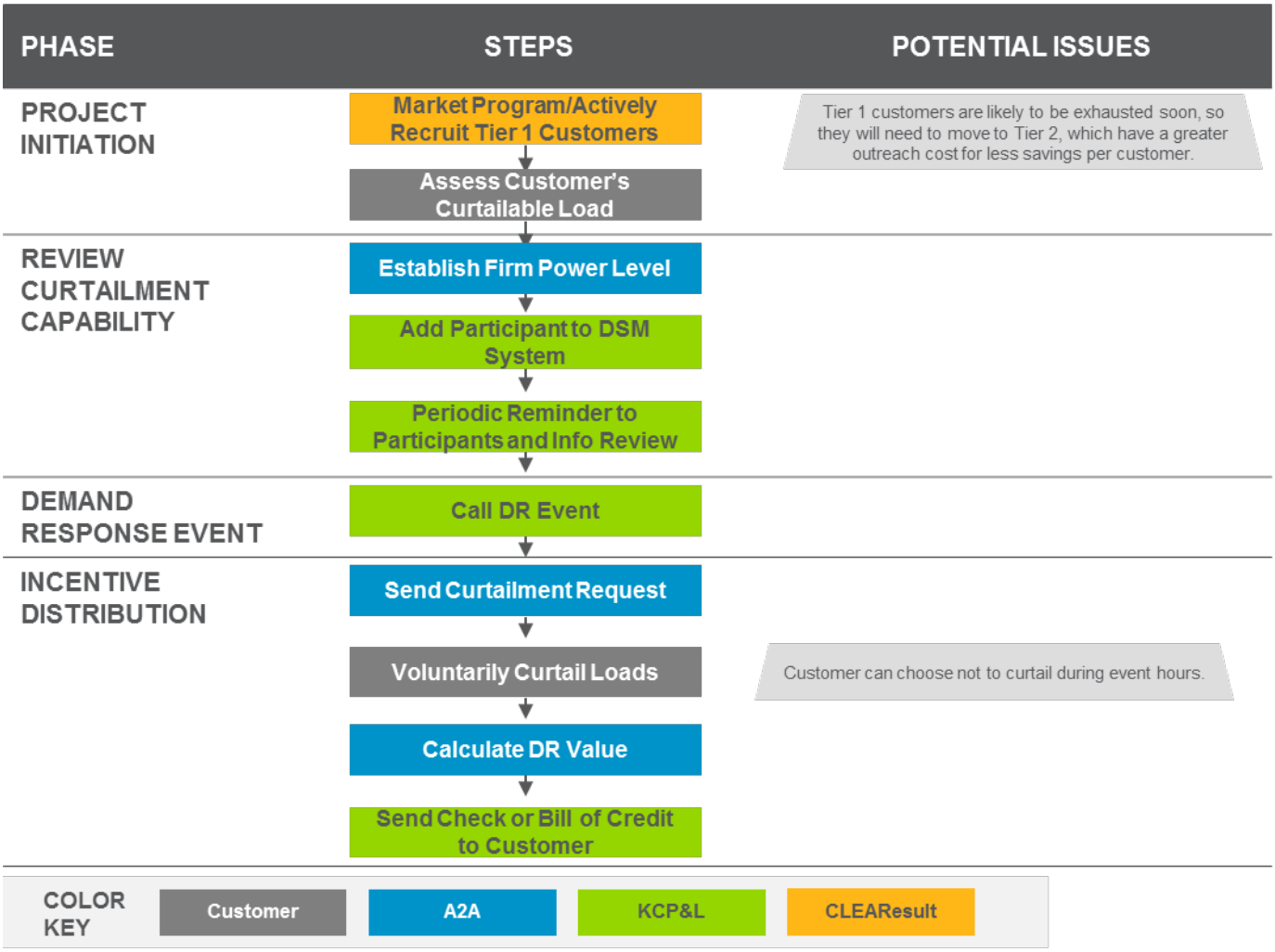
Figure B-15. DR Incentive Process Map



Source: Navigant

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APPENDIX C. STANDARD METHODOLOGIES

This appendix covers Navigant's overall approach toward cross-cutting methodologies, namely determining cost-effectiveness and net-to-gross (NTG) savings. Appendix E through Appendix P detail program-specific methodologies, including any differences between these standard methodologies and those the evaluation team used for each program.

C.1 Cost-Effectiveness Approach

Navigant calculated benefit cost ratios and total net benefits at the program and portfolio level for the five standard benefit cost tests. These tests include the Total Resource Cost (TRC) test, Societal Cost Test (SCT), Utility Cost Test (UCT), Participant Cost Test (PCT), and Ratepayer Impact Measure (RIM) test. Benefit-cost ratios are informative as they show the value of monetary benefits relative to the value of monetary costs as seen from various stakeholder perspectives. Cost-effectiveness values were calculated using KCP&L's DSMore model in conjunction with Navigant-verified EM&V findings including: energy and demand impacts, incremental costs, NTG ratios, participation numbers, and measure lifetimes. All program and avoided cost data, and discount rates, are consistent with those used by KCP&L in calculating cost-effectiveness as part of their annual filing. KCP&L's DSMore formulation of the cost-benefit tests followed the 2001 California Standard Practice Manual (SPM)[1] and does not account for the subsequent 2007 SPM Clarification Memo.[2]

Table C-1 summarizes how program costs and benefits are assigned to each of the cost tests, consistent with the California SPM. In this analysis, the TRC test and the SCT test only differ in the discount rate assumed (i.e., externalities are not included in this SCT analysis). Refer to Table C-2 for sources of assumptions regarding discount rates. For comparison with KCP&L-MO reported cost-benefit ratios, this report provides TRC and SCT results without including incentives paid to free riders as required by the 2007 Clarification Memo.

[1] California Public Utilities Commission. October 2001. "California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects." http://www.cpuc.ca.gov/NR/rdonlyres/004ABF9D-027C-4BE1-9AE1-CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf.

[2] California Public Utilities Commission. 2007. "2007 SPM Clarification Memo." http://www.cpuc.ca.gov/NR/rdonlyres/004ABF9D-027C-4BE1-9AE1-CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf.

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Table C-1. Cost and Benefit Assignments by Cost Test

Item	TRC Test	SCT	UCT	PCT	RIM Test
Avoided Costs	Benefit	Benefit	Benefit	N/A	Benefit
Incentives	Transfer	Transfer	Cost	Benefit	Cost
Lost Revenues	Transfer	Transfer	N/A	Benefit	Cost
Administrative Costs	Cost	Cost	Cost	N/A	Cost
Participant Equip. Costs	Cost	Cost	N/A	Cost	N/A

Source: Navigant

C.1.1 Sources of Benefit and Cost Assumptions

The sources of data used in the cost-benefit analysis are summarized in Table C-2. Many of the input assumptions used in Navigant's analysis came directly from KCP&L-MO. Critical assumptions that differed in Navigant's analysis were energy and peak demand savings (derived from verified data rather than reported estimates), NTG ratios, effective useful life (EUL) and remaining useful life (RUL) values, and participant equipment costs. Please refer to Appendix R for inputs to Navigant's cost-benefit model.

Table C-2. Sources of Benefit and Cost Data

Data[3]	Source
Avoided energy costs	Provided by KCP&L-MO
Avoided capacity costs	Provided by KCP&L-MO
Retail rates	Provided by KCP&L-MO
Load shapes	Provided by KCP&L-MO
Discount rates	Provided by KCP&L-MO and classified by KCP&L-MO as highly confidential
Participant equip. costs	Illinois Technical Reference Manual (TRM), KCP&L-MO Assumptions
Energy and peak demand savings	Navigant engineering analyses
EUL	Illinois TRM
RUL	Navigant analysis based on lifetime of replaced equipment and related mortality analysis techniques
NTG	Navigant NTG analysis
Line loss factors	Provided by KCP&L-MO
Incentives	Program tracking database
Participation	Program tracking database
Administrative costs	Provided by KCP&L-MO

Source: Navigant

[3] Navigant did not provide the avoided energy and capacity costs in this report as they are confidential to KCP&L-MO.

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C.2 Net-to-Gross

This section outlines the methods Navigant used to estimate free ridership (FR) and spillover (SO) as part of its evaluation of the KCP&L-MO portfolio of energy efficiency and demand response (DR) programs.

The goal of Navigant's approach is to accurately estimate NTG components using multiple methods to approximate not only FR but also SO over the course of the 3-year program cycle. Navigant used the following definitions, provided by the Uniform Methods Project,[4] to calculate net savings:

- **FR:** The program savings attributable to free riders—i.e., program participants who would have implemented a program measure or practice in the absence of the program.
- **Participant SO (PSO):** Additional energy savings achieved when a program participant—because of the program's influence—installs energy efficient measures or practices outside the efficiency program after having participated.
- **Nonparticipant SO (NPSO):** Additional energy savings achieved when a nonparticipant implements energy efficiency measures or practices because of the program's influence (e.g., through exposure to the program) that are not accounted for in program savings.

Using these definitions, the NTG ratio is calculated using Equation C-1.

Equation C-1. NTG Ratio

$$\text{NTG Ratio} = 1 - \text{FR rate} + \text{PSO rate} + \text{NPSO rate}$$

The Navigant team used several types of NTG estimates depending on the program type, data availability, and the level of evaluation effort planned for the PY2017 evaluation. Some programs' savings estimates are inherently net, therefore no NTG estimation is necessary. Some programs receive a deemed value of 1.0 based on assumptions about potential free ridership (e.g., evaluators expect income-eligible programs to have zero free ridership) or data availability. Some programs use the prior year's estimated NTG value in the absence of new NTG research. Finally, some of the evaluated programs have no claimed savings and therefore do not require NTG estimation. Table C-3 summarizes the NTG method used for each program.

[4] Daniel M. Violette and Pamela Rathbun. *Estimating Net Savings: Common Practices*, Chapter 23 in The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. 2014. http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf.

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Table C-3. NTG Methods by Program

Program Name*	Estimated in 2017	Savings are Inherently Net	Deemed Value of 1.0	Used Prior Year's Value	Not Applicable (No Claimed Savings)
Business EER Custom	X				
Business EER Standard				X	
Strategic Energy Management			X		
Block Bidding				X	
Online Business Energy Audit					X
Small Business Lighting				X	
Business Programmable Thermostat		X			
Demand Response Incentive		X			
Income-Eligible Home Energy Report		X			
Home Energy Report		X			
Online Home Energy Audit					X
Whole House Efficiency				X	
Income-Eligible Multi Family			X		
Home Lighting Rebate	X				
Residential Programmable Thermostat		X			

The remainder of this section describes the self-report method used for Small Business Lighting.

C.2.1 Participant FR

This section presents the general FR methodology. FR was assessed using a customer self-report approach following the Research Into Action and Energy Trust of Oregon (ETO) framework.[5] This approach used surveys designed to assess the likelihood that participants would have installed some or all of the energy efficiency measures incented by the program even if the program had not existed. The participant surveys followed the same basic structure as the ETO framework.

Based on the ETO methodology, the FR analysis included the following two elements: 1) intention to carry out the energy efficient project without program funds, and 2) influence of the program in the decision to carry out the energy efficient project.

The total FR score was the sum of the intention and program influence scores, resulting in a score ranging from 0 to 100. This score was divided by 100 to convert it into a proportion for application to gross savings values (see Equation C-2).

[5] Jane Peters and Ryan Bliss. *Common Approach for Measuring Free Riders for Downstream Programs.* Research Into Action. October 4, 2013.

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Equation C-2. Total FR

$$\text{Free Ridership (FR)} = \frac{\text{Intention Score + Program Influence Score}}{100}$$

C.2.1.1 Participant FR Intention Score

The evaluation team assessed intention through several brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asked the respondent to identify, out of a limited set of options, the option that best described what most likely would have occurred without program assistance. Specific wording of the questions varied based on the types of measures installed through the program, but the offered response options captured the following four general outcomes:

1. Would have canceled the project, upgrade, purchase, etc.
2. Would have postponed the project by at least 1 year
3. Would have done something that would have produced savings but not as much as those achieved through the project as implemented
4. Would have done the project exactly as implemented through the program
5. Don't know

Respondents who said they would have canceled or postponed the project were not considered free riders in terms of intention (a score of 0 for the intention score). The respondents that indicated they would have undertaken the project as implemented or purchased/installed the same energy efficient equipment without the program were considered total free riders in terms of intention (a score of 50 for the intention component). Respondents who indicated they would have done something that would have resulted in less savings were considered partial free riders with an intention score of 25.

The level of FR depended on the level of savings that the respondent would have achieved without the program's assistance. "Don't know" responses were assigned the midpoint score of 25 for the intention component.

C.2.1.2 Participant FR Influence Score

The evaluation team assessed the program influence on the participant's decision to implement energy efficiency improvements by asking the respondent how much influence—on a scale of 1 (no influence) to 5 (great influence)—various program elements such as incentives and program information had on the decision to implement the measure.

A participant's program influence score was then set to the participant's maximum influence rating for any program element. The rationale was that if any given program element had a great influence on the respondent's decision then the program itself had that level of influence, even if other elements had less influence.

The following table shows the questions asked to calculate the influence score and the possible answers.

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Table C-4. FR Program Influence Responses

Rate the influence of the following program elements in your decision to implement the measure:	Not at all influential Very influential	
Program incentive	1 2 3 4 5	Don't know
Program information from KCP&L	1 2 3 4 5	Don't know
Recommendations and information from your contractor or installer	1 2 3 4 5	Don't know
The information provided through the home energy assessment you received*	1 2 3 4 5	Don't know

** If applicable*

Source: Navigant analysis

Table C-5 shows the influence score for each possible influence rating response. An influence rating response of "5 – Very influential" resulted in an influence score of 0, contributing no value to the total FR score. Program influence and FR have an inverse relationship: the greater the program influence, the lower the FR, and vice versa.

Table C-5. FR Program Influence Scores

Maximum Program Influence Rating Response	Influence Score
1 – Not at all influential	50
2	37.5
3	25
4	12.5
5 – Very influential	0
Don't know	25

Source: Research Into Action and ETO Standard FR Protocol

FR is estimated individually for each participant survey respondent according to the algorithm described above and then savings are weighted by the individual participant's share of program savings to estimate measure category-level FR (e.g., lighting, envelope, HVAC). Measure-level FR is then weighted by each measure category's share of total program savings to estimate program-level FR.

C.2.2 Participant SO

Navigant also assesses SO through the customer surveys. SO is the energy savings influenced by the program but that did not receive program incentives and are not included in the program records. Survey questions aimed to identify whether participants purchased or installed additional energy efficient products without an incentive. Below are examples of these SO questions:

1. Since your participation in the program, did you install or purchased any ADDITIONAL energy efficient products in your home that did NOT receive incentives through KCP&L?

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2. Could you describe the energy efficient product installed or purchased?
3. How did you know the product was energy efficient?
4. How many energy efficient products did you purchase without an incentive?

Additionally, the evaluation team included a question about the level of influence the program had on the respondent's decision to install the additional measures. An example of the question is below.

1. On a 1-5 scale where 1 is not at all influential and 5 is very influential, how influential was your experience in the KCP&L program in your choice to install or purchase the energy efficient product?

The 1-5 influence ratings form a SO influence score as follows:

- 1 (low program influence) = 0%
- 2 = 25%
- 3 = 50%
- 4 = 75%
- 5 (high program influence) = 100% (full attribution)

For each participant, Navigant calculated SO for measures reported as the product of the measure savings, number of units, and influence score, as illustrated in Equation C-3.

Equation C-3. SO Savings from Installed Measures

$$\text{Measure SO} = \text{Measure Savings} * \text{Quantity} * \text{SO Influence Score}$$

For each participant, the evaluators then totaled the measure-level SO savings to give the participant-level SO savings reflected in Equation C-4.

Equation C-4. Overall Participant SO

$$\text{Participant SO} = \Sigma\text{Measure SO}$$

The team then multiplied the mean participant SO savings (including zeroes) for the participant sample by the total number of participants to yield an estimated total participant SO savings at the stratum level. SO is first summed at the stratum level to correct any bias in the survey due to oversampling of specific populations. Equation C-5 shows the algorithm used to calculate SO for each stratum.

Equation C-5. SO Savings for the Stratum

$$\Sigma\text{Participant SO (population)} = \frac{\sum \text{Participant SO (sample)}}{\text{Sample n}} * \text{Population N}$$

Finally, the team summed the SO across strata and divided the program total SO savings by the program total savings to yield a participant SO percentage, as shown in Equation C-6.

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Equation C-6. Participant SO Percentage

$$\% \text{ Participant SO} = \frac{\sum \text{Participant SO (population)}}{\text{Program Savings}}$$

C.2.3 Trade Ally FR and NPSO

The following sections present details on the trade ally NTG methods used. Navigant's trade ally (TA) net-to-gross (NTG) analysis employs an incremental scoring approach (i.e., 0=0%, 1=25%, 2=50%, 3=75%, 4=100%) for all scoring.

C.2.3.1 Program Influence on Trade Ally and FR Methodology

The analysis used the responses to the program influence on trade ally (PITA) questions in three ways:

- To qualitatively provide insight and context for the NTG analysis
- To ensure that trade allies' responses to direct measure-level FR questions are consistent with their account of the program's influence
- To form part of an attribution factor to determine what share of non-incented high efficiency project savings should be attributed to the program as SO

Navigant's analysis resulted in a marketing influence score based on questions that focus on how trade allies are marketing energy efficient products due to program influence. Table C-6 presents the question and resulting program volume influence scores.

Table C-6. Calculation of Marketing Influence Score

Response to Question: "How much influence has that marketing assistance had on your ability to successfully market energy efficiency to your customers?" (Scale of 1-5)	Marketing Influence Score
1 (Not at all influential)	0%
2	25%
3	50%
4	75%
5 (Very influential)	100%

Source: Navigant analysis

Navigant also asked trade allies about the likelihood that they would have recommended the same high efficiency measures in the absence of the program. That response was converted into a recommendation program influence score as shown in Table C-7. Note that a high likelihood score converts into a low program influence score and vice versa.

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Table C-7. Calculation of Recommendations Influence Score

Response to Question: "Since participating in the KCP&L program, have you changed your energy efficiency offerings to customers? For instance, have you added more high efficiency products to your offerings, stopped offering lower efficiency models, or started recommending higher efficiency models as the "default" option? If the program had never been available, what is the likelihood that you would have made those same changes? (Scale of 1-5)	Recommendations Influence Score
1 (Not at all likely)	100%
2	75%
3	50%
4	25%
5 (Very likely)	0%

Source: Navigant analysis

Table C-8. Calculation of High Efficiency Sales Influence Score

Response to Question: "How influential do you think the program was the increase in high efficiency sales?" (Scale of 1-5)	Marketing Influence Score
1 (Not at all influential)	0%
2	25%
3	50%
4	75%
5 (Very influential)	100%

Source: Navigant analysis

Table C-9. Calculation of Early Replacement Influence Score (WHE Program Only)

Response to Question: "How influential do you think the program was the increase in customer willingness to replace still-functioning equipment?" (Scale of 1-5)	Marketing Influence Score
1 (Not at all influential)	0%
2	25%
3	50%
4	75%
5 (Very influential)	100%

Source: Navigant analysis

Finally, the team calculated an overall PITA score. The score is the maximum of the previously calculated influence scores. The maximum of the scores is used rather than an average because using an average would unduly underestimate the program's impact in instances where the program has had a strong influence on the high efficiency sales of a trade ally who has always recommended high efficiency measures, for example.

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Trade Ally Direct Estimate of FR. The web surveys ask a series of program influence questions prior to direct queries regarding the trade ally's views on FR to assist the trade ally in recalling the diversity of ways in which the program may have influenced their high efficiency projects. The program influence questions were asked generally about all high efficiency measures. The direct FR questions focused specifically on the trade ally's top three measures based on program savings. The trade allies were asked to directly assess FR by estimating the number of units they would have sold in the absence of the program after being reminded of how many units they sold through the program. The trade ally estimates of free ridership are used as a cap on the participant estimates of free ridership on a measure-by-measure basis, based on the rationale that participants have the best sense of their ability to afford high efficiency measures without rebates, but participants may not be aware of the ways in which the program has influenced trade allies beyond the provision of rebates. These trade ally estimates of free ridership are estimated at the measure level as described in the following equation.

Equation C-7. Trade Ally Free Ridership Estimated at Measure Level

$$Trade\ Ally\ FR_{\ Measure} = \frac{\sum Trade\ Allies'\ Direct\ Estimate\ of\ Units\ Sold\ without\ Program}{\sum Program\ Incented\ Units}$$

C.2.3.2 NPSO Methodology

Trade allies answered a series of questions to establish the possible existence of SO for their top three highest saving measures.

Estimating the Number of Non-Incented High Efficiency Projects. For each measure, the survey asked the trade ally to estimate how many (if any) additional projects it completed without rebates.

Attributing Non-Incented Projects to the Program. For each SO measure, Navigant calculated the number of SO projects by multiplying each trade ally's total number of non-incented projects by an attribution factor based on the trade ally's responses to program influence questions. If the trade ally said that the program did not have any influence on the non-incented measures, the attribution factor was automatically 0% (meaning that no SO was assigned to the program for those measures for that trade ally). Otherwise, the attribution factor was based on the PITA score (discussed above) and the trade ally's response to the following question on program influence:

"How influential do you think the program was on these additional units sold without rebates?" (Scale of 1-5)

The 1-5 influence ratings form a SO influence score as follows:

- 1 (low program influence) = 0%
- 2 = 0%
- 3 = 50%
- 4 = 100%
- 5 (high program influence) = 100%

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Equation C-8. Attribution Factor

$$\text{Attribution} = \text{PITA Score} * \text{SO Influence Score}$$

Next, Navigant calculated the number of SO projects per trade ally for each measure by multiplying the total number of non-incented projects by the attribution factor.

Equation C-9. Number of SO Projects by Trade Ally and Measure

$$\#\text{ of SO Projects}_{Measure} = \#\text{ of Non-Incented Projects}_{Measure} * \text{Attribution}$$

Estimating SO Project Savings. SO was calculated for each trade ally/measure combination separately. Navigant then calculated the total number of SO projects per measure category and multiplied the total number of SO projects across all trade allies by the measure's savings adjustment factor.

Equation C-10. Savings-Adjusted SO at the Measure Level

$$SO_{Measure} = \frac{\sum \#\text{ of SO Projects}_{Measure}}{\#\text{ of Program Projects}_{Measure}}$$

Finally, Navigant calculated a program-level SO estimate by weighting each measure's SO estimate by the measure's share of total program energy savings, as shown in Equation C-11.

Equation C-11. SO at the Program Level

$$SO = \sum SO_{Measure} * \frac{\text{Program Savings}_{Measure}}{\text{Program Savings}_{Total}}$$

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APPENDIX D. MISSOURI REQUIREMENTS FOR IMPACT EVALUATION

In accordance with Missouri regulations,[6] the KCP&L-MO Company is required to complete an impact evaluation for each program using one or both of the methods and one or both of the protocols detailed below.

1. **Impact evaluation methods.** At a minimum, comparisons of one or both of the following types shall be used to measure program and rate impacts in a manner that is based on sound statistical principles:
    a. Comparisons of pre-adoption and post-adoption loads of program or demand-side rate participants, corrected for the effects of weather and other intertemporal differences
    b. Comparisons between program and demand-side rate participants' loads and those of an appropriate control group over the same period
2. **Load impact measurement protocols.** The evaluator shall develop load impact measurement protocols designed to make the most cost-effective use of the following types of measurements, either individually or in combination:
    a. Monthly billing data, hourly load data, load research data, end-use load metered data, building and equipment simulation models, and survey responses
    b. Audit and survey data on appliance and equipment type, size and efficiency levels, household or business characteristics, or energy-related building characteristics

The evaluator will also be required to develop protocols to gather information and to provide estimates of program FR, SO, and program NTG ratios.

The Navigant team's methods and protocols, as they align with Missouri requirements, for the impact evaluation are summarized in Table D-1.

[6] Missouri Code of State Regulations 4 CSR-240-22-070 (8)

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Table D-1. Missouri Regulations Impact Evaluation Methods and Protocols

Program		Impact Evaluation Method	Impact Evaluation Protocol
C&I Energy Efficiency Programs	Business EER Standard Program	1a	2a and 2b
	Business EER Custom Program	1a	2b
	Block Bidding	1a	2b
	Strategic Energy Management (SEM)	1a	2a
	Small Business Lighting (SBL)	1a	2a and 2b
Residential Energy Efficiency Programs	Whole House Efficiency (WHE)	1a	2b
	Income-Eligible Multifamily (IEMF)	1a	2b
	Home Lighting Rebate (HLR)	1a**	2b
Educational/Behavioral Programs	Home Energy Report (HER)	1b	2a
	Online Business Energy Audit*	1b	2a
	Online Home Energy Audit*	1b	2a
DR Programs	Business Programmable Thermostat	1b	2b
	Residential Programmable Thermostat	1b	2b
	Demand Response Incentive (DRI)	1a	2a

**Navigant does not recommend conducting an impact evaluation for these programs because KCP&L does not claim savings. However, these programs would likely be evaluated using 1b and 2a.*

***The upstream nature of the HLR does not allow for identification of participants and nonparticipants for assessments for comparisons of load shapes; for budgetary reasons the evaluation did not include an hours of use study, which could have provided lighting load shapes for all households.*

Source: Navigant analysis

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APPENDIX E. C&I BUSINESS EER STANDARD PROGRAM-SPECIFIC METHODOLOGIES

KCP&L designed the Business Energy Efficiency Rebate (Business EER) Standard program to help commercial and industrial (C&I) customers save energy through a broad range of energy efficiency options that address all major end uses and processes. The program offers standard rebates as well as mid-stream incentives. The measures incentivized—including lighting, HVAC equipment, and motors—are proven technologies that are readily available with known performance characteristics.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2a and 2b to evaluate the C&I Business EER Standard program. This evaluation of the Standard program consisted of the following activities:

- Gross impact evaluation (detailed in Section E.1)
- Process evaluation (detailed in Section E.2)
- NTG analysis based on work conducted in PY2016 (detailed in Section C.2)

E.1 Impact Evaluation

The evaluation team conducted the bulk of the Standard program gross impact evaluation activities in PY2016, with smaller efforts in PY2017 and PY2018 to update results in a cost-effective manner. The impact evaluation assessed gross energy and demand savings by conducting the following activities:

- Tracking database review
- Deemed measure savings review

E.1.1 Tracking Database Review

The evaluation team conducted a thorough review of the program tracking database in February 2019 that included data for the first 10 months (April 2018-January 2019) of the program year. Navigant reviewed the program tracking database to assess the availability of data fields that help the impact evaluation, including the following:

- Participant contact details and installation address
- Building type
- Installed measure information (quantity, measure type, size, capacity, efficiency levels)
- Reported energy and demand savings at the measure and project[7] levels
- Project costs (implementation cost and incremental equipment cost)
- Trade ally contact information

[7] A project is a unique application that includes single or multiple Standard measures.

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E.1.2 Deemed Measure Savings Review

The KCP&L Missouri Energy Efficiency Investment Act (MEEIA) TRM documents assumptions for deemed measure savings for the Business EER Standard program. The evaluation team reviewed the deemed measure savings used to calculate the reported savings for the Business EER Standard program. This review identified and verified the accuracy and completeness of the engineering algorithms and assumptions used in the deemed savings calculations to ensure they reflect equipment performance in KCP&L's service territory. Navigant reviewed the baseline and efficient case wattages, hours of use (HOU), waste heat factors (WHFs), and coincident factors (CFs) used for lighting measures. For non-lighting measures, Navigant reviewed the baseline and efficient case ratings and calculation variables such as HOU, CF, etc. used to calculate the deemed savings. The deemed measures do not differentiate by building type whereas many of the values used for calculating savings such as HOU, WHFs, and CFs do vary by building type.

The table below summarizes the assumed baseline wattages for all the lighting measures included in the Standard Program savings. The majority of these are from the IL TRM V6 but some updates were made to more closely match the baseline wattage range listed in the measure name.

Table E-1. Baseline Wattage Assumptions

Measure Code	Measure Name	Baseline Wattage Assumption (W)
96.1	Directional LED Lamp replacing 50-70W Lamp	60
96.2	Interior Directional LED Lamp replacing 50-70W Lamp	60
97.1	Directional LED Lamp replacing 71-110W Lamp	90
97.2	Interior Directional LED Lamp replacing 71-110W Lamp	90
102	LED Exit Sign	11
109.1	Remove 4ft Lamp from T8 or T12 system	28
110.1	Remove 8ft Lamp from T8 or T12 System	58
112.1	Omnidirectional LED Lamp replacing 40-60W Lamp	50
112.2	Interior Omnidirectional LED Lamp replacing 40-60W Lamp	50
113.1	Omnidirectional LED Lamp replacing 61-100W Lamp	80
113.2	Interior Omnidirectional LED Lamp replacing 61-100W Lamp	80
149.1	Exterior LED replacing > 400W Fixture or Mogul Screw-Base Lamp	1031
150.1	Exterior LED replacing 251W-400W Fixture or Mogul Screw-Base Lamp	325
151.1	Exterior LED replacing 175W-250W Fixture or Mogul Screw-Base Lamp	213
152.1	Exterior LED replacing < 175W Fixture or Mogul Screw-Base Lamp	151
153.1	Parking Garage LED replacing > 175W Fixture or Mogul Screw-Base Lamp	258
154.1	Parking Garage LED replacing 101W-175W Fixture or Mogul Screw-Base Lamp	137

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155.1	Parking Garage LED replacing ≤ 100W Fixture or Mogul Screw-Base Lamp	124
166	LED linear replacement lamp replacing a 4' T8, T12, or T5 lamp (Eligible for lighting optimization if applicable to project)	29
166.1	LED Linear Lamp Replacing 4ft T8, T12, or T5 Lamp	29
167.1	LED Linear Lamp Replacing 2ft T8, T12, or T5 Lamp	17
168.1	LED 1X4 Retrofit Kit replacing T8, T12 or T5/T5HO fixture	77
169.1	LED 2X4 Retrofit Kit replacing T8, T12 or T5/T5HO fixture	98
170.1	LED 2X2 Retrofit Kit replacing T8, T12 or T5/T5HO fixture	77
171.1	LED 1X4 Troffer or Linear Ambient replacing T8, T12 or T5/T5HO fixture	77
172.1	LED 2X4 Troffer or Linear Ambient replacing T8, T12 or T5/T5HO fixture	98
173.1	LED 2X2 Troffer or Linear Ambient replacing T8, T12 or T5/T5HO fixture	77
174.1	LED Refrigerated Case Lights w/Doors 4ft, 5ft, or 6ft replacing Fluorescent Refrigerated Case Lights w/Doors 4ft, 5ft, or 6ft	102
175.1	LED Freezer Case Lights w/Doors 4ft, 5ft, or 6ft replacing Fluorescent Freezer Case Lights w/Doors 4ft, 5ft, or 6ft	102
176.1	LED Downlight or Retrofit Kit replacing 45-60W Fixture	52
177.1	LED Downlight or Retrofit Kit replacing 61-100W Fixture	80
178.1	LED Downlight or Retrofit Kit replacing 101-155W Fixture	128
220.1	LED Low Bay Fixture replacing 150W-300W fixture	225
221.1	LED Low/High Bay Fixture replacing 301W-450W fixture	375
221.2	LED Low/High Bay Fixture replacing 301W-450W fixture	375
222.1	LED High Bay Fixture replacing 451W - 750W fixture	600
223.1	LED High Bay fixture replacing > 750W fixture	1078
226	LED low bay mogul screw-base lamp/retrofit kit replacing 150W - 300W fixture	225
227	LED low/high bay mogul screw-base lamp/retrofit kit replacing 301W - 450W fixture	375
228	LED high bay mogul screw-base lamp/retrofit kit replacing 451W - 750W fixture	600
229	LED high bay mogul screw-base lamp/retrofit kit replacing > 750W fixture	1078
313	Interior 8' LED Linear Lamp Replacing 8ft T8 or T12 Lamp	58

Source: Navigant analysis.

E.1.3 Verified Savings Analysis

This section describes Navigant's methodology for the completion of the onsite metering and associated analysis of the sites selected for metering from the PY2016 Business EER Standard project sample. Navigant used results of the sampling of the PY2016 project population for PY2017 and PY2018 based on review of the mix of building types showed that the PY2016 project population is similar to the PY2018 project population.

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E.1.3.1 Sampling

For PY2016, Navigant selected a sample of projects completed through November 2016 for onsite EM&V during the January-February 2017 timeframe. This assumes that the population of projects through the end of November 2016 are representative of the entire PY2016, PY2017 and PY2018 populations of the Business EER Standard program within a stratum. Navigant evaluated both service territories in a combined sample based on discussions with implementer and KCP&L product managers. Navigant feels that this is a reasonable approach due to similarities in program execution. Additional detail on the sampling is available in the PY2016 Report and Appendix. Navigant completed both short-term and long-term metering at the sampled sites. Table E-2 lists the meter count by building type for the short-term metering.

Table E-2: Business EER Standard Program Meter Count by Building Type

Strata	PY2016 + PY2017 Standard		PY2016 + PY2017 SBL		Cycle 1 Loggers		Total
	GMO	KCP&L-MO	GMO	KCP&L-MO	GMO	KCP&L-MO	
Industrial	14	6			13		33
Office	3	20	0	6			29
Other	7	7	7	4	36		61
Retail	17	17	8	3	51	7	103
School	15	29			1		45
Warehouse	12	17	5		26		60
Exterior	7	7	2	2			18
Total	**75**	**103**	**22**	**15**	**127**	**7**	**349**

Source: Navigant Analysis

Table E-3 lists the meter count by building type for the long-term metering. A total of 18 sites were included in the long-term metering and a total of 97 lighting loggers were installed.

Table E-3: Business EER Standard Program Meter Count by Building Type for Long-term Metering

Strata	Long-term Sampling Standard		Total
	GMO	KCP&L-MO	
Office	3	20	23
School	15	29	44
Warehouse	12	18	30
Total	**30**	**67**	**97**

Source: Navigant Analysis

Table E-4 presents a comparison of the program participation by strata between PY2016, PY2017, and PY2018 for the Standard program. The percent of total reported savings by strata is similar between PY2016, PY2017 and PY2018 except that the “Warehouse” strata had a much larger percentage of both reported kWh and kW for both GMO and KCP&L-MO. This is because the high bay measure with the

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overestimated savings accounted for a large fraction of the "Warehouse" strata savings. With the correction made to this measure for PY2017, the percent of the total savings in the "Warehouse" decreased in PY2017 and PY2018.

Table E-4. Comparison of PY2016, PY2017 and PY2018 Reported Savings by Strata for GMO and KCP&L-MO

Strata	GMO						KCP&L-MO					
	% of Total Reported kWh			% of Total Reported kW			% of Total Reported kWh			% of Total Reported kW		
	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018
Industrial	27%	28%	12%	28%	28%	10%	21%	22%	8%	22%	23%	7%
Office	2%	3%	6%	2%	4%	7%	2%	7%	17%	2%	8%	19%
Other	21%	13%	24%	20%	10%	24%	16%	21%	28%	15%	16%	27%
Retail	9%	24%	36%	7%	25%	36%	8%	11%	35%	7%	11%	35%
School	9%	15%	13%	9%	17%	14%	6%	2%	2%	6%	3%	2%
Warehouse	32%	16%	9%	33%	16%	9%	47%	37%	10%	48%	39%	10%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Navigant Analysis

The following table provides the number of buildings metered and the number of meters for each stratum for the PY2016-PY2017 lighting study, as well as relative precision values for energy and demand impacts for each building type. Navigant used a confidence and relative precision target analysis to confirm that enough individual buildings were metered to provide reasonable values for HOU and CF. For the combined GMO and KCP&L-MO sample, the relative precision and confidence for each building type fell within the target range of 90/20 confidence and precision at the program level.

Table E-5. Business EER Standard Program Metering by Strata

Program	Stratum	Buildings		Meters	Energy	Demand
		Year-End Building Population	Building Sample Size	Meters Sample Size	Relative Precision at 90% Confidence (one-tailed)	Relative Precision at 90% Confidence (one-tailed)
Standard & SBL	Industrial	163	7	33	7.3%	5.9%
	Office	144	5	29	34.6%	29.9%
	Other	262	9	61	27.8%	22.2%
	Retail	251	12	103	34.6%	17.4%
	School	94	8	45	9.5%	14.5%
	Warehouse	206	9	60	13.9%	10.9%
	Total	**1,120**	**50**	**331**	**13.5%**	**10.4%**

Source: Navigant Analysis

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Navigant also calculated the relative precision for the CF and HOU for each stratum at end of the long-term metering. The following table presents these results at the 90% confidence interval. The overall relative precision for the mix of building types falls within the 90/20 target range.

Table E-6. Business EER Standard Program Relative Precision by Strata

Strata	CF Relative Precision at 90% Confidence	HOU Relative Precision at 90% Confidence
Industrial	29%	44%
Office	15%	19%
Other	9%	20%
Retail	6%	7%
School	9%	19%
Warehouse	14%	24%
Exterior	NA	7%
Total Program	**9%**	**14%**

Source: Navigant Analysis

E.1.3.2 Onsite Verification and Metering

In PY2017, Navigant completed the onsite verification and metering of sampled projects for the Business EER Standard program that was started in PY2016. For the sample selected in PY2016, Navigant stratified the Standard program population by building type, including “Industrial”, “Office”, “Retail”, “School”, “Warehouse”, and “Other”. Navigant developed the sample by building type to capture the hours of operation (HOU) and coincident demand factors (CF) by building type for the lighting measures installed in the Standard program.

Navigant metered most of the sampled projects for the short-term duration (8 weeks, February 2017-April 2017) and completed long term metering of a smaller sample for three strata. The three strata were selected based on feedback from the KCP&L team on which building types were of most interest to them. Navigant selected three strata—school, warehouse, and office—for the long-term (12 months) metering. “Warehouse” building type represented highest energy savings (32%) of the program level savings for PY2016. “School” building type has considerable seasonality through a typical year which Navigant aimed to capture through the long-term metering. “Office” building type represented less than 5% of program level energy savings for PY2016. However, KCP&L anticipates future growth in this building type, thus Navigant included “Office” in long-term metering as well. Other space types included in the study, “Industrial” and “Retail”, have consistent hours. Whereas, the “Other” space type includes wide range of different building types which does not warrant a long-term metering strategy.

The evaluation team retrieved short-term data for the three long-term metering strata in April 2017, along with the other short-term sites, and used that data for the PY2016 verification. The evaluation team also collected metering data in October 2017 and for a final time in March 2018. Navigant used onsite verification to verify project implementation information and to collect the operating parameters for

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installed lighting projects. Navigant used the metered data (lighting loggers, current data loggers, etc.) to develop building type level inputs for HOUs and CFs used in the verified savings calculations for PY2017 and PY2018.

E.1.3.3 Hours of Use and Coincident Factor Analysis Methodology

The following discussion is for reference, as PY2018's analysis used the results from the PY2016 and PY2017 lighting logger activities. In PY2017 the evaluation team stratified each of the building type strata (i.e. Industrial, Office, Retail, etc) further into "large" and "small" building types, because the HOU for large and small customers is measurably different. The evaluation team stratified the sites by size based on whether the reported energy savings for a site were greater than 100,000 kWh or the reported demand savings by site were greater than 10 kW. Navigant did not use building size (e.g. square footage) as a method to stratify the population because these data were not available for all sites. However, for the sites with square footage data, Navigant compared the stratification using the kWh and kW savings criteria to the building size and found good correlation. Navigant used the substrata to determine the weighted strata HOU and CF as outlined in the figure below.

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Figure E-1 Methodology for Determining Strata HOU and CF from Logger Data

Step 1: Stratify PY2016 population by size	• Use information on reported kWh and kW savings by site to stratify into large and small sites
Step 2: Determine a substrata weight	• Determine what % each strata's kWh savings is represented by small or large sites in the PY2016 population
Step 3: Assign a substrata to each HOU and CF determined from the logger data by space type	• Roll up the lighting logger data to be by space type withing the site • Link the results of step 1 to the logger data so that each logger data point by space type is assigned to a substrata
Step 4: Assign a substrata for Cycle 1 and SBL logger sites	• Use reported kWh or KW to assign a substrata for Cycle 1 sites • All small business lighting sites from the short terms sampling are assigned to the small strata
Step 5: Determine a substrata HOU and CF	• Equally weight all logger calculated HOUs and CFs within a substrata • Result will be 13 HOUs and CFs
Step 6: Determine a weighted strata HOU and CF	• Weight substrata results by substrata population weight determined in Step 2 • End result will be a 7 strata HOU and CF

The results of this analysis using the long-term metering data compared to the HOU and CF calculated for PY2016 from just the short-term logger data are presented in Table E-7. Overall, the HOU decreased between 7-19% for all interior space types. This decrease is due to two reasons. First, for the strata with the long-term metering, HOU in the summer months declined leading to an overall lower HOU than just the HOU based on the short-term metering in the winter months. Second, the previous weighting method gave more weight to some sites with higher than average HOU, independent of whether these sites represented the overall population. The HOU increased for exterior space types 15% due to some of the long-term metering sites having exterior loggers that recorded higher HOU. The CF increased for the industrial, other, and school strata, and decreased for the office, retail, and warehouse strata. The change for the three strata with long-term metering, school, office, and warehouse, is based on seasonal variations in operating hours captured in the long-term metering. The change for the three strata not included in the long-term metering is based on the updated weighting. If the CF increased such as for industrial and other building types, the previous weighting was weighing sites with lower CF more heavily. If it decreased, such as for retail, the previous weighting was weighing sites with higher CF more heavily.

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Table E-7 Comparison Between PY2016 and PY2017 for CF and HOU for Standard Program

Strata	Results of Short-Term Logger Analysis		Results of Long-Term Logger Analysis and Updated Weighting		% Change	
	CF	HOU	CF	HOU	CF	HOU
Industrial	0.62	5,144	0.64	4,584	3%	-11%
Office	0.75	4,484	0.69	3,636	-8%	-19%
Other	0.67	5,280	0.73	4,925	9%	-7%
Retail	0.83	5,662	0.74	4,921	-10%	-13%
School	0.59	4,074	0.63	3,642	6%	-11%
Warehouse	0.64	4,110	0.55	3,611	-15%	-12%
Exterior	0.0	4,702	0.0	5,392	0%	15%

Source: Navigant Analysis

The WHF_e and WHF_d at the strata level for offices and schools varied slightly between PY2016 and PY2017 due to the updated weighting. Each PY2016 sampled site was assigned a WHF_e and WHF_d based on the building type and size. These were then weighted based on the substrata weights determined for the HOUs and CF. The updated WHF_e and WHF_d at the strata level are presented in Table E-8.

Table E-8 Comparison Between PY2016 and PY2017 for WHF_e and WHF_d

Strata	Results of Short-Term Logger Analysis		Results of Long-Term Logger Analysis and Updated Weighting		% Change	
	WHF_e	WHF_d	WHF_e	WHF_d	WHF_e	WHF_d
Industrial	1.02	1.04	1.02	1.04	0%	0%
Office	1.21	1.44	1.25	1.39	3%	-3%
Other	1.09	1.36	1.09	1.36	0%	0%
Retail	1.12	1.29	1.12	1.29	0%	0%
School	1.18	1.35	1.17	1.33	0%	-2%
Warehouse	1.00	1.22	1.00	1.22	0%	0%
Exterior	1.00	1.00	1.00	1.00	0%	0%

Source: Navigant Analysis

E.1.3.4 Analysis

The following section describes the evaluation team's analysis methodology to calculate the verified energy savings and coincident peak demand savings for the Business EER Standard program measures. Navigant applied the calculation algorithms from the KCP&L MEEIA TRM which is based on the IL TRM v5 which includes industry standard algorithms for engineering review of the following measures implemented:

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1. Lighting
2. Compressed Air – No Loss Condensate Drain/Valve
3. ECM Motors Walk-in Coolers & Freezers
4. High Efficiency Reach-in Freezers
5. Strip Curtains
6. Variable Speed Drive Compressor – 3 Shift Weekdays Plus Weekends
7. Low Flow Faucet Aerator

For the Advanced Rooftop Unit Controls, Navigant verified the program's deemed savings and found them to be reasonable based on the provided sources.

Lighting Measures
The team referenced the KCP&L MEEIA TRM to obtain the calculation inputs.

Energy Savings

Equation E-1. Energy Savings for C&I Lighting Measures

$$\Delta kWh = \frac{(Watts_{base} - Watts_{ee}) * ISR * Hours * WHF_e}{1{,}000}$$

Where:

$Watts_{base}$ Wattage of actual baseline lighting fixture/lamp. The evaluation team used the following data sources (listed by priority)

1. Wattages from the onsite verification for the LED High Bay (176-350W) measure
2. The midpoint of the replacement wattage listed in the measure name
3. Wattages in the KCP&L MEEIA TRM (derived from the ILTRM v5, IL TRM v4[8], or Appendix B Table of Standard Fixture Wattages [9]

$Watts_{ee}$ Actual wattage of installed efficient lighting. The evaluation team used the following data sources (listed by priority):

1. Actual wattage from the tracking database
2. Wattage listed by the manufacturer for the efficient technology reported in the tracking database
3. Efficient wattage in the KCP&L MEEIA TRM (derived from the IL TRM v5, the IL TRM v4, or Appendix B Table of Standard Fixture Wattages)

ISR In-service rate (99% assumed for interior lighting, 97% assumed for exterior lighting based on the onsite findings)

[8] Navigant referred to the IL TRM v4 for wattages of measures which are not in the IL TRM v5 or v6.

[9] 2013-15 Statewide Customized Offering Procedures Manual for Business: http://www.aesc-inc.com/download/spc/2015SPCDocs/PGE/Customized%201.0%20Policy.pdf

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Hours[10] Average HOU per year. The evaluation team used the following data sources to get the HOU (listed by priority):
1. HOU according to space type based on results of the long-term metering
2. HOU from Section 4.5 of the IL TRM v5 for parking garage measures

WHF_e[11] Waste heat factor for energy to account for cooling energy savings from efficient lighting. The waste heat factor varies according to space type and is based on Section 4.5 from the ILTRM v5.

Coincident Peak Demand Savings

Equation E-2. Coincident Peak Demand Savings for C&I Lighting Measures

$$\Delta kW = \frac{(Watts_{base} - Watts_{ee}) * ISR * CF * WHF_d}{1{,}000}$$

Where:

$Watts_{base}$ Same as above

$Watts_{ee}$ Same as above

ISR Same as above

CF Summer peak coincidence demand factor. The evaluation team used the following data sources to get the CF (listed by priority):
1. CF according to space type based on results of the long-term metering
2. CF according to space type from Section 4.5 of the IL TRM v5 for parking garages

WHF_d Waste heat factor for demand to account for cooling energy savings from efficient lighting. The waste heat factor varies according to space type and is based on Section 4.5 from the IL TRM v5.

Compressed Air – No Loss Condensate Drain/Valve

Navigant evaluation team utilized the calculation inputs from the KCP&L MEEIA TRM (based on values in Section 4.7.3 of the IL TRM v5).

[10] The referenced version of the KCP&L MEEIA TRM uses annual HOU from the IL TRM v4 for the Office-Midrise space type for most interior lighting measures.

[11] Ibid.

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Energy Savings

Equation E-3. Energy Savings for Measure of Compressed Air – No Loss Condensate Drain/Valve

$$\Delta kWh = CFM_{reduced} \times kW_{CFM} \times Hours$$

Where:

$CFM_{reduced}$	Reduced air consumption (CFM) per drain = 3 CFM
kW_{CFM}	System power reduction per reduced air demand (kw/CFM) depending on the type of compressor control = 0.107 kW/CFM
Hours	Compressed air system pressurized hours = 6,136 hours

Coincident Peak Demand Savings

Equation E-4. Coincident Peak Demand Savings for Measure of Compressed Air – No Loss Condensate Drain/Valve

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

Hours	Same as above
CF	0.95

ECM Motors Walk-in Coolers & Freezers

The KCP&L MEEIA TRM provides deemed savings for measure of ECM Motors Walk-in Coolers & Freezers. Navigant used 401 kWh Savings per Motor and 0.042 kW Savings per Motor (based on Section 4.6.4 of the IL TRM v5).

High Efficiency Reach-in Freezers

The KCP&L MEEIA TRM provides deemed savings for measure of High Efficiency Reach-in Freezers. Navigant used 869.3 kWh Savings per freezer and 0.092 kW Savings per freezer (based on the IL TRM v5).

Strip Curtains

The KCP&L MEEIA TRM includes deemed savings for Strip Curtain measure (based on Section 4.6.7 of the IL TRM v5).

Energy Savings

Equation E-5. Energy Savings for Measure of Strip Curtains

ΔkWh = 2,974 per freezer with curtains installed
= 422 per cooler with curtains installed

Coincident Peak Demand Savings

Equation E-6. Coincident Peak Demand Savings for Measure of Strip Curtains

ΔkW = ΔkWh / 8766 * CF
= 0.34 for freezers
= 0.05 for coolers

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Where:

8766	Hours per year
CF	1.0

Variable Speed Drive Compressor – 3 Shift Weekdays Plus Weekends

The evaluation team employed the calculation inputs from the KCP&L MEEIA TRM (based on Section 4.7.1 of the IL TRM v5).

Energy Savings

Equation E-7. Energy Savings for Measure of Variable Speed Drive Compressor

$$\Delta kWh = 0.9 \times hp_{compressor} \times HOURS \times (CF_b - CF_e)$$

Where:

ΔkWh	Gross customer annual kWh savings for the measure
$hp_{compressor}$	Compressor motor nominal hp
0.9	Compressor motor nominal hp to full load kW conversion factor
HOURS	Compressor total hours of operation below depending on shift = 8,320 hours for 3 shift weekdays plus weekends
CF_b	Baseline compressor factor = 0.890
CF_e	Efficient compressor = 0.705

Coincident Peak Demand Savings

Equation E-8. Coincident Peak Demand Savings for Measure of Variable Speed Drive Compressor

$$\Delta kW = \Delta kWh / HOURS * CF$$

Where:

CF	Coincidence Factor = 0.95

Low Flow Faucet Aerator

Navigant evaluation team utilized the calculation inputs from the KCP&L MEEIA TRM (based on values in Section 4.3.2 of the IL TRM v5).

Energy Savings

Equation E-9. Energy Savings for Measure of Low Flow Faucet Aerator

$$\Delta kWh = \%ElectricDHW * ((GPM_base - GPM_low)/GPM_base) * Usage * EPG_electric * ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric resistance heating = 100%
GPM_base	Average flow rate, in gallons per minute, of the baseline faucet “as-used” = 1.826 gallons
GPM_low	Average flow rate, in gallons per minute, of the low-flow faucet aerator “as-used” = 1.41 gallons for kitchen and 0.94 gallons for bathroom
Usage	Estimated usage of mixed water (mixture of hot water from water heater line and cold water line) per faucet (gallons per year) = 4,247 gallons

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EPG_electric	Energy per gallon of mixed water used by faucet (electric water heater) = 0.0795 kWh/gal for bathroom, 0.0969 kWh/gal for kitchen
ISR	In service rate of faucet aerators = 0.95

Coincident Peak Demand Savings

Equation E-10. Coincident Peak Demand Savings for Measure of Low Flow Faucet Aerator

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

Hours	Annual Recovery Hours - Annual electric DHW recovery hours for faucet use = 41 hours
CF	.0102

E.2 Process Evaluation

Navigant addressed two process evaluation research questions and the five Missouri-required questions for process evaluation through staff interviews, a program materials review, and review of participant surveys collected by the implementer for the C&I Business EER Standard program.

Table E-9 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table E-9. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activities
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews
2. What changes have been made to the program in this program year?	• Program staff interviews
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Implementer administered participant surveys
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Implementer administered participant surveys

Source: Navigant

E.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview on January 31, 2019 and February 4, 2019, respectively. Specific process topics addressed included the following:

- Program operation, challenges, successes, and goals
- Qualification process for trade allies to apply for rebates through the program
- Qualifications for customers to participate in the program

E.2.2 Implementer Administered Participant Surveys

Navigant reviewed participant surveys collected by the implementer after completion of projects in PY2018 collected by March 2019. Table E-10 summarizes the responses to the survey.

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Table E-10. Responses to Implementer Administered Online Survey

	GMO & KCP&L-MO Total
Population	893
Survey Completions	58
Completion Percentage	6.5%

Source: Navigant analysis

Navigant reviewed the survey questions related to the following categories:

- Participant program material accessibility
- Participant reasons for considering energy efficiency upgrades
- Participant satisfaction with the KCP&L program overall
- Participant satisfaction with the KCP&L contractor

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APPENDIX F. C&I BUSINESS EER CUSTOM PROGRAM-SPECIFIC METHODOLOGIES

The Business Energy Efficiency Rebate (Business EER) Custom program is designed to help C&I customers save energy and peak demand through a broad range of energy efficiency options that align with customers' needs.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2b to evaluate the Business EER Custom program. This evaluation of the Custom program consisted of the following activities:

- Gross impact evaluation (detailed in Section F.1)
- Process evaluation (detailed in Section F.2)

F.1 Impact Evaluation

The program went through several major changes in the last program year. KCP&L recruited another implementation contractor, Lockheed Martin, to promote non-lighting projects in its service territory. CLEAResult primarily focuses on implementation of lighting projects since the implementation contractor transformation took effect. To support the transition, Navigant conducted a parallel path review working with the two implementers. In addition, KCP&L developed a midstream HVAC program under the Custom program with CLEAResult as the implementer.

Navigant performed the following evaluation activities:

- Tracking database review
- Engineering review consisting of:
    - Engineering desk review
    - Measure and project verification via phone interviews
    - Parallel path review

F.1.1 Tracking Database Review

The evaluation team conducted a thorough review of the program tracking database as described in Section E.1.1.

F.1.2 Engineering Desk Review

Based on the program tracking database review, Navigant drew a sample of the program population for an engineering review. Assessing savings for a sample of the program population is a uniform method for

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the evaluation of large energy efficiency programs [12]. This section describes Navigant's methodology for the sampling and engineering review of the Business EER Custom program in PY2018.

F.1.2.1 Sampling

Navigant used a stratified ratio estimation sampling design to develop an efficient sample achieving 90/10 confidence/precision on the program-level realization rate. The following steps were taken:

- Review the program tracking database and define the confidence and precision at the overall program level
- Define the statistical stratum based on program characteristics
- Estimate an appropriate variance for each stratum
- Select a random sample within each stratum

The evaluation team then divided the projects by reported energy savings (size) into the following strata:

- Certainty
- Large Lighting
- Small Lighting
- Large Non-Lighting
- Small Non-Lighting

Stratification aligns with the project size variability and allows the sampling to have a good representation of the population. The Navigant team randomly selected projects proportionately within each stratum to ensure both of the following:

- The evaluation of the largest projects and contributors to the program performance
- The fair representation of smaller projects in the evaluation

The Certainty stratum included the largest projects implemented in the program year, each of which accounted for 10% or greater of the total program savings. The evaluation team removed very small projects for sampling. The total savings of those very small projects made up no more than 2% of the total program savings. Navigant then divided the remaining projects into lighting and non-lighting projects. Lighting projects constituted most of the program savings, thus this sampling approach avoids over representation of lighting projects. The evaluation team divided lighting projects into Large Lighting and Small Lighting strata, with large projects constituting the top 50% of lighting project savings and small projects the bottom 50%. The same approach was applied for non-lighting projects. The evaluation team

[12] Chapter 11: Sample Design Cross-Cutting Protocol. National Renewable Energy Laboratory (NREL). https://www.nrel.gov/docs/fy17osti/68567.pdf

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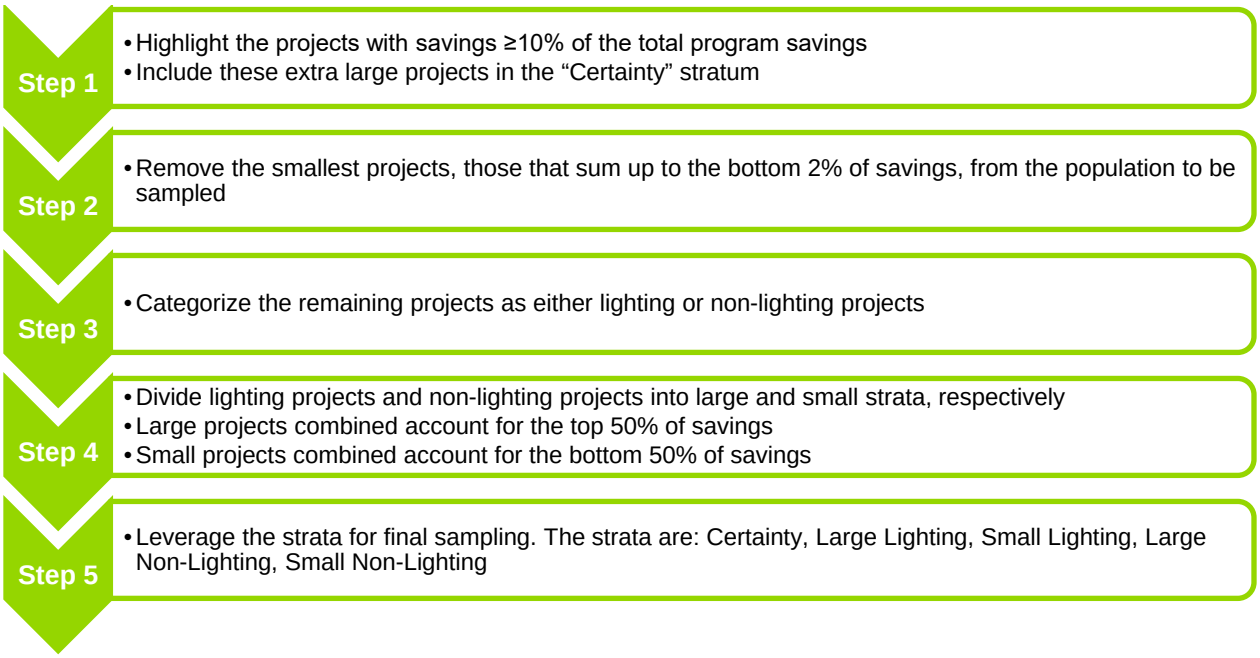
then randomly selected projects within each stratum to determine the final sample. The sampling procedures are summarized in the following figure.

Figure F-1. Custom Program Sampling Procedures in PY2018



F.1.2.2 Engineering Review Methodology

The evaluation team requested project files for the sampled projects from KCP&L and the implementation team. The team reviewed the project files and all the assumptions made by the implementer in developing reported savings. The team also conducted telephone interviews with customers whose projects were large and complex to ensure full understanding of the project. Navigant then verified the energy and coincident peak demand savings for each sampled project using industry standard evaluation methodologies based on the Uniform Methods Protocols (UMP)[13], all of which are detailed further below in this section. Finally, Navigant calculated realization rates (RR) for the program using the following process.

Equation F-1. Realization Rates Per Stratum

$$RR_{stratum} = \frac{\sum_{sampled} E_{ex-post}}{\sum_{sampled} E_{ex-ante}}$$

Where:

E Electric energy savings or peak demand reduction for each project in the stratum

[13] https://www.energy.gov/eere/about-us/ump-protocols

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Realization rates in each stratum were applied to the project population of that stratum using Equation F-2:

Equation F-2. Realization Rates Per Stratum and Project Population

$$E_{i,ex-post} = RR_{stratum} * E_{i,ex-ante}$$

The program level realization rate for the program was calculated using Equation F-3:

Equation F-3. Realization Rates for the Entire Program

$$RR_{program} = \frac{\sum_{i=1}^{5} E_{i,ex-post}}{\sum_{i=1}^{5} E_{i,ex-ante}}$$

The evaluation team's engineering review methodology to calculate the verified energy savings and coincident peak demand savings for the Business EER Custom program measures is described below. Navigant applied industry standard methodologies for engineering review of the following measures or similar measures implemented in the program year.

- Lighting Measures
- Building Optimization
- Variable Speed Drive for Pump or Fan
- Miscellaneous Custom
- Refrigeration Upgrade
- New Construction

Lighting Measures

Energy Savings

Equation F-4. Energy Savings for C&I Lighting Measures

$$\Delta kWh = (kW_{base} - kW_{ee}) * ISR * Hours * WHF_e$$

Where:

kW_{base}	kW of the baseline lighting, based on kW of existing lighting fixtures for retrofit projects or based on the lumens of baseline lighting fixtures (lumen match approach) for new construction projects
kW_{ee}	kW of the post-retrofit or energy efficient lighting system, based on lighting plans and specifications and verified by phone interview
HOURS	Average hours of use per year, based on project information and verified by phone interview
WHF_e	Waste heat factor for energy, based on the IL TRM v6 for each building type
ISR	In-service rate, based on project information and verified by phone interview

Equation F-5. Energy Savings for C&I Lighting Controls

$$\Delta kWh = kW_{controlled} * ISR * Hours * ESF * WHF_e$$

Where:

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$kW_{controlled}$	Total lighting load connected to the installed lighting controls, based on lighting plans and specifications and verified by phone interview
ESF	energy savings factor for installed lighting controls, based on the IL TRM v6 for each building type

Coincident Peak Demand Savings

Equation F-6. Coincident Peak Demand Savings for C&I Lighting Measures

$$\Delta kW = (kW_{base} - kW_{ee}) * ISR * CF * WHF_d$$

Where:

CF	Summer peak demand coincidence factor, based on the IL TRM v6 and verified by phone interview to confirm lighting operation schedule
WHF_d	Waste heat factor for demand, based on the IL TRM v6

Equation F-7. Coincident Peak Demand Savings for C&I Lighting Controls

$$\Delta kW = kW_{controlled} * ISR * (CF_{baseline} - 0.15) * WHF_d$$

Where:

$CF_{baseline}$	Summer peak demand coincidence factor, based on the IL TRM v6 for each building type

Building Optimization

Navigant evaluated building optimization as a control measure. Under this measure, thermostat upgrades or other HVAC controls are implemented at facilities. The Navigant team applied one of four approaches for determining the energy savings resulting from the controls measures, including:

- Calibrated Simulation
- Bin Model Calculations
- End Use Regression Model
- Consumption Data Analysis

Calibrated simulation is appropriate and reasonably cost effective if the building simulation model is available for evaluation from the reported savings estimate documentation. For the KCP&L building optimization projects, Navigant didn't find that reported savings were calculated via building simulation.

Bin model calculations are commonly utilized. However, this type of analysis is expensive to perform for building optimization projects for evaluation unless a model is available from the reported savings calculation or the evaluator has a model available that can be easily employed.

End use regression modeling is the most accurate methodology and is recommended for EM&V of HVAC controls measures. However, it is rarely adopted because it needs extensive pre- and post-retrofit metering and includes potential impacts from interactions with other measures or equipment concurrently installed.

Considering the above limitations and available data for these building optimization projects, Navigant applied consumption data analysis, also called billing data analysis. Billing data analysis is a reasonable approach for the estimation of whole building energy savings. It is simpler and more cost effective to conduct compared to the end use regression model method.

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The billing data analysis approach proceeds by the following steps:

1. Review the billing data and corresponding historical weather data for the site location
    a. The billing data analysis depends on the types of data available. If hourly billing data are collected, an hourly billing data analysis is conducted. An hourly billing data analysis is more accurate than a monthly billing data analysis and easy to align with the peak period for the calculation of peak demand savings.
2. Define the pre- and post-retrofit period
3. Create a regression relationship between the billing data and historical weather data for both pre- and post-retrofit periods
4. Predict the pre- and post-retrofit hourly power demand using the created regression models and the Typical Meteorological Year 3 (TMY3) weather data
5. Calculate the project savings by subtracting the post-retrofit consumption from the pre-retrofit consumption

Variable Speed Drive for Pump or Fan

Navigant applied the end use regression model approach for the estimation of energy and peak demand savings for variable speed drive projects. Navigant performed an end use regression analysis using the following steps.

1. Review the metering data and other variables (such as outdoor air temperature, production data—this depends on the project type)
2. Create a regression relationship between the metering data and other variables for both pre- and post-retrofit periods
3. Predict the pre- and post-retrofit hourly power using the created regression models and other variables
    a. Other variables depend on the project type. For example, if the regression analysis is run for metering data and weather data, the TMY3 data is used for the prediction
4. Calculate the project savings by subtracting the post-retrofit consumption from the pre-retrofit consumption

Miscellaneous Custom

Navigant applied the bin model approach for the determination of energy and peak demand savings for the other types of custom projects. To align the calculations of peak demand savings with the peak period, Navigant used 8,760 hours of data for the creation of the bin model. The steps for Navigant's bin model approach are as follows:

1. Create a regression model comparing the demand against dry bulb temperatures or other relevant variables
    a. For example, the regression model could be performed for a performance curve for a cooling system, pump, or fan
2. Calculate the hourly power for each hour using the regression model
3. Calculate the pre- and post-retrofit energy consumptions by summing up the 8,760 hours of power
4. Calculate the pre- and post-retrofit peak demand by extracting savings that fall within the peak period

Refrigeration Upgrade

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Navigant applied the end use regression model approach for the estimate of energy and peak demand savings for the refrigeration upgrade project. The detailed methodology is summarized in the section 'Variable Speed Drive for Pump or Fan'.

New Construction
Navigant used the updated bin model approach summarized in the section 'Miscellaneous Custom', for the estimate of energy and peak demand savings for non-lighting new construction projects.

Navigant applied the relevant codes and standards for evaluation of new construction projects as described below.

- **Baseline standard or code for Custom new construction projects**
  The local enforcement baseline code is IECC 2012.

- **Calculation approach for Custom new construction lighting projects**
  The evaluation team used the building-area or space-by-space method defined by the ASHRAE Standard 90.1 2010 to calculate savings for the Custom program's new construction lighting projects. The implementer applied the lumen match approach by using particular lighting fixtures as the baseline rather than the standard-defined methods. The baseline lighting fixtures are determined by aligning the total baseline lighting lumen outputs with the proposed lighting lumen outputs for a zone. The lumen match approach makes baseline cost calculations more straightforward for new construction lighting projects. The evaluation team conducted research on the lumen match methodology and the utility practices for calculation of baseline costs. Based on the research, the team summarized the following utility practices for calculation of baseline costs:

  1. Use deemed incremental measure costs (IMC) values based on the amount of energy saved (have been accepted as reasonable in past filings)
  2. Use IMC values from program experience; assumes it is possible to identify all measures and base measure equivalents, and that contractors are able to produce receipts for equipment purchased
  3. Use derived IMC values based on the Database for Energy Efficient Resources (DEER)[14]

  Navigant found that using the building-area or space-by-space method defined by the baseline standard overstates the baseline lighting fixtures the customer would have installed. Based on research and discussions with the implementer, Navigant used the lumen match approach for calculation of both project savings and incremental costs.

F.1.2.3 Parallel Path Review

Navigant performed parallel path reviews for CLEAResult and Lockheed Martin. The goal of this parallel path approach was to minimize risk and uncertainty in application of kW factors, engineering approach, data collection, and measurement and verification. The evaluation team applied the industry standard approaches based on the International Performance Measurement and Verification Protocol (IPMVP) Options[15] and the Uniform Methods Protocol (UMP).

[14] https://www.energy.ca.gov/_deer/

[15] https://evo-world.org/en/products-services-mainmenu-en/protocols/ipmvp

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F.2 Process Evaluation

Navigant addressed two process evaluation research questions and the five Missouri-required questions for process evaluation through program staff interviews, a program materials review, three market actor surveys, and three participant surveys for the Business EER Custom program.

Table F-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table F-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews • Materials review
2. What changes have been made to the program in this program year, and what changes are planned for the next program year?	• Program staff interviews • Materials review
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review • Trade ally surveys
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review • Trade ally surveys
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review • Trade ally surveys
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review • Trade ally surveys • Participant surveys
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review • Trade ally surveys • Participant surveys

Source: Navigant

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F.2.1 Program Staff Interviews

Navigant conducted a program manager interview and two implementation contractor interviews as described in Section E.2.1.

F.2.2 Materials Review

Navigant conducted a review of the program description and documents available from KCP&L to understand the Custom program application process and program requirements. Navigant reviewed the following program documents:

- Program tracking database
- Bill inserts, brochures, point of sales materials, and other marketing collateral
- Contractor/trade ally training materials
- Program implementation manual
- Internal process checklists or flowcharts
- Any regulatory filings regarding the program
- Program logic model

F.2.3 Market Actor Surveys

The evaluation team conducted three waves of trade ally surveys for the process evaluation.

F.2.4 Participant Surveys

The evaluation team conducted three waves of participant surveys for the process evaluation.

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APPENDIX G. C&I BLOCK BIDDING PROGRAM-SPECIFIC METHODOLOGIES

The Block Bidding program offers two options to large commercial and industrial (C&I) customers and trade allies to reserve financial incentives for planed energy efficiency (EE) projects. First, commercial customers, trade allies, and energy service companies can participate in the Block Bidding program after passing the rebate threshold in the Custom, Standard, and other commercial programs. Second, the Block Bidding program provides a reverse auction where the participants reverse bid the incentive per kWh or per kW down from the starting price. The lowest proposed incentive per kWh saved wins the auction. The other customers who miss the online auction can attend the Block Bidding program at a Buy Now incentive rate which is lower than the winning bid rate. Customers and/or third parties submit proposals to deliver the requested block of cost-effective electric savings. The electric savings may be achieved in a variety of ways—for example, one customer facility might accomplish their savings by installing energy efficiency equipment while another might accomplish savings by bundling projects across multiple sites.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2b to evaluate the C&I Block Bidding program. The evaluation of the Block Bidding program consisted of the following activities:

- Gross impact evaluation (detailed in Section G.1)
- Process evaluation (detailed in Section G.2)

G.1 Impact Evaluation

In PY2018, there were three KCP&L-MO projects completed. The evaluation team performed the following evaluation activities:

- Tracking database review
- Engineering review
    - Engineering desk review
    - Phone interview supported engineering review

G.1.1 Tracking Database Review

The evaluation team conducted a tracking database review of the KCP&-MO Block Biding program, in the same method as with the Custom program as detailed in the Section E.1.1.

G.1.2 Engineering Review

This section describes Navigant's methodology for the sampling and engineering review of the Block Bidding program projects.

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G.1.2.1 Sampling

There were three KCP&L-MO Block Bidding projects completed in PY2018. Navigant verified all the three projects for the program evaluation.

G.1.2.2 Engineering Review

Navigant evaluated the three projects via engineering desk review and telephone verification and using the engineering approaches described in the Section F.1.2.

G.2 Process Evaluation

Navigant addressed the five Missouri-required questions for process evaluation through program staff interviews, a program materials review and in-depth customer interviews for the KCP&L-MO Block Bidding program.

Table G-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table G-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review • In-depth customer interview
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review • In-depth customer interview

Source: Navigant

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G.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview as described in Section E.2.1.

G.2.2 Materials Review

Navigant conducted a review of the program description and documents from KCP&L to understand the Block Bidding program application process and program requirements as described in Section F.2.2.

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APPENDIX H. C&I STRATEGIC ENERGY MANAGEMENT PROGRAM-SPECIFIC METHODOLOGIES

The Strategic Energy Management (SEM) program is a systematic approach to delivering persistent energy savings to organizations by integrating energy management into regular business practices. The program involves the appointment of an energy liaison(s) and a team within participating organizations who regularly correspond with program representatives. This is a new program for the PY2016-PY2018 implementation cycle.

H.1 Impact Evaluation

This evaluation consisted of the following activities.

- **Tracking System and Database Review:** The evaluation team reviewed the program tracking database by comparing reported savings and program details to the provided program year reports.
- **Model Review:** The program's impact evaluation involved reviewing detailed energy and demand models provided by the program for each participant. For the energy models, Navigant used site data for the two years before SEM program participation to create a "baseline model" for each site. After program training began for each participant, actual site usage was compared to the "baseline model" and the calculated difference was identified as the program energy savings. More details about this approach are included in Section H.1.3 below. For demand savings, Navigant used calendar year (CY) 2016 as the baseline year. Peak demand during CY2017 was compared to the demand during this baseline period, and the calculated difference was identified as the demand savings.

H.1.1 Sampling

Navigant requested and received detailed PY2018 documentation for all customers participating in the SEM program in December 2018. All models for PY2018 contained between 1 and 4 months of data. Navigant developed a verification methodology to calculate incremental savings for all projects compared to the equivalent time period in PY2017. This methodology is detailed in Section H.1.3.

H.1.2 Model Review

The implementation team provided Navigant with detailed site reports, energy savings models, and demand savings models. Savings were calculated using whole building energy data with a variety of site-specific variables such as production levels, temperature and operation schedules (holidays/shut downs). The impact evaluation was grounded in site-specific engineering models and analysis as detailed below.

1. A site-specific analysis approach was implemented. Each engineering model was carefully reviewed in an effort to connect the behaviors observed in the models with actual site activities. In this way, Navigant staff could separate savings occurring because of SEM and other energy or demand changes that may have been related to site operational or equipment changes.

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2. Because this program contains primarily behavioral-based changes, the International Performance Measurement and Verification Protocol (IPMVP) option C, billing/metered data regression, was the main method of impact evaluation. The data collection focused on verifying and/or updating the assumptions that went into the implementer's energy model for each site. The data collected could include the following.
    a. program tracking savings
    b. capital project data
    c. supporting documentation (project specifications, invoices, etc.)
    d. utility billing/interval data
    e. building automation system (BAS) trend logs (Navigant calibrated these models as needed)
    f. phone conversations with onsite staff

H.1.3 Energy Model Review

For each site, Navigant reviewed and updated the energy savings models provided by the implementation team. Navigant staff followed the process below for each model.

1. Navigant re-created the model provided by the implementer. The model is the implementation contractor "baseline model". This model serves as the starting point for Navigant's analysis. Updates to these models were driven by review of activities that occurred at the site. During the impact evaluation the evaluation staff used a variety of techniques to update these models appropriate to each site, including:
    a. Navigant used the provided baseline power and variable data to create a multi regression baseline model. This model was compared to the multi regression model that the implementer created.
    b. The evaluation staff excluded data points that were considered outliers. This includes any variables that are 110% or more than the maximum or 90% or less of the minimum for that variable in the baseline model.
    c. The evaluation staff reviewed all non-SEM activities (such as capital project or equipment installs) to ensure that they were properly handled by the original model.
    d. The evaluation staff made adjustments to the model to account for any activities that may have been missed by the implementer such as unexpected shutdowns, equipment failures, or large operational changes.
2. Navigant closely investigated the results of the energy model looking for trends that may indicate changes that were occurring outside of the regular SEM activities. This included periods of time when savings seemed to greatly change either positively or negatively.

    Once the cause of these trends was identified, Navigant verified that the impact of these changes was properly accounted for in the model. For example, changes might have been excluding certain data points that were being affected by short term changes at the site or including additional variables to account for more permanent changes such as the installation of new equipment.

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3. If major changes occurred at the site during or after the SEM measures, the model was adjusted in order to account for these changes. The changes that could have affected the model savings include:
   - Changes in hours of operation
   - Changes in employees (number, schedules, others)
   - Changes in production levels
   - Other measures installed at the site that were implemented through other utility EE/DR programs

In PY2018, savings were claimed for only a 2 to 4-month period, varying by site. This occurred due to the 24-month ex ante savings period that was contracted with the utility. Navigant adopted a modified approach to estimate the energy savings during this short period in order to account for the strong seasonal dependence of energy consumption for many program participants.

Savings for this program are incremental to activities completed in the past. For this reason, each annual claimed savings value must account for savings claimed in previous years. Since PY2018 savings were claimed for a 2 to 4-month period, the implementer had to estimate a partial incremental savings from PY2017. In order to do this, the implementer divided the annual PY2017 savings by 365 and multiplied this by the number of days a customer participated in the PY2018 program.

Navigant took a different approach to calculating the incremental savings for this program in PY2018. Navigant identified the 2 to 4-month period in PY2018 and compared this to the savings claimed during the same period in PY2017. For example, if the *ex ante* savings period in PY2018 is Jan, Feb, and Mar, Navigant subtracted the savings claimed during only Jan, Feb, and Mar of PY2017 from the savings claimed in PY2018. Navigant also accounted for the incentivized savings that occurred during the equivalent period in PY2017. This method allowed Navigant to better capture the incremental savings for that specific time of year over previous project years and to better account for the strong seasonal dependence of SEM savings.

The method used by Navigant for calculating daily PY2018 savings, DES_{net}, is summarized below:

$$\mathrm{DES}_{net} = (\mathrm{DES}_{total} - \mathrm{DES}_{inc,PY3}) - (\mathrm{DES}_{prev} - \mathrm{DES}_{inc,prev})$$

1. Calculate the total PY2018 savings and divide by the number of days in PY2018 to obtain the daily energy savings, DES_{total} [kWh/yr]

2. Divide the incentivized savings for PY2018 by the number of days in PY2018 to obtain the daily incentivized energy savings, DES_{inc}

3. Calculate the total savings during PY2017 which occurred during the same months that are in PY3 (typically January 2018 through April 2018) and divide by the number of days in this same period to obtain the previously claimed daily energy savings, DES_{prev}

4. Calculate the incentivized savings which occurred before or during the equivalent months in PY2017. Then divide these savings by the number of days in the period to obtain the daily incentivized savings which occurred during the equivalent period during PY2017, $DES_{inc,\ prev}$

5. Multiply the net daily energy savings by the number of days in PY3 to obtain the total energy savings for PY2018.

This approach to calculating savings more accurately represents the seasonal savings claimed in PY2018.

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H.1.4 Demand Model Review

For each site, Navigant reviewed and updated the demand savings models provided by the implementation team. The demand savings verified in PY2018 were calculated as a comparison of the peak demand periods of 2016 and 2017. The reasons for this are as follows:

- Training for the SEM program was in its early stages during the demand period of PY2016, and most of the sites had not been able to implement changes at this point. Therefore, the peak demand during PY2016 was not expected to vary significantly from the baseline period and no savings were claimed.
- The three-year program ended in May 2018. Accordingly, the variables that are needed to adjust the demand models, such as production and shut down days, were not collected by the implementer during the demand period of 2018.
- Two sequential years were chosen as the baseline and measurement years to compare site operation that was similar year-to-year. No changes had been implemented before the peak period of PY2016, and no peak demand data was collected during PY2018. Therefore, PY2017 was selected as the measurement year, and PY2016 was selected as the baseline year.

The demand savings models use the baseline energy savings model in order to account for site-specific differences between the baseline year (PY2016) and the measurement year (PY2017), including weather and production variables. Navigant staff followed the process below for this review.

1. Navigant confirmed that the coefficients from the baseline energy model were properly implemented such that the demand savings accounted for seasonal and production differences between the baseline and measurement years.
2. The evaluation staff reviewed all non-SEM activities (such as capital project or equipment installs) to ensure that they were properly handled by the original model.
3. The evaluation staff reviewed the models to ensure that the implementer accounted for any activities such as unexpected shutdowns, equipment failures, or large operational changes.
4. Navigant reviewed the models to ensure that the demand savings were properly calculated using the correct peak period.

H.2 Process Evaluation

Navigant addressed the five Missouri-required questions for process evaluation through staff interviews and a program materials review for the SEM program in PY2016. Navigant conducted a full-scale process evaluation in PY2017.

Table H-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table H-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interview • CLEAResult interview • Materials review
Missouri-Required Questions for Process Evaluation	
2. What are the primary market imperfections that are common to the target market segment?	• Program staff interview • CLEAResult interview • Materials review
3. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interview • CLEAResult interview • Materials review
4. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interview • CLEAResult interview • Materials review
5. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interview • CLEAResult interview • Materials review
6. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interview • CLEAResult interview • Materials review

Source: Navigant

H.2.1 Program Staff and IC Interviews

Navigant conducted a program manager interview and an implementation contractor interview. Specific process topics addressed included the following:

- Program operation, challenges, successes, and goals
- Qualifications for customers to participate in the SEM program

H.2.2 Materials Review

Navigant conducted a review of the program description and documents available on the KCP&L website to understand the SEM program application process and program requirements.

Navigant also reviewed the implementation contractor's program handouts and materials to understand the support provided to the participants.

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APPENDIX I. SMALL BUSINESS LIGHTING PROGRAM-SPECIFIC METHODOLOGIES

The Small Business Lighting program (SBL) offers customers an energy assessment that includes information on potential energy savings and anticipated payback, as well as incentives that cover up to 70% of the equipment and installation costs. Eligible measures include but are not limited to occupancy sensors, LED exit signs, and T5 lamps.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2a and 2b to evaluate the SBL program. The evaluation of the SBL program consisted of the following activities:

- Gross impact evaluation (detailed in Section I.1)
- Process evaluation (detailed in Section I.2)
- NTG analysis conducted in PY2016 (detailed in Section C.2)

I.1 Impact Evaluation

The evaluation team conducted the bulk of the SBL program evaluation in PY2016, with smaller efforts completed in PY2017 and PY2018 to update results in a cost-effective manner. The impact evaluation assessed gross energy and demand savings by conducting the following activities in PY2018:

- Tracking database review
- Deemed measure savings review
- Verified savings analysis

I.1.1 Tracking Database Review

The evaluation team conducted a thorough review of the program tracking database in March 2019 as described in the Section E.1.1.

I.1.2 Deemed Measure Savings Review

KCP&L developed an internal deemed measure savings for the SBL program. The evaluation team conducted a detailed review of the deemed measure savings used to calculate the reported. The review's objective was to identify and verify the engineering algorithms and assumptions used in the deemed savings calculations. Navigant reviewed the baseline and efficient case wattages, HOU, WHFs, and CFs used for the SBL measures.

I.1.3 Verified Savings Analysis

This section describes Navigant's methodology for the onsite verification and analysis of the SBL projects.

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I.1.3.1 Sampling

In PY2016, Navigant selected a sample of projects completed through November 2016 for onsite EM&V during the January-February 2017 timeframe and used those results for the PY2018 evaluation. Navigant evaluated both service territories in a combined sample based on discussions with implementer and KCP&L product managers. This a reasonable approach due to similarities in program execution. Additional detail on the sampling is available in the PY2016 Report and Appendix. Navigant completed both short-term and long-term metering at the sampled sites. Table I-1 lists the meter count by building type for the short-term metering.

Table I-1: Small Business Lighting Program Meter Count by Building Type

Strata	PY2016 + PY2017 Standard		PY2016 + PY2017 SBL		Cycle 1 Loggers		Total
	GMO	KCP&L-MO	GMO	KCP&L-MO	GMO	KCP&L-MO	
Industrial	14	6			13		33
Office	3	20	0	6			29
Other	7	7	7	4	36		61
Retail	17	17	8	3	51	7	103
School	15	29			1		45
Warehouse	12	17	5		26		60
Exterior	7	7	2	2			18
Total	**75**	**103**	**22**	**15**	**127**	**7**	**349**

Source: Navigant Analysis

Table I-2 lists the meter count by building type for the long-term metering. A total of 18 sites were included in the long-term metering and a total of 97 lighting loggers were installed.

Table I-2: Small Business Lighting Program Meter Count by Building Type for Long-term Metering

Strata	Long-term Sampling Standard		Total
	GMO	KCP&L-MO	
Office	3	20	23
School	15	29	44
Warehouse	12	18	30
Total	**30**	**67**	**97**

Source: Navigant Analysis

Table I-3 presents a comparison of the program participation by strata between PY2016 and PY2018 for the Small Business Lighting program. The percent of total reported savings by strata differ significantly in PY2018, since only ten projects continued into this program year.

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Table I-3. Comparison of PY2016, PY2017 and PY2018 Reported Savings by Strata for GMO and KCP&L-MO

Strata	GMO						KCP&L-MO					
	% of Total Reported kWh			% of Total Reported kW			% of Total Reported kWh			% of Total Reported kW		
	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018	PY2016	PY2017	PY2018
Industrial	12%	2%	0%	13%	2%	0%	12%	8%	0%	12%	9%	0%
Office	31%	10%	15%	34%	12%	16%	6%	13%	0%	7%	14%	0%
Other	7%	21%	51%	5%	23%	53%	4%	19%	0%	3%	15%	0%
Retail	49%	60%	34%	47%	56%	31%	31%	35%	100%	29%	32%	100%
School	0%	5%	0%	0%	6%	0%	0%	2%	0%	0%	2%	0%
Warehouse	1%	1%	0%	1%	1%	0%	48%	25%	0%	50%	27%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Navigant Analysis

Navigant used a confidence and relative precision target analysis to confirm that enough individual buildings were metered to provide reasonable values for HOU and CF. The following table provides the number of buildings metered and the number of meters for each stratum for the PY2016-PY2017 lighting study, as well as relative precision values for energy and demand impacts for each building type. For the combined GMO and KCP&L-MO sample, the relative precision and confidence for each building type fell within the target range of 90/20 confidence and precision at the program level.

Table I-4. Small Business Lighting Program Metering by Strata

Program	Stratum	Buildings		Meters	Energy	Demand
		Year-End Building Population	Building Sample Size	Meters Sample Size	Relative Precision at 90% Confidence (one-tailed)	Relative Precision at 90% Confidence (one-tailed)
Standard & SBL	Industrial	163	7	33	7.3%	5.9%
	Office	144	5	29	34.6%	29.9%
	Other	262	9	61	27.8%	22.2%
	Retail	251	12	103	34.6%	17.4%
	School	94	8	45	9.5%	14.5%
	Warehouse	206	9	60	13.9%	10.9%
	Total	**1,120**	**50**	**331**	**13.5%**	**10.4%**

Source: Navigant Analysis

Navigant also calculated the relative precision for the CF and HOU for each stratum at end of the long-term metering. The following table presents these results at the 90% confidence interval. The overall relative precision for the mix of building types falls within the 90/20 target range.

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Table I-5. Small Business Lighting Relative Precision by Strata

Strata	CF Relative Precision at 90% Confidence	HOU Relative Precision at 90% Confidence
Industrial	29%	44%
Office	15%	19%
Other	9%	20%
Retail	6%	7%
School	9%	19%
Warehouse	14%	24%
Exterior	NA	7%
Total Program	**9%**	**14%**

Source: Navigant Analysis

I.1.3.2 Onsite Verification and Metering

In PY2017, Navigant completed the onsite verification and metering of sampled projects for the Standard and Small Business Lighting programs that was started in PY2016 with partner Tierra. For the sample selected in PY2016, Navigant considered Small Business Lighting program population its own strata in addition the strata sampled for the Standard Program. This was possible because the SBL program offers identical lighting measures to the Standard program. However, the incentive levels and targeted end users for the SBL program are different than the Standard program. Navigant developed the sample to capture the hours of operation (HOU) and coincident demand factors (CF) by building type for the lighting measures installed in the SBL program.

Navigant conducted this fieldwork to obtain building type level parameters for HOUs and CFs for the lighting measures installed through the program. Navigant only metered the SBL sampled projects for the short-term duration (8 weeks, February 2017-April 2017) and completed long term metering of a smaller sample for three strata in the Standard Program. The three strata were selected based on feedback from the KCP&L team on which building types were of most interest to them. Navigant selected three strata—school, warehouse, and office—for the long-term (12 months) metering.

The evaluation team retrieved short-term data for the three long-term metering strata in April 2017, along with the other short-term sites and the SBL sites, and used those data for the PY2016 verification. The evaluation team also collected metering data in October 2017 and for a final time in March 2018. For the PY2017 and PY2018 evaluations, Navigant used the waste heat factors, HOU, and CF determined the small substrata determined based on the methodology discussed in Section E.1.3.3.

The values for the waste heat factors, CF, and HOU by strata within the small business lighting program are listed in Table I-6.

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Table I-6 Waste Heat Factors, CF, and HOU used for Small Business Lighting Program

Strata	WHF_e	WHF_d	CF	HOU
Industrial	1.02	1.04	0.64	4,262
Office	1.25	1.39	0.61	2,399
Other	1.09	1.36	0.55	4,774
Retail	1.12	1.29	0.77	4,183
School	1.17	1.33	0.53	3,675
Warehouse	1.00	1.22	0.56	2,378
Exterior	1.00	1.00	0.00	5,392

Source: Navigant Analysis

The comparison between the CF and HOU by strata used for the PY2016 versus the PY2017 and PY2018 evaluations for the small business lighting program are listed in Table I-7. The CF changed from a decrease of -18% for “Office” and “Other” and an increase of +3% for “Industrial” sites. The HOU decreased for all interior strata between -46% for “Office” and -10% for “Other” and “School” sites. Lower HOU for smaller sites is likely because these sites are not open on weekends or holidays and close by 5 or 6 pm during the week. A building operated from 8 am to 5 pm for five days a week for 52 weeks a year will have 2,340 annual hours of use, close to the results for small warehouses and offices. The waste heat factors are the same between the Standard and SBL programs.

Table I-7 Comparison Between PY2016 and PY2017/PY2018 for CF and HOU for Small Business Lighting Program

Strata	Results of Short-Term Logger Analysis		Results of Long-Term Logger Analysis and Use of Small Sites Only		% Change	
	CF	HOU	CF	HOU	CF	HOU
Industrial	0.62	5,144	0.64	4,262	3%	-17%
Office	0.75	4,484	0.61	2,399	-18%	-46%
Other	0.67	5,280	0.55	4,774	-18%	-10%
Retail	0.83	5,662	0.77	4,183	-7%	-26%
School	0.59	4,074	0.53	3,675	-10%	-10%
Warehouse	0.64	4,110	0.56	2,378	-13%	-42%
Exterior	0.0	4,702	0.00	5,392	0%	15%

Source: Navigant Analysis

I.1.3.3 Analysis

The following section describes the evaluation team’s analysis methodology to calculate the verified energy savings for the SBL program measures.

SBL Measures

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The evaluation team used industry standard algorithms to calculate the verified savings from the lighting measures discussed in Section E.1.3.4. These algorithms include WHFs, which account for cooling energy savings from efficient lighting. Consistent with the evaluation team's approach in the Cycle 1 evaluation, the team referenced the KCP&L MEEIA TRM based on inputs from the IL TRM v5 to obtain these values.

Energy Savings

The evaluation team used Equation E-1 to calculate energy savings for SBL measures. The evaluation team used the efficient wattage recorded in the tracking database in the savings analysis.

Coincident Demand Savings

The evaluation team used Equation E-2 to calculate coincident demand savings for SBL measures. The evaluation team used the efficient wattage recorded in the tracking database in the savings analysis.

I.2 Process Evaluation

Navigant addressed one process evaluation research questions and the five Missouri-required questions for process evaluation through staff interviews, review of participant surveys collected by the implementer after completing a project, and a program materials review.

Table I-8 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table I-8. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activities
General Process Evaluation Questions	
1. How satisfied are participants with the program overall?	• Implementer administered participant surveys
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews

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Process Evaluation Research Question	Evaluation Activities
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Implementer administered participant surveys
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Implementer administered participant surveys

Source: Navigant

I.2.1 Program Manager and Implementation Contractor Interviews

Navigant conducted a program manager and a separate implementation contractor interview in February 2019.

I.2.2 Implementer Administered Participant Surveys

Navigant reviewed combined participant surveys collected by the implementer up until February 2018 after completion of a project in PY2017. Table I-9 lists the number of survey completions reviewed.

Table I-9 Responses to Implementer Administered Online Survey

	GMO & KCP&L-MO Total
Population	227
Survey Completions	6
Completion Percentage	2.6%

Source: Navigant analysis

Navigant reviewed the survey questions related to the following categories:

- Participant program material accessibility
- Participant reasons for considering energy efficiency upgrades
- Participant satisfaction with the KCP&L program overall
- Participant program improvement recommendations

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APPENDIX J. WHOLE HOUSE EFFICIENCY PROGRAM-SPECIFIC METHODOLOGIES

The Whole House Efficiency (WHE) Program encourages whole house improvements to existing homes by promoting home energy audits and comprehensive retrofits. This program is eligible to customers that own or rent a residence, or are building a new residence. It's also eligible to HVAC contractors for trade ally participation. The program has the five key goals listed below:

- Demonstrate persistent energy savings
- Encourage energy-saving behavior and whole house improvements
- Help residential customers reduce their electricity bills
- Educate customers about the benefits of installing high efficiency HVAC equipment
- Develop partnerships with HVAC contractors to bring efficient systems to market

In PY2018, customers could participate in the program through three different options, or tiers. Tier 1 offered a home energy audit and direct install measures such as faucet aerators, low-flow showerheads, advanced power strips, hot water pipe insulation, energy efficient lighting, and furnace whistles. Tier 2 consisted of weatherization measures including air sealing, ceiling insulation and wall insulation. Tier 3 consisted of HVAC measures such as heat pump water heaters, ECM furnace fans, indoor and outdoor coil cleaning, HVAC maintenance and tune-ups, efficient air conditioners, and efficient heat pumps.

Based on Missouri regulations (see Appendix D), Navigant used impact evaluation method 1a and protocol 2b to evaluate the WHE program. The evaluation consisted of the following activities for PY2017:

- Gross impact evaluation (detailed in Section J.1)
- Process evaluation (detailed in Section J.2)
- Cost-effectiveness (detailed in Section C.1)

J.1 Impact Evaluation

To estimate gross savings for the WHE program, the evaluation team conducted the following activities:

- Tracking database review
- Deemed savings review

J.1.1 Tracking Database Review

The evaluation team obtained program tracking data from the WHE program management team covering the period from April 2018 through the end of March 2019. The team reviewed the program data to assess the following:

- Ability to verify gross savings by the inclusion of data about the baseline units removed and efficient units installed

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- Level of detail on the characteristics of products sold, including rebate amounts, number of units installed, and measure-specific data such as unit efficiencies, wattage values, operating schedules, nameplate data, and similar specifications
- Possible errors in the data by verifying that the values for each variable fell within reasonable bounds
- Data aligned with expectations based on the program design

Navigant held several meetings with the KCP&L WHE program staff and the program implementation team (ICF) to discuss the results of the review. WHE and ICF program staff provided additional data to Navigant when needed.

J.1.2 Deemed Savings Review

The evaluation team conducted a thorough engineering desk review of the approaches used to estimate reported gross savings for the WHE program.

The team used site-level data and industry standard algorithms to calculate the verified savings for the program measures. Consistent with the evaluation team's approach in the MEEIA Cycle 1 evaluation and both PY2016 and PY2017, it referenced the IL TRM v5 to obtain these values for most measures, except where otherwise noted. The IL TRM v7 was used to determine both time-of-sale and early retirement HVAC savings, as well as lighting savings. The team then compared these calculations against the energy and coincident demand savings reported by the WHE program. As a result of the review, the evaluation team highlighted any cases where discrepancies between the savings goals, reported values, and evaluated values arose or where insufficient data gathering occurred.

The algorithms for each measure evaluated in this analysis are detailed below.

J.1.2.1 Tier 1: Home Energy Audit and Direct Install Measures

The evaluation team used industry standard algorithms to calculate the verified savings from the direct install measures. Consistent with the evaluation team's approach in the MEEIA cycle 1, and with the PY2016 and PY2017 evaluations, the team referenced IL TRM v5 and v7 to calculate the verified savings values, except where otherwise noted.

Low-Flow Faucet Aerator Energy Savings

Equation J-1. Low-Flow Faucet Aerator Energy Savings

$$\Delta kWh = \%ElectricDHW * \left(\left(L * (GPM_{base} - GPM_{ee}) \right) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric water heaters = 1 electric, 0 gas
GPM_{base}	Baseline Gallons per minute = 2.2
GPM_{ee}	Efficient Gallons per minute = 1.5 kitchen, 1.0 bathroom
L	Minutes per day = 4.5 kitchen, 1.6 bathroom
Household	Persons per household = 2.56

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FPH	Faucets per household = 1 kitchen, 2.83 bathroom
DF	Drain factor = 75% kitchen, 90% bathroom
$EPG_{electric}$	Energy per gallon of hot water supplied by electricity = 0.0969 kWh/gal kitchen, 0.0795 kWh/gal bathroom
ISR	In-service rate = 95%

Low-Flow Faucet Aerator Coincident Demand Savings

Equation J-2. Low-Flow Faucet Aerator Coincident Demand Savings

$$\Delta kW = \frac{\left[\%ElectricDHW * \left(\left(L* \left(GPM_{base} - GPM_{low}\right)\right)\times Household*365.25*\frac{DF}{FPH}\right)* EPG_{electric}* ISR\right]}{Hours*CF}$$

Where:

%ElectricDHW	Same as above
GPM	Same as above
L	Same as above
Household	Same as above
FPH	Same as above
DF	Same as above
$EPG_{electric}$	Same as above
ISR	Same as above
Hours	Annual electric hot water recovery hours = 94 kitchen, 14 bathroom
CF	Coincidence factor = 0.022

Low-Flow Showerhead Energy Savings

Equation J-3. Low-Flow Showerhead Energy Savings

$$\Delta kWh = \%ElectricDHW* \left(\left(L* \left(GPM_{base} - GPM_{low}\right)\right)\times Household*SPCD*365.25/SPH\right)*EPG_{electric}*ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric water heaters = 1 electric, 0 gas
GPM	Gallons per minute = actual for low-flow, 2.67 base
L	Minutes per day = 7.8
Household	Persons per household = 2.56
SCPD	Showers per capita per day = 0.6
SPH	Showers per household = 1.79
$EPG_{electric}$	Energy per gallon of hot water supplied by electricity = 0.117 kWh/gal
ISR	In-service rate = 98%

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Low-Flow Showerhead Coincident Demand Savings

Equation J-4. Low-Flow Showerhead Coincident Demand Savings

$$\Delta kW = \frac{\left[\left(\%ElectricDHW * \left(\left(L * (GPM_{base} - GPM_{low})\right) \times Household * SPCD * \frac{365.25}{SPH}\right) * EPG_{electric} * ISR\right)\right]}{Hours * CF}$$

Where:

%ElectricDHW	Same as above
GPM	Same as above
L	Same as above
Household	Same as above
SCPD	Same as above
SPH	Same as above
$EPG_{electric}$	Same as above
ISR	Same as above
Hours	Annual electric hot water recovery hours = 302
CF	Coincidence factor = 0.0278

Advanced Power Strip Energy Savings

Equation J-5. Advanced Power Strip Energy Savings

$$\Delta kWh_{7\text{-}plug} = 103$$

Where:

ΔkWh	Deemed energy savings = 103 kWh for 7-plug

Advanced Power Strip Coincident Demand Savings

Equation J-6. Advanced Power Strip Coincident Demand Savings

$$\Delta kW_{7\text{-}plug} = 0.0115$$

Where:

ΔkW	Deemed coincident demand savings = 0.0115 kW for 7-plug

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Hot Water Pipe Insulation Energy Savings

Equation J-7. Hot Water Pipe Insulation Energy Savings

$$\Delta kWh = \frac{\left(\pi * L * \left(\left(\frac{D_{base}}{R_{base}}\right) - \left(\frac{D_{ee}}{R_{ee}}\right)\right)\right) * \Delta T * Hours}{(EffDHW / 3{,}412)}$$

Where:

D_{base}	Hot Water Pipe Diameter = 0.75 inch / 12 = 0.0625 ft
D_{ee}	Insulation + Hot Water Pipe Diameter= 2.75 inch / 12 = 0.229 ft
L	Length of pipe from water heating source covered by pipe wrap (ft) = 6ft
R_{base}	Pipe heat loss coefficient of uninsulated pipe (existing) [(hr-°F-ft)/Btu] = 1
R_{ee}	Pipe heat loss coefficient of insulated pipe (new) [(hr-°F-ft)/Btu] = 1 + 5 = 6
ΔT	Average temperature difference between supplied water and outside air temperature = 60°F
Hours	Hours in a year = 8,766
EffDHW	Recovery efficiency of electric water heater = 98%
3,412	Conversion factor from Btu to kWh

Hot Water Pipe Insulation Coincident Demand Savings

Equation J-8. Hot Water Pipe Insulation Coincident Demand Savings

$$\Delta kW = \frac{\Delta kWh}{8{,}766}$$

LED Energy Savings

LED energy savings algorithms are from v7 of the IL TRM. Where applicable, variable values were calculated based on weighted averages of actual KCP&L-specific measure installation data.

Equation J-9. LED Energy Savings

$$\Delta kWh = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Wattage of baseline bulb = 60W Candle, 40W Globe, 50W BR30, 43W A19
W_{ee}	Wattage of efficient bulb from program tracking data = 5W Candle, 6W Globe, 8W BR30, 9W A19
ISR	In-service rate = 94.2%
Hours	Average HOU per year = 974
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.05

LED Coincident Demand Savings

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Equation J-10. LED Coincident Demand Savings

$$\Delta kW = \left[\frac{(W_{base} - W_{ee})}{1{,}000} * ISR * WHF_d\right] * CF$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	Same as above
WHF_d	Waste heat factor to account for cooling savings from efficient lighting = 1.1
CF	Coincidence factor = 12.90%

Furnace Filter Alarm Energy Savings

Equation J-11. Furnace Filter Alarm Energy Savings

$$\Delta kWh = D\mathbf{kWh/yr_{heat}} + D\mathbf{kWh/yr_{cool}}$$

$$D\mathbf{kWh/yr_{heat}} = \mathbf{kW_{motor}} \times \mathbf{EFLH_{heat}} \times \mathbf{EI} \times \mathbf{ISR}$$

$$D\mathbf{kWh/yr_{cool}} = \mathbf{kW_{motor}} \times \mathbf{EFLH_{cool}} \times \mathbf{EI} \times \mathbf{ISR}$$

Where:

kW_{motor}	Average motor full load electric demand = 0.5
$EFLH_{heat}$	Estimated full load hours for heating = 1376 based on normalizing Kansas City's ENERGY STAR heating hours to correlate with the IL TRM v5 effective full load heating hours using heating degree days
$EFLH_{cool}$	Estimated full load hours for cooling = 738 based on draft 2017 MO TRM
EI	Efficiency improvement = 15%
ISR	In-service rate = 47.4%

Furnace Filter Alarm Coincident Demand Savings

Equation J-12. Furnace Filter Alarm Coincident Demand Savings

$$\Delta kW = \frac{\Delta\, kWh/yr_{cool}}{EFLH_{cool}} \times CF$$

Where:

$\Delta kWh/yr_{cool}$	Same as above
$EFLH_{cool}$	Same as above
CF	Coincidence factor = 65%

J.1.2.2 Tier 2: Building Shell Measures

The evaluation team used industry standard algorithms to calculate the verified savings from the building shell measures. Consistent with the evaluation team's approach in MEEIA cycle 1 evaluation, the team referenced IL TRM v5 to obtain these values, except where otherwise noted.

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Air Sealing Energy Savings

Equation J-13. Air Sealing Energy Savings

$$\Delta kWh = \Delta kWh_{cooling} + \Delta kWh_{heating}$$

Equation J-14. Air Sealing Energy Savings - Cooling

$$\Delta kWh_{cooling} = \frac{(CFM_{base} - CFM_{ee})}{N_{cool}} * 60 * 24 * CDD * DUA * 0.018 / (1{,}000 * EffCool) * LM$$

Where:

CFM	Infiltration from program tracking data
N_{cool}	Infiltration conversion factor = 35.8
60*24	Conversion factor from cubic feet per minute to cubic feet per day
CDD	Cooling degree days = 1,445 per ORNL for Kansas City[16]
0.018	Specific heat capacity of air
EffCool	Seasonal energy efficiency ratio (SEER) of cooling equipment = 10 for units before 2006, 13 for units on or after 2006
LM	Latent cooling multiplier = 3.6

Equation J-15. Air Sealing Energy Savings - Heating

$$\Delta kWh_{heating} = \frac{(CFM_{base} - CFM_{ee})}{N_{heat}} * 60 * 24 * HDD * 0.018 / (1{,}000 * EffHeat) * 3{,}412$$

Where:

CFM	Same as above
N_{heat}	Infiltration conversion factor = 22.5
60*24	Same as above
HDD	Heating degree days = 5,155 per Oak Ridge National Laboratory for Kansas City[17]
0.018	Same as above
EffHeat	SEER of heating equipment = 1.7 for units installed before 2006, 1.92 for units installed between 2006 and 2014, 2.40 for units installed on or after 2015
3,412	Conversion factor from Btu to kWh

Air Sealing Coincident Demand Savings

Equation J-16. Air Sealing Coincident Demand Savings

[16] http://web.ornl.gov/sci/buildings/tools/heating-data/

[17] http://web.ornl.gov/sci/buildings/tools/heating-data/

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$$\Delta kW = \left(\frac{\Delta kWh_{cooling}}{EFLH_{cool}}\right) \times CF$$

Where:

$EFLH_{cool}$	Effective full load cooling hours =738 based on draft 2017 MO TRM
CF	Coincidence factor = 72% for heat pumps, 68% for air conditioners

Insulation Energy Savings

Equation J-17. Insulation Energy Savings

$$\Delta kWh = \Delta kWh_{cooling} + \Delta kWh_{heating}$$

$$\Delta kWh_{cooling} = \left(\frac{\left(\left(\left(\frac{1}{R_{old}} - \frac{1}{R_{new}}\right) \times Area \times (1-Ff)\right) \times 24 \times CDD \times DUA\right)}{(1{,}000 \times \eta Cool)}\right) \times ADJ_{Cool}$$

$$\Delta kWh_{heating} = \left(\frac{\left(\left(\left(\frac{1}{R_{old}} - \frac{1}{R_{new}}\right) \times Area \times (1-Ff)\right) \times 24 \times HDD\right)}{(3{,}412 \times \eta Heat)}\right) \times ADJ_{Heat}$$

Where:

R_{old}	Existing R-value from program tracking data
R_{new}	New R-value from program tracking data
Area	Area of insulation installed from program tracking data
Ff	Framing factor = 7% for ceiling, 25% for wall
CDD	Cooling degree days = 1,445 per Oak Ridge National Laboratory for Kansas City[18]
DUA	Discretionary use adjustment factor = 0.75
ηCool	Cooling efficiency SEER, from program tracking data when available or as defined in Table 2 of Section 5.6.4 of the IL TRM v5
Adj_{Cool}	Adjustment for cooling savings from basement wall insulation = 80%
HDD	Heating degree days = 5,155 per Oak Ridge National Laboratory for Kansas City[19]
ηHeat	Heating efficiency, from program tracking data when available or as defined in Table 4 of Section 5.6.4 of the IL TRM v5
Adj_{Heat}	Adjustment for wall and attic insulation = 60%

Insulation Coincident Demand Savings

Equation J-18. Insulation Coincident Demand Savings

$$\Delta kW = \left(\frac{\Delta kWh_{cooling}}{EFLH_{cool}}\right) \times CF$$

[18] http://web.ornl.gov/sci/buildings/tools/heating-data/

[19] http://web.ornl.gov/sci/buildings/tools/heating-data/

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Where:

$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CF	Coincidence factor = 72% for heat pumps, 68% for air conditioners

J.1.2.3 Tier 3: HVAC Measures

The evaluation team used industry standard algorithms to calculate the verified savings from the HVAC measures. As an update to the evaluation team's approach in MEEIA cycle 1 and the PY2016 and PY2017 evaluations, the team referenced IL TRM v7 for these values, except where otherwise noted.

Air Conditioner and Air Conditioner, Early Retirement

Air conditioners are split into six specific measures:

- Air Conditioner SEER 15
- Air Conditioner SEER 16
- Air Conditioner SEER 17
- Air Conditioner SEER 15, Early Retirement
- Air Conditioner SEER 16, Early Retirement
- Air Conditioner SEER 17, Early Retirement

The savings algorithms and inputs are detailed below.

Air Conditioner and Air Conditioner, Early Retirement Energy Savings

Equation J-19. Air Conditioner and Air Conditioner, Early Retirement Energy Savings

$$\Delta kWh = \frac{\left(EFLH_{cool} \times CAP_{cool} \times \left(\frac{1}{(SEER_{base} \times (1 - DeratingCool_{base})} - \frac{1}{SEER_{ee} \times SEERadj \times (1 - DeratingCool_{eff})}\right)\right)}{1{,}000}$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CAP_{cool}	Cooling capacity from program tracking data
$SEER_{base}$	Baseline SEER from the IL TRM v7. The Early Retirement baseline SEER is specified to be 9.3 for the first six years of an early retirement measure and 13 otherwise.
$SEER_{ee}$	Installed SEER from program tracking data when available, or the average SEER of the installed units when not available for a specific project.
$DeratingCool_{base}$	Baseline Central Air Conditioner Cooling derating = 10%
$DeratingCool_{eff}$	Efficient Central Air Conditioner Cooling derating = 10% (no quality installation)
SEERadj	Adjustment percentage to account for in-situ performance of the unit = 0.805 X (EER_{ee} / $SEER_{ee}$) + 0.367

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Air Conditioner and Air Conditioner, Early Retirement Coincident Demand Savings

Equation J-20. Air Conditioner and Air Conditioner, Early Retirement Coincident Demand Savings

$$\Delta kW = \left(\frac{CAP_{cool} \times \left(\frac{1}{EER_{base} \times (1 - DeratingCool_{base})} - \frac{1}{EER_{ee} \times (1 - DeratingCool_{eff})} \right)}{1{,}000} \right) \times CF$$

Where:

CAP_{cool}	Same as above
EER_{base}	The Early Retirement baseline EER is specified in the IL TRM v7 as 7.5 for early retirement measures and is an average of KCP&L tracking data for time-of-sale measures.
EER_{ee}	Installed EER from program tracking data when available, the average EER of the installed units when not available for a specific project within a given SEER level, or the IL TRM v7's deemed value if neither is available.
$DeratingCool_{base}$	Same as above
$DeratingCool_{eff}$	Same as above
CF	Summer peak coincidence factor = 68%

$EFLH_{Heating}$ Approach Summary

Navigant leveraged the IL TRM v5 to develop a more precise estimate (when compared to a weighted average based on housing units) of Full Load Hours Heating (FLH_h). Using Heating Degree Day (HDD) data for each of the four regions presented in the IL TRM, Navigant developed a linear equation, shown below in Equation J-23, to estimate a normalized FLH_h for Kansas City, MO, using an HDD of 5154.5.

Equation J-21. Normalized Full Load hours - Heating

$$y = mx + b$$

Where:

Y	Normalized Full Load Hours – Heating
m	0.3605 FLH_h
b	482.9 FLH_h
x	HDD for city or region of interest.

Error! Reference source not found. below shows a comparison of the FLH_h presented in the IL TRM, Normalized FLH_h based on Equation J-23, and Energy Star estimates for heating hours. Also shown in **Error! Reference source not found.**, the evaluation team reviewed Energy Star estimates for the cities presented in the IL TRM in addition to Kansas City and found that the normalized values used in the PY 2017 evaluation were conservative when compared to the values used by Energy Star.

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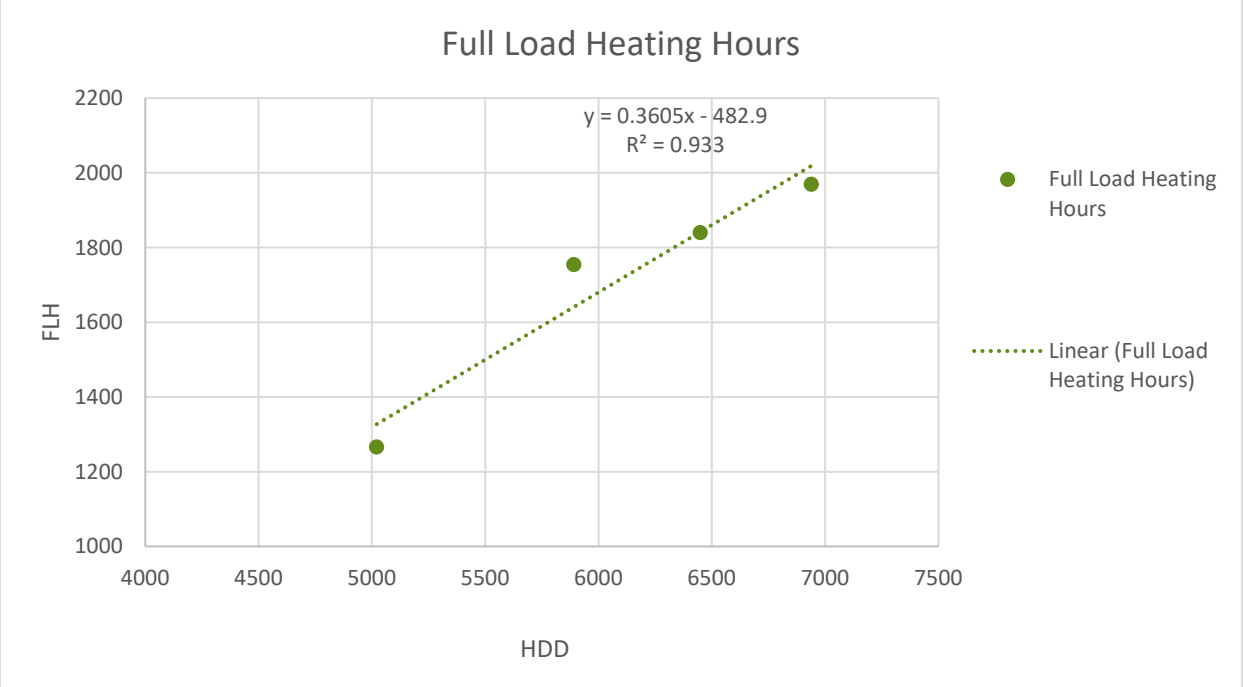
Table J-1. Full Load Hour Comparison - Heating

City	Full Load Heating Hours (IL TRM)	Normalized EFLH Heating Hours, per HDD 65	Energy Star Heating Hours	HDD 65
Rockford, IL	1,969	2,019.69	2,418	6,939.5
Chicago, IL	1,840	1,843.04	2,459	6,449.5
Springfield, IL	1,754	1,642.07	2,154	5,892
Belleville, IL / St. Louis, MO	1,266	1,328.07	2,009	5,021
Kansas City, MO		**1,376.20**	**2,149**	**5,154.5**

Source: Navigant Analysis

Inputting an HDD value for Kansas City, MO of 5,154.5 yields a normalized FLH_h of 1,376.20. **Error! Reference source not found.** shows the FLH_h for each of the four cities presented in the IL TRM plotted against their corresponding HDD. Additionally, the linear equation for heating hours is presented with its corresponding R-Squared value.

Figure J-1. FLH Versus HDD



Source: Navigant Analysis

In conclusion, in the absence of primary field collected data, the PY2017 FLH_h is tailored to the local KCP&L markets while also providing a more conservative estimate when compared to the Energy Star estimates.

Heat Pumps - Air Source, Ductless Mini-Split, and Ground Source

The heat pumps are split into 7 specific measures:

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- Heat Pump, Air Source, Time of Sale
- Heat Pump, Air Source, Early Replacement
- Heat Pump, Air Source, Replace Electric Resistance Heat
- Heat Pump, Ductless Mini-Split
- Heat Pump, Ground Source, Time of Sale
- Heat Pump, Ground Source, Early Replacement
- Heat Pump, Ground Source, Replace Electric Resistance Heat

The savings algorithms and inputs are detailed below.

Heat Pumps, Air Source and Ductless Mini-Split Energy Savings

Equation J-22. Heat Pumps, Air Source and Ductless Mini-Split Energy Savings

$$\Delta kWh = \left(\frac{EFLH_{cool} \times CAP_{cool} \times \left(\frac{1}{(SEER_{base} \times (1 - DeratingCool_{base})} - \frac{1}{SEER_{ee} \times SEERadj \times (1 - DeratingCool_{eff})}\right)}{1{,}000}\right) + \left(\frac{EFLH_{heat} \times CAP_{heat} \times \left(\frac{1}{HSPF_{base} \times (1 - DeratingHeat_{base})} - \frac{1}{HSPF_{ee} \times HSPFadj \times (1 - DeratingHeat_{eff})}\right)}{1{,}000}\right)$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CAP_{cool}	Cooling capacity from program tracking data
$SEER_{base}$	Baseline SEER from the IL TRM v7. The Early Retirement baseline SEER is 9.3, and the time-of-sale seer is 13.
$SEER_{ee}$	Installed SEER from program tracking data when available, or the average SEER of the installed units when not available for a specific project.
$EFLH_{heat}$	Effective full load heating hours = 1,376. Based on normalizing Kansas City's ENERGY STAR heating hours to correlate with the IL TRM v5 effective full load heating hours using heating degree days.
CAP_{heat}	Heating capacity from program tracking data
$HSPF_{base}$	Baseline heating system performance factor (HSPF) from the IL TRM v7. The Early Retirement baseline HSPF is 5.54, and the time-of-sale value is 8.2.
$HSPF_{ee}$	Installed HSPF from program tracking data when available, or the average HSPF of the installed units.
$DeratingCool_{base}$	Baseline Heat Pump Cooling derating = 10%
$DeratingCool_{eff}$	Efficient Heat Pump Cooling derating = 10% (no quality installation)
SEERadj	Adjustment percentage to account for in-situ performance of the unit = 0.805 X (EER_{ee} / $SEER_{ee}$) + 0.367
$DeratingHeat_{base}$	Baseline Heat Pump Cooling derating = 10%
$DeratingHeat_{eff}$	Efficient Heat Pump Cooling derating = 10% (no quality installation)

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HSPFadj	Adjustment percentage to account for in-situ performance of the unit, dictated based on a ratio of effective heating capacity at 17F versus effective heating capacity at 47F. In lieu of measured data, HSPFadj is assumed to = 1.001 as in the TRM example.

Heat Pumps, Air Source and Ductless Mini Split Coincident Demand Savings

Equation J-23. Heat Pumps, Air Source and Ductless Mini Split Coincident Demand Savings

$$\Delta kW = \left(\frac{CAP_{cool} \times \left(\frac{1}{EER_{base} \times (1 - DeratingCool_{base})} - \frac{1}{EER_{ee} \times (1 - DeratingCool_{eff})} \right)}{1{,}000} \right) \times CF$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CAP_{cool}	Same as above
EER_{base}	Baseline EER from the IL TRM v7. The Early Retirement baseline EER is 7.5, and the time-of-sale value is an average of the 2015 program tracking data.
EER_{ee}	Installed EER from program tracking data when available, or the average EER of the installed units.
$DeratingCool_{base}$	Same as above
$DeratingCool_{eff}$	Same as above
CF	Summer peak coincidence factor = 72%

Heat Pumps, Ground Source Energy Savings

Equation J-24. Heat Pumps, Ground Source, Time of Sale Energy Savings

$$\Delta kWh = [(EFLHcool * CAP_{cool} * (1/SEER_{base} - (1/EER_{PL})/1000] + [Elec_{heat} * EFLH_{heat} * CAP_{heat} * (1/HSPF_{base} - (1/COP_{PL} * 3.412)))/1000] + [Elec_{DHW} * DHW_{Displaced} * (((1/EF_{ELEC}) * GPD * Household * 365.25 * \gamma_{Water} * (T_{OUT} - T_{IN}) * 1.0) / 3412)]$$

Equation J-25. Heat Pumps, Ground Source, Early Replacement Energy Savings

$$\Delta kWh = [(EFLHcool * CAP_{cool} * (1/SEER_{exist} - (1/EER_{PL})/1000] + [Elec_{heat} * EFLH_{heat} * CAP_{heat} * (1/HSPF_{exist}) - (1/COP_{PL} * 3.412)))/1000] + [Elec_{DHW} \ \%DHWDisplaced * (((1/ EF_{ELEC}) * GPD * Household * 365.25 * \gamma_{Water} * (T_{OUT} - T_{IN}) * 1.0) / 3412)]$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CAP_{cool}	Cooling capacity from program tracking data
$SEER_{base}$	9.3 for early retirement units and 14 for time-of-sale units, as per the v7 IL TRM
$SEER_{exist}$	SEER for removed units = 9.3
$SEER_{ee}$	Installed SEER from program tracking data when available, or the average SEER of the installed units when not available for a specific project
$Elec_{heat}$	Heating factor = 1 if existing building is electrically heated, = 0 if existing building is not electrically heated
EER_{PL}	Part Load EER Efficiency of efficient GSHP unit

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$EFLH_{heat}$	Effective full load heating hours = 1,376. Based on normalizing Kansas City's ENERGY STAR heating hours to correlate with the IL TRM v5 effective full load heating hours using heating degree days.
CAP_{heat}	Heating capacity from program tracking data
$HSPF_{base}$	Federal baseline HSPF = 3.41 for early retirement of electric resistance heating systems, 5.54 for other early retirement, and 8.2 for time-of-sale
$HSPF_{exist}$	Baseline heating system performance factor (HSPF) from the IL TRM v5. The Early Retirement baseline HSPF = 3.41 for early retirement of electric resistance heating systems, 5.54 for other early retirement.
$HSPF_{ee}$	Installed HSPF from program tracking data when available, or the average HSPF of the installed units.
COP_{PL}	Part Load Coefficient of Performance of efficient unit
$Elec_{DHW}$	Water heating factor = 1 if existing DHW is electrically heated, = 0 if existing DHW is not electrically heated
$DHW_{displaced}$	Percentage of total DHW load that the GSHP will provide
EF_{Elec}	Efficiency factor of electric water heater
GPD	Gallons of hot water use per day
Household	Average number of people per household
γ_{Water}	Specific weight of water
T_{out}	Tank temperatuire
T_{in}	Incoming water temperature

Heat Pumps, Ground Source Coincident Demand Savings

Equation J-26. Heat Pumps, Ground Source, Time of Sale Coincident Demand Savings

$$\Delta kW = (CAP_{cool} * (1/EER_{base} - 1/EER_{FL}))/1000) * CF$$

Equation J-27. Heat Pumps, Ground Source, Early Replacement Coincident Demand Savings

$$\Delta kW = (CAP_{cool} * (1/EER_{exist} - 1/EER_{FL}))/1000) * CF$$

Where:

Cap_{cool}	Same as above
EER_{exist}	Energy efficiency ratio of existing unit = 7.5 as per v7 IL TRM
EER_{base}	Energy efficiency ratio of the equivalent federal standard unit = 11.8 for time-of-sale or 11 for time-of-sale replacing electric resistance.
CF	Coincidence factor

Heat Pump Water Heater Energy Savings

Equation J-28. Heat Pump Water Heater Energy Savings

$$\Delta kWh = \left(\frac{\left(\left(\frac{1}{EF_{Base}} - \frac{1}{EF_{new}} \right) \times GPD \times Household \times 365.25 \times \gamma Water \times (T_{out} - T_{in}) \right)}{3{,}412} \right) + kWh_{cooling} - kWh_{heating}$$

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$$kWh_{cooling} = \left(\left(\left(\left(\frac{(GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}))}{3{,}412} \right) - \left(\left(\frac{1}{EF_{new} \times GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in})} \right) \right) \right) \times LF \times 27\% \right) \right) \times LM$$

$$kWh_{heating} = \left(\left(\left(\left(\frac{(GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}))}{3{,}412} \right) - \left(\left(\frac{1}{EF_{new} \times GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in})} \right) \right) \right) \times LF \times 49\% \right) \right) \times$$

(1-% NaturalGas)

Where:

EF_{base}	Energy factor of standard electric water heater = 0.945
EF_{new}	Energy factor of installed heat pump water heater from program tracking data
GPD	Gallons per day of hot water use per person = 17.6
Hh	Average number of people per household = 2.56
γWater	Specific weight of water = 8.33 pounds/gallon
T_{out}	Tank temperature = 125°F
T_{in}	Incoming water temperature from well or municipal system = 54°F
LF	Location factor = 0.5
LM	Latent multiplier to account for latent cooling demand = 1.33
COP_{cool}	COP of central air conditioner from program tracking data
COP_{heat}	COP of electric heating system from program tracking data

Heat Pump Water Heater Coincident Demand Savings

Equation J-29. Heat Pump Water Heater Coincident Demand Savings

$$\Delta kW = \frac{\Delta kWh}{Hours * CF}$$

Where:

Hours	Full load hours of water heater = 2,533
CF	Summer peak coincidence factor = 0.12

Efficient ECM Fan Energy Savings

Equation J-30. Efficient ECM Fan Energy Savings

ΔkWh = Heating Savings + Cooling Savings + Shoulder Season Savings

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Where:

Heating Savings	Blower motor savings during the heating season = 418
Cooling Savings	Blower motor savings during the cooling season = 263 for central AC, 175 if no central AC, 241 if cooling system unknown
Shoulder Season Savings	ECM furnace fan savings during shoulder seasons = 51

Efficient ECM Fan Coincident Demand Savings

Equation J-31. Efficient ECM Fan Coincident Demand Savings

$$\Delta kW = \frac{\text{Cooling Savings}}{EFLH_{cool}} \times CF$$

Where:

Cooling Savings	Same as above
$EFLH_{cool}$	Effective full load cooling hours = 738 based on draft 2017 MO TRM
CF	Summer peak coincidence factor = 68%

SEER and EER Baseline Calculation Details

For PY2018, Navigant updated the early retirement AC and heat pump measure calculations to use IL TRM v7 methodologies. The SEER and EER values of units that were removed for subsequent installation of Tier 3 early retirement air conditioners and heat pumps are explicitly defined in the v7 TRM, as opposed to a more ambiguous definition in the v5 TRM. The SEER values recorded in the program tracker for these units were almost exclusively listed as SEER 10. Given the federal efficiency standards in place at the time of install, that may not be an entirely unreasonable number, but it is unlikely that more than 90% of units have identical efficiencies. Navigant compared equipment age and efficiency values recorded during Efficiency Analysis (EA) program site visits, as well as a 1%-per-year degradation factor suggested by the v7 TRM. Each of these methods produced comparable results, and as such, Navigant moved forward with the simplest and most defensible approach – application of the IL v7 TRM as written.

Error! Reference source not found.Error! Reference source not found. shows the differences in the SEER and energy efficiency ratio baseline values used for reported and verified savings.

Table J-2. WHE Program PY2017 vs PY2018 HVAC Baseline SEER and EER Adjustments

Tier 3 Early Retirement HVAC Measure	PY2017 Verified Baseline SEER	PY2018 Verified Baseline SEER*	PY2017 Verified Baseline EER	PY2018 Verified Baseline EER*
Air Conditioning Units	6.82	9.3	6.00	7.5
Heat Pumps	6.82	9.3	6.00	7.5

*These SEER and EER values are explicitly defined in the IL TRM v7, as SEER_exist and EER_exist. The values are the same for both heat pumps and central AC units.

Source: IL TRM v7 and Navigant analysis

J.1.3 Net-to-Gross

See Section C.2 for a detailed discussion of the evaluation team's NTG methodology.

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J.2 Process Evaluation

Navigant addressed the five Missouri-required questions for process evaluation through several activities (listed below). Table J-3 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table J-3. MO Process Research Questions

Research Questions	Evaluation Activity
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Interviews with product manager and implementation staff • Trade ally surveys
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Interviews with product manager and implementation staff • Trade ally surveys • Participant surveys • Secondary research
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Interviews with product manager and implementation staff • Trade ally surveys • Tracking database review • Secondary research
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Interviews with product manager and implementation staff • Ride-along observations • Trade ally surveys • Participant surveys
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Interviews with product manager and implementation staff • Trade ally surveys • Participant surveys

Source: Navigant

J.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with the program management team over the course of several phone and in-person conversations to better understand the program design, goals and targets, recent and upcoming changes to program design, and challenges faced by the implementation team. These interviews assisted the evaluation team in prioritizing research questions and informed the development of all subsequent process evaluation activities.

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APPENDIX K. INCOME-ELIGIBLE MULTIFAMILY PROGRAM-SPECIFIC METHODOLOGIES

The Income-Eligible Multifamily (IEMF) program delivers long-term energy savings and bill reduction to residents in multifamily housing that meets the income requirements as well as multifamily housing buildings with income-eligible residents. The program is separated into three tracks: one consisting of efficiency kits installed directly in residences, one consisting of installing efficiency measures into multifamily common areas; and the distribution of LEDs by food bank programs. This section outlines Navigant's methodology for evaluating the savings and processes associated with this program.

This evaluation of the IEMF program consisted of the following activities for PY2018:

- Gross impact evaluation detailed in Section K.1)
- Process evaluation (detailed in Section K.2)
- Cost-effectiveness (detailed in Section C.1)

K.1 Impact Evaluation

To estimate gross savings for the IEMF program, the evaluation team conducted the following activities during PY2018 to answer the impact evaluation questions:

- Tracking database review
- Measure-level review

K.1.1 Tracking Database Review

The evaluation team completed a thorough tracking database review to determine if it included the key items needed for measure-level evaluation. Such items included the following:

- Measure description
- Measure savings (kW and kWh)
- Savings equations

K.1.2 Measure-Level Review

The evaluation team used site-level data and industry standard algorithms to calculate the verified savings for the program measures. Consistent with the evaluation team's approach in the MEEIA Cycle 3 evaluation, the team referenced the IL TRM v5 and v7 to obtain these values. The team then compared these calculations against the kilowatt (kW) and kilowatt-hour (kWh) savings reported by the IEMF program. As a result of the review, the evaluation team offered mitigation options for any cases where discrepancies between the savings goals, reported values, and evaluated values arose or where insufficient data gathering occurred.

The algorithms for each measure evaluated in this analysis are detailed in the following sections.

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K.1.2.1 Apartment Measures

Low-Flow Faucet Aerator Energy Savings

Equation K-1. Low-Flow Faucet Aerator Energy Savings

$$\Delta kWh = \%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{low} * L_{low}) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric resistance heating
GPM_{base}	Baseline Gallons per minute = 2.2
GPM_{ee}	Efficient Gallons per minute = 1.5 kitchen, 1.0 bathroom
L	Minutes per day = 4.5 kitchen, 1.6 bathroom
Household	Persons per household = 2.1
FPH	Faucets per household = 1 per kitchen, 1.5 for bathrooms
DF	Drain factor = 75% kitchen, 90% bathroom
$EPG_{electric}$	Energy per gallon of hot water supplied by electricity = 1.12 kWh/gal kitchen, 0.0926 kWh/gal bath
ISR	In-service rate = 95% bathroom, 91% kitchen

Low-Flow Faucet Aerator Coincident Demand Savings

Equation K-2. Low-Flow Faucet Aerator Coincident Demand Savings

$$\Delta kW = \frac{\left[\%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{low} * L_{low}) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR \right]}{Hours} * CF$$

Where:

%ElectricDHW	Same as above
GPM	Same as above
L	Same as above
Household	Same as above
FPH	Same as above
DF	Same as above
$EPG_{electric}$	Same as above
ISR	Same as above
Hours	Annual electric DHW recovery hours for faucet use per faucet = 77 for kitchen; 22 for bath
CF	Coincidence factor = 0.022

Low-Flow Showerhead Energy Savings

Equation K-3. Low-Flow Showerhead Energy Savings

$$\Delta kWh = \%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{low} * L_{low}) \times Household * SPCD * 365.25 / SPH \right) * EPG_{electric} * ISR$$

Where:

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%ElectricDHW	Proportion of water heating supplied by electric resistance heating
GPM	Gallons per minute = actual for energy efficient, 2.67 base, 1.0 for efficient
L	Minutes per day = 7.8 energy efficient, 7.8 base
Household	Same as above
SCPD	Showers per capita per day = 0.6
SPH	Showers per household = 1.3
$EPG_{electric}$	Energy per gallon of hot water supplied by electricity = 0.117 kWh/gal
ISR	In-service rate = 95%

Low-Flow Showerhead Coincident Demand Savings

Equation K-4. Low-Flow Showerhead Coincident Demand Savings

$$\Delta kW = \frac{\left[\left(\%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{ee} * L_{ee}) \times Household * SPCD * \frac{365.25}{SPH}\right) * EPG_{electric} * ISR\right)\right]}{Hours} * CF$$

Where:

%ElectricDHW	Same as above
GPM	Same as above
L	Same as above
Household	Same as above
SCPD	Same as above
SPH	Same as above
$EPG_{electric}$	Same as above
ISR	Same as above
Hours	Annual electric DHW recovery hours for showerhead use, 248 for MF Direct Install
CF	Coincidence factor = 0.0278

Hot Water Pipe Insulation Energy Savings

Equation K-5. Hot Water Pipe Insulation Energy Savings

$$\Delta kWh = \frac{\left(\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) * (L * C)\right) * \Delta T * 8{,}766/nDHW}{(3{,}412)}$$

Where:

R_{exist}	Pipe heat loss coefficient of uninsulated, existing pipe (hr-°F-ft/Btu), 1.0
R_{new}	Pipe heat loss coefficient of insulated pipe (hr-°F-ft/Btu), 1.0+R-value of insulation = 6
L	Length of pipe from water heating source covered by pipe wrap (ft) = 6
C	Circumference of pipe (ft), Diameter (in) * π/12 = 0.131

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R_{base}	Pipe heat loss coefficient of uninsulated pipe (existing) [(hr-°F-ft)/Btu] = 1
ΔT	Average temperature difference between supplied water and outside air temperature = 60°F
Hours	Hours in a year = 8,766
nDHW	Recovery efficiency of electric water heater = 98%
3,412	Conversion factor from Btu to kWh

Hot Water Pipe Insulation Coincident Demand Savings

Equation K-6. Hot Water Pipe Insulation Coincident Demand Savings

$$\Delta kW = \frac{\Delta kWh}{8{,}766}$$

Advanced Power Strip Energy Savings

Equation K-7. Advanced Power Strip Energy Savings

$$\Delta kWh_{7\text{-}plug} = 103$$

Where:

ΔkWh	Deemed energy savings: 103 kWh for 7-plug strip

Advanced Power Strip Coincident Demand Savings

Equation K-8. Advanced Power Strip Coincident Demand Savings

$$\Delta kW_{7\text{-}plug} = 0.0115$$

Where:

ΔkW	Deemed coincident demand savings: 0.0115 kW for 7-plug strip

LEDs Energy Savings

Equation K-9. LEDs Energy Savings

$$\Delta kWh = \frac{(W_{base} - W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Wattage of baseline bulb (43W for 9W LED, 60 W for 5W Candelabra, 40W for 6W Globe, 50W for 8W BR30)
W_{ee}	Wattage of efficient bulb (9W, 5W Candelabra, 6W Globe, and 8W BR30)
ISR	In-service rate = 96.9%
Hours	1,089 for 9W and 763 for Candelabra, Globe, and BR30
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.04

LEDs Coincident Demand Savings

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Equation K-10. LEDs Coincident Demand Savings

$$\Delta kW = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * WHF_d * \mathbf{CF}$$

Where:

W_{base}	Wattage of baseline bulb (43W for 9W LED, 53W for 15W LED)
W_{ee}	9W or 15W
ISR	Same as above
Hours	Same as above
WHF_d	Waste heat factor to account for cooling savings from efficient lighting = 1.07
CF	Coincidence factor = 0.128 for 9W bulbs, 0.109 for Candelabra, Globe, and BR 30 (assumed "Interior")

K.1.2.2 Common Area Measures

Lighting Energy Savings

Equation K-11. LEDs Energy Savings

$$\Delta kWh = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	In-service rate = 96.9%
Hours	1,159 Unknown
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.051 Multifamily Unknown Area

Lighting Coincident Demand Savings

Equation K-12. LEDs Coincident Demand Savings

$$\Delta kW = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * WHF_d * \mathbf{CF}$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	Same as above
Hours	Same as above
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.093 Multifamily Unknown Area
CF	Coincidence factor = 0.128 interior

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K.1.2.3 Custom Measures

Variable values for the custom measures are unique to each project and are provided by the implementer and the IL TRM v7 for HVAC measures or v5 for appliance measures.

Refrigerator Energy Savings

Equation K-13. Refrigerator Energy Savings

$$\Delta kWh = UEC_exist - UEC_ee$$

Where:

UEC_exist	Energy use of existing unit
UEC_ee	Energy use of efficient unit

Refrigerator Coincident Demand Savings

Equation K-14. Refrigerator Coincident Demand Savings

$$\Delta kW = (\Delta kWh/8766)*TAF*LSAF$$

Where:

ΔkWh	Calculated above
TAF	Temperature Adjustment Factor
LSAF	Load Shape Adjustment Factor

Washing Machine Energy Savings

Equation K-15. Washing Machine Energy Savings

$$\Delta kWh = Capacity * (1/IMEFbase - 1/IMEFeff) * Ncycles$$

Where:

Capacity	Capacity of washing machine
IMEF base	Integrated Modified Energy Factor of the baseline unit
IMEF ee	Integrated Modified Energy Factor of the efficient unit
Ncycles	Number of cycles per year

Washing Machine Coincident Demand Savings

Equation K-16. Washing Machine Coincident Demand Savings

$$\Delta kW = \Delta kWh \,/\, Hours * CF$$

Where:

ΔkWh	Calculated above
Hours	Annual operating hours

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CF	Coincidence Factor

Bathroom Exhaust Fan Energy Savings

Equation K-17. Bathroom Exhaust Fan Energy Savings

$$\Delta kWh = (CFM * (1/Nbase - 1/Nee) / 1000) * Hours$$

Where:

CFM	Nominal capacity of exhaust fan
Nbase	Average efficacy of baseline fan
Nee	Average efficacy of efficient fan
Hours	Annual run hours

Bathroom Exhaust Fan Coincident Demand Savings

Equation K-18. Bathroom Exhaust Fan Coincident Demand Savings

$$\Delta kW = (\Delta kWh/Hours) * CF$$

Where:

ΔkWh	Calculated above
Hours	From above
CF	Coincidence Factor

VFD Valve Energy Savings

Equation K-19. VFD Valve Energy Savings

$$\Delta kWh = BHP / EFFi * Hours * ESF$$

Where:

BHP	System brake horsepower
EFFi	Motor efficiency
Hours	Operating hours
ESF	Energy savings factor

VFD Valve Coincident Demand Savings

Equation K-20. VFD Valve Coincident Demand Savings

$$\Delta kW = BHP / EFFi * DSF$$

Where:

BHP	Same as above
EFFi	Same as above
DSF	Demand savings factor

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Ductless Heat Pump Mini-Split Energy Savings

Equation K-21. Ductless Heat Pump Mini-Split Energy Savings

$$\Delta kWh = ((Elecheat * Capheat + EFLHheat * (1/HSPFexist - 1/HSPFee)) / 1000) + ((Capcool * EFLHcool * (1/SEERexist - 1/SEERee))/1000)$$

Where:

Elecheat	If building is electrically heated = 1, otherwise =0
Capheat	Heating capacity of the ductless heat pump in Btu/hr
EFLHheat	Equivalent full load heating hours
HSPFexist	Heating system performance factor of existing heating system
HSPFee	Heating system performance factor of efficient heating system
Capcool	Cooling capacity of ductless heat pump in Btu/hr
SEERexist	SEER efficiency of existing unit
SEERee	SEER rating of efficient equipment

Ductless Heat Pump Mini-Split Coincident Demand Savings

Equation K-22. Ductless Heat Pump Mini-Split Coincident Demand Savings

$$\Delta kW = (Capcool * (1/EERexist - 1/EERee))/1000) * CF$$

Where:

Capcool	Same as above
EERexist	Energy efficiency ratio of existing cooling system
EERee	Energy efficiency ratio of new ductless heat pump mini-split
CF	Coincidence Factor

High Efficiency Air Conditioner Energy Savings

Equation K-23. High Efficiency Air Conditioner Energy Savings

$$\Delta kWh = (FLHcool * Capacity * (1/SEERexist * (1-DeratingCoolBase)) - 1/(SEERee * SEERadj * (1-DeratingCoolEff))))/1000$$

Where:

FLHcool	Full load cooling hours
Capacity	Size of new equipment in Btu/hr
SEER exist	Seasonal energy efficiency ratio of existing unit
SEERee	Seasonal energy efficiency ratio of efficient unit
DeratingCoolBase	Baseline central air conditioner cooling derating
DeratingCoolEff	Efficient central air conditioner cooling derating

High Efficiency Air Conditioner Coincident Demand Savings

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Equation K-24. High Efficiency Air Conditioner Coincident Demand Savings

$$\Delta kW = (Capacity * (1/EERexist * (1\text{-}DeratingCoolBase)) - 1/(EERee * SEERadj * (1\text{-}DeratingCoolEff))))/1000 * CF$$

Where:

Capacity	Same as above
EERexist	Energy efficiency ratio of existing cooling system
EERee	Energy efficiency ratio of efficient
DeratingCoolBase	Baseline central air conditioner cooling derating
DeratingCoolEff	Efficient central air conditioner cooling derating
CF	Coincidence Factor

Lighting Energy Savings

Equation K-25. LEDs Energy Savings

$$\Delta kWh = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Wattage of existing system
W_{ee}	Wattage of efficient system
ISR	In-service rate
Hours	Annual operating hours
WHF_e	Waste heat factor to account for cooling savings from efficient lighting

Lighting Coincident Demand Savings

Equation K-26. LEDs Coincident Demand Savings

$$\Delta kW = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * WHF_d * \mathbf{CF}$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	Same as above
Hours	Same as above
WHF_e	Waste heat factor to account for cooling savings from efficient lighting
CF	Coincidence factor

K.2 Process Evaluation

Navigant addressed two process evaluation research questions and the five Missouri-required questions for process evaluation through staff interviews and a program materials review.

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Table K-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table K-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews • Materials review
2. What changes have been made to the program in PY2018?	• Program staff interviews • Materials review
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review

Source: Navigant

K.2.1 Program Staff Interviews

The team performed an in-depth interview with KCP&L program staff and a separate interview with ICF International, the program implementer. These interviews addressed the following topics:

- Roles and responsibilities of program and implementation staffs
- Program goals and objectives, including progress on recommendations made in MEEIA I evaluation
- Program budget, including non-program incentives and any budget changes
- Program implementation, including marketing, products supported, installation mechanisms (direct install vs. custom), and problems encountered in the first year of the program

K.2.2 Materials Review

Navigant reviewed materials provided by KCP&L, including brochures linked to the program, and the materials available for review on the KCP&L website. Since the primary marketing for this program is direct contact with property owners and managers, this was the most relevant information.

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APPENDIX L. HOME LIGHTING REBATE PROGRAM-SPECIFIC METHODOLOGIES

The KCP&L Home Lighting Rebate (HLR) program provides upstream incentives to partnering manufacturers and retailers in the KCP&L-MO and GMO service territories. The program started in April 2016 and continues to operate as of March 2019, the period covered in this annual report. In PY2018, the HLR supported specialty LEDs (reflectors, floods, candelabras, and globe lamps, among others) in all retail channels for the entire year. The program limited support of standard A-line LEDs to discount stores largely in the first two quarters of the year[20].

As discussed more fully in the main report, the focus on specialty LEDs and the related budget reductions represent substantial changes from PY2016 and PY2017. KCP&L reduced the program budget and shifted program support from standard to specialty LEDs due to the strong HLR performance in the first 2 years of MEEIA Cycle II and a portfolio shift toward programs with more concentrated demand savings. Concurrently, the Navigant team reduced the HLR evaluation efforts to a narrow focus on savings verification and process updates.

Based on Missouri regulations (see Appendix D), the Navigant team used impact evaluation method 2b to evaluate the HLR program in PY2018, but they also incorporated results produced in PY2016 and PY2017 using impact evaluation method 1a (modified for the upstream nature of the program). This program evaluation consisted of the following activities for PY2018:

- Gross impact evaluation (detailed in Section L.1.1)
- NTG analysis (detailed in Section L.1.2)
- Process evaluation (detailed in Section L.2)

L.1 Impact Evaluation

The Navigant team focused the impact evaluation activities conducted in PY2018 to answer the following questions:

- Do the reported energy and demand savings accurately characterize program impacts? If not, what are the gross savings associated with the program?
- What is the appropriate NTG ratio for the program?

These questions represent those addressed through evaluation best practices and provide input on the critical impact information needed for residential programs.

L.1.1 Gross Analysis

To estimate the gross savings for the HLR program, the evaluation team conducted the following activities:

[20] Standard LED sales reported for PY2018 reflected PY2017 sales invoiced in PY2018 or sell-through of LEDs covered under PY2017 MOUs but sold in PY2018.

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- Tracking database review
- Engineering desk review

L.1.1.1 Tracking Database Review

The evaluation team requested and obtained the 2018 program tracking data from the HLR program implementer ICF (the IC). The IC data also included summaries of sales, incentives, and reported savings for MEEIA Cycle II through PY2018.

The Navigant team reviewed the program tracking data to assess the following (some of which also informed the process evaluation):

- Ability to verify gross first year and lifetime savings by the inclusion of measure wattage, rated measure life, and number of products sold
- Tracking of significant program changes, namely the focus on specialty products
- Level of detail on the characteristics of products sold, especially the shape and features of bulbs, number of bulbs per package, pre-rebate price of package, rebate amount per package, and post-rebate price per package
- Retail store or other location from which the bulbs were sold to allocate savings accurately across retail channels (KCP&L-MO supported standard bulbs largely in the discount channel for PY2018)
- Dates of bulb sales and invoices

L.1.1.2 Engineering Desk Review

The evaluation team performed an engineering desk review of savings algorithms and deemed inputs to verify that the reported energy and demand savings accurately characterized program impacts. Next, the Navigant team calculated verified energy and demand savings based on the number and characteristics of LEDs sold through the program in the 2018 program year as described above in Section L.1.1.1.

For the engineering desk review, the Navigant team drew on primary evaluated results from PY2016 and PY2017 KCP&L-MO or GMO and information from the program tracking database. When primary information was not available for KCP&L-MO or GMO, the Navigant team supplemented with inputs from the IL TRM V7. In PY2016 and PY2017, the evaluation team had relied on the IL TRM V5. However, in PY2017, the Missouri State Auditor requested that the Navigant team make a mid-life adjustment to assumed baseline wattage for the cost-effectiveness calculations.[21] To maintain consistency and to use

[21] The State Auditor made this request because the Energy Independence and Security Act calls for an increase in standard bulb efficiency to 45 lumens per watt. Only CFLs and LEDs meet this efficiency. At the time of the auditor's request, the DOE had issued a rulemaking to also apply the 45 lumens per watt to most specialty bulbs. The IL TRM V7 was written under the assumption that this rule would be implemented. It allows the utilities to claim the current baseline through 2020 for standards and 2023 for specialty bulbs, after which they must claim a baseline reflecting the then-proposed federal standards. Subsequent to the publication of the IL TRM V7, the DOE has rescinded their directive to apply the 45 lumens per watt to specialty bulbs and they have drawn into question whether the efficiency increase should go into effect for standard bulbs. In short, the future of lighting efficiency standards will almost certainly be decided through lawsuits. The Navigant team has decided to retain the mid-life adjustment for PY2018 given that the final rulemakings withdrawing the higher efficiency standards were not in place when the sales occurred or during the verification process.

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the most recent information available, the Navigant team updated current and mid-life baseline wattages and all other inputs drawn from the IL TRM to match those of the IL TRM V7. Table L-1 summarizes these changes.

Table L-1: Gross Savings Inputs PY2017 and PY2018

Gross Energy or Demand Savings Assumption	Bulb Type	PY2017		PY2018	
		Value	Source	Value	Source
Baseline Wattage ($Watts_{base}$)	Standard	43	Market Research[1]	43	IL TRM V7[1,2,]
Baseline Wattage ($Watts_{base}$)	Specialty	43	Market Research[1]	54	IL TRM V7[1,2]
Program Sales Wattage ($Watts_{LED)}$)	Standard	9.4	Tracking	9.8	Tracking
Program Sales Wattage ($Watts_{LED)}$)	Specialty	9.1	Tracking	8.2	Tracking
Hours of Use (HOU)	Standard	840	IL TRM V5	1,089	IL TRM V7[3]
Hours of Use (HOU)	Specialty	986	IL TRM V5[2]	974	IL TRM V7[4]
In-Service Rate (ISR)	Both	94.2%	Navigant Research PY2016	94.2%	Navigant Research PY2016
Waste Heat Factor (WHF) – Energy	Standard	1.06	IL TRM V5	1.06	IL TRM V7[3]
Waste Heat Factor (WHF) – Energy	Specialty	1.06	IL TRM V5	1.05	IL TRM V7[4]
Waste Heat Factor (WHF) – Demand	Standard	1.11	IL TRM V5	1.11	IL TRM V7[3]
Waste Heat Factor (WHF) – Demand	Specialty	1.11	IL TRM V5	1.10	IL TRM V7[4]
Summer Peak Coincidence Factor	Standard	0.08	IL TRM V5	0.128	IL TRM V7[3]
Summer Peak Coincidence Factor	Specialty	0.08	IL TRM V5	0.129	IL TRM V7[4]

[1] Cost effectiveness analysis applies a mid-life adjustment
[2] Weighted to program sales by bulb shape and lumens.
[3] Assumes interior installation for all standard bulbs.
[4] Weighted to program sales by bulb shape, and assumes exterior installation of all reflector bulbs over 900 lumens.
Source: Navigant Analysis

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The Navigant team reviewed the equations used by KCP&L to estimate reported savings to make certain that they aligned with those the evaluation team used to estimate gross energy and demand savings for each LED sold through the program. The evaluation team used

Equation L-1 and Equation L-2 to calculate gross energy and demand savings, respectively, based on the inputs in Table L-1 above.

Equation L-1. Annual Residential Lighting Energy Savings

$$\Delta kWh = \frac{(Watts_{base} - Watts_{ee})}{1{,}000} \times Annual\ HOU \times ISR \times WHF_e$$

Equation L-2. Annual Residential Lighting Demand Savings

$$\Delta kW = \frac{(Watts_{base} - Watts_{ee})}{1{,}000} \times ISR \times WHF_d \times CF$$

The Navigant team adjusted the residential savings downwards by 14% to account for leakage outside of the KCP&L service territory, as estimated in PY2017.

The evaluation team applied alternative values to the percentage of cross-sector sales – HLR bulbs installed in C&I settings. Navigant research conducted in PY2017 confirmed a 4% cross-sector sales rate. They then recalculated

Equation L-1 and Equation L-2 using the listed assumptions for the 4% of program sales likely installed in C&I settings. The alternative values result from Navigant research on omnidirectional LEDs installed only in the retail, small business, and "other" C&I locations, so they differ from the assumptions for C&I lighting more generally. The greater hours of use and peak coincidence factors mean that HLR bulbs installed in C&I setting yield greater per bulb savings than in residential settings.

$Watts_{base}$	Wattage of baseline bulb = 43 watts for standard LEDs and 54 watts for specialty LEDs (Source: IL TRM V7 guidance for assumed baseline wattages of equivalent lumen bulbs and Program Tracking Database)
$Watts_{LED}$	Wattage of program-supported LED = 9.4 watts for standard LEDs and 9.1 watts for specialty LEDs (Source: Program Tracking Database
HOU	Annual hours of use = 3306 (Source: Navigant Research PY2016)
ISR	In-service rate = 94.2% (Source: Navigant research PY2016
WHF	Waste heat factor = 1.23 for energy and 1.31 for demand (Source: Navigant research PY2016)
CF	Peak coincidence factor = 0.6 (Source: Navigant research PY2016)

The Navigant team then multiplied the per bulb savings for each bulb type (standard and specialty) and sector (residential and C&I) and summed the results to yield program-level energy and demand savings.

After computing energy and demand savings using these updated inputs, the evaluation team compared KCP&L-MO's deemed savings and assumptions based on actual program sales and input values, calculating realization rates as verified savings divided by reported savings.

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L.1.2 NTG Analysis

The Navigant team did not conduct primary NTG research in PY2018, as net savings was explored in both PY2016 (using demand elasticity modeling [DEM]) and PY2017 (using DEM and responses to an in-store intercept survey). Concern raised by the state auditor regarding the spillover (SO) estimate developed in PY2017 led to the use of a negotiated, deemed NTG ratio, which was agreed to by KCP&L, the state auditor, and the Navigant team. The main body of the report discusses these concerns.

In summary, the negotiated NTG ratio draws on PY2017 evaluated results for free ridership (FR) from DEM and SO from in-store intercepts, but partially adjusts SO by FR because the in-store intercept approach may have overstated SO. Table L-2 summarizes the values and recommended final NTG ratios. Neither the evaluated results nor the negotiated deemed approach was able to provide reliable separated estimates of participant and non-participant SO or SO by LED type due to small sample sizes of in-store respondents for each sub-group.

Table L-2. Negotiated NTG Ratio for PY2018

LED Type	Column A: Original SO Rate	Column B: FR Rate	Column C: Adj. SO Rate C=A*(1-B)	Column D: Mid-point between Col A and Col C	Column E: PY2018 NTG E=(1-B) + D	Column F: PY2017 NTG for Comparison
Standard	0.21	0.33	0.14	0.18	0.85	0.88
Specialty	0.21	0.50	0.11	0.16	0.66	0.71

Source: Navigant Analysis and State Auditor Suggestions.

L.2 Process Evaluation

The evaluation team addressed two process research questions and the five Missouri-required questions for process evaluation in PY2018 due to the limited scope of the HLR in PY2018. Prior evaluations had addressed all of the questions. Table L-3 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions in PY2016 through PY2018.

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Table L-3. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions for PY2018	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews
2. What changes have been made to the program in PY2018 and what changes are planned for the PY2019 extension and MEEIA Cycle 3?	• Program staff interviews
• **Missouri-Required Questions for Process Evaluation**	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review • Consumer surveys
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review • Consumer surveys • Onsite saturation visits
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review • Supplier interviews • In-store intercept surveys
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review • Consumer surveys • Onsite saturation visits • In-store intercept surveys

Source: Navigant

L.2.1 Program Staff Interviews

The Navigant team performed an in-depth interview with KCP&L program staff and a separate interview with ICF International, the program implementer. These interviews addressed the following topics:

- Roles and responsibilities of program and implementation staffs
- Program goals and objectives, including addressing the five required Missouri process questions and progress on recommendations made in the PY2017 evaluation
- Effects of program product and budget shifts in PY2018
- Plans for PY2019 extension and MEEIA Cycle 3

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APPENDIX M. HER AND IEHR PROGRAM-SPECIFIC METHODOLOGIES

Through the Home Energy Reports (HER) and Income-Eligible Home Energy Reports (IE-HER) programs KCP&L distributes single-page print reports by mail to educate residential customers about their home energy usage and to provide them with information designed to encourage behavior change. Each report contains comparisons of the recipient's energy usage to that of similar homes in their area, historical trends in the recipient's energy usage, and energy-saving action steps. KCP&L-MO sends reports to three waves of customers in the HER program and one wave of customers in the IE-HER program. The HER waves started receiving reports in 2014, 2015, and 2016 respectively and the IE-HER wave started receiving reports in 2014.

The evaluation plan included a full billing analysis in PY2016 and PY2018. Thus, the program evaluation consisted of the following activities:

- Impact evaluation (detailed in Section M.1)
- Process evaluation (detailed in Section M.2)

M.1 Impact Evaluation

The HER and IE-HER programs are randomized control trials (RCTs), wherein the treatment and control groups for each wave are randomly drawn from a single group of eligible customers, ensuring that the control group is equivalent to the treatment group. In this case, the treatment group receives home energy reports while the control group does not. The evaluation team measured energy use using monthly billing data from participants and controls. This evaluation consisted of the following activities, which are detailed in this section.

- **Data cleaning:** Identified customer data to be excluded from the analysis. Reasons for exclusion included an insufficient number of pre-period and program period months, insufficient billing days within a given month to determine a monthly average, or a treatment customer not having received a report.
- **Equivalency check:** Verified that the distribution of average monthly energy usage before receiving the HERs was sufficiently similar between the treatment and control groups, ensuring that estimates of energy savings were unbiased.
- **Pre-period program participation equivalency check:** Verified that the treatment and control groups had similar rates of participation in energy efficiency programs in the year prior to the start of the treatment.
- **Regression analysis:** Verified program impacts using two alternative statistical models: a post-period regression (PPR) analysis with lagged customer controls and a linear fixed-effects regression (LFER) analysis. Both were applied to monthly energy usage data obtained from customer bill records.
- **Channeling analysis:** Estimated the uplift in other energy efficiency programs due to suggested actions on HERs through a post-only difference (POD) approach applied to program tracking data from other programs.

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Demand reductions: Monthly billing data do not have sufficient granularity to estimate demand impacts. Modeling demand impacts requires hourly or shorter-interval meter data. The implementer calculated coincident demand savings by taking energy savings from August and dividing it by the number of hours in August times a factor of 1.5. The evaluation team verified that the implementer applied this calculation correctly. The evaluation team also applied the same calculation to the evaluated savings from August.

M.1.1 Data Cleaning

The evaluation team cleaned the billing data to ensure data used in the billing analysis contained sufficient pre- and post-months in the analysis periods, sufficient billing days, and no outlying values. The number of records removed from each wave and the reason for removal are shown in the databook.

M.1.2 Pre-Period Program Participation Equivalency Check

The validity of impact estimates from comparing changes in energy use between the treatment and control group rests on the assumption that the groups are truly random and equivalent in the pre-period. In addition to checking for equivalency in pre-period energy use across all waves, we tested for equivalency in prior program participation one waves.

Table M-1 lists each wave, treatment group size, pre-period time span, and our decision to analyze based on available data and wave size. We focused on the largest wave for which the evaluation team had data on energy efficiency programs during the wave's pre-period: KCP&L MO 2016, as noted by the shaded row.

Table M-1. Status of Energy Efficiency Program Data

Wave	Treatment N Control N	First Report Date	Pre-period	Available Data Notes[1]
KCP&L-MO 2014	94,500 12,600	Jul 2014	Jul 2013 to Jun 2014	No data from Cycle 1[2]
KCP&L-MO 2015	12,600 10,000	Mar 2015	Mar 2014 to Feb 2015	ACUR; HARR[3] but we did not analyze due to small wave size
KCP&L-MO 2016	18,021 11,522	Jul 2016	Jul 2015 to Jun 2016	ACUR, HARR, WHE and HPwES
KCP&L- MO 2014 Income Eligible	21,000 12,600	Jul 2014	Jul 2013 to Jun 2014	No data from Cycle 1[2]

[1] The Navigant team has data starting with the MEIA Cycle 1 programs that started in 2014.
[2] Retrieving data from older programs would be an administrative burden on KCP&L.
[3] Program Key: ACURR = Air Conditioning Upgrade Rebate, HARR = Home Appliance Recycling Rebate, WHE = Whole House Efficiency program, HPwES = Home Performance with ENERGY STAR®, Tstat = Residential Thermostat program
KCP&L offered ACUR, HARR, and HPwES during Cycle 1, but discontinued in Cycle 2. KCP&L offered WHE and Tstats in Cycle 2.
Source: Navigant Analysis

To compare participation in energy efficiency programs in the pre-period, we:

- Pulled a list of treatment and control customers from each of the three waves from a list provided by KCP&L for the PY 2019 evaluation

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- Merged the participant list with energy efficiency program tracking data (described in Table 1) by premise and account identification numbers
- Flagged customers with participation in an energy efficiency program if the customer installed a device or participated in a program in the pre-period defined for each wave in Table 1
- Compared the proportion of the treatment and control group customers who we flagged as participants using a two-tailed z-test of proportions

Table M-2 displays the number and percentage of customers who participated in a program during the wave's pre-period. We see no difference (at two decimal places) in participation between the treatment and control groups.

Table M-2. Participation Proportions

	% of Treatment Group with Prior Participation (n)	% Control Group with Prior Participation (n)	Difference (p-value)
KCP&L MO 2016	0.33% (59)	0.33% (38)	0% (0.9681)

Source: Navigant Analysis

M.1.3 Equivalency Check

The HER and IE-HER programs are RCTs, in which individual customers are randomly assigned to the treatment group (receive HERs) or the control group (do not receive HERs) for estimating changes in energy usage due to the program. Because the treatment and control groups are randomly assigned, pre-treatment energy use should be equivalent between the groups. The evaluation team performed an equivalency check of the energy usage patterns of the treatment and control groups of each program in the year preceding the rollout to confirm that the data were consistent with an RCT design in each case. In the 2013-2015 program cycle, equivalency checks were performed for the 2014 and 2015 HER waves and the IE-HER wave. The Navigant team checked the equivalency of the 2016 wave as part of the PY2016 evaluation.

The Navigant team employed three separate methods of evaluating the equivalency of treatment and control energy usage:

- Visual inspection of overlaid plots of monthly mean energy use for treatment and control groups.
- T-tests[22] on monthly differences in mean energy use between treatment and control groups in each month. A significant difference ($p<0.05$) indicates that pre-period usage is dissimilar between groups.
- Regression analysis of pre-period usage with the treatment/control group as a predictor. A significant effect ($p<0.05$) of the group category indicates that pre-period usage is dissimilar between groups.

[22] A t-test is a statistical test of the difference between mean values of an observed characteristics between two populations. In this case, it is a test of the difference in average electricity usage in each month comparing treatment and control group customers.

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M.1.4 Regression Analysis

As mentioned above, the evaluation team conducted the regression analysis to determine energy savings for treatment and control customers using two models: PPR and LFER. Both approaches should, in principle, produce unbiased estimates of program savings under a wide range of conditions, but the evaluation team reports the PPR results. Navigant prefers the PPR results because, based on past experience analyzing the impacts of similar programs as well as recent findings from the academic literature, the savings estimates produced by the PPR approach tend to be more accurate and more precisely estimated than those from the LFER model. However, the evaluation team also employed the LFER model as a robustness check. Although the two models are structurally different, assuming the RCT is well-balanced with respect to the drivers of energy use, the two models should produce similar program savings estimates.

M.1.4.1 Post-Period Regression

The PPR model controls for anomalous differences in energy usage between treatment group and control group customers by using lagged energy use as an explanatory variable. In other words, the model frames energy use in each calendar month of the post-program period as a function of both the treatment variable and energy use in the same calendar month of the pre-program year. The underlying logic is that any small systematic differences between the control and treatment customers that remain, despite the randomization, will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Including the lagged energy use term in the model serves as a control for any such differences.

Equation M-1. Post-Period Regression

$$ADC_{kt} = \beta_0 + \beta_1 ADClag_{kt} + \beta_2 Treatment_k + \sum_j \beta_{3j} Month_{jt} + \sum_j \beta_{4j} Month_{jt} * ADClag_{kt} + \varepsilon_{kt}$$

Where:

ADC_{kt}	The average daily usage in kWh for customer *k* during billing cycle *t*. This is the dependent variable in the model.
$Month_{jt}$	A binary variable taking a value of 1 when *j=t* and 0 otherwise.[23]
$ADCLag_{kt}$	Customer *k*'s energy use in the same calendar month of the pre-program year as the calendar month of month *t.*
$Treatment_k$	A binary variable indicating whether customer *k* is in the participant group (taking a value of 1) or in the control group (taking a value of 0).
ε_{kt}	The cluster-robust error term for customer *k* during billing cycle *t.* Cluster-robust errors account for heteroscedasticity and autocorrelation at the customer level.

[23] If there are T post-program months, there are T monthly dummy variables in the model, with the dummy variable $Month_{jt}$ the only one to take a value of 1 at time t. These are, in other words, monthly fixed effects.

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M.1.4.2 Linear Fixed-Effects Regression

As with the PPR model, the LFER model combines both cross-sectional and time series data. Unlike the PPR model, however, an LFER models the full set of pre- and post-program usage data. The regression essentially compares the pre- and post-program energy usage of participants to those in the control group to identify the effect of the program. The purpose of the customer-specific fixed effect is to capture all systematic cross-customer variation in electric energy usage that is not captured by the model. Like the lagged usage variable in the PPR model, the fixed effect represents an attempt to control for any small systematic differences between the treatment and control customers that might occur in the data despite the randomization.

Equation M-2. Linear Fixed-Effects Regression

$$ADC_{kt}=\beta_{0k}+\beta_1 Post_t+\beta_2 Treatment_k Post_t+\varepsilon_{kt}$$

Where:

ADC_{kt}	The average daily usage in kWh for customer *k* during billing cycle *t*. This is the dependent variable in the model.
$Post_t$	A binary variable indicating whether bill cycle *t* is in the post-program period (taking a value of 1) or in the pre-program period (taking a value of 0).
$Treatment_k$	A binary variable indicating whether customer *k* is in the participant group (taking a value of 1) or in the control group (taking a value of 0).
ε_{kt}	The cluster-robust error term for customer *k* during billing cycle *t*. Cluster-robust errors account for heteroscedasticity and autocorrelation at the customer level.

M.1.5 Channeling Analysis

HERs sent to participating households included energy-saving tips, some of which encouraged participants to enroll in other KCP&L energy efficiency programs. If participation rates in other residential energy efficiency programs were the same for HER participant and control groups, the savings estimates from the regression analysis were already net of savings from the other programs, as this indicates the HER program had no effect on participation in other energy efficiency programs. However, if the HER program affected participation rates in other energy efficiency programs by channeling participants into them, then savings detected in the HER billing analysis would include savings also counted by those energy efficiency programs. For instance, if the HER program increased participation in a home retrofit program, the increase in savings could be allocated to either the HER program or the home retrofit program (or some portion to each) but could not be fully allocated to both programs simultaneously.

The RCT design allows for the unbiased estimation of the effects of channeling by HERs. Instead of using the treatment and control groups to calculate energy savings, the same sets may be used to estimate uplift and double-counted savings. The control group acts as the counterfactual for both participation and savings from other programs.

The preferred method of estimating uplift in other energy efficiency programs is a difference-in-difference (DID) statistic. To calculate a DID statistic, the evaluation team subtracts the change in the participation rate in another energy efficiency program between the program year and the pre-program year for the control group from the same change for the treatment group. However, this statistic is only applicable in

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the absence of large portfolio changes, including the consolidation or reorganization of programs. Given that KCP&L reorganized programs to create WHE, IEMF, and IEW, the use of a DID statistic is impractical.

An alternative statistic that generates an unbiased estimate of uplift when the baseline average rate of participation in the energy efficiency program is the same for the treatment and control groups is the simple difference in participation rates during the current program year. The evaluation team uses this alternative statistic—the POD statistic—in cases where the energy efficiency programs did not exist for the entire pre-enrollment year or where programs have undergone significant structural changes that would prevent comparing year-to-year participation numbers.
Navigant examined the uplift associated with WHE equipment rebates, WHE insulation and windows, energy efficiency kits, and thermostats. The WHE program combines the Home Performance with ENERGY STAR (HPwES) and the ACUR programs previously offered by KCP&L. Due to the program's diverse offerings, the Navigant team analyzed participation by measure type. Since these programs are combinations or reconfigurations of previous programs, the POD method is most appropriate.

To calculate uplift Navigant merged KCP&L's energy efficiency program tracking databases with the lists of HER treatment and control group customers. For each energy efficiency program, Navigant flagged customers in the treatment and control groups that participated in the program during PY 2018 to obtain a participation rate for group for each program. The difference in participation rate represents the percentage uplift in participation due to the program. Next, the team multiplied the uplift percent by the number of treatment customers in the wave to arrive at the number of uplift customers. Finally, the team multiplied the number of uplift customers in each energy efficiency program by the overall median program-level savings for each energy efficiency program to arrive at the double-counted savings estimate. To obtain the net energy impact, Navigant subtracted these savings from the estimate obtained from the billing analysis. The incremental calculation steps are detailed in the databook.

To account for participation in EE programs in prior program years, but after treatment customers began receiving HERs, we:

1) Pulled the double-counted savings values by wave from the MEEIA Cycle 1 evaluation report and MEEIA Cycle 2 PY 2016 evaluation report
2) Estimated double-counted savings for PY 2017 by taking a weighted average of PY 2016 and PY 2018 since the PY 2017 evaluation did not include a double-counted savings analysis.
3) Carried the double-counted savings from each year forward, adjusting for the declining number of treatment customers in each year.

M.2 Process Evaluation

Navigant addressed four process evaluation research questions and the five Missouri-required questions for process evaluation through staff interviews, a program materials review, and analysis of the program implementation contractor's Customer Engagement Tracker (CET) survey.

Table M-3 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table M-3. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews • Materials review
2. What changes have been made to the program in PY 2018 and what changes are planned for PY 2019?	• Program staff interviews • Materials review
3. How are customers engaging with the program through the reports and energy-saving actions?	• CET survey
4. How satisfied are customers with the reports? Do reports impact their satisfaction with KCP&L?	• CET survey
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review • CET survey

Source: Navigant

M.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Elena Hill, and the program implementer's lead staff members, Nishtha Ghosh and Lisa Farley, to better understand the HER/IHER program and to try and investigate the key considerations of the five Missouri questions, namely:

- Program's performance to date
- Any issues or challenges faced
- Potential opportunities for improvement
- Effectiveness of program communication

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M.2.2 Materials Review

Navigant reviewed the following program planning and marketing materials to investigate the key considerations of the five Missouri questions, namely:

- HER Report examples
- Samples of marketing modules included on the HERs in 2018
- Implementer's program design and report schedule documents
- Implementer reporting of CET results
- KCP&L-MO program description documents
- KCP&L Report on 2018 marketing efforts

M.2.3 CET Survey

The implementation contractor designed and conducted the telephone CET survey. However, Navigant worked with the implementer to ensure the survey collected information instrumental to answering the process evaluation questions and followed industry best practices to remain neutral. The survey was fielded in December 2018, after treatment customers had received 3 of the 4 reports for PY 2018. Respondents included 503 HER recipients and 305 non-recipient control group customers randomly selected from eight KCP&L deployment waves from both KCP&L-MO and GMO territories.

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APPENDIX N. HOME ONLINE ENERGY ANALYZYER AND BUSINESS ONLINE ENERGY ANALYZER PROGRAM-SPECIFIC METHODOLOGIES

The Home Online Energy Analyzer (HOEA) and the Business Online Energy Analyzer (BOEA) are opt-in online tools that provide energy-saving tips and help customers track their energy usage. The tools encourage customers to take energy-saving actions in their homes and businesses through actions they can take on their own and by participating in other KCP&L energy efficiency programs.

KCP&L does not claim energy savings for the Energy Analyzer tools. This evaluation program consisted of the following activities for PY2018:

- Process evaluation (detailed in Section N.1)

N.1 Process Evaluation

Navigant addressed four process evaluation research questions and the five Missouri-required questions for process evaluation through staff interviews, a program materials review, and analysis of the program implementation contractor's CET survey, which included questions about the HOEA[24].

Table N-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table N-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What is the status of the program's progress toward implementing the key process recommendations provided in the program's most recent EM&V report?	• Program staff interviews • Materials review
2. What changes have been made to the program in PY2018, and what changes are planned for PY2019?	• Program staff interviews • Materials review
3. How are residential customers engaging with the Energy Analyzer and energy-saving actions?	• CET survey
4. How satisfied are residential customers with the Energy Analyzer?	• CET survey
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review

[24] The survey did not include businesses and so did not include any questions on BOEA.

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Process Evaluation Research Question	Evaluation Activity
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review • CET survey

Source: Navigant

N.1.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Elena Hill, and the program implementer's lead staff members, Nishtha Ghosh and Lisa Farley, to better understand the HOEA/BOEA program and to try and investigate the key considerations of the five MO questions, namely:

- Program's performance to date
- Any issues or challenges faced
- Potential opportunities for improvement
- Effectiveness of program communication

N.1.2 Materials Review

Navigant reviewed the following program planning and marketing materials to investigate the key considerations of the 5 MO questions, namely:

- Screen shots of the online tools available to customers through HOEA and BOEA
- Promotional banner ads
- Modules used on HERs to promote HOEA
- Lists of tips used in HOEA and BOEA
- Implementer reporting of CET results
- KCP&L-MO program description documents
- KCP&L Report on 2018 marketing efforts

N.1.3 CET Survey

As noted in Appendix M, the implementation contractor designed and conducted the telephone CET survey. However, Navigant worked with the implementer to ensure the survey collected information instrumental to answering the process evaluation questions and followed industry best practices to remain neutral. The survey was fielded during December 2019. Respondents included 503 HER recipients and 305 non-recipient control group customers randomly selected from eight KCP&L

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deployment waves. While most of the questions pertained to HERs, several questions asked respondents about the HOEA

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APPENDIX O. RESIDENTIAL AND BUSINESS THERMOSTAT PROGRAM-SPECIFIC METHODOLOGIES

The Residential and Business Programmable Thermostat (PT) programs employ the Nest 3rd generation thermostat as well as the Nest Thermostat E to achieve annual energy savings as well as demand curtailment during summer months. KCP&L calls demand response (DR) events during peak demand periods by sending a signal to participating thermostats that causes them to run HVAC systems in reduced load mode for up to 4 hours. A subset of thermostat customers also participates in the Seasonal Savings (SS) program which offers customers an opportunity to make their cooling schedules more efficient. Following the PY 2017 season, Navigant reviewed Nest's impact findings for SS customers and used these findings to identify potential SS impact. The PT programs operate the same way in the KCP&L-MO and GMO territories.

Based on Missouri regulations (see Appendix D), Navigant used method 1b and protocol 2b to evaluate the Residential and Business PT programs. This program evaluation consisted of the following activities for PY 2017:

- Impact evaluation (detailed in Section Appendix P)
- Process evaluation (detailed in Section O.2)

In PY 2017 of Cycle 2, the evaluation team also estimated program demand impacts for the Rush Hour Rewards Program and annual energy savings for the Nest thermostat through two separate billing analyses. The methodologies are described in full in the following section. In addition, the team calibrated the Nest energy savings analysis for SS to align with cooling system load assumptions in the Rush Hour Rewards impact analysis. In PY 2018 of Cycle 2, Navigant used the impact findings from PY 2017 to determine impacts for the population of thermostat participants in PY 2018.

O.1 Impact Evaluation

The following section details the methodologies used to calculate Rush Hour Rewards DR impacts and annual thermostat savings for the thermostat programs in PY 2017, and methodologies for extrapolating those impacts to PY 2018 thermostat participants.

O.1.1 Rush Hour Rewards

The Rush Hour Rewards (RHR) Program is a DR program designed to reduce demand during system peak hours. Participating customers were provided with a free programmable, two-way communicating Nest Thermostat which automatically reduces electric cooling load upon request during the curtailment events. KCP&L called two events in the summer of 2018.

In PY 2017, the evaluation team relied on thermostat run time data, supplied by Nest, to estimate the impacts of the RHR program. The thermostat run time data was converted to energy demand using an average cooling system maximum demand of 3.1 kW. After converting the thermostat runtime data to average kW demand during 15-minute intervals, a within-subject Linear Fixed Effects Regression (LFER) model was run to estimate the impacts during RHR events. The LFER model uses participating

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customers' thermostat run times on similar non-event days to estimate the impact on energy demand. The LFER model specified energy demand as a function of temperature and other variables that influence usage in the regression equation.

In PY 2017, Navigant conducted the following steps to calculate the per-device demand impacts of the Rush Hour Rewards program:

1. Collected and reviewed thermostat run time data, program tracking data, and event signal data.
    a. Ensured that tracking data were complete and consistently formatted.
    b. Verified completeness of thermostat run time data and removed devices that fall under the following conditions:
        i. Indoor air temperature was below cooling target by more than 3 degrees while cooling time was non-zero; i.e. system should not have been cooling but was.
        ii. Indoor air temperature is above cooling target by more than 2 degrees while cooling time is zero; i.e. system is not cooling but should be.
        iii. Device is associated with more than one structure.
        iv. Device where zip code is missing. Thermostat zip code is necessary for the analysis because it allows associated weather data to be linked to the device run time data.
        v. Device with a zip code not in the KCP&L-MO or GMO service territory.
2. Created and calculated the following variables in the dataset:
    a. Created dummy variables for event periods and calendar-related effects (i.e., days of the week, month, etc.)
    b. Calculated variables for weather data (i.e., cooling degree hours, snapback counters, etc.).
    c. Converted the thermostat run time values to an estimate of kW demand based on utility specific assumed average AC unit capacity of 37,200Btu/Hr and Energy Efficiency Ratio or 10.1[25].

    Equation O-1 presents the modeled relationship between AC runtime and electric demand

Equation O-1. RHR Program Run Time Conversion

$$kW = 0.07 + 0.84 * \frac{Runtime * \frac{Btu}{h}}{EER * 1000} - 0.001 * CDH70 + 0.0056 * CDH * \frac{Runtime * \frac{Btu}{h}}{EER * 1000}$$

Where:

[25] Navigant calculated AC unit capacity, for the runtime to power conversion, using program tracking data. The team took an average of all customers' system sizes. The customers with AC unit system sizes listed in the tracking data were a subset of direct install customers. Presumably this is because the direct install technicians were responsible for recording AC unit size information. The team used the age associated with these AC units to estimate EER of each unit. The assumption used was units manufactured 2007 and later used an EER 11.1 and units manufactured 2006 and before used an EER of 9. Ultimately, the team averaged the EER of all AC units to get the EER value for the runtime to power conversion calculation.

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Runtime	Length of time that the AC unit is running
Btu/h	Assumed average of AC unit capacity in the utility territory
EER	Assumed Energy Efficiency Ratio
CDH70	Cooling degree hours

Equation O-2 presents the KCP&L-MO specific AC runtime and electric demand conversion

Equation O-2. RHR Program Run Time Conversion[26]

$$kW = 0.07 + 0.84 * \frac{Runtime * 38,528}{6 * 1000} - 0.001 * CDH + 0.0056 * CDH * \frac{Runtime * 38,528}{6 * 1000}$$

3. Identified 4 non-event days during the same month of the events, July 2017, whose weather pattern most closely matched the weather pattern of the event days. These non-event days served as the counterfactual baseline.
4. Implemented two-way Linear Fixed Effects (FE) regression models to estimate impacts for each event while controlling for time and individual invariants. The general form of the equation for the regression model is shown below, Equation O-3.

Equation O-3. RHR Program Regression Model

$$kW_estimate_{it} = \beta_1 * CDH_{it} + \beta_2 * MA4CDH_{it} + \beta_3 * MA24CDH_{it} + \beta_4 * PreCooling_{it} + \beta_5 * NHBU_{it} + \beta_6 * Event_{it} + \beta_7 * Snapback_{it} * + \varepsilon_{it}$$

Where:

β_{1-7}	Coefficients to be estimated by the model
β_6	Coefficient of interest
t	Index for time intervals
i	Index for individual devices
kW	Average kW during interval
CDH	Cooling degree hours with a set point of 72 degrees
MA4CDH	Moving average of the last 4 hours CHD with a base of 72 degrees
MA24CDH	Moving average of the last 24 hours CDH with a set point of 72 degrees
PreCooling	Counter for precooling hours, the 3 hours preceding an event
NHBU	Normalized Heat Build Up defined as the cumulative heat buildup based on the weighted average of past hourly values. The weighting uses a compounded discount factor of 0.958333 for the number of hours prior - up to 72 hours prior
Event	Binary for event hours

[26] Source: WHE program tracking database and Navigant analysis

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Snapback	Counter for snapback hours, the 3 hours following an event
ε	Error term

To calculate gross impacts for the RHR program in PY 2018, Navigant multiplied the average DR impact per thermostat obtained in the steps listed above by the number of thermostats activated by the end of the program year. Navigant used the "completion date" column to identify customers in the tracking data who activated their thermostat within the program year.

The sources for the data used in this analysis are as follows:

1. KCP&L provided Navigant with PY 2018 program tracking data.
2. Nest provided Navigant with PY 2017 thermostat run time data and event signal data.
3. The Navigant team retrieved weather data from NOAA for the summer of 2017.

O.1.2 Annual Thermostat Energy Savings

Nest is a learning thermostat that once installed, identifies patterns in customer behavior that aims to maximize comfort while optimizing electricity use. In PY 2017, Navigant calculated gross annual energy savings for PT customers by employing a Lagged Dependent Variable (LDV) regression model. The model used monthly billing data and tracking data provided by KCP&L as inputs.

In PY 2017, Navigant conducted the following steps to calculate per-device annual energy savings for the PT program:

1. Collected billing and tracking data.
    a. Ensured that the tracking data were complete.
    b. Reviewed monthly billing data for outliers and ensured that there was enough pre-participation data to identify a matched control for each participant.
2. Created a matched control group.
    a. Used twelve months of consumption data prior to the month in which the thermostat was installed to identify a control customer for each program participant using a matching algorithm.
    b. The matching algorithm accounted for the magnitude and monthly pattern of consumption in determining the best match. Another customer (non-participant) with the lowest sum of squared monthly differences was selected as the matched control for each participant.
    c. Checked the quality of the matches for each participant and excluded participants for whom a relatively good[27] match was not found so as to prevent unintended bias from being introduced into the model due to inappropriate matches.

[27] For some participants, the closest match had a notably high sum of square error compared to other matched controls meaning that quality of the match was not reliable. It was not unusual for some customers to have a notably higher monthly consumption or a unique monthly consumption pattern that was uncommon when compared to rest of the population and hence a reliable matched control could not be found.

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3. Extracted and Prepared Weather Data
    a. The Kansas City International Airport weather station was used for all customers.
    b. Average daily weather from NOAA[28] was used to calculate cooling (CDD) and heating (HDD) degree days for each month of the year. Thresholds of 60^0F and 72^0F were used as thresholds for HDD and CDD respectively.
4. Prepared Data for Regression
    a. A dummy variable corresponding to each month was created.
    b. A new variable containing the same month's consumption in the previous year was created for each customer[29].
    c. For each participant, the post period was identified as the month after the thermostat installation was completed. The installation month was excluded from analysis.
    d. For each participant and their matched control, data within the participant's post period timeframe was kept. This resulted in each participant and their matched control having the same number of observations in the post period.
5. LDV Regression Analysis
    a. A LDV model was run using only the post period data for all the participants and their matched controls. The regression model presented in Equation O-4.

Equation O-4. Programmable Thermostat Energy Savings Regression Model

$$kWh_{i.t} = \sum_{m=1}^{12} \alpha_m * Month_{m.t} + \beta * kWh_Lag12_{i.t} + \sum_{m=1}^{12} \gamma_m * No_Thermostats_{i.t} \cdot HDD60_{i.t} \cdot Month_{m,t} + \sum_{m=1}^{12} \delta_m * No_Thermostats_{i.t} \cdot CDD72_{i.t} \cdot Month_{m,t} + \eta * HDD60_{i.t} + \phi * CDD72_{i.t} + \varepsilon_{i.t}$$

Where:

i	Index to denote an individual customer
t	Index to denote the month
$kWh_{i.t}$	Kilowatt hours consumed for month t
$Month_{i.t}$	Dummy variable for the month of the year
$kWh_Lag12_{i.t}$	Kilowatt hours consumed in the same month one year ago
$No_Thermostats_{i.t}$	Number of thermostats installed in month t

[28] Local Climatological Data

[29] This was the lagged dependent (consumption) variable.

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$HDD60_{i,t}$	Heating degree days in month t
$CDD72_{i,t}$	Cooling degree days in month t
$\varepsilon_{i,t}$	Error term in month t
$\alpha, \beta, \gamma, \delta, \eta, \phi$	Parameters to be estimated by the model

6. Weather Normalization
    a. Thirty-year weather normal values for CDD72 and HDD60 were extracted from NOAA for Kansas City International Airport.
7. Average Savings per Thermostat under Normal Weather
    a. The monthly weather normal HDD and CDD values were interacted with the coefficients from the regression model, namely the gamma's (γ) and delta's (δ), to calculate the average savings associated with heating and cooling loads respectively for a single thermostat.

To obtain the total estimated energy savings on a program level in PY 2018, the team multiplied the average savings per thermostat of 197 kWh per thermostat, which was obtained in PY 2017 according to the steps above, by the number of thermostats considered part of the thermostat program in PY 2018[30].

Navigant assumed that thermostats also participating in the Seasonal Savings[31] (SS) program achieved 121 kWh of incremental energy savings per device[32]. The team multiplied the number of devices in SS by 121 kWh and added this number to the step identified directly above to ultimately get the verified total program annual energy savings.

O.1.3 PowerSaver Program

In 2018, Navigant estimated the impacts from a small study of the PowerSaver program offered through Tendril. The PowerSaver Program consists of a DR program designed to reduce demand during system peak hours, plus a thermostat optimization program that sends schedules to the customers' thermostats designed for energy efficiency and customer comfort. Customers with existing programmable, two-way

[30] The count of thermostats consisted of: Direct Install (DI) thermostats with a completion date in PY3, Do It Yourself (DIY) thermostats with a work order date within PY3. The kWh savings calculation does not include Bring Your Own Device (BYOD) thermostats because it is assumed these customers would have kWh savings through their thermostat without being enrolled in KCP&L's thermostat program.

[31] Seasonal Savings is an opt-in aspect of the PT program that provides customers with the opportunity to make their thermostats' cooling schedules even more efficient than default. These thermostats undergo a three-week algorithm that optimizes energy efficiency and results in a more efficient cooling schedule for the rest of the cooling season.

[32] In PY 2017, the evaluation team did not have sufficient data to evaluate a SS specific kWh savings through a billing analysis due to the lack of experimental design (i.e. no control group for SS customers) for the SS program, so the team used a modified version of what Nest found for the annual energy saved by SS thermostats participants. Nest found that each SS thermostat achieved 144 kWh savings per year assuming average population system capacity was 3.8 kW. Navigant assumed average population system capacity was 3.1 kW based on an assessment of program tracking data used in "Step Two" or the RHR methodology. The evaluation team scaled Nest's 144 kWh down to assume a 3.1 kW system capacity, instead of 3.8 kW, bringing the team to 121 kWh additional annual energy savings for SS customers.

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communicating ecobee thermostats participated in two Peak Savings events in the summer of 2018. All other non-event days in August and September of 2018 were split between 80% energy efficiency days (PowerSaver program in operation) and 20% learning days (thermostat reverts to original schedule).

In PY 2018, Navigant calculated per-device demand and seasonal energy savings for the PowerSaver program as follows.

Demand Savings Calculations
To calculate demand savings from the Peak Savings events, Navigant followed a similar methodology that was used for the RHR program in 2017, outlined in section **Error! Reference source not found.**. In addition to running regression models using runtime data to calculate the dependent variable, Navigant conducted the same analysis using whole-home interval data. The two methods provided similar impact estimates, supporting the system-sizing assumptions used in **Error! Reference source not found.**.

Seasonal Energy Savings Calculations
To calculate seasonal energy savings from the PowerSaver program, Navigant relied on non-event "learning" days to estimate program impacts. Because the program was only in operation during the months of August and September, Navigant only included CDH (base 72) and Heat Building variables in the regression specification, in addition to customer fixed effects and weekend and month dummy variables.

O.2 Process Evaluation

Navigant addressed two research questions and the five Missouri-required questions for process evaluation. To answer these questions and gain information for this process evaluation, the evaluation team interviewed the product manager at KCP&L and the implementation contractor.

Error! Reference source not found. displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table O-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What changes have been made to the program since PY2017 and how have these changes affected program satisfaction, participation, savings, and costs?	• Program staff interviews
2. Are there additional changes to the program that would be useful in future years or are planned for PY2019?	• Program staff interviews
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Materials review
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Materials review
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program staff interviews • Materials review

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4.	Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Materials review
5.	What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program staff interviews • Materials review

O.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Elena Johnston, to better understand the Residential and Business PT programs and to try and investigate the key considerations of the five Missouri questions, namely:

- Issues or challenges faced
- Opportunities for improvement and efficiencies
- Participant recruitment and communication
- Internal program partnerships
- Upcoming program changes

O.2.2 Materials Review

Navigant reviewed the following materials to gain insight on the process evaluation research questions:

- Business Thermostat Program customer website: https://www.kcpl.com/save-energy-and-money/business/incentives/thermostat
- Residential Thermostat Program customer website: https://www.kcpl.com/save-energy-and-money/home/programs/thermostat

O.2.3 PowerSaver Customer Surveys

Navigant analyzed responses to customer surveys fielded by Tendril during the PowerSaver study period (August and September 2018). The surveys included the following:

- Two post-event surveys following each of the two Peak Savings events
- Monthly impact surveys for August and September
- Two randomized program surveys, targeting 50% of the population

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APPENDIX P. DEMAND RESPONSE INCENTIVE PROGRAM-SPECIFIC METHODOLOGIES

The Demand Response Incentive (DRI) Program is a C&I DR program that is designed to reduce demand during system peak load periods. Participating customers provide the utility with demand reduction capacity by committing to reduce electric load upon request during the curtailment season (June to September). In return, the utility provides customers with an economic incentive to meet contracted curtailment loads. The utility counts the DR savings capacity represented by the summed differences between participants' estimated peak demands and firm power level as an offset to generation. The programs operate the same between KCP&L-MO and GMO.

Based on Missouri regulations (see Appendix D), Navigant used method 1a and protocol 2a to evaluate the DRI program. The program evaluation consisted of the following activities:

- Impact evaluation (detailed in Section P.1)
- Process evaluation (detailed in Section P.2)

The evaluation team also estimated program load impacts through hourly load data supplied by automated meter reading (AMR) and advanced metering infrastructure (AMI). Both are described in more detail below.

P.1 Impact Evaluation

The Demand Response Incentive program incentivizes commercial and industrial customers to curtail load during peak demand events that KCP&L identifies. The following section discusses the methodology for evaluating this program.

To estimate the impacts of the DRI program, the evaluation team relied on hourly load data supplied by AMR and AMI—described in more detail below.

Navigant answered the research questions in Table P-1 during the DRI program impact evaluation. These questions represent those addressed through evaluation best practices and provide input on the critical impact information needed for this program.

Table P-1. Impact Evaluation Research Questions

	Research Questions
1	Does the reported demand impact accurately characterize program impacts? And if not, what is the gross impact associated with the program?
2	What is the verified demand impact associated with the program?

Source: Navigant Analysis

P.1.1 Gross Analysis

Navigant utilized the following approaches to estimate the gross impact of the DRI program:

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1. **Within-subject regression:** Uses loads of participating customers on non-event days to estimate the reference load. Demand is specified as a function of temperature and other variables that influence usage in the regression equation.
2. **Day averaging (CBL):** Reference load calculation, which is the simple arithmetic mean of loads from the same hour on preceding non-event days.

Navigant primarily aimed to employ within-subject regression approach to evaluate demand savings from the DRI participants. Navigant specified a separate regression equation for each customer and estimated the gross impacts for customers that had sufficient continuous interval data to support the regression analysis. As a secondary option, Navigant calculated savings using a day averaging (CBL) approach in cases where within-subject regression is not possible to employ, or Navigant believes a customer's load is not weather-dependent. A noted difference between within-subject regression approach and CBL approach is that the within-subjects approach controls for the weather impacts while the CBL approach does not account for weather impacts on customer demand.

Navigant conducted the following steps to calculate gross impacts and savings for the DRI program:

1. Collected billing and tracking data
    a. Ensured that tracking data were complete and consistently formatted.
    b. Ensured that billing data is complete and identified any outliers (high usage, no usage, etc.).
    c. Pulled Kansas City weather data from NOAA.
2. Created dummy variables and calculated variables in dataset
    a. Dummy variables for event periods and calendar-related effects (i.e., days of the week, month, etc.).
    b. Calculated variables for weather data (i.e., cooling degree hours, etc.).
3. Examined the load profiles of each customer to identify patterns in usage due to business operations. This information was used to help specify the regression model for each customer and to inform the estimation of impacts.
4. For each customer, a customer-specific ordinary least squares (OLS) regression model was implemented to estimate impacts. The general form of the equation for the regression model is shown below in Equation P-1. After running the regression model for each customer, the following diagnostic steps were taken:
    a. Tested for statistical significance of coefficients to determine whether their estimated impact is significantly different from zero.
    b. Identified the coefficient estimates for each customer and event.
    c. Summarized the coefficients for each event and customer to provide a cumulative impact for each event across all customers.

Equation P-1. DRI Program Regression Model

$$kW_t = \beta_0 + \beta_1 * CDH_t + \beta_2 * Month + \beta_3 * DOW + \beta_4 * Hour_t + \beta_5 * PreEvent + \beta_6 * Event + \beta_7 * Snapback + \beta_8 * PreUsage + \beta_9 * Holiday + \beta_{10} * JulyThird + \varepsilon$$

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Where:

β_{1-7}	Parameters to be estimated by the model
t	Index for hourly time intervals
kW	Average hourly kW
CDH	Cooling degree hours
PreEvent	Two binary variables for the two hours prior to an event
Event	A series of binary variables, one for each hour of the event
Snapback	Three binary variables for the three hours following an event
PreUsage	Average usage during the previous 'like' day from 8am to 10am. For weekdays, use the previous weekday 8am to 10am average usage. For example, on Monday use the value from Friday, on Friday use the value from Thursday. For Saturday and Sunday, use the 8am to 10am average from 7 days prior. For example, on Saturday use the value from the previous Saturday. For any event day, use the 8am to 10am average from two days before the event. If the event occurs on a Monday, use the 8am to 10am average from the previous Friday.
Holiday	Binary variable equal to 1 for holidays (Independence Day and Labor Day) and 0 otherwise
JulyThird	Binary variable equal to 1 for the day prior to Independence Day and 0 otherwise
ε	Error term

5. For each customer, a day-matching approach was also estimated to provide an alternative baseline calculation for customers without sufficient data for regression analysis.
    a. Identified the baseline (non-event) days preceding each event.
        i. Baselines were calculated using data from the month prior to the event day for each customer. Weekends, holidays, and July 3rd were excluded from the calculation.
    b. Determined if an event-day adjustment is needed for each customer.
        i. After selecting the days in the baseline, we assessed whether an adjustment to the baseline was needed to account for differences in the baseline load and the loads during the event day preceding the event.
        ii. Based on this analysis, we decided to not use an event-day adjustment. This was due to decreases in load that were evident for some customers altering their operations earlier in the event day due to notifications that were sent the preceding day.
    c. Calculated the average usage for each hour of the day during the day-matching baseline for each customer.

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d. Calculated impact estimates from the difference between event-day usage and the baseline average.

6. Compiled impact estimates from Step 4 and Step 5 for all participants and events. The impact estimates were then compared between the regression and day-matching approaches to determine the consistency of impact estimates across approaches. With the context of the weather sensitivity identified in Step 3, a determination was made regarding the approach that provided the most appropriate estimation for each customer. This determination was based on the weather sensitivity of the customer's loads, predictability of usage patterns, and the magnitude of fluctuations in a customer's loads. For most customers, the regression and day-matching approaches provided similar impact estimates for each event. In those cases, the regression analysis estimates were selected due to the ability to identify the statistical significance of those estimates. In the cases where the regression model produced negative coefficients on the CDH variable, the customer was determined not to be weather sensitive. For those customers, the day-matching impact estimate was selected since it reflected the average usage leading up to an event and that was determined to be the best available estimate of their usage in absence of the event.
7. Summed impact by event and averaged the two events for reporting purposes.

P.2 Process Evaluation

Navigant addressed two research questions and the five Missouri-required questions for process evaluations. To answer these questions and gain information for this process evaluation, Navigant interviewed the product manager at KCP&L and reviewed program materials.

Error! Reference source not found. displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table P-2. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activity
General Process Evaluation Questions	
1. What changes have been made to the program since PY2017 and how have these changes affected program satisfaction, participation, savings, and costs?	• Program Staff Interviews
2. Are there additional changes to the program that would be useful in future years or are planned for PY2019?	• Program Staff Interviews
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program Staff Interviews
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program Staff Interviews • Materials Review
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	• Program Staff Interviews
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program Staff Interviews • Materials Review
5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	• Program Staff Interviews • Materials Review

Source: Navigant

P.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Angie Boone, to better understand the DRI program and to try and investigate the key considerations of the five Missouri questions, namely:

- Program's performance to date
- Issues or challenges faced
- Opportunities for improvement and efficiencies
- Participant recruitment and communication
- Internal program partnerships
- Upcoming program changes

P.2.2 Materials Review

Navigant reviewed the following materials to gain insight on the process evaluation research questions:

- KCP&L Demand Response Incentive Program Operating Plan-Public Facing document provided to Navigant by product manager, Angie Boone.
- DRI customer website: https://www.kcpl.com/save-energy-and-money/business/incentives/demand-response

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