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GMO Evaluation, Measurement, and Verification Report – Appendices

Program Year 2016

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KCP&L – Greater Missouri Operations

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TABLE OF CONTENTS

Disclaimer viii

Report Definitions ix

Reporting Periods ix
Savings Types ix
Net-to-Gross Components x

Key Report Sources xi

Acronyms and Abbreviations xii

Appendix A. Survey Instruments 1

A.1 Participant Survey Guides 1
A.1.1 Business EER Standard and SBL Participant Online Survey 1
A.1.2 Whole House Efficiency Participant Survey Guide 8
A.1.3 HLR Consumer Lighting Survey 30
A.2 Trade Ally Survey Guides 43
A.2.1 C&I Standard and SBL Trade Ally Online Survey 43
A.2.2 Whole House Efficiency Trade Ally Online Survey 56
A.3 Supplier Survey Guides 66
A.3.1 HLR Manufacturer and Retail Buyer Survey Guide 66

Appendix B. Process Flow Diagrams 76

B.1 Commercial Energy Efficiency Programs 76
B.2 Residential Energy Efficiency Programs 81
B.3 Educational Programs 87
B.4 Demand Response Programs 89

Appendix C. Standard Methodologies 92

C.1 Cost-Effectiveness Approach 92
C.1.1 Sources of Benefit and Cost Assumptions 93
C.1.2 Early Retirements 94
C.1.3 Operations and Maintenance Savings for Standard and Small Business Lighting Measures 95
C.2 Net-to-Gross 95
C.2.1 Participant FR 97
C.2.2 Participant SO 101
C.2.3 Trade Ally FR and NPSO 102

Appendix D. Missouri Requirements for Impact Evaluation 107

Appendix E. C&I Business EER Standard Program-Specific Methodologies 109

E.1 Gross Impact Evaluation Methodology 109
E.1.1 Tracking Database Review 109
E.1.2 Deemed Measure Savings Review 110
E.1.3 Verified Savings Analysis 110
E.2 Process Evaluation 117

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E.2.1 Program Staff Interviews 118
E.2.2 Market Actor Surveys 118
E.2.3 Participant Surveys 119

Appendix F. C&I Business EER Custom Program-Specific Methodologies 120

F.1 Gross Impact Evaluation Methodology 120
F.1.1 Tracking Database Review 120
F.1.2 Engineering Desk Review 120
F.2 Process Evaluation 121
F.2.1 Program Staff Interviews 122
F.2.2 Materials Review 122

Appendix G. C&I Block Bidding Program-Specific Methodologies 123

G.1 Gross Impact Evaluation Methodology 123
G.1.1 Tracking Database Review 123
G.1.2 Engineering Desk Review 123
G.2 Process Evaluation 124
G.2.1 Program Staff Interviews 125
G.2.2 Materials Review 125

Appendix H. C&I Strategic Energy Management Program-Specific Methodologies 126

H.1 Process Evaluation 126
H.1.1 Program Staff Interviews 127
H.1.2 Materials Review 127

Appendix I. Small Business Lighting Program-Specific Methodologies 128

I.1 Gross Impact Evaluation Methodology 128
I.1.1 Tracking Database Review 128
I.1.2 Deemed Measure Savings Review 128
I.1.3 Verified Savings Analysis 129
I.2 Process Evaluation 130
I.2.1 Program Staff Interviews 130
I.2.2 Onsite Ride-Along Visits 131
I.2.3 Market Actor Surveys 131
I.2.4 Participant Surveys 132

Appendix J. Income-Eligible Weatherization Program-Specific Methodologies . 133

J.1 Gross Impact Evaluation 133
J.1.1 Tracking Database Review 133
J.1.2 Desk Review of a Sample of Projects 134
J.2 Process Evaluation 134
J.2.1 Program Staff Interviews 135
J.2.2 Materials Review 135

Appendix K. Whole House Efficiency Program-Specific Methodologies 136

K.1 Gross Impact Evaluation 136
K.1.1 Tracking Database Review 136
K.1.2 Deemed Savings Review 137
K.1.3 Net-to-Gross 152
K.2 Process Evaluation 152

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K.2.1 In-Depth Product Manager and Implementer Interviews 153
K.2.2 Ride-Along Visits 153
K.2.3 Tracking Database Review 154
K.2.4 Participant Surveys 154
K.2.5 Trade Ally Web Surveys 154
K.2.6 Customer Journey Mapping 155

Appendix L. Income-Eligible Multifamily Program-Specific Methodologies 156

L.1 Gross Impact Evaluation 156
L.1.1 Tracking Database Review 156
L.1.2 Measure-Level Review 156
L.2 Process Evaluation 161
L.2.1 Program Staff Interviews 162
L.2.2 Materials Review 163

Appendix M. Home Lighting Rebate Program-Specific Methodologies 164

M.1 Impact Evaluation 164
M.1.1 Gross Impact Evaluation 164
M.1.2 NTG Analysis 168
M.2 Process Evaluation 169
M.2.1 Program Staff Interviews 170
M.2.2 Materials Review 171
M.2.3 Supplier Interviews 171
M.2.4 Onsite Saturation Visits 172
M.2.5 Consumer Surveys 172

Appendix N. HER Program-Specific Methodologies 174

N.1 Impact Evaluation 174
N.1.1 Data Cleaning 175
N.1.2 Equivalency Check 175
N.1.3 Regression Analysis 175
N.1.4 Channeling Analysis 177
N.2 Process Evaluation 178
N.2.1 Program Staff Interviews 179
N.2.2 Materials Review 179
N.2.3 CET Survey 179

Appendix O. Home Online Energy Analyzyer and Business Online Energy Analyzer Program-Specific Methodologies 180

O.1 Impact Evaluation 180
O.1.1 Data Cleaning 180
O.1.2 Participant and Comparison Group Definition 181
O.1.3 Participation Analysis 182
O.2 Process Evaluation 183
O.2.1 Program Staff Interviews 183
O.2.2 Materials Review 184
O.2.3 CET Survey 184

Appendix P. Residential and Business Thermostat Program-Specific Methodologies 185

P.1 Impact Evaluation 185

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P.1.1 Gross Analysis 186
P.2 Process Evaluation 187
P.2.1 Program Staff Interviews 188
P.2.2 Materials Review 188

Appendix Q. Demand Response Incentive Program-Specific Methodologies 189

Q.1 Impact Evaluation 189
Q.1.1 Gross Analysis 190
Q.2 Process Evaluation 192
Q.2.1 Program Staff Interviews 193
Q.2.2 Materials Review 193

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LIST OF TABLES

Table A-1. Anticipated Sample Design 30
Table C-1. Cost and Benefit Assignments by Cost Test....93
Table C-2. Sources of Benefit and Cost Data....93
Table C-3. NTG Methods by Program 97
Table C-4. FR Intention Scores: WHE Program 99
Table C-5. FR Intention Scores: Business EER Standard and SBL....99
Table C-6. FR Program Influence Responses....100
Table C-7. FR Program Influence Scores....100
Table C-8. Calculation of Marketing Influence Score 103
Table C-9. Calculation of Recommendations Influence Score 103
Table C-10. Calculation of High Efficiency Sales Influence Score 103
Table C-11. Calculation of Early Replacement Influence Score (WHE Program Only)....104
Table C-12. Free Ridership by Measure Type and Program Actor (WHE Program Only) 105
Table D-1. Missouri Regulations Impact Evaluation Methods and Protocols 108
Table E-1: Business EER Standard Program Meter Count by Building Type 110
Table E-2: Deemed kWh Savings for Measure of High Volume Low Speed Fans....116
Table E-3: Deemed kW Savings for Measure of High Volume Low Speed Fans....116
Table E-4. Process Evaluation Research Questions and Approaches 118
Table E-5. Sample Design and Response Rate 119
Table F-1. Process Evaluation Research Questions and Approaches....122
Table G-1. Process Evaluation Research Questions and Approaches 124
Table H-1. Process Evaluation Research Questions and Approaches 126
Table I-1. Process Evaluation Research Questions and Approaches....130
Table I-2. Sample Design and Response Rate....132
Table J-1. Process Evaluation Research Questions and Approaches 135
Table K-1. Full Load Hour - Cooling and Heating Comparison 147
Table K-2. Summary of SEER Calculation Methodology....152
Table K-3. MO Process Research Questions 152
Table L-1. Process Evaluation Research Questions and Approaches....162
Table M-1. Process Evaluation Research Questions and Approaches....170
Table M-2. Sample Design, Response Rate, and Sample Error 173
Table N-1. Process Evaluation Research Questions and Approaches 178
Table O-1. Counts of Energy Efficiency Program Participation 182
Table O-2. Process Evaluation Research Questions and Approaches 183
Table P-1. Savings Key Values Summary 186
Table P-2. Impact Evaluation Research Questions 186
Table P-3. Process Evaluation Research Questions and Approaches 187
Table Q-1. Impact Evaluation Research Questions....189
Table Q-2. Process Evaluation Research Questions and Approaches 193

LIST OF FIGURES

Figure B-1. Business EER – Standard Process Map 76
Figure B-2. Business EER – Custom Process Map....77

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Figure B-3. Block Bidding....78
Figure B-4. Strategic Energy Management Process Map....79
Figure B-5. Small Business Lighting Process Map....80
Figure B-6. Income-Eligible Weatherization Process Map....81
Figure B-7. Whole House Efficiency Process Map – Tier 1 Energy Savings Kit and Walkthrough....82
Figure B-8. Whole House Efficiency Process Map – Tier 2 Building Shell Measures....83
Figure B-9. Whole House Efficiency Process Map – Tier 3 HVAC Measures....84
Figure B-10. Income-Eligible Multifamily Process Map....85
Figure B-11. Home Lighting Rebate Process Map....86
Figure B-12. Home Energy Report and Income-Eligible Home Energy Report Process Map....87
Figure B-13. Energy Analyzer and Small Business Energy Analyzer Process Map....88
Figure B-14. Residential and Business Programmable Thermostat Process Map – DIY....89
Figure B-15. Residential and Business Programmable Thermostat Process Map – BYOT....90
Figure B-16. DR Incentive Process Map....91
Figure K-1. FLH Versus CDD,HDD....147
Figure P-1. Steps in Impact Evaluation....186

LIST OF EQUATIONS

Equation C-1. NTG Ratio....96
Equation C-2. Total FR....98
Equation C-3. SO Savings from Installed Measures....101
Equation C-4. Overall Participant SO....101
Equation C-5. SO Savings for the Stratum....102
Equation C-6. Participant SO Percentage....102
Equation C-7. Trade Ally Free Ridership Estimated at Measure Level....104
Equation C-8. Attribution Factor....105
Equation C-9. Number of SO Projects by Trade Ally and Measure....106
Equation C-10. Savings-Adjusted SO at the Measure Level....106
Equation C-11. SO at the Program Level....106
Equation E-1. Energy Savings for C&I Lighting Measures....112
Equation E-2. Coincident Peak Demand Savings for C&I Lighting Measures....113
Equation E-3. Energy Savings for Measure of Air Sourced Air Conditioners....113
Equation E-4. Coincident Peak Demand Savings for Measure of Air Sourced Air Conditioners....114
Equation K-1. Low-Flow Faucet Aerator Energy Savings....138
Equation K-2. Low-Flow Faucet Aerator Coincident Demand Savings....138
Equation K-3. Low-Flow Showerhead Energy Savings....139
Equation K-4. Low-Flow Showerhead Coincident Demand Savings....139
Equation K-5. Advanced Power Strip Energy Savings....139
Equation K-6. Advanced Power Strip Coincident Demand Savings....140
Equation K-7. Water Heater Tank Wrap Energy Savings....140
Equation K-8. Water Heater Tank Wrap Coincident Demand Savings....140
Equation K-9. Hot Water Pipe Insulation Energy Savings....141
Equation K-10. Hot Water Pipe Insulation Coincident Demand Savings....141
Equation K-11. LED Energy Savings....141
Equation K-12. LED Coincident Demand Savings....141
Equation K-13. Air Sealing Energy Savings....142

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Equation K-14. Air Sealing Energy Savings - Cooling 142
Equation K-15. Air Sealing Energy Savings - Heating 142
Equation K-16. Air Sealing Coincident Demand Savings 143
Equation K-17. Insulation Energy Savings 143
Equation K-18. Insulation Coincident Demand Savings 144
Equation K-19. Window Energy Savings 144
Equation K-20. Window Coincident Demand Savings 144
Equation K-21. Air Conditioner and Air Conditioner, Early Retirement Energy Savings 145
Equation K-22. Air Conditioner and Air Conditioner, Early Retirement Coincident Demand Savings 145
Equation K-23. Normalized Full Load Hours – Cooling/Heating 146
Equation K-24. Heat Pumps, Ductless Mini-Split, and Air Source Energy Savings 148
Equation K-25. Heat Pumps, Ductless Mini-Split, and Air Source Coincident Demand Savings 149
Equation K-26. Heat Pump Water Heater Energy Savings 149
Equation K-27. Heat Pump Water Heater Coincident Demand Savings 150
Equation K-28. Efficient ECM Fan Energy Savings 150
Equation K-29. Efficient ECM Fan Coincident Demand Savings 151
Equation L-1. Low-Flow Faucet Aerator Energy Savings 157
Equation L-2. Low-Flow Faucet Aerator Coincident Demand Savings 157
Equation L-3. Low-Flow Showerhead Energy Savings 158
Equation L-4. Low-Flow Showerhead Coincident Demand Savings 158
Equation L-5. Hot Water Pipe Insulation Energy Savings 159
Equation L-6. Hot Water Pipe Insulation Coincident Demand Savings 159
Equation L-7. Advanced Power Strip Energy Savings 159
Equation L-8. Advanced Power Strip Coincident Demand Savings 159
Equation L-9. LEDs Energy Savings 160
Equation L-10. LEDs Coincident Demand Savings 160
Equation L-11. LEDs Energy Savings 160
Equation L-12. LEDs Coincident Demand Savings 161
Equation L-13. LEDs Energy Savings 161
Equation L-14. LEDs Coincident Demand Savings 161
Equation M-1. Annual Residential Lighting Energy Savings 165
Equation M-2. Annual Residential Lighting Demand Savings 166
Equation M-3. Poisson Model Form 168
Equation M-4. DEM Free Rider Estimation 169
Equation M-5. DEM Net of Free Rider Estimation 169
Equation N-1. Post-Period Regression 176
Equation N-2. Linear Fixed-Effects Regression 176
Equation Q-1. DRI Program Regression Model 191

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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 Greater Missouri Operations' (GMO's) annual reports prior to net-to-gross (NTG) adjustments. In previous evaluation, measurement, and verification (EM&V) reports, reported values were referred to as ex ante. Reported savings presented throughout this report are representative of gross savings and may have been adjusted from net savings for comparison purposes.

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

Gross Realization Rates
The ratio of verified gross savings to reported gross savings; indicates the accuracy of deemed savings tracked by GMO.

Missouri Energy Efficiency Investment Act (MEEIA) Target
Three-year savings target for a given program exclusive of any NTG adjustments.

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

Percentage of MEEIA Target Achieved
The ratio of verified net savings to the MEEIA savings target; reflects GMO's overall achievement toward the goal.

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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.

Participant Spillover (PSO)
The additional energy savings achieved when a program participant—because 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 savings.

Market-Level 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), 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.

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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 (TRM) Version 5.0.
http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/

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

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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
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

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[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
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

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[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

[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]

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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]

[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 <u>in helping you decide whether to move forward with the lighting project</u>? Please rate on a 5-point scale in which 5 is very useful and 1 is not at all useful.

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[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]

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

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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
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 Whole House Efficiency Participant Survey Guide

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.
MEASURECAT: HVAC, Envelope, or Kit *(Note: each respondent is assigned to one category – Envelope (if applicable), HVAC (if applicable), or Kit (if no other measures installed).)*
MEASURE: air conditioner, heat pump ductless mini-split, heat pump, insulation, or air sealing *(Note: each respondent is assigned one measure based on the highest savings, if they have multiple measures.)*
REBATE: *This variable will provide the exact dollar value of the rebate for the prioritized measure.*
ERFLAG: yes or no *(This variable will flag HVAC systems that are noted as early replacement in the program database. This will be used to drive a skip pattern so that we ask respondents to verify that their previous equipment was still functioning only if they were flagged as early replacement in the database. This variable is applicable only to the HVAC stratum.)*
AUDITFLAG: yes or no *(This variable indicates whether or not the participant received an assessment. This ensures that anyone who received an assessment gets the appropriate questions related to the assessment, even if they are assigned to the HVAC or Envelope strata. This applies only to questions regarding the influence of the assessment due to survey length.)*
LEDFLAG, AERATORFLAG, SHOWERFLAG, PIPEFLAG, and **STRIPFLAG: yes or no** *(Each of these variables will indicate whether the participant received these kit measures. These variables are applicable only to the Kit Only stratum.)*

Screening

S1. Hi, may I please speak with <NAME FROM DATABASE>?

S2A. My name is ____ and I'm calling from Blackstone on behalf of KCP&L. We're talking to KCP&L customers who participated in energy efficiency programs to understand your experience with the program. Your responses will be kept confidential; your answers will be included with answers from other program participants and used to help evaluate the effectiveness of the program. [Interviewer Note: If participant asks about the length of the survey, tell them the survey will take about 15-20 minutes] [CONTINUE to S2A-1]

[ASK IF <MEASURECAT>="HVAC" or "Water Heater"]
S2A-1. According to our records you received a rebate from KCP&L to install a new <MEASURE>. Is this correct?

1. Yes [SKIP TO NEXT SECTION]
2. No [TERMINATE]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

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S2A-2. Were you involved in the decision to purchase a new <MEASURE>?

1. Yes
2. No [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

[ASK IF <MEASURE>="Insulation"]

S2B-1. According to our records you received a rebate from KCP&L to install insulation in your home. Is this correct?

1. Yes [SKIP TO NEXT SECTION]
2. No [TERMINATE]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

S2B-2. Were you involved in the decision to install insulation?

1. Yes [SKIP TO NEXT SECTION]
2. No [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

[ASK IF <MEASURE>="Air Sealing"]

S2C-1. According to our records you received a rebate from KCP&L to have air sealing conducted on your home. Is this correct? [If needed: Air sealing is a process that reduces the amount of air that leaks in and out of your house. It may involve caulking, weatherstripping, or other techniques.]

1. Yes [SKIP TO NEXT SECTION]
2. No [TERMINATE]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

S2C-2. Were you involved in the decision to have air sealing done?

3. Yes
4. No [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
98. (Don't know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

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[ASK IF <MEASURECAT>=”Kit”]

S2D-1. According to our records you received an Energy Savings Kit, which includes a home energy assessment and a kit of free energy efficient products such as <MEASURE>. Is this correct?

1. Yes [SKIP TO NEXT SECTION]
2. No [TERMINATE]
98. (Don’t know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

S2D-2. Were you involved in the decision to receive this Kit?

1. Yes
2. No [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
98. (Don’t know) [GET CONTACT INFORMATION FROM SOMEONE WHO MIGHT KNOW AND CONTACT THAT PERSON]
99. (Refused) [TERMINATE]

TERMINATE MESSAGE: “Thank you for your time. We have no further questions for you.”

Energy Savings Kit and Home Assessment Experience

[ASK THIS SECTION ONLY IF <MEASURECAT>=Kit. ELSE SKIP TO NEXT SECTION]

AE1. How did you first learn about the Energy Savings Kit and home assessment? [ROTATE, DO NOT READ LIST, SELECT ALL THAT APPLY.]

3. KCP&L information received after participating in another KCP&L program
4. KCP&L newsletter
5. KCP&L bill insert
6. KCP&L other mailing
7. KCP&L community event
8. KCP&L website
9. Newspaper/magazine/print media
10. Radio
11. Family/friend/word of mouth
12. Contractor/Vendor/Installer
13. KCP&L call center
14. Other [SPECIFY]
98. (Don’t know)
99. (Refused)

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AE2. What was the main reason you had an assessment done in your home? [ROTATE, DO NOT READ LIST, SELECT ONE.]

8. Required to receive a rebate for another KCP&L program
9. Recommended by contractor
10. Wanted to learn about replacing old equipment
11. High utility bills/wanted to save money
12. Wanted to save energy to protect the environment
13. Wanted to make my home more comfortable
97. Other [SPECIFY]
98. (Don't know)
99. (Refused)

AE3. Next I'd like to ask you some questions about scheduling. How did you schedule your home assessment with KCP&L? [READ, SELECT ONE.]

1. Phone
2. KCP&L Website
97. Other [SPECIFY]
98. (Don't know)
99. (Refused)

AE4. On a scale of 1 to 5, where 1 is extremely difficult and 5 is extremely easy, how would you rate the process of scheduling your home audit? [RECORD 1-5, DK, (REFUSED)]

[ASK AE4a IF AE4<3 OTHERWISE SKIP TO AE5]
AE4a. What could the program do to make the scheduling process easier for you?
[OPEN END. RECORD VERBATIM.]

AE5. At any point in the process, did you consider canceling your appointment?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[IF AE5=1]
AE5a. Why did you consider canceling your appointment?
[OPEN END. RECORD VERBATIM.]

AE8. Were you told how long your home assessment would take before the energy efficiency professional came to your home? [DO NOT READ, SELECT ONE.]

1. Yes
2. No
98. (Don't know)
99. (Refused)

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AE9. When the energy efficiency professional walked through your home, he or she may have installed some items. I am going to list off some items. Please tell me whether they are currently installed, in storage, discarded, or never received.

[IF <LEDFLAG>=Yes]
AE9a. **LED light bulbs** [SELECT ALL THAT APPLY; respondents may have installed some but not all light bulbs]

1. Installed
2. In storage
3. Discarded
4. Never received
98. (Don't know)
99. (Refused)

[IF <AERATORFLAG>=Yes]
AE9b. **Faucet aerators for your kitchen or bathroom sinks** [SELECT ALL THAT APPLY; IF NECESSARY READ ANSWER CATEGORIES AGAIN]

1. Installed
2. In storage
3. Discarded
4. Never received
98. (Don't know)
99. (Refused)

[IF <SHOWERFLAG>=Yes]
AE9c. **Low-flow showerhead** [SELECT ALL THAT APPLY; IF NECESSARY READ ANSWER CATEGORIES AGAIN]

1. Installed
2. In storage
3. Discarded
4. Never received
98. (Don't know)
99. (Refused)

[IF <PIPEFLAG>=Yes]
AE9d. **Water heater pipe insulation** [SELECT ONE; IF NECESSARY READ ANSWER CATEGORIES AGAIN]

1. Installed
2. In storage
3. Discarded
4. Never received
98. (Don't know)
99. (Refused)

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[IF <STRIPFLAG>=Yes]
AE9e. **Power saving strip** [SELECT ONE; IF NECESSARY READ ANSWER CATEGORIES AGAIN]

1. Installed
2. In storage
3. Discarded
4. Never received

98. (Don't know)
99. (Refused)

[If AE9a=2 or 3]
AE10a. Why aren't the LED light bulbs installed?

1. Tried them but did not like them
2. Waiting for old bulbs to burn out
3. Other [SPECIFY]

98. (Don't know)
99. (Refused)

[If AE9b=2 or 3]
AE10b. Why aren't the faucet aerators installed?

1. Tried them but did not like them
2. Haven't had time to install yet
3. Other [SPECIFY]

98. (Don't know)
99. (Refused)

[If AE9c=2 or 3]
AE10c. Why aren't the showerheads installed?

1. Tried them but did not like them
2. Other [SPECIFY]

98. (Don't know)
99. (Refused)

[If AE9d=2 or 3]
AE10d. Why isn't the water heater pipe insulation installed?

1. Tried them but did not like them
2. Haven't had time to install yet
3. Other [SPECIFY]

98. (Don't know)
99. (Refused)

[If AE9e=2 or 3]
AE10e. Why isn't the power saving strip installed?

1. Tried them but did not like them
2. Haven't had time to install yet
3. Other [SPECIFY]

98. (Don't know)
99. (Refused)

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AE11. Did you accompany the energy efficiency professional throughout the appointment as he or she assessed your home?

1. Yes
2. No
98. (Don't know)
99. (Refused)

AE12. At the end of your appointment, did you receive a report that contained recommendations for making your home more energy efficient?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK AE12a IF AE12=YES; OTHERWISE SKIP TO AE13].
AE12. Can you tell me what types of recommendations were made to you? [DO NOT READ; SELECT ALL THAT APPLY]

1. Add attic/ceiling insulation
2. Duct sealing or air sealing
3. Replace HVAC filters
4. Replace windows
5. Upgrade heating system/furnace/heat pump
6. Upgrade air conditioner
7. Upgrade water heater
8. Install LED light bulbs
9. Install programmable or smart thermostat
10. Change thermostat settings
97. Other [RECORD VERBATIM]
98. (Don't know)
99. (Refused)

AE12b. On a scale of 1 to 5, where 1 is not at all useful and 5 is extremely useful, how useful were these recommendations?
[RECORD 1-5, DK, (REFUSED)]

[ASK AE12c IF A12b<3].
AE12c. Why weren't these recommendations useful?
[OPEN END. RECORD VERBATIM.]

AE13. Did the energy efficiency professional leave any other materials with you at the end of the assessment? These may have included materials about other KCP&L programs or rebates.

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK AE13a IF AE13=YES; ELSE SKIP TO AE14]
AE13a. What other information did you receive?

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[RECORD VERBATIM]

AE14. Is there any other information that you would have liked to receive as part of the assessment process?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK AE14a IF AE14=YES; ELSE SKIP TO AE15]
AE14a. What other information would have liked to receive? [OPEN END. RECORD VERBATIM.]

AE15. Using a scale of 1 to 5, where 1 is not at all useful and 5 is extremely useful, how useful was the information provided to you during your assessment, including any information that the energy efficiency professional told you?
[RECORD 1-5, DK, (REFUSED)]

[ASK AE15a IF AE15<3 OTHERWISE SKIP TO AE16].
AE15a. Why do you say that?
[OPEN END. RECORD VERBATIM.]

AE16. Later in the survey we will ask you about energy-saving actions that you have already taken since participating in the program. Are there any recommended equipment upgrades or behavior changes that the energy efficiency professional mentioned that you are <u>considering</u> but haven't yet implemented?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK AE16a IF AE16=1; ELSE SKIP TO AE17]
AE16a. What are they? [DO NOT READ LIST, CHECK ALL THAT APPLY]

1. Add attic/ceiling insulation
2. Duct sealing or air sealing
3. Replace HVAC filters
4. Replace windows
5. Upgrade heating system/furnace/heat pump
6. Upgrade air conditioner
7. Upgrade water heater
8. Install LED light bulbs
9. Install programmable or smart thermostat
10. Change thermostat settings
11. Other [Specify]

98. (Don't know)
99. (Refused)

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AE17. How long did the home assessment take to complete? [INTERVIEWER, RECORD IN MINUTES]

_____ MINUTES
998 (Don't know)
999 (Refused)

AE18. Do you think that the length of your home assessment was: [ROTATE, READ ALL, SELECT ONE].

1. Too short
2. Too long
3. Just right
98. (Don't know)
99. (Refused)

AE19. On a scale of 1 to 5 where 1 is not at all satisfied and 5 is very satisfied, how would you rate your satisfaction with the following aspects of your experience? [ROTATE ORDER – KEEP AE19d LAST]

AE19a. The energy-saving items provided in the kit
[1-5, 98. DK, 99. REF]
AE19b. The information provided in the assessment
[1-5, 98. DK, 99. REF]
AE19c. The energy efficiency professional who conducted your assessment
[1-5, 98. DK, 99. REF]
AE19d. Your overall experience with the Energy Savings Kit and home assessment
[1-5, 98. DK, 99. REF]

[ASK AE20 FOR EACH AE19 WHERE SATISFACTION IS RATED <3]
AE20. What were the reasons that you give it that rating?
[OPEN-ENDED]

Heating and Cooling Rebate

[ASK THIS SECTION ONLY IF <MEASURECAT>=HVAC, ELSE SKIP TO NEXT SECTION]

AC1. How did you hear about the KCP&L heating and cooling rebate? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Contractor/Vendor/Installer
2. Family/friend/word of mouth
3. KCP&L Energy Savings Kit home energy assessment
4. KCP&L information received after participating in another KCP&L program
5. KCP&L website
6. KCP&L bill insert
7. KCP&L newsletter
8. KCP&L door hanger
9. KCP&L other mailing
10. Newspaper/magazine/print media
11. Radio
12. KCP&L call center representative
97. Other [SPECIFY]
98. (Don't know)
99. (Refused) [SKIP TO PA2]

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AC2. What was the main reason you started thinking about purchasing a <MEASURE>? [DO NOT READ LIST, SELECT ONE]

1. KCP&L program incentive
2. KCP&L Energy Savings Kit home energy audit
3. Another home energy audit or assessment
4. Special deal from contractor
5. Recommended by contractor
6. Product was on sale at store
7. Old equipment was malfunctioning
8. Old equipment was no longer functioning; replacement was necessary
9. High utility bills/wanted to save money
10. Save energy to protect the environment

97. Other [SPECIFY]
98. (Don't know)
99. (Refused)

[ASK AC3 IF AC1<>1]

AC3. Did your contractor tell you about the KCP&L rebate as part of their sales process?

1. Yes
2. No

98. (Don't know)
99. (Refused)

[ASK ONLY IF <MEASURE>=heat pump or heat pump ductless mini-split, else skip to AC5]

AC4. For what function do you use the new <MEASURE>: heating, air conditioning, or both?

1. Heating
2. Air conditioning
3. Both heating and air conditioning

97. (Other [SPECIFY])
98. (Don't know)
99. (Refused)

AC5. What type of heating or air conditioning system did this new system replace, if any? [DO NOT READ LIST; SELECT ALL THAT APPLY]

1. Central air conditioner [SKIP TO AC7]
2. Room/window air conditioner [SKIP TO AC7]
3. Heat pump
4. Ductless mini-split heat pump
5. Did not replace an old system [SKIP TO NEXT SECTION]

97. (Other [SPECIFY])
98. (Don't know)
99. (Refused)

[ASK ONLY IF AC5=3, 4 or 97, ELSE SKIP TO AC7]

AC5a. Did you use the old system for heating, air conditioning, or both?

1. Heating
2. Air conditioning
3. Both heating and air conditioning

97. Other [SPECIFY]
98. (Don't know)

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99. (Refused)

[ASK ONLY IF AC5a=3 AND AC4=1 OR 2]
AC5b. Why did you purchase a system that only provides <AC4> when your old system provided both heating and air conditioning?
[OPEN ENDED]

[IF AC5=5, SKIP TO NEXT SECTION]

[ASK ONLY IF <ERFLAG>=Yes, ELSE SKIP TO AC7]
AC6. Was your previous <AC5> still working at the time of replacement?
1. Yes
2. No [SKIP TO AC7]
98. (Don't know) [SKIP TO AC7]
99. (Refused) [SKIP TO AC7]

[ASK IF AC6=1, ELSE SKIP TO AC7]
AC6a. Was your previous <AC5> in need of repairs at the time of replacement?
1. Yes
2. No [SKIP TO AC7]
98. (Don't know) [SKIP TO AC7]
99. (Refused) [SKIP TO AC7]

[ASK IF AC6a=1, ELSE SKIP TO AC7]
AC6b. Do you recall how much the repair would have cost? Was it…
1. Less than $500
2. More than $500
98. (Don't know)
99. (Refused)

AC7. Did you plan to replace your <AC5> before you learned about the KCP&L rebate?
1. Yes
2. No [SKIP TO AC8]
98. (Don't know) [SKIP TO AC8]
99. (Refused) [SKIP TO AC8]

[ASK IF AC7=1, ELSE SKIP TO AC8]
AC7a. When were you planning to replace it? [READ LIST, RECORD ONE]
1. Within the next year
2. 1-3 years
3. 3-5 years
4. 5+ years
98. (Don't know)
99. (Refused)

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AC8. Approximately how old was your previous <AC2> at the time of replacement? [Record in amount in years.]

[RECORD NUMBER]
98. (Don't know)
99. (Refused)

Free Ridership – Heating and Cooling Rebate

[ASK ONLY IF <MEASURECAT>=HVAC]

ACFR1. If the rebate program had not been available, which of the following actions best describes what you would have done? [ROTATE RESPONSES, RECORD ONE]

1. [IF AC2<>5 ONLY] Not replaced the old <AC2> [SKIP TO ACFR3]
2. Postponed the purchase for more than one year [SKIP TO ACFR3]
3. Purchased exactly the same system [CONTINUE TO ACFR2]
4. Purchased a less efficient system [SKIP TO ACFR3]
97. (Other) [SPECIFY] [SKIP TO ACFR3]
98. (Don't know) [SKIP TO ACFR3]
99. (Refused) [SKIP TO ACFR3]

[ASK IF ACFR1=3]
ACFR2. Does this mean you would have paid an additional <REBATE> to purchase the exact same <MEASURE>? [If necessary: <REBATE> is the amount of the rebate you received from KCP&L for the <MEASURE>; you may have received other rebates for additional measures as well.]

1. Yes
2. No
98. (Don't know)
99. (Refused)

ACFR3. Using a scale of 1 to 5 where 1 is "not at all influential" and 5 means "very influential", how influential were the following on your decision to purchase a high efficiency <MEASURE>? [ROTATE ORDER, RECORD NUMBER 1-5, 98=DK, 99=REF FOR EACH ITEM]

ACFR3a. **Program rebate**
ACFR3b. **Recommendations and information from your contractor or installer**
ACFR3c. **[IF <AUDITFLAG>=Yes only] The information provided through the home energy assessment you received**

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Insulation and Air Sealing

[ASK SECTION ONLY IF <MEASURECAT>=ENVELOPE]

E1. The KCP&L program required that you complete a comprehensive home energy audit prior to receiving a rebate for the <MEASURE> project that you completed. What was the main reason you had an energy audit done in your home? [ROTATE, DO NOT READ LIST, SELECT ONE.]

14. Required to receive the rebate
15. Recommended by contractor
16. Wanted to learn about replacing old equipment
17. High utility bills/wanted to save money
18. Wanted to save energy to protect the environment
19. Wanted to make my home more comfortable
20. Wanted to learn the best ways to save energy in my home
97. Other [SPECIFY]
98. (Don't know)
99. (Refused)

E2. Did you decide to do the <MEASURE> project before or after completing the home energy audit?

1. Decided before audit
2. Decided after audit
98. (Don't know)
99. (Refused)

E3. Did the program requirements delay your <MEASURE> project?

1. Yes
1. No
98. (Don't know)
99. (Refused)

[IF E3=1, ELSE SKIP TO E4]

E3a. By about how many weeks was your project delayed?

____ WEEKS
998. (Don't know)
999. (Refused)

E4. Later in the survey we will ask you about energy-saving actions that you have already taken since receiving the home energy audit. Are there any recommended equipment upgrades or behavior changes that the energy efficiency professional mentioned that you are <u>considering</u> but haven't yet implemented?

1. Yes
2. No
98. (Don't know)
99. (Refused)

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[ASK E4a IF E4=1; ELSE SKIP TO E5]

E4a. What are they? [DO NOT READ LIST, CHECK ALL THAT APPLY]

1. Add attic/ceiling insulation
2. Duct sealing or air sealing
3. Replace HVAC filters
4. Replace windows
5. Upgrade heating system/furnace/heat pump
6. Upgrade air conditioner
7. Upgrade water heater
8. Install LED light bulbs
9. Install programmable or smart thermostat
10. Change thermostat settings
11. Other [Specify]

98. (Don't know)
99. (Refused)

E5. Did you also receive a kit of energy-saving items such as light bulbs, faucet aerators, or other items?

1. Yes
2. No

98. (Don't know)
99. (Refused)

E6. On a scale of 1 to 5 where 1 is not at all satisfied and 5 is very satisfied, how would you rate your satisfaction with the following aspects of your experience? [ROTATE ORDER – KEEP Ee LAST]

E6a. [ONLY IF E5=1] **The energy-saving items provided in the kit**
[1-5, 98. DK, 99. REF]
E6b. The information provided in the home energy audit
[1-5, 98. DK, 99. REF]
E6c. The energy efficiency professional who conducted your home energy audit
[1-5, 98. DK, 99. REF]
E6d. The cost of the home energy audit
[1-5, 98. DK, 99. REF]
E6e. Your overall experience with the home energy audit
[1-5, 98. DK, 99. REF]

[ASK E6f FOR EACH E6a-e WHERE SATISFACTION IS RATED <3]
E6f. What were the reasons that you give it that rating?
[OPEN-ENDED]

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E7. How did you first hear about the KCP&L <MEASURE> rebate? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Contractor/Vendor/Installer/Auditor
2. KCP&L Energy Savings Kit Audit/home energy assessment
3. KCP&L information received after participating in another KCP&L program
4. KCP&L door hanger
5. KCP&L newsletter
6. KCP&L bill insert
7. KCP&L other mailing
8. KCP&L website
9. Newspaper/magazine/print media
10. Radio
11. Family/friend/word of mouth
12. Retailer advertising
13. Store salesperson
14. KCP&L call center representative

97. Other [SPECIFY]
98. (Don't know)
99. (Refused) [SKIP TO PA2]

E8. What was the main reason you started thinking about <MEASURE>? [DO NOT READ LIST, SELECT ONE]

1. Home energy audit
2. KCP&L program incentive
3. KCP&L Energy Saving Kit home energy assessment
4. Special deal from auditor
5. Recommended by auditor
6. Home was drafty/uncomfortable
7. High utility bills/wanted to save money
8. Save energy to protect the environment

97. Other [SPECIFY]
98. (Don't know)
99. (Refused)

E9. What type of air conditioning do you have in your home, if any? [READ LIST, RECORD ALL RESPONSES]

1. Central air conditioning
2. Air conditioning through a heat pump
3. Window or room air conditioner
4. (Other) [Specify]
5. (No air conditioning)

98. (Don't know)
99. (Refused)

E10. Is your heating system primarily fueled by electricity or gas? If you have more than one heating system, think about the one you use most often. [DO NOT READ, SELECT ONE]

1. Electricity (heat pump)
2. Gas

98. (Don't know)
99. (Refused)

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Free Ridership - Insulation

[ASK SECTION ONLY IF <MEASURE>=Insulation]

IFR1. If the rebate had not been available, which of the following actions best describes what you would have done? [ROTATE RESPONSES, RECORD ONE]

1. Not added insulation [SKIP TO IFR3]
2. Postponed the insulation project for more than one year [SKIP TO IFR3]
3. Installed exactly the same level of insulation that I installed through the program [CONTINUE TO IFR2]
4. Installed a lesser level of insulation [SKIP TO IFR3]

97. (Other [SPECIFY]) [SKIP TO IFR3]
98. (Don't know) [SKIP TO IFR3]
99. (Refused) [SKIP TO IFR3]

[ASK IF IFR1=3]
IFR2. Does this mean you would have paid an additional <REBATE> to complete the insulation project? [If necessary: <REBATE> is the amount of the rebate you received from KCP&L for the insulation project; you may have received other rebates for additional measures as well.]

1. Yes
2. No

98. (Don't know)
99. (Refused)

IFR3. Using a scale of 1 to 5 where 1 is "not at all influential" and 5 means "very influential", how influential were the following on your decision to install a program-qualifying level of insulation in your home? [ROTATE ORDER, RECORD NUMBER 1-5, 98=DK, 99=REF FOR EACH ITEM]

IFR3a. Program rebate
IFR3b. Recommendations and information from your auditor, contractor, or installer
IFR3c. The information provided through the home energy audit you received

Free Ridership – Air Sealing

[ASK SECTION ONLY IF <MEASURE>=Air Sealing]

AFR1. If the air sealing rebate had not been available, which of the following actions best describes what you would have done? [ROTATE RESPONSES, RECORD ONE]

1. Not conducted air sealing in your home [SKIP TO AFR3]
2. Postponed the air sealing project for more than one year [SKIP TO AFR3]
3. Completed the same air sealing project that I did through the program [SKIP TO AFR2]

97. (Other [SPECIFY]) [SKIP TO AFR3]
98. (Don't know) [SKIP TO AFR3]
99. (Refused) [SKIP TO AFR3]

[ASK IF AFR1=3]
AFR2. Does this mean you would have paid the additional <REBATE> to complete the air sealing project? [If necessary: <REBATE> is the amount of the rebate you received from

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KCP&L for the air sealing project; you may have received other rebates for additional measures as well.]

1. Yes
2. No
98. (Don't know)
99. (Refused)

AFR3. Using a scale of 1 to 5 where 1 is "not at all influential" and 5 means "very influential", how influential were the following on your decision to complete an air sealing project in your home? [ROTATE ORDER, RECORD NUMBER 1-5, 98=DK, 99=REF FOR EACH ITEM]

AFR4a. Program rebate
AFR4b. Recommendations and information from your auditor, contractor, or installer
AFR4c. The information provided through the home energy audit you received

Other Programs/Channeling

[ALL RESPONDENTS]

OP1. Besides the program that we have been discussing, what other KCP&L energy efficiency programs or rebates have you heard of? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Heating and Cooling Rebate program
2. Insulation 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. None; not aware of any other KCP&L programs [SKIP TO NEXT SECTION]
97. Other [SPECIFY]
98. (Don't know) [SKIP TO NEXT SECTION]
99. (Refused) [SKIP TO NEXT SECTION]

OP2. Have you participated in any of these other energy efficiency programs?

1. Yes [CONTINUE TO OP2a]
2. No [SKIP TO NEXT SECTION]
98. (Don't know) [SKIP TO NEXT SECTION]
99. (Refused) [SKIP TO NEXT SECTION]

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OP2a. Which other KCP&L programs have you participated in? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Heating and Cooling Rebate program
2. Insulation 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

97. Other [SPECIFY]
98. (Don't know) [SKIP TO NEXT SECTION]
99. (Refused) [SKIP TO NEXT SECTION]

[IF OP2a=1-6 or 97 AND <AUDITFLAG=Yes>, ASK OP2b, ELSE SKIP TO NEXT SECTION]

OP2b. Did you participate in this other program before or after you received the Energy Savings Kit home assessment? [DO NOT READ, SELECT ONE]

1. Before [SKIP TO NEXT SECTION]
2. After [CONTINUE TO OP2c]

98. (Don't know) [SKIP TO NEXT SECTION]
99. (Refused) [SKIP TO NEXT SECTION]

OP2c. How influential was the home assessment in encouraging you to participate in the other energy efficiency program(s)? Please rate this on a 1-5 scale, where 1 means not at all influential and 5 means very influential.
[RECORD NUMBER 1-5]

98. (Don't know)

99. (Refused)

Spillover

[ALL RESPONDENTS]

[Interviewer Note: READ THIS STATEMENT TO ALL] Now I would like to ask you about any energy efficiency equipment and appliances that you might have installed ***after participating*** in the KCP&L program and that you ***did not*** receive a rebate for from any program.

SO1. Apart from the upgrades for which you received a KCP&L rebate, have you made any additional energy efficiency improvements to your home which did not receive a rebate?

1. Yes
2. No [SKIP TO VI1]

97. (Don't know) [SKIP TO VI1]
98. (Refused) [SKIP TO VI1]

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SO2. What energy efficient improvements did you make after your participation in the KCP&L program?

[IMPROVEMENT 1, SPECIFY]
[IMPROVEMENT 2, SPECIFY]
98. (Don't know) [SKIP TO VI1]
99. (Refused) [SKIP TO VI1]

SO3. How do you know the <IMPROVEMENT> installed is energy efficient? [Note to interviewer: probe respondent to describe the equipment or service that was performed]
97. Open End
98. (Don't know)
99. (Refused)

SO4. How many <IMPROVEMENT> did you install?
[SPECIFY NUMBER]
98. (Don't know) [SKIP TO VI1]
99.(Refused) [SKIP TO VI1]

SO5. [FOR every response given for (1) in SO2] On a scale of 1 – 5, where 1 means not at all influential and 5 means very influential, how influential was your experience in the KCP&L program in your choice to install or purchase <IMPROVEMENT>?
[Programmer Note: Get improvement name from SO2]
[RECORD NUMBER 1-5]
98. (Don't know) [CONTINUE TO VI1]
99. (Refused) [CONTINUE TO VI1]

Vendor Information

[ASK IF <MEASURECAT> <>"Kit", ELSE SKIP TO PS1]

VI1. Were you aware that KCP&L requires you use an authorized contractor to receive the rebate?
1. Yes
2. No [SKIP TO PS1]
98. (Don't know) [SKIP TO PS1]
99. (Refused) [SKIP TO PS1]

[ASK VI2 IF VI1=1 ELSE SKIP TO PS1]
VI2. Did this requirement influence your decision on which contractor to use?
1. Yes
2. No
98. (Don't know)
100. (Refused)

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[ASK VI3 IF VI2=1 ELSE SKIP TO PS1]
VI3. How did you know that you were working with an authorized contractor? [DO NOT READ; INDICATE ALL THAT APPLY]

1. Contractor informed me
2. Checked on KCP&L website
3. Rebate program mentioned on contractor website
4. Rebate program mentioned on contractor marketing piece
5. Other (Record verbatim)

98. (Don't know)
99. (Refused)

Program Satisfaction

[Ask if <MEASURECAT>=HVAC, Water Heater, or Envelope, else skip to PS3]
PS1. On a scale of 1 to 5 where 1 is not at all satisfied and 5 is very satisfied, how would you rate your satisfaction with the following aspects of your experience? [ROTATE ORDER]

PS1a. The amount of the rebate provided by KCP&L.
[1-5, 98. DK, 99. REF]
PS1b. Participation requirements
[1-5, 98. DK, 99. REF]
PS1c. Your installation contractor.
[1-5, 98. DK, 99. REF]
P1d. Time to receive the rebate
[1-5, 98. DK, 99. REF]
P1e. Contractor communications
[1-5, 98. DK, 99. REF]

[ASK PS1a FOR EACH PS1 WHERE SATISFACTION IS RATED <3]
PS1a. What were the reasons that you give it that rating?
[OPEN-ENDED]

[Ask if <AUDITFLAG>=Yes, else skip to next question]
PS2. Have you recommended the KCP&L Energy Savings Kit and Assessment to friends and family?

1. Yes
2. No

98. (Don't know)
100. (Refused)

[Ask if <MEASURECAT>=HVAC, Water Heater, or Envelope, else skip to PS4]
PS3. Have you recommended the KCP&L <MEASURE> rebate program to friends and family?

1. Yes
2. No

98. (Don't know)
99. (Refused)

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PS4. On a scale of 1 to 5 where 1 means not at all satisfied and 5 means very satisfied, please rate your satisfaction with the KCP&L program overall.

[RECORD 1-5]
98. (Don't know) [SKIP TO PS5]
99. (Refused) [SKIP TO PS5]

[IF PS4 <3, ASK PS4a. ELSE SKIP TO PS5]
PS4a. What are the reasons that you give it that rating?
[OPEN-ENDED]

PS5. From your perspective, what if anything could be done to improve the KCP&L program?
[OPEN-ENDED]

KCP&L Satisfaction

KS1. 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 1-5]
98. (Don't know) [SKIP TO OP1]
99. (Refused) [SKIP TO OP1]

[IF KS1<3, ASK KS1a. ELSE SKIP TO D1]
KS1a. What were the reasons that you give it that rating?
[OPEN-ENDED]

Demographics

We're almost finished. I have a few final questions about your household and then we are done.

D1. Do you own or rent your home? [DO NOT READ, SELECT ONE]
1. Own
2. Rent/Lease
98. (Don't know)
99. (Refused)

D2. What is the approximate square footage of your house?
[RECORD NUMBER]
98. (Don't know)
99. (Refused)

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D3. In what year were you born? [DO NOT READ, SELECT ONE]

1. 18-19 (1997-1998)
2. 20-24 (1992-1996)
3. 25-34 (1982-1991)
4. 35-44 (1972-1981)
5. 45-54 (1962-1971)
6. 55-64 (1952-1961)
7. 65+ (1951 or earlier)

98. (Don't know)
99. (Refused)

D4. What is the last level of education you completed? [DO NOT READ LIST, CODE INTO CATEGORIES BELOW]

1. Grade school or less (1-8)
2. Some high school (9-11)
3. Graduated high school (12)
4. Vocational/technical school
5. Some college (1-3 years)
6. Graduated college (4 years)
7. Post-graduate education

98. (Don't know)

99. (Refused)

D5. Please stop me when I read your household annual income before taxes in 2015. Is it … [READ LIST, STOP WHEN RESPONDENT ANSWERS]

1. Under $15,000
2. $15,000 to less than $25,000
3. $25,000 to less than $35,000
4. $35,000 to less than $50,000
5. $50,000 to less than $75,000
6. $75,000 to less than $100,000
7. $100,000 or more

98. (Don't know)
99. (Refused)

D6. [DO NOT ASK - SURMISE] **Gender**

1. Male
2. Female

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A.1.3 HLR Consumer Lighting Survey

The survey below has two primary purposes:

1. Gathering of customer-based data in support of the HLR Process Evaluation
2. Recruitment of households interested in the onsite saturation visits

The survey population is residential electric customers of KCP&L, both KMO and GMO. The sample design is listed below.

Table A-1. Anticipated Sample Design

Jurisdiction (As Listed in Database)	Desired Completions	No. of Cleaned Records Available
KCP&L-MO	250	2,371
GMO	250	2,411
Total	**500**	**4,782**

The survey would be fielded in January and February, 2017. If needed, the survey fielding could carry into March, but we'd need all completes in mid-March.

The Navigant team's preferred approach for the survey would be to mail randomly selected customers a personalized letter with an invitation to take part in a web survey. Interviewers would follow up with anyone who has not responded to the web survey 1-2 weeks after the initial mailing. Note that handful of records lack phone numbers; it is our desire that these customers be offered the option to participate in the web survey, but clearly Blackstone will not be able to call them. These "no phone" households can still receive the same letter as all other customers. We have also provided email addresses for those customers who supplied them; after sending the letter, you can email potential respondents to remind them to respond to the survey if you feel that this approach would increase response rates.

Caution: About 500 records lack a matching mailing and service address. For most of these cases, we decided to have Blackstone send the letter to the service address, as this is where we would like to conduct the onsite saturation visit. However, when making phone calls, the Blackstone interviewers may find that potential respondents do not recall receiving the letter. That is OK. They should still proceed with the survey. If the person is not the correct respondent, they will be screened out.

When you prepare the final dataset, please make sure to include the NMRID so we can match the household back to their KCP&L account information.

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Introductions

[FOR WEB SURVEY ONLY] Kansas City Power and Light is interested in your knowledge and experience with various lighting products. This survey asks a number of questions about lighting your home. Please answer the questions to the best of your ability. All of your responses will remain confidential. The survey will take approximately 15 minutes to complete.

[FOR PHONE SURVEY] Hello, my name is _____ and I am calling from Blackstone on behalf of Kansas City Power and Light. You should have received a letter from KCP&L explaining a study that they are doing about household lighting. I'm not selling anything. I just want to ask you some questions about lighting in your home. The survey will take about 15 to 20 minutes to complete.

May I please speak with [INSERT FIRST NAME AND LAST NAME FROM DATASET]?

[IF ACCOUNT HOLDER ISN'T AVAILABLE, READ] Is there an adult over the age of 18 available who is responsible for purchasing the light bulbs for your household? [IF NOT AVAILABLE, TRY TO RESCHEDULE AND THEN TERMINATE]

[If necessary, the respondent can contact the KCP&L Home Energy Programs at (855) 442-0114 with any questions about the validity of the research.]

Screeners:

R1 Are you 18 years of age or older?

1 Yes [CONTINUE]
2 No [THANK AND TERMINATE] [SKIP TO TERM]

R2 Is [INSERT ADDRESS AND CITY] your primary address, meaning that you live at this location six or more months of the year?

1 Yes
2 No [THANK AND TERMINATE] [SKIP TO TERM]
88 (Don't know) [THANK AND TERMINATE] [SKIP TO TERM]

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BULB FAMILIARITY AND USE

S1 Compact fluorescent light bulbs – also known as CFLs – usually do not look like regular incandescent bulbs. The most common type of CFL bulb is shaped like a spiral, resembling soft-serve ice cream, and it fits in a regular light bulb socket. How familiar are you with CFLs? [PHONE: WOULD YOU SAY THAT YOU ARE…?]

1 Very familiar
2 Somewhat familiar
3 Not too familiar
4 Not at all familiar
88 DON'T KNOW

USE1 [ASK USE1 IF S1= 1, 2, OR 3] Have you EVER used a CFL screw in bulb in your home—the kind that screw into regular light fixtures?

1 Yes
2 No
88 DON'T KNOW

S2 Another type of light bulb that is used in homes is called an LED [PHONE: SAY THE LETTERS L-E-D], also known as a light-emitting diode bulb. These bulbs have regular screw bases that fit into most sockets. I am **NOT** referring to battery-operated LEDs, holiday lights, or decorative strands. How familiar are you with LED light bulbs that screw into regular light sockets? [PHONE WOULD YOU SAY THAT YOU ARE…?]

1 Very familiar
2 Somewhat familiar
3 Not too familiar
4 Not at all familiar
88 DON'T KNOW

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USE2 [ASK USE2 IF S2= 1, 2, OR 3] Have you EVER used an LED screw in bulb in your home—the kind that screw into regular light fixtures?

1 Yes
2 No
88 DON'T KNOW

S3 Another type of light bulb is a halogen bulb. These bulbs have regular screw bases that fit into most sockets. I am **NOT** referring to halogen bulbs that clip into fixtures using pins or to tube based halogens. How familiar are you with halogen bulbs that screw into regular light sockets? [PHONE WOULD YOU SAY THAT YOU ARE…?]

1 Very familiar
2 Somewhat familiar
3 Not too familiar
4 Not at all familiar
88 DON'T KNOW

USE3 [ASK USE3 IF S3= 1, 2, OR 3] Have you EVER used a halogen screw in bulb in your home—the kind that screw into regular light fixtures?

1 Yes
2 No
88 DON'T KNOW

USE4 [ASK IF USE1 = 1 AND USE2=1, ELSE SKIP TO USE6] Based on what you have told me, you have used both CFLs and LEDs. Thinking about each of these bulbs, would you say that you… [RANDOMIZE 1 AND 2 THEN ASK 3]

1 Prefer CFLs over LEDs
2 Prefer LEDs over CFLs
3 Depends on the situation
4 Not yet sure which you prefer
88 DON'T KNOW

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USE5 [ASK IF USE4 <> 99] Why do you say this? [ON PHONE; DO NOT READ BUT LIST OPTIONS] [ON WEB; RECORD VERBATIM, DON'T SHOW RESPONSES] [SELECT ALL THAT APPLY]

1 (CFLs are less expensive than LEDs/LEDs more expensive than CFLs)
2 (CFLs are more energy efficient compared to LEDs)
3 (LEDs turn on instantly)
4 (LEDs produce better light than CFLs)
5 (LEDs have a longer bulb life/CFLs have a shorter bulb life)
6 (LEDs are more energy efficient compared to CFLs)
7 (Depends on lighting needs or settings)
88 (DON'T KNOW) (use for phone survey only)

USE6 [ASK IF USE2 = 1 AND USE3=1, ELSE SKIP TO BUY0] Based on what you have told me, you have used both LEDs and halogens. Thinking about each of these bulbs, would you say that you… [RANDOMIZE 1 AND 2 THEN ASK 3]

1 Prefer LEDs over halogens
2 Prefer halogens over LEDs
3 Depends on the situation
4 Not yet sure which you prefer
88 DON'T KNOW (use for phone survey only)

USE7 [ASK IF USE6 <> 99] Why do you say this? [ON PHONE; DO NOT READ BUT LIST OPTIONS] [ON WEB; RECORD VERBATIM, DON'T SHOW RESPONSES] [SELECT ALL THAT APPLY]

1 (Halogens are less expensive than LEDs/LEDs more expensive than halogens)
2 (I've always used halogens)
3 (Halogens looks more like an incandescent bulb)
4 (I like the shape of halogens better)
5 (Halogens produce better light than LEDs)
6 (LEDs produce better light than CFLs)
7 (LEDs have a longer bulb life/halogens have a shorter bulb life)
8 (LEDs are more energy efficient compared to halogens)
9 (Depends on lighting needs or settings)
88 (DON'T KNOW) (use for phone survey only)

BULB PURCHASES

BUY0 Who is responsible for purchasing bulbs in your home? [READ LIST]
1 I or someone else who lives here is responsible for purchasing bulbs for my home
2 The landlord/building management is responsible for purchasing bulbs for my home [SKIP TO R3]
88 (Don't know) [SKIP TO R3]

BUY1 Have you purchased any light bulbs in the past six months?
1 Yes
2 No [SKIP TO BUY3]
88 DON'T KNOW [SKIP TO BUY3]

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BUY2 [ASK IF BUY1=1 AND [(S1 = 1, 2, OR 3) OR (S2 = 1, 2, OR 3) OR (S3 = 1, 2, OR 3)]; OTHERWISE SKIP TO BUY3] Which of these bulb types have your purchased in the past six months? [READ LIST; ALLOW MULTIPLE RESPONSE FOR 1 TO 4.]

1 [READ IF S1 = 1, 2, OR 3) CFLs
2 [READ IF S2 = 1, 2, OR 3) LEDs
3 [READ] IF S3 = 1, 2, OR 3) Halogens
4 Other types of bulbs (Please specify)
5 I have not purchased any light bulbs in the past six months [SKIP TO BUY3]
88 (Don't know) [SKIP TO BUY3]

BUY2a [ASK IF (BUY2_1 CFLS = 1) How many CFLs did you buy in the past six months? RECORD ANSWER ____ [DON'T KNOW = 88]

BUY2b [ASK IF (BUY2_2 L EDS = 1) How many LEDS did you buy in the past six months? RECORD ANSWER ____ [DON'T KNOW = 88]

BUY2c [ASK IF (BUY2_3 HALOGENS = 1) How many Halogens did you buy in the past six months? RECORD ANSWER ____ [DON'T KNOW = 88]

BUY2d [ASK IF (BUY2_4 OTHER = 1) How many of these other types of bulbs did you buy in the past six months? RECORD ANSWER ____[DON'T KNOW = 88]

BUY3 [PHONE: I'm going to read a list of…] [WEB: Below is a list of…] information you might look for when shopping for light bulbs. Which of the following have you looked for when shopping for light bulbs? [Select all that apply] [PHONE: RANDOMIZE 1-12, THEN READ 10. RECORD AS YES/NO FOR EACH. ONLY SELECT 88 OR 99 IF "NO" TO ALL 1 TO 10.]

1 Price
2 Wattage or Wattage Equivalency
3 ENERGY STAR Label
4 Lumens or Brightness
5 Bulb Life
6 Dimming
7 Bulb Shape
8 Color Appearance [IF NEEDED DAYLIGHT, SOFTLIGHT, WARM GLOW.]
9 Something else [SPECIFY]
10 (I have never shopped for light bulbs) [SKIP TO BUY4]
88 (Don't know) [SKIP TO BUY4]

BUY3a [SKIP IF BUY3.10, BUY3.88, OR BUY3.99 = 1] [IF BUY3.1 = 1 READ, "OTHER THAN PRICE] Which of these is most important in your selection of a light bulb? [IF NEEDED, FOR PHONE REMIND INTERVIEWEE OF THOSE THEY SAID "YES" TO IN BUY3.2 TO BUY3.9. FOR WEB, HAVE LIST OF "YES" FOR BUY3.2 TO BUY3.9 ON SCREEN AND ALLOW THEM TO SELECT ONLY ONE.]

RECORD RESPONSE _____ [DON'T KNOW = 88]

[IF BUY1 > 1 SKIP TO R3]

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BUY4 [IF BUY1 = 1] In general, how often do you shop for light bulbs at these types of stores? [RANDOMIZE AND READ 1 – 7, THEN 8; RESPONSES = 1 NEVER, 2 RARELY, 3 SOMETIMES, 4 ALMOST ALWAYS, 5 ALWAYS, 88 DON'T KNOW]

1. Home improvement or do-it-yourself (e.g., Home Depot, Lowe's, Menards)
2. Hardware store (e.g., Ace, True Value)
3. Grocery store (e.g., Price Chopper, Save-a-Lot)
4. Drug store (e.g., Walgreens, CVS)
5. Club or membership store (e.g., Sam's, Costco)
6. Bargain or dollar store (e.g., Dollar Tree, Family Dollar)
7. Mass merchandise store (e.g., Walmart, Target)
8. Other [SPECIFY]

Now I want you to think about your most recent lighting purchase – that is, the last light bulb you bought.

BUY5 [ASK BUY5 IF MULTIPLE BUY2 = 1; OTHERWISE, SKIP TO BUY6] Which type of light bulb did you **MOST** recently buy? [ALLOW ONLY ONE RESPONSE; IF RESPONDENT SAYS BOUGHT MULTIPLE TYPES AT THE SAME TIME, DIRECT THEM TO CHOOSE ONE OF THE TYPES AND KEEP THAT BULB IN MIND FOR THE NEXT FEW QUESTIONS]]

1 [READ IF BUY2.1 = 1) CFLs
2 [READ IF BUY2.2 = 1) LEDs
3 [READ IF BUY2.3 =1) Halogens
4 [READ IF BUY2.4 = 1) Another type of bulb
88 (Don't know) [SKIP TO R3]

BUY6 On a scale of 1 to 5, where 1 is not at all difficult and 5 is very difficult, how difficult was it for you to choose the last light bulb you bought?
[RECORD RESPONSE 1 to 5 OR 88=DON'T KNOW]

BUY6a [ASK IF BUY6 < 88] Why do you say this?

[WEB: PLEASE TYPE ANSWER]

[PHONE: DO NOT READ, RECORD VERBATIM ANY RESPONSES THAT DO NOT FIT PRECODES. SELECT ALL THAT APPLY]

1. (Too many choices)
2. (Bulb I'm used to was not on shelf)
3. (Bulb that looked like the one I needed to replace was not on the shelf)
4. (Did not understand the information on the package)
88. (Other [SPECIFY])

BUY7 When shopping for this most recent light bulb, did you see any lighting signs, displays, or other materials near the light bulbs? These would be signs other than the price of the bulb.

1 Yes
2 No [SKIP TO R3]
88 DON'T KNOW [SKIP TO R3]

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BUY8 [IF BUY7 = 1] What sign, displays, or other materials did you see?

[WEB: (Please type answer below)]

[PHONE: DO NOT READ. RECORD VERBATIM ANY RESPONSES THAT DO NOT FIT PRECODES. SELECT ALL THAT APPLY]

1 (Told me that the bulb was part of a KCP&L program)
2 (Told me that the bulb was part of a utility or energy efficiency program)
3 (Displayed different types of light bulbs)
4 (Tried to help me choose the best bulb for my needs)
5 (Explained what bulbs I should use to replace an incandescent)
6 (Compared energy use or savings of different light bulbs)
7 (Explained that some bulb types would not be sold anymore)
8 (Explained lighting terms like lumens, wattage, bulb color)
8 (Other, specify)
88 (DON'T KNOW)

BUY9 [IF BUY7 = 1] On a scale of 1 to 5, where 1 is not at all helpful and 5 is very helpful, how helpful were the signs, displays, or other material you saw in your choice of which bulb to buy? RECORD RESPONSE 1 to 5; DON'T KNOW = 88]

CUSTOMER DEMOGRAPHICS

R3 KCP&L is offering you the opportunity to take part in an important study. Participating households will receive a $100 gift card to allow a trained technician to visit their homes to gather more information about the lighting products they use. The visit should take about an hour and a half and the $100 gift card will be provided during the visit. During this visit, there will be no attempt to sell you anything. The information gathered will be used to evaluate and improve the energy efficiency programs offered by your electric utility.

Would you be interested in being a part of this type of visit?

1 Yes [GO TO R5 BELOW FAQ]
2 No [GO TO DEM1]
3 (Don't know) [GO TO R4]

R4 We understand you are unsure about the home visit, here is some additional information to help make your decision -

What's in it for me and how long will this take?
We are offering $100 for your time. The visit should take around one hour and a half, depending on the size of your house.

What does the visit involve?
Technicians will walk around your home and count the various types of lighting products you have installed.

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When will the visits take place? / Can I schedule a visit now?
We will be calling in March to schedule the visits, which will take place in April, May, and June.

Who are you?
Navigant, NMR Group, Inc., and Blackstone are consulting firms. We have been hired by KCP&L to perform this study.

What is the purpose of this study?
The purpose is to establish customer awareness of lighting options and changes in the lighting market. The results of the study will be used in planning for future energy needs in the KCP&L service territory.

How do I know you are legitimate?
If you would like more information about the study, you can contact Kiersten von Trapp at 617-284-6230 ext. 18 or at kvontrapp@nmrgroupinc.com.

Can I talk to someone at KCP&L to verify the study?
KCP&L is sponsoring this program and study. If you would like to contact KCP&L to confirm, please call the KCP&L Home Energy Programs at (855) 442-0114.

[IF STILL UNDECIDED, READ: You do not have to decide now. Would it be okay if someone calls you when visits are being scheduled to talk more about what would be involved?]

1 Respondent agrees to do onsite [CONTINUE TO R5]
2 Respondent declines onsite [GO TO DEM1]
3 Respondent undecided, would like to be contacted [GO TO DEM1]
4 Respondent undecided, would not like to be contacted [GO TO DEM1]

CONTINUE TO R5 IF R3=1 OR R4=1

R5 READ "[PHONE: I just need to get some] [WEB: Please provide your] contact information so we can call and [schedule and talk more about the details of the visit]"]

First and Last Name: [RECORD]_____

R6 [IF R3=1 or R4=1] Primary Number (###-###-####):

[RECORD NUMBER; IF SAME NUMBER CALLED FOR SURVEY INDICATE HERE]_

R7 Secondary Number (###-###-####): _____
R8 [PHONE: EMAIL ADDRESS.

EMAIL: _____] [ALLOW REFUSE]

R8a What is the best method to contact you about scheduling a visit? Email or phone?

1 Email

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2 Phone
3 (Either)

R9 What is the best time of day to reach you? Morning, afternoon, or evening?

1 Morning
2 Afternoon
3 Evening
4 (Anytime)

R11 If your household is eligible for this study, when we call to schedule, your caller ID will most likely say “NMR or NMR Group” and will have a 617 area code.]

Now, there are just have a few more questions about some characteristics of your households. [IF R3=1 These questions will help us make sure we visit a wide variety of homes in the state.]

DEM1 What type of home do you live in? [PHONE: WOULD YOU SAY THAT IT IS…?]

1 A one-family house detached from any other house
2 A one-family house attached to one or more houses
3 In a building with 2, 3, or 4 units
4 In a building with 5 or more units
5 A mobile home?
6 Or something else? [SPECIFY]
99 (Prefer not to answer)

DEM2 Do you or members of your household own this home or do you rent?

1 Own/Buying
2 Rent/Lease
3 Occupied without Payment or Rent
4 OTHER (SPECIFY)
99 (Prefer not to answer)

DEM3 Approximately how large is your home? [PHONE: READ LIST]

1 Less than 1,400 square feet
2 1,400 to less than 2,000 square feet
3 2,000 to less than 2,500 square feet
4 2,500 to less than 3,500 square feet
5 3,500 to less than 4,000 square feet
6 4,000 to less than 5,000 square feet
7 5,000 square feet or more
88 DON’T KNOW
99 (Prefer not to answer)

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DEM4 How many rooms are in your home, not counting bathrooms?
[PHONE: HELP RESPONDENTS COUNT ROOMS IF NEEDED, KEEPING TRACK ON A PIECE OF PAPER OF THE # OF ROOMS AS THEY NAME THEM]

__ RECORD RESPONSE
99 (Prefer not to answer)

DEM5 Which of the following best describes your age? [READ LIST]

1 18-24 years old
2 25-34 years old
3 35-44 years old
4 45-54 years old
5 55-64 years old
6 65-74 years old
7 75 or older
99 (Prefer not to answer)

DEM6 What is the highest level of education achieved by anyone in your household so far?
[PHONE: READ CATEGORIES]

1 Less than Ninth Grade
2 Ninth to Twelfth Grade, No Diploma
3 High School Graduate (includes GED)
4 Some College, No Degree
5 Associates Degree
6 Bachelor's Degree
7 Graduate or Professional Degree
99 (Prefer not to answer)

DEM7 Including yourself, how many people have lived in your home for most of this year?

1	(1) Person	[GO TO D8_1]
2	(2) People	[GO TO D8_2]
3	(3) People	[GO TO D8_3]
4	(4) People	[GO TO D8_4]
5	(5) People	[GO TO D8_5]
6	(6) People	[GO TO D8_6]
7	(7) People	[GO TO D8_7]
8	(8) or more people	[GO TO D8_8]
99	(Prefer not to answer)	[GO TO DEM9]

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D8_1 [IF DEM7=1] Which of these categories best describes your expected total household income in 2016 before taxes—counting everyone living in your house?

1 Less than $16,044, OR [GO TO DEM9]
2 $16,044 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_2 [IF DEM7=2] Which of these categories best describes your expected total household income in 2016 before taxes—counting everyone living in your house?

1 Less than $21,648, OR [GO TO DEM9]
2 $21,648 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_3 [IF DEM7=3] Which of these categories best describes your expected total household income in 2016 before taxes—counting everyone living in your house?

1 Less than $27,264, OR [GO TO DEM9]
2 $27,264 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_4 [IF DEM7=4] Which of these categories best describes your expected total household income in 2016 before taxes—counting everyone living in your house?

1 Less than $32,892 OR [GO TO DEM9]
2 $32,892 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_5 [IF DEM7=5] Which of these categories best describes your expected total household income in 2016 before taxes—counting everyone living in your house?

1 Less than $38,496, OR [GO TO DEM9]
2 $38,496 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_6 [IF DEM7=6] Which of these categories best describes your expected total household income in 2016 before taxes— counting everyone living in your house?

1. Less than $44,112 OR [GO TO DEM9]
2 $44,122 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

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D8_7 [IF DEM7=7] Which of these categories best describes your expected total household income in 2016 before taxes— counting everyone living in your house?

1 Less than $49,740, OR [GO TO DEM9]
2 $49,740 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

D8_8 [IF DEM7=8] Which of these categories best describes your expected total household income in 2016 before taxes— counting everyone living in your house?
1 Less than $55,344, OR [GO TO DEM9]
2 $55,344 or more [GO TO DEM9]
99 (Prefer not to answer) [GO TO DEM9]

DEM9 [EVERYONE] Which category best describes your expected total household income in 2016 before taxes? [PHONE: Please stop me when I get to the appropriate category.]

1 Less than $15,000
2 $15,000 to less than $20,000
3 $20,000 to less than $30,000
4 $30,000 to less than $40,000
5 $40,000 to less than $50,000
6 $50,000 to less than $75,000
7 $75,000 to less than $100,000
8 $100,000 to less than $150,000
9 $150,000 or more
99 (Prefer not to answer)

DEM10 Which of the following best describes how your electric bill is paid:

1 I pay my electric bill
2 Someone else pays my electric bill
3 [IF DEM2 = 2] My bill is included in my rent
4 Other [SPECIFY]
5 Don’t know
99 (Prefer not to answer)

FIN Thank you very much for taking the time to complete this important survey. (IF R3=1 or R4 = 1: The NMR Group will be scheduling these visits in the next few weeks and will call you then.) (FOR WEB SURVEY ONLY: Please press 'Next' to submit your survey)

Do you have any comments you would like to share with the research team?

1 Yes
2 No

TERM [IF R1=2] Thank you for your interest in this study. You must be 18 years or older to complete the survey. Please proceed to the next page to find out more about ways to save energy.

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TERM [IF R2=2 OR 3] Thank you for your interest in this study. We are currently only surveying people who live at our selected homes for most of the year.

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 2016
<Measure2qty>: Number of program-incented <Measure2> units in 2016 (if applicable)
<Measure3qty>: Number of program-incented <Measure3> units in 2016 (if applicable)

Intro & Screeners (2 questions)

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

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 (6-15 questions)

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"]
98 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

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 <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 2016?

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 (5-12 questions)

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 2016. 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 2016
<Measure1>	<Measure1qty>
<Measure2>	<Measure2qty>
<Measure3>	<Measure3qty>

Did you sell any more of these measures *without* KCP&L program rebates in 2016? 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 2016 without rebates, in KCP&L's Missouri territory? An estimate is fine.

Measure Name	Number of Units Rebated by KCP&L in 2016	Number of Additional Units Sold Without Rebates in 2016
<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]

[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

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[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]

[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 **in 2015** in KCP&L's Missouri territory *without* KCP&L program rebates? An estimate is fine.

Measure Name	Total Number of Units Sold in 2016	Total Number of Units Sold in 2015
<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 in 2016	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.

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Measure Name	Total Number of Units Sold in 2016	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 in 2016	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]

Program Experiences (8-21 questions)

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

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[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

[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 2016 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

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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?
[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

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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

Participant Insights (4-5 questions)

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

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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 (1-7 questions)

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

[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]

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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 (3 questions)

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

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 (3-4 questions)

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

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[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 Whole House Efficiency 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.
<Strata>: *Large, Medium, Small,* or *Envelope*
<Program>: *Heating and Cooling Rebate Program* or *Insulation and Air Sealing Rebate Program*
<MeasureCat>: *HVAC* or *Envelope*
<InsulationFlag>: *Yes* or *No* (indicates whether envelope contractors have submitted insulation projects through the program)
<AirSealingFlag>: *Yes* or *No* (indicates whether envelope contractors have submitted air sealing projects through the program)
<InsulationQty>: Number of program-incented insulation projects
<AirSealingQty>: Number of program-incented air sealing projects
<AC15Qty>: Number of program-incented SEER 15 central air conditioners in 2016
<AC16Qty>: Number of program-incented SEER 16 central air conditioners in 2016
<HP15Qty>: Number of program-incented SEER 15 heat pumps in 2016
<HP16Qty>: Number of program-incented SEER 16 heat pumps in 2016
<HP17Qty>: Number of program-incented SEER 17 heat pumps in 2016
<ECMQty>: Number of program-incented ECM furnace fans in 2016

Intro & Screeners

Thank you for participating in the KCP&L <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.

S1. Was 2016 the first year that you've participated in KCP&L's residential energy efficiency rebate programs?

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

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

8. Making sales calls via phone
9. Making sales calls in person
10. Preparing project specifications/proposals for customers
11. Processing incentive applications
12. Installing equipment at customer sites
13. Other [Please describe _____]
98. Don't know

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S3. Which of the following energy efficiency measures and services do you offer to your residential customers? Please check all that apply.

1. Central air conditioner - SEER 15
2. Central air conditioner - SEER 16
3. ECM furnace fan
4. Heat pump ductless mini-split
5. Heat pump - SEER 15
6. Heat pump - SEER 16
7. Heat pump - SEER 17
8. Heat pump - geothermal
9. Heat pump water heater
10. Ceiling insulation
11. Wall insulation
12. ENERGY STAR windows
13. Air sealing
14. Comprehensive energy audit
15. HVAC tune-up service
16. Other (SPECIFY)
98. Don't know

HVAC Specific Questions 1

H1. What do you think prevents more customers from purchasing high efficiency air conditioners and heat pumps without program incentives? Please select the top three barriers. [LIMIT TO 3 RESPONSES]

1. Customers are unaware of energy savings
2. Customers are unaware of non-energy benefits (e.g., increased comfort)
3. Customers prioritize other features over energy efficiency
4. Customers balk at the high cost
5. Some contractors do not offer higher efficiency units
6. Customers are unwilling to replace still-functioning equipment
7. Customers do not believe that energy savings will offset extra cost of high efficiency unit
8. Other (SPECIFY)

98. Don't know

H2. Under what circumstances are customers willing or likely to replace a still-functioning air conditioner or heat pump to upgrade to higher efficiency equipment?

[OPEN END, DK]

H3. What do you think prevents more customers from performing regular tune-ups on their HVAC systems? Please rank in order from the most significant barrier to the least significant. [RANK ORDER]

1. Customers are unaware of the need for tune-ups
2. Customers don't know how to find qualified contractors to perform tune-ups
3. Customers balk at the high cost
4. Not enough contractors are qualified to perform tune-ups
5. Customers perceive that their equipment is still functioning properly
6. Other (SPECIFY)

98. Don't know

[Ask if S3=15, else skip to H5]

H4. About how many tune-up service agreements do you currently have with residential customers?

[NUMERIC OPEN END, DK]

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H5. Do you ever see situations in which customers replace existing heat pumps with new air conditioners?

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

[Ask if H5=Yes, else skip to PITA1]

H6. Why would customers choose to replace a system that provides both heating and cooling with one that provides only cooling?

[OPEN END, DK]

Program Influence on Trade Ally

PITA1. Have you participated in any KCP&L program training sessions?

1 YES
2 NO
98 Don't Know

[Ask if PITA1=Yes, else skip to PITA3]

PITA2. How useful were those program training sessions? Please rate on a 5-point scale.

[1-5 scale, endpoints labeled 1 "Not at all useful" and 5 "Very useful"]
98. Don't Know

PITA3. Are there any topics that you would like to see covered in future KCP&L trainings?

[OPEN ENDED, No, DK]

PITA4. Have you received any marketing assistance from the <Program>?

1 YES (Please describe: _____)
2 NO
98 Don't Know

[Ask if PITA4=1, else skip to PITA6]

PITA5. How much influence has that marketing assistance had on your ability to successfully market energy efficiency to your customers? Please think specifically about the marketing assistance and not the rebate.

[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98 Don't Know

[Ask if <MEASURECAT>=HVAC, else skip to PITA15]

PITA6. Which of the following energy efficiency measures did you offer to your customers **prior to participating** in KCP&L's rebate programs? Please check all that apply.

[List HVAC measures selected in S3]

PITA7. Since you started participating in the <PROGRAM>, have you changed the HVAC equipment that you offer to your customers, especially regarding level of efficiency? For example, have you… [ROTATE TOP 3 RESPONSES; ALLOW MULTIPLE SELECTIONS]

6. Started offering higher efficiency equipment as the "default" recommendation
7. Added new high efficiency equipment to your offerings
8. Stopped carrying lower efficiency equipment
9. Other [SPECIFY]
10. None of the above
98. Don't know

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[Ask IF PITA7=1, 2, or 3, ELSE SKIP TO PITA9]
PITA8. If the KCP&L program had never been available, what is the likelihood that you would have made those same changes in your offerings for high efficiency HVAC equipment? Please rate on a 5-point scale.
[1-5 scale, endpoints labeled 1 "Not at all likely" and 5 "Very likely"]
98 Don't Know

PITA9. Have you observed an increase in your overall high efficiency HVAC sales since participating in the KCP&L program?
3. Yes
4. No [SKIP TO PITA13]
98. Don't know [SKIP TO PITA13]

[ASK IF PITA9=1, ELSE SKIP TO PITA13]
PITA10. Would you say that your overall HVAC sales have increased, a higher percentage of customers are choosing high efficiency HVAC, or both? [SELECT ONE]
4. Overall sales have increased (including standard and high efficiency)
5. A higher percentage of customers are choosing high efficiency
6. Both
98. Don't know

PITA11. How influential do you think the <Program> was on the increase in high efficiency sales? Please rate on a 5-point scale.
[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98. Don't Know

[Ask if PITA11=2, 3, 4, or 5, else skip to PITA13]
PITA12. Has the program's influence on your business enabled you to hire additional employees to meet the additional demand for high efficiency?
3. Yes
4. No
98. Don't know

PITA13. Have you observed an increase in the number of customers willing to replace still-functioning HVAC equipment with high efficiency equipment, since participating in the program?
1. Yes
2. No [SKIP TO PITA15]
98. Don't know [SKIP TO PITA15]

PITA14. How influential do you think the KCP&L program was on this increase in customer willingness to replace still-functioning equipment? Please rate on a 5-point scale.
[1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98. Don't Know

PITA15. If the <Program> did not exist, how would your business be different (if at all)?
[OPEN ENDED]
98 Don't Know

HVAC Specific Questions 2

[Ask section if <MeasureCat>=HVAC, else skip to E1]

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HV1. Did you sell any of these measures **without program rebates** since April 2016 (when the KCP&L program began)? Please check any measures that you sold without rebates in KCP&L's Missouri territory.

[List HVAC measures selected in S3]
98. Don't know

[IF HV1<> None or Don't know, ELSE SKIP TO HV5]
HV2. How influential do you think the <Program> was on these additional units sold without rebates?

[MATRIX: Rows are responses to HV1, columns are 1-5 scale, endpoints labeled 1 "Not at all influential" and 5 "Very influential"]
98. Don't Know

[IF HV2=3, 4, or 5, ELSE SKIP TO HV4]
HV3. Approximately how many additional units did you sell in 2016 without rebates, in KCP&L's Missouri territory? An estimate is fine.

Measure Name	Number of Additional Units Sold Without Rebates in 2016
[Responses to HV1]	[NUMERIC OPEN END]
[Responses to HV1]	[NUMERIC OPEN END]
[Responses to HV1]	[NUMERIC OPEN END]

HV4. Why didn't you seek KCP&L rebates for these additional measures sold?

[OPEN ENDED]
98 Don't Know

HV5. The following table shows the approximate quantities of measures you installed through the KCP&L <Program> in 2016, according to the program records.

Measure Name	Number of Units Sold with KCP&L Rebates in 2016
Central air conditioner – SEER 15	<AC15Qty>
Central air conditioner – SEER 16	<AC16Qty>
Heat pump – SEER 15	<HP15Qty>
Heat pump – SEER 16	<HP16Qty>
Heat pump – SEER 17	<HP17Qty>
ECM furnace fan	<ECMQty>

Given your experience in the market, how many units do you think you would have sold in 2016 if KCP&L **had not offered** the <Program>? Please provide your best estimate.

Measure Name	Best Estimate of Number Sold without Program
[If S3=1] Central air conditioner – SEER 15	[NUMERIC OPEN END]
[If S3=2] Central air conditioner – SEER 16	[NUMERIC OPEN END]
[If S3=5] Heat pump – SEER 15	[NUMERIC OPEN END]
[If S3=6] Heat pump – SEER 16	[NUMERIC OPEN END]
[If S3=7] Heat pump – SEER 17	[NUMERIC OPEN END]
[If S3=3] ECM furnace fan	[NUMERIC OPEN END]

HV6. 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

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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	Lower Bound	Upper Bound
[If S3=1] Central air conditioner – SEER 15	[NUMERIC OPEN END]	[NUMERIC OPEN END]
[If S3=2] Central air conditioner – SEER 16	[NUMERIC OPEN END]	[NUMERIC OPEN END]
[If S3=5] Heat pump – SEER 15	[NUMERIC OPEN END]	[NUMERIC OPEN END]
[If S3=6] Heat pump – SEER 16	[NUMERIC OPEN END]	[NUMERIC OPEN END]
[If S3=7] Heat pump – SEER 17	[NUMERIC OPEN END]	[NUMERIC OPEN END]
[If S3=3] ECM furnace fan	[NUMERIC OPEN END]	[NUMERIC OPEN END]

Envelope Specific Questions

[Ask if <MeasureCat>=Envelope, else skip to PE1]

[ASK IF <AirSealingFlag>=Yes, ELSE SKIP TO E5]
E1. Did you offer air sealing services to your residential customers prior to participating in the KCP&L program?

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

[IF E1=Yes, ELSE SKIP TO E4]
E2. Have you observed an increase in the number of air sealing projects your company completes since participating in the KCP&L program?

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

[IF E2=Yes, ELSE SKIP TO E4]
E3. How influential do you think the program was on the increase in air sealing projects?
[1-5, DK]

E4. Program records show that you completed approximately <AirSealingQty> air sealing projects through the program in 2016. Given your experience in the market, how many air sealing projects do you think you would have completed if KCP&L **had not** offered the rebate program?
[NUMERIC OPEN END, DK]

[ASK IF <InsulationFlag>=Yes, else skip to E10]
E5. Did you install insulation in residential homes prior to participating in the program?

1. Yes
2. No [SKIP TO E9]
98. Don't know [SKIP TO E9]

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[Ask if E5=Yes, else skip to E9]
E6. Have you observed an increase in the number of insulation projects your company completes since participating in the KCP&L program?

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

[Ask if E5=Yes, else skip to E9]
E7. Have you observed an increase in the average R-value of residential insulation projects that your company installs since participating in the KCP&L program?

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

[Ask if E6=Yes or E7=Yes, else skip to E9]
E8. How influential do you think the program was on the increase in insulation projects and/or R-value?

[1-5, DK]

E9. Program records show that you completed approximately <InsulationQty> insulation projects through the program in 2016. Given your experience in the market, how many insulation projects do you think would you have completed if KCP&L **had not** offered the rebate program?

[NUMERIC OPEN END, DK]

E10. Why do you think residential customers don't complete more energy efficiency upgrades to their home's envelope (e.g., insulation, windows, air sealing)?

[OPEN END, DK]

Participants and Barriers

PA1. Which of the following energy efficiency measures are most popular among your residential customers? Please select all that apply.

[List measures selected in S3]
98. Don't know

PA2.Can you think of any other residential energy efficiency measures that the program should include in the future?

[OPEN ENDED]
1. None
98. Don't know

PA3. In your experience, what types of residential customers typically choose to complete energy efficiency projects? [BIPOLAR MATRIX, ROTATE ORDER]

PA3a. Lower income ←→ Higher income
PA3b. Smaller homes ←→ Larger homes
PA3c. Environmentally concerned ←→ Not motivated to go green
PA3d. Budget conscious ←→ Big spenders
PA3e. Older homes ←→ Younger homes
PA3f. Suburban dwellers ←→ City slickers

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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? Please describe these customers (in terms of home type, demographics, 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

PA6. As you likely know, KCP&L offers home energy assessments and direct installation of small energy-saving items through the Energy Savings Kit program. What do you think the KCP&L program could do to move more customers from this program to implementing more significant energy efficiency upgrades in their homes?

[OPEN ENDED]
98 Don't Know

Program Experiences

You're almost done with the survey, just a few more questions.

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

PE1a. Marketing support provided by the program
PE1b. Amount of communication received from the program
PE1c. Ease of project application process
PE1d. Time to complete a project through the program
PE1e. The amount of the program incentives

[Ask if PE1a<3]
PE2a. Why did you rate your satisfaction with **the marketing support 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 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 **project application process** like that?

[OPEN ENDED]
98 Don't Know

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[Ask if PE1d<3]
PE2d. Why did you rate your satisfaction with **time to complete a project** like that?
[OPEN ENDED]
98 Don't Know

[Ask if PE1e<3]
PE2e. Why did you rate your satisfaction with **the amount of the program incentive** like that?
[OPEN ENDED]
98 Don't Know

PE3. KCP&L has worked to integrate several of its various residential energy efficiency programs under the Whole House Energy program umbrella. What are your thoughts on the new program structure?
[OPEN ENDED]
1. Unaware of change in program structure
98 Don't Know

PE4. How would you rate your overall satisfaction with the <Program>?
[SCALE OF 1 to 5, ENDS LABELED "Not at all satisfied" (1) and "Very satisfied" (5)]
98 Don't Know

PE5. Why did you provide that rating?
[OPEN ENDED]
98 Don't Know

PE6. How can the KCP&L <Program> be improved? [ROTATE RESPONSES, ALLOW MULTIPLE RESPONSES]
8. Offer incentives for additional types of equipment; note which types: [OPEN END]
9. More marketing directly to customers
10. More marketing support for contractors and other trade allies
11. More training/technical support for contractors and other trade allies
12. More administrative support for contractors and other trade allies
13. Target marketing to specific customer groups; note which groups: [OPEN END]
14. No improvements necessary
15. Other; describe: [OPEN END]
98. Don't Know

PE7. Do you have any other thoughts you would like to share regarding the KCP&L <Program>?
[OPEN ENDED]
1. None
98. Don't Know

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Closing Text

[Ask if <Strata>=Large, else skip to CT2]
CT1. Our research team is interested in better understanding the challenges and opportunities associated with KCP&L's residential energy efficiency programs. Would you be willing to participate in a brief follow-up telephone interview to discuss those topics? If so, please provide the best phone number and email address to coordinate with you.

1. Yes (Specify phone and email)
2. No

CT2. Those are all of our questions. Thank you for your time. Your input will help KCP&L improve the <Program>.

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A.3 Supplier Survey Guides

A.3.1 HLR Manufacturer and Retail Buyer Survey Guide

Interview Guide for Home Lighting Rebate Manufacturers and Retail Buyers

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Contact Protocol

1. Call potential interviewees to verify serving as a program partner in 2016 and to ascertain most appropriate interviewee. Obtain email address(es) of appropriate interviewees. If company refuses interview, determine reasons for refusal and if it's logistical in nature, try to find workaround.
2. Send email interview invitation to appropriate interviewee. This invitation will include:
    a. Explanation of purpose and scope of interview.
    b. Explanation of timeframe within which the interview will need to be completed.
    c. Explanation of expected duration of interview and flexibility to complete interview over multiple sessions.
    d. Instructions to propose a convenient interview time.
    e. Contact information for interviewers.
    f. Assurances of confidentiality.
    g. A letter attachment from KCP&L/GPES or perhaps ICF explaining the importance of the interview.
3. Once an interview time has been arranged, the interviewee will be sent an email in advance of the interview that summarizes their program sales for both KCP&L-MO and GMO so they have time to verify the estimates. The email will also contain additional assurances of confidentiality.

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Introduction and Respondent Background

Interviewer: _____
Date of Interview: _____
Time Begun_____ Time Ended _____
Respondent Name: _____
Respondent Title: _____
Phone Number(s): _____
Email Address: _____

[NOTE: NOT MEANT TO BE READ VERBATIM BUT AS ROUGH GUIDE]
Thank you for taking the time to talk with me today about Kansas City Power and Light's Home Lighting Rebate Program. KCP&L is interested in obtaining feedback from program partners who have direct experience with the program. Your input will help identify the strengths and challenges with the program and also provide information critical to future planning. Our interview for today focuses on three related issues:

1. The impact of the program on your sales of LEDs
2. Your perspectives on non-ENERGY STAR LEDs
3. Thoughts on the program and on training on energy efficient bulbs

[ASK FOR PERMISSION TO RECORD THE CALL FOR TRANSCRIPTION PURPOSES ONLY, AGAIN ASSURING THEM OF THE CONFIDENTIALITY OF THEIR RESPONSES]
The first set of questions I have are about your role with the program.

I1. What is your position at [INSERT COMPANY NAME], and how long have your worked at this position?

I2. What involvement do you have with the KCP&L Home Lighting Rebate Program?

Program Attribution (Net-to-Gross)

In this survey, I will be referring to standard and specialty LEDs. For the purposes of this interview, standard means A-line, general service, medium screw base lamps. Specialty means lamps with something other than the A-line shape or a medium screw base. The most common specialty lamps are reflectors, floods, candelabras, and globe lamps, but there are others.

P1. A few days ago, I emailed you information from the program records about the number of standard and specialty LED bulbs [INSERT COMPANY NAME] supported through the KCP&L Home Lighting Program in both Kansas City, Missouri (KCP&L-MO) and the Greater Missouri (GMO) service territories since the start of the current program cycle (April 2016 through September 2016). Can you verify that the number from the program records matches the number of standard and specialty LED bulbs you supported in each of the service territories? If not, what number of bulbs did you support?

Service Territory	Standard LEDs		Specialty LEDs	
	Program Records	Respondent Verified	Program Records	Respondent Verified
KCP&L-MO				
GMO				

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Now, I'd like you to think about what your LED sales would have been if KCP&L hadn't offered the Home Lighting Rebate Program. First I'm going to ask you about standard LED bulbs, and then we will discuss specialty ones.
[IF MANUFACTURER, CONTINUE; IF RETAIL BUYER SKIP TO P10]

Manufacturer series [MANUFACTURER = 1]

STANDARD LEDS

Since the start of the 2016 program year in April, the Home Lighting Rebate program paid an average markdown discount of $XX per standard LED bulb and also provided educational and promotional support.

P2. [ASK IF KCP&L-MO = 1] If the discounts had not been available since April 2016, are there any retailers that you worked with through the program that you think **would have been selling** standard LED bulbs in **the KCP&L-MO service** territory anyway?
   a. Which retailers would have sold standard LED bulbs without the program?
   b. Which retailers would not have sold any standard LEDs bulbs without the program? [PROBE: ARE YOU SURE?]
   c. Why do you say this?

Pre-P3 [ASK IF GMO = 1] You also work with retailers in the GMO service territory. Thinking about the previous questions, do the same answers apply to GMO? [IF YES, SKIP TO P4; OTHERWISE, ASK P3].

P3. [ASK IF GMO = 1] If the discounts had not been available since April 2016, are there any retailers that you worked with through the program that you think **would have been selling standard** LED bulbs in **the GMO service** territory?
   a. Which retailers would have sold standard LED bulbs without the program?
   b. Which retailers would not have sold any standard LEDs bulbs without the program? [PROBE: ARE YOU SURE?]
   c. Why do you say this?

[IF MANUFACTURER WOULD HAVE SOLD NO STANDARD LED BULBS IN EITHER SERVICE TERRITORY, SKIP TO SPECIALTY SERIES; OTHERWISE, ASK P4 AND P5 AS APPROPRIATE PER RESONSES TO PP2 AND PP3]

P4. [ASK IF P2 = YES (SOME RETAILERS WOULD HAVE SOLD STANDARD LEDS)] If the program discounts and materials had not been available, do you think your sales of **standard** LED bulbs through the retailer stores you worked with in the **KCP&L KCP&L-MO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?
   a. Why do you say this?

   [IF SAME, SKIP TO P5; OTHERWISE ASK B OR C BASED ON ANSWER TO P4].
   b. [IF LOWER] By what percentage would standard LED sales have decreased? RECORD PERCENTAGE
      i. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

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c. [IF HIGHER] By what percentage would standard LED sales have increased? RECORD PERCENTAGE
    i. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

[IF GMO = 0, GO TO SPECIALTY SERIES. IF GMO=1 CONTINUE]
[IF GMO = 1 AND KCP&L-MO = 1; ASK IF ANSWER TO P4 IS THE SAME FOR GMO AND KCP&L-MO. IF YES RECORD KCP&L-MO ANSWER BELOW AND GO TO SPECIALTY SERIES. IF NO, CONTINUE TO P5.]

P5. [ASK IF P3 = YES (SOME RETAILERS WOULD HAVE SOLD STANDARD LEDS)] If the program discounts and materials had not been available, do you think your sales of standard LED bulbs through the retailer stores you worked with in the **KCP&L GMO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?
    a. Why do you say this?

    [IF SAME, SKIP TO SPECIALTY SERIES; OTHERWISE ASK B OR C BASED ON ANSWER TO P5].
    b. [IF LOWER] By what percentage would standard LED sales have decreased? RECORD PERCENTAGE
        ii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]
    c. [IF HIGHER] By what percentage would standard sales have increased? RECORD PERCENTAGE
        iii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

SPECIALTY LEDS

Since the start of the 2016 program year in April, the Home Lighting Rebate program paid an average markdown discount of $XX per specialty LED bulb and also provided educational and promotional support.

P6. [ASK IF KCP&L-MO = 1] If the discounts had not been available since April 2016, are there any retailers that you worked with through the program that you think **would have been selling** specialty LED bulbs in **the KCP&L-MO service** territory anyway?
    a. Which retailers would have sold specialty LED bulbs without the program?
    b. Which retailers would not have sold any specialty LEDs bulbs without the program? [PROBE: ARE YOU SURE?]
    c. Why do you say this?

Pre-P7 [ASK IF GMO = 1] You also work with retailers in the GMO service territory. Thinking about the previous questions, do the same answers apply to GMO? [IF YES, SKIP TO P8; OTHERWISE, ASK P7].

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P7. [ASK IF GMO = 1] If the discounts had not been available since April 2016, are there any retailers that you worked with through the program that you think **would have been selling** specialty LED bulbs in **the GMO service** territory?

a. Which retailers would have sold specialty LED bulbs without the program?
b. Which retailers would not have sold any specialty LEDs bulbs without the program? [PROBE: ARE YOU SURE?]
c. Why do you say this?

[IF MANUFACTURER WOULD HAVE SOLD NO SPECIALTY LED BULBS IN EITHER SERVICE TERRITORY, SKIP TO FUTURE OF LIGHTING SERIES; OTHERWISE, ASK P8 AND P9 AS APPROPRIATE PER RESONSES TO P6 AND P7]

P8. [ASK IF P6 = YES (SOME RETAILERS WOULD HAVE SOLD SPECIALTY LEDS)] If the program discounts and materials had not been available, do you think your sales of **specialty** LED bulbs through the retailer stores you worked with in the **KCP&L KCP&L-MO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?

d. Why do you say this?

[IF SAME, SKIP TO PP5; OTHERWISE ASK B OR C BASED ON ANSWER TO PP4].

e. [IF LOWER] By what percentage would specialty LED sales have decreased? RECORD PERCENTAGE
    i. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]
f. [IF HIGHER] By what percentage would specialty LED sales have increased? RECORD PERCENTAGE
    i. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

[IF GMO = 0, GO TO FUTURE OF LIGHTING SERIES. IF GMO=1 CONTINUE]
[IF GMO = 1 AND KCP&L-MO = 1; ASK IF ANSWER TO P8 IS THE SAME FOR GMO AND KCP&L-MO. IF YES RECORD KCP&L-MO ANSWER BELOW AND GO TO FUTURE OF LIGHTING SERIES. IF NO, CONTINUE TO P9.]

P9. [ASK IF P7 = YES (SOME RETAILERS WOULD HAVE SOLD SPECIALTY LEDS)] If the program discounts and materials had not been available, do you think your sales of **specialty** LED bulbs through the retailer stores you worked with in the **KCP&L GMO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?

d. Why do you say this?

[IF SAME, SKIP TO FUTURE OF LIGHTING SERIES; OTHERWISE ASK B OR C BASED ON ANSWER TO P9].

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e. [IF LOWER] By what percentage would specialty LED sales have decreased? RECORD PERCENTAGE
   ii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]
f. [IF HIGHER] By what percentage would specialty sales have increased? RECORD PERCENTAGE
   iii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

Retail buyer series [RETAILER = 1]

STANDARD LEDS

Since the start of the 2016 program year in April, the Home Lighting Rebate program paid an average markdown discount of $XX per standard LED bulb and also provided educational and promotional support.

P10. [IF RETAIL BUYER] If the discounts had not been available since April 2016, do you think you would **have been selling any standard LED bulbs** in the **KCP&L-MO service territory**?
   a. [IF NO ASK] Are you sure you wouldn't have sold any standard LEDs if there were no KCP&L discounts?
   b. [ASK ALL] Why do you say this?

Pre-P11 [ASK IF GMO = 1] Thinking about the previous questions, do the same answers apply to your locations in the GMO service territory? [IF YES, SKIP TO P12; OTHERWISE, ASK P11].

P11. [IF RETAIL BUYER] If the discounts had not been available since April 2016, do you think you would **have been selling any standard LED bulbs** in the **GMO service territory**?
   a. [IF NO ASK] Are you sure you wouldn't have sold any standard LEDs if there were no KCP&L discounts?
   b. [ASK ALL] Why do you say this?

[IF RETAIL BUYER WOULD HAVE SOLD NO LED STANDARD BULBS IN EITHER SERVICE TERRITORY, SKIP TO SPECIALTY SERIES; OTHERWISE, ASK P12 AND P13 AS APPROPRIATE PER RESONSES TO P10 AND P11].]

P12. [ASK IF P10 = YES (WOULD HAVE SOLD STANDARD LEDS)] If the program discounts and materials had not been available, do you think sales of **standard** LED bulbs through the retailer stores you worked with in the **KCP&L KCP&L-MO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?
   a. Why do you say this?

   [IF SAME, SKIP TO P13; OTHERWISE ASK B OR C BASED ON ANSWER TO P12].
   b. [IF LOWER] By what percentage would standard sales have decreased? RECORD PERCENTAGE

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iv. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

c. [IF HIGHER] By what percentage would standard LED sales have increased? RECORD PERCENTAGE

v. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

[IF GMO = 0, SKIP TO SPECIALTY SERIES. IF GMO = 1 CONTINUE]
[IF GMO = 1 AND KCP&L-MO = 1; ASK IF ANSWER TO P12 IS THE SAME FOR GMO AND KCP&L-MO. IF YES RECORD KCP&L-MO ANSWER BELOW AND GO TO FUTURE OF LIGHTING SERIES. IF NO, CONTINUE TO P13.]

P13. [ASK IF P11 = YES (WOULD HAVE SOLD STANDARD LEDS)] If the program discounts and materials had not been available, do you think your sales of LED **standard** bulbs through the retailer stores you worked with in the **KCP&L GMO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?

a. Why do you say this?

[IF SAME, SKIP TO FUTURE OF LIGHTING SERIES; OTHERWISE ASK B OR C BASED ON ANSWER TO P13].

b. [IF LOWER] By what percentage would standard LED sales have decreased? RECORD PERCENTAGE

vi. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

c. [IF HIGHER] By what percentage would standard LED sales have increased? RECORD PERCENTAGE

vii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 standard LED bulbs in a week with the program, without the program the standard LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

SPECIALITY LEDS

Since the start of the 2016 program year in April, the Home Lighting Rebate program paid an average markdown discount of $XX per specialty LED bulb and also provided educational and promotional support.

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P14. [IF RETAIL BUYER] If the discounts had not been available since April 2016, do you think you would **have been selling any specialty LED bulbs** in the **KCP&L-MO service territory**?

c. [IF NO ASK] Are you sure you wouldn't have sold any specialty LEDs if there were no KCP&L discounts?

d. [ASK ALL] Why do you say this?

Pre-P15 [ASK IF GMO = 1] Thinking about the previous questions, do the same answers apply to your locations in the GMO service territory? [IF YES, SKIP TO P16; OTHERWISE, ASK P15].

P15. [IF RETAIL BUYER] If the discounts had not been available since April 2016, do you think you would **have been selling any specialty LED bulbs** in the **GMO service territory**?

c. [IF NO ASK] Are you sure you wouldn't have sold any specialty LEDs if there were no KCP&L discounts?

d. [ASK ALL] Why do you say this?

[IF RETAIL BUYER WOULD HAVE SOLD NO LED SPECIALTY BULBS IN EITHER SERVICE TERRITORY, SKIP TO FUTURE OF LIGHTING SERIES; OTHERWISE, ASK P16 AND P17 AS APPROPRIATE PER RESONSES TO P14 AND P15].]

P16. [ASK IF P14 = YES (WOULD HAVE SOLD SPECIALTY LEDS)] If the program discounts and materials had not been available, do you think sales of **specialty** LED bulbs through the retailer stores you worked with in the **KCP&L KCP&L-MO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?

d. Why do you say this?

[IF SAME, SKIP TO P17; OTHERWISE ASK B OR C BASED ON ANSWER TO P16].

e. [IF LOWER] By what percentage would specialty sales have decreased? RECORD PERCENTAGE

viii. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

f. [IF HIGHER] By what percentage would specialty LED sales have increased? RECORD PERCENTAGE

ix. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

[IF GMO = 0, SKIP TO FUTURE OF LIGHTING SERIES. IF GMO = 1 CONTINUE]
[IF GMO = 1 AND KCP&L-MO = 1; ASK IF ANSWER TO P16 IS THE SAME FOR GMO AND KCP&L-MO. IF YES RECORD KCP&L-MO ANSWER BELOW AND GO TO FUTURE OF LIGHTING SERIES. IF NO, CONTINUE TO P17.]

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P17. [ASK IF P15 = YES (WOULD HAVE SOLD SPECIALTY LEDS)] If the program discounts and materials had not been available, do you think your sales of LED **specialty** bulbs through the retailer stores you worked with in the **KCP&L GMO** service territory would have been about the same, lower, or higher during the period of April 2016 through September 2016?

d. Why do you say this?

[IF SAME, SKIP TO FUTURE OF LIGHTING SERIES; OTHERWISE ASK B OR C BASED ON ANSWER TO P17].

e. [IF LOWER] By what percentage would specialty LED sales have decreased? RECORD PERCENTAGE

x. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

f. [IF HIGHER] By what percentage would specialty LED sales have increased? RECORD PERCENTAGE

xi. [CLARIFICATION] To make sure I understand, this means that if you sold 100 specialty LED bulbs in a week with the program, without the program the specialty LED sales would have really been [INSERT PERCENTAGE PLUS 100]. Do I have this right? [REVISE PERCENTAGE IF NEEDED]

Non-ENERGY STAR LEDs

The next few questions I have for you are about a subset of LEDs that do not qualify under ENERGY STAR Version 1.1 AND still won't qualify under Version 2.0. These LED bulbs often lack certain efficacy (lumens per watt) and lifetime requirements that prevent them qualifying for the ENERGY STAR designation. Some people call these "value-line" LEDs. Are you familiar with these types of LEDs? [IF YES CONTINUE; IF NO, GO TO CONCLUSION]

F1. What do you think are the strengths of value-line LEDs? What about weaknesses? [Probe: I'm thinking not only about engineering characteristics but also about such things as price, availability, etc.]

F2. What impact will value-line LEDs have on the residential lighting market in general? On energy efficient lighting programs such as KCP&L's Home Lighting Rebate Program?

Program Processes

PP1. Are there certain types of the energy efficient lighting products that you think the Home Lighting Rebate Program should be promoting that they are not currently promoting? If so, what are these products? Why do you think KCP&L should be supporting them?

PP2. Are there certain types of retailers that you think the Massachusetts ENERGY STAR Lighting Program should be focusing on more to encourage their sales of energy efficient lighting products? Which type of retailers? Why?

PP3. What type of training do you provide to your field representatives on energy efficient lighting? [PROBE ONE]

a. Topics covered

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b. Frequency
c. Training delivery (e.g., self-guided, in person, etc.,)

PP4. [IF RETAILER] What type of training do you provide to the sales staff at individual store locations on the energy efficient lighting?
a. Who delivers the training?
b. Topics covered
c. Frequency
d. New hires
e. Training delivery

PP5. Using a scale of 0 to 10 where 10 = very satisfied and 0 = very dissatisfied, how satisfied are you with the program? Please explain your answer.

PP6. In what way could the program processes be improved

CONCLUSION

That is all the questions I have for you today. Is there anything that you would like me to share with KCP&L regarding the Home Lighting Rebate Program that we have not discussed today?

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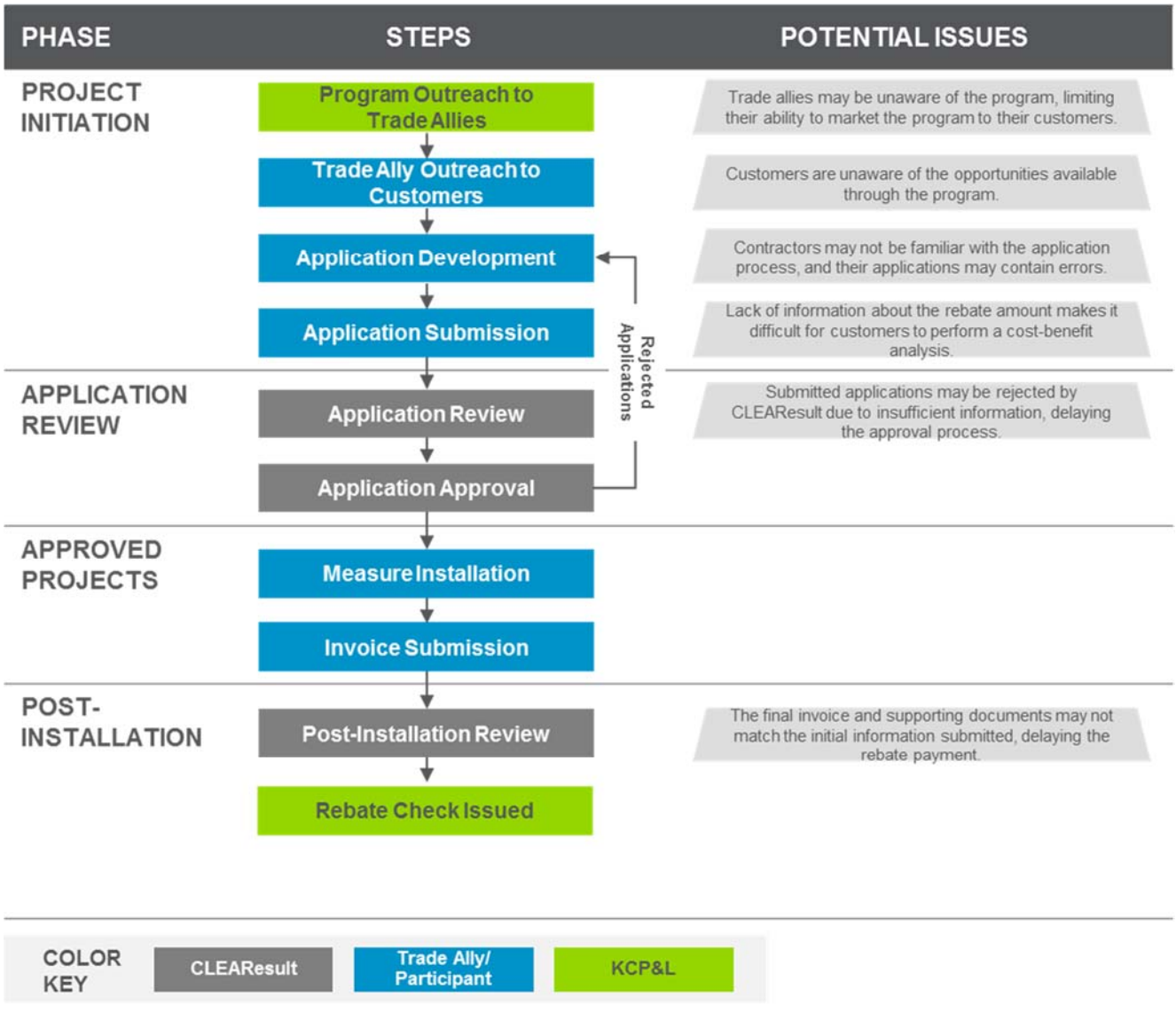
APPENDIX B. PROCESS FLOW DIAGRAMS

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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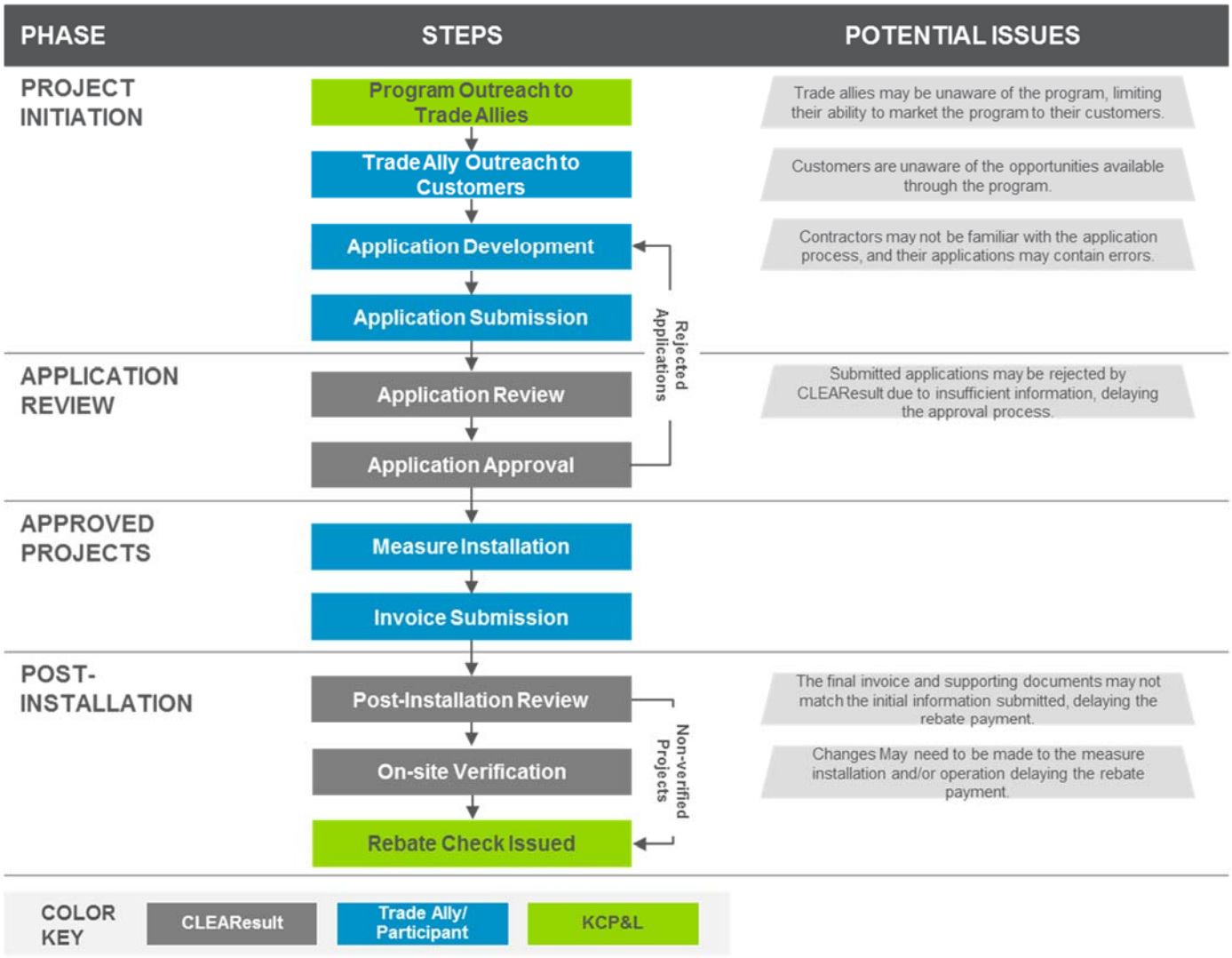
Figure B-2. Business EER – Custom Process Map



Source: Navigant

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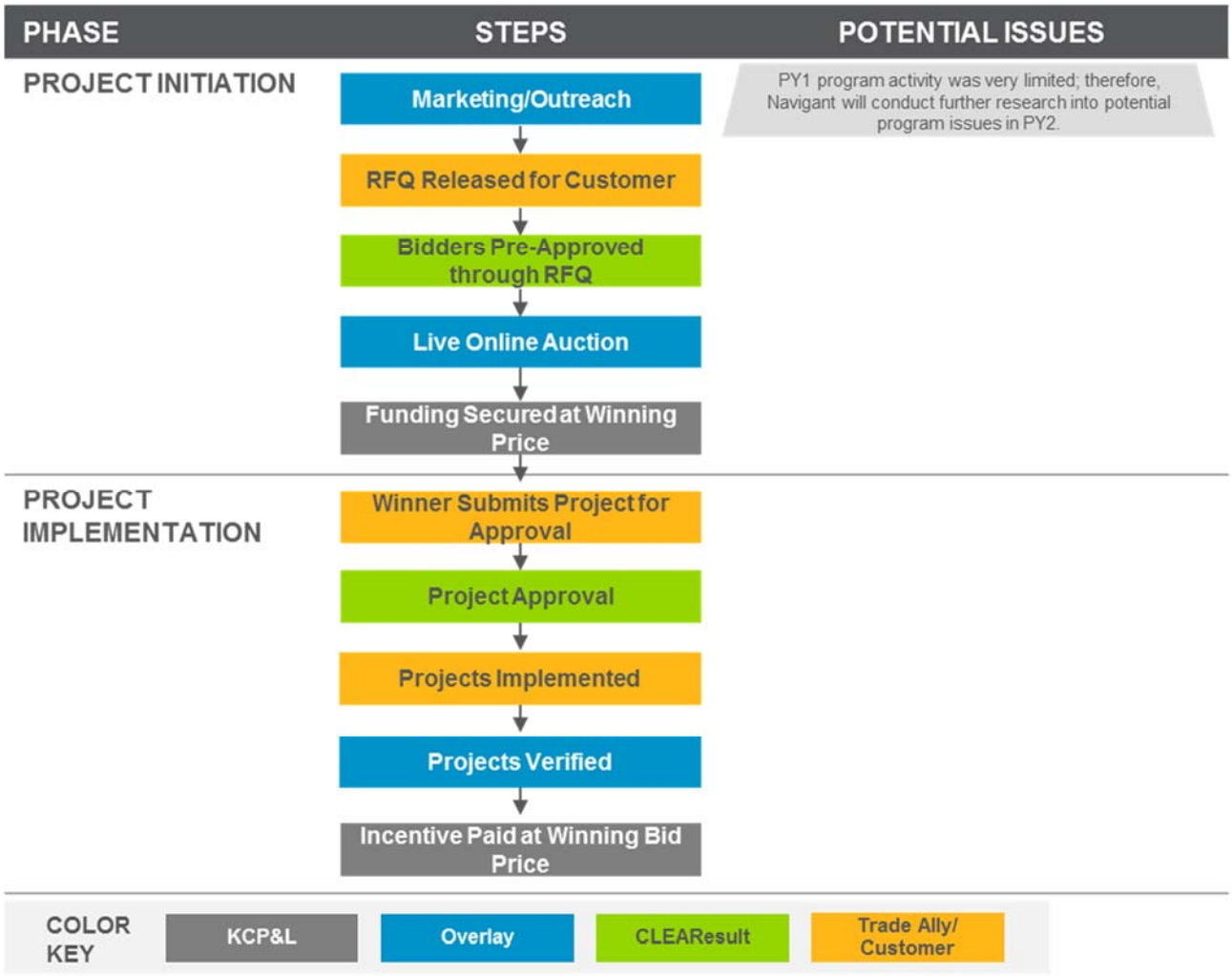
Figure B-3. Block Bidding



Source: Navigant

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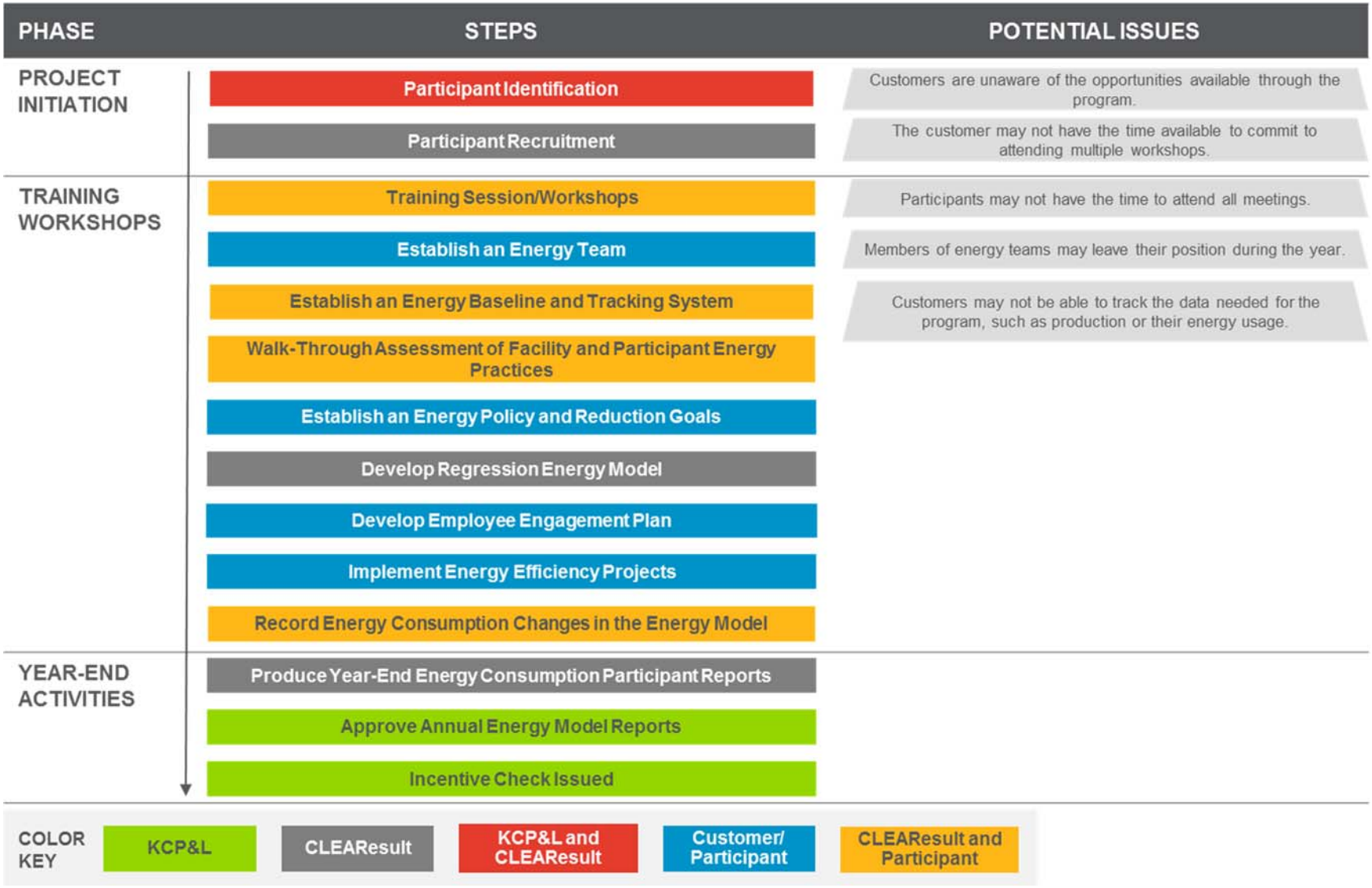
Figure B-4. Strategic Energy Management Process Map



Source: Navigant

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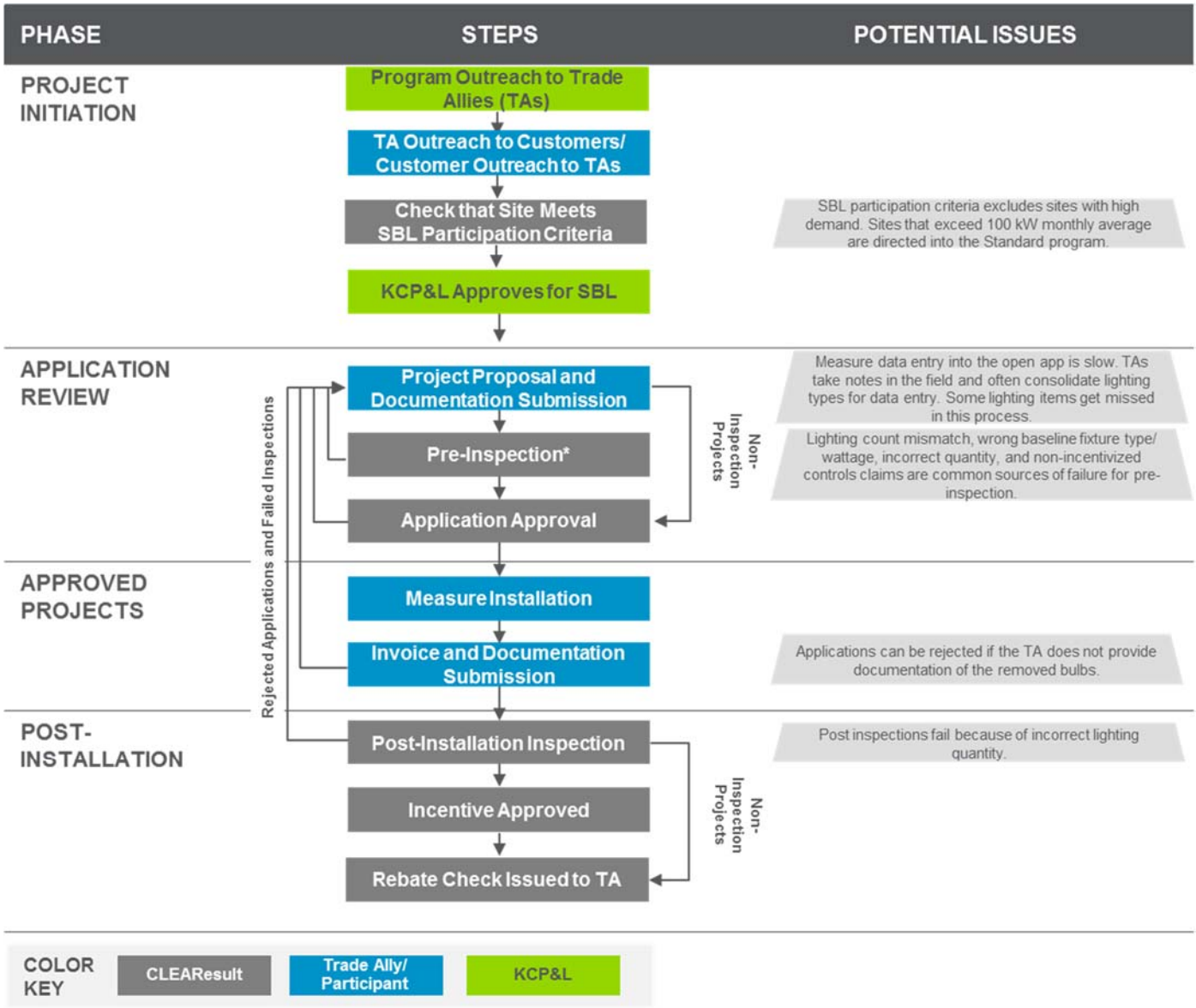
Figure B-5. Small Business Lighting Process Map



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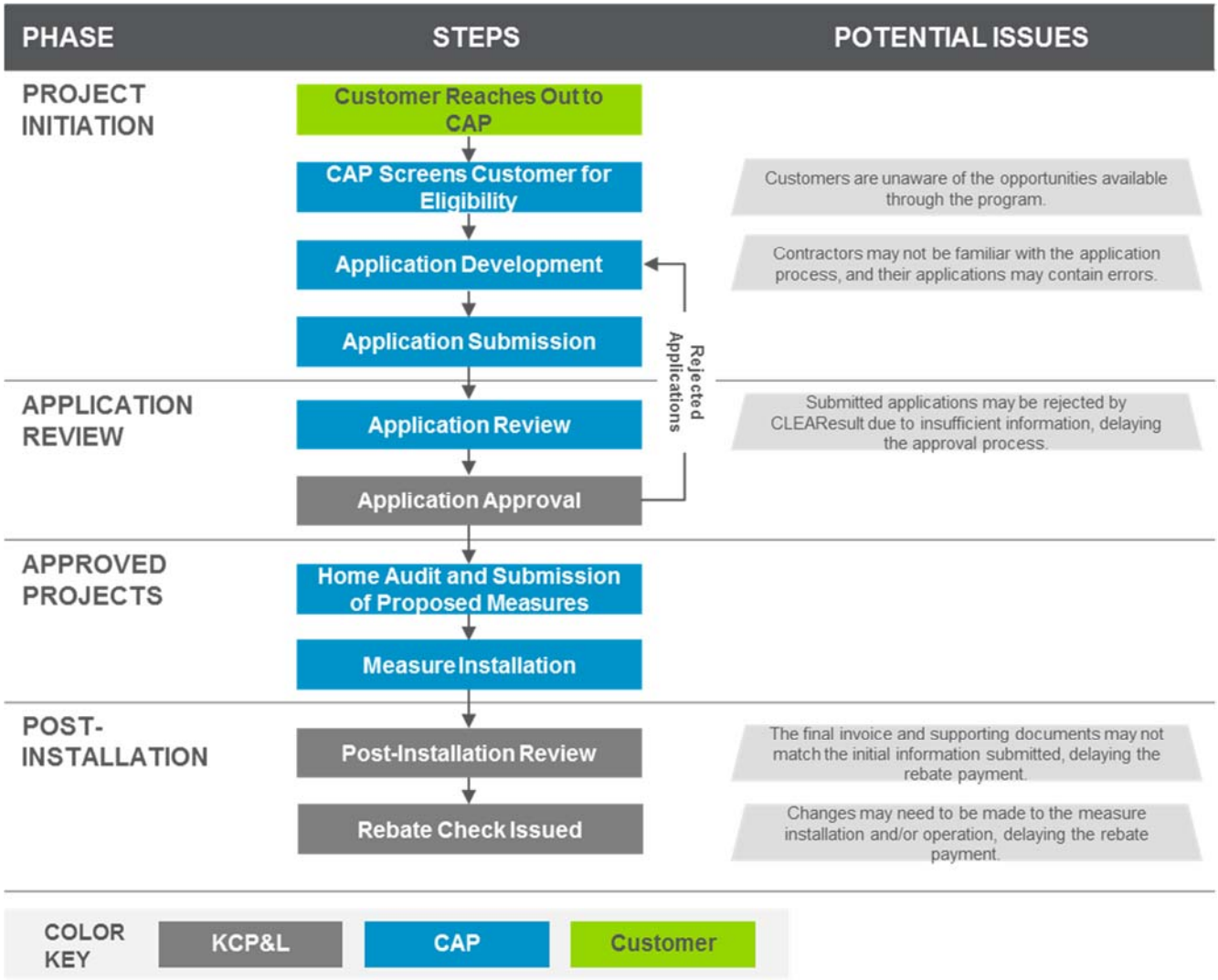
B.2 Residential Energy Efficiency Programs

Figure B-6. Income-Eligible Weatherization Process Map



Source: Navigant

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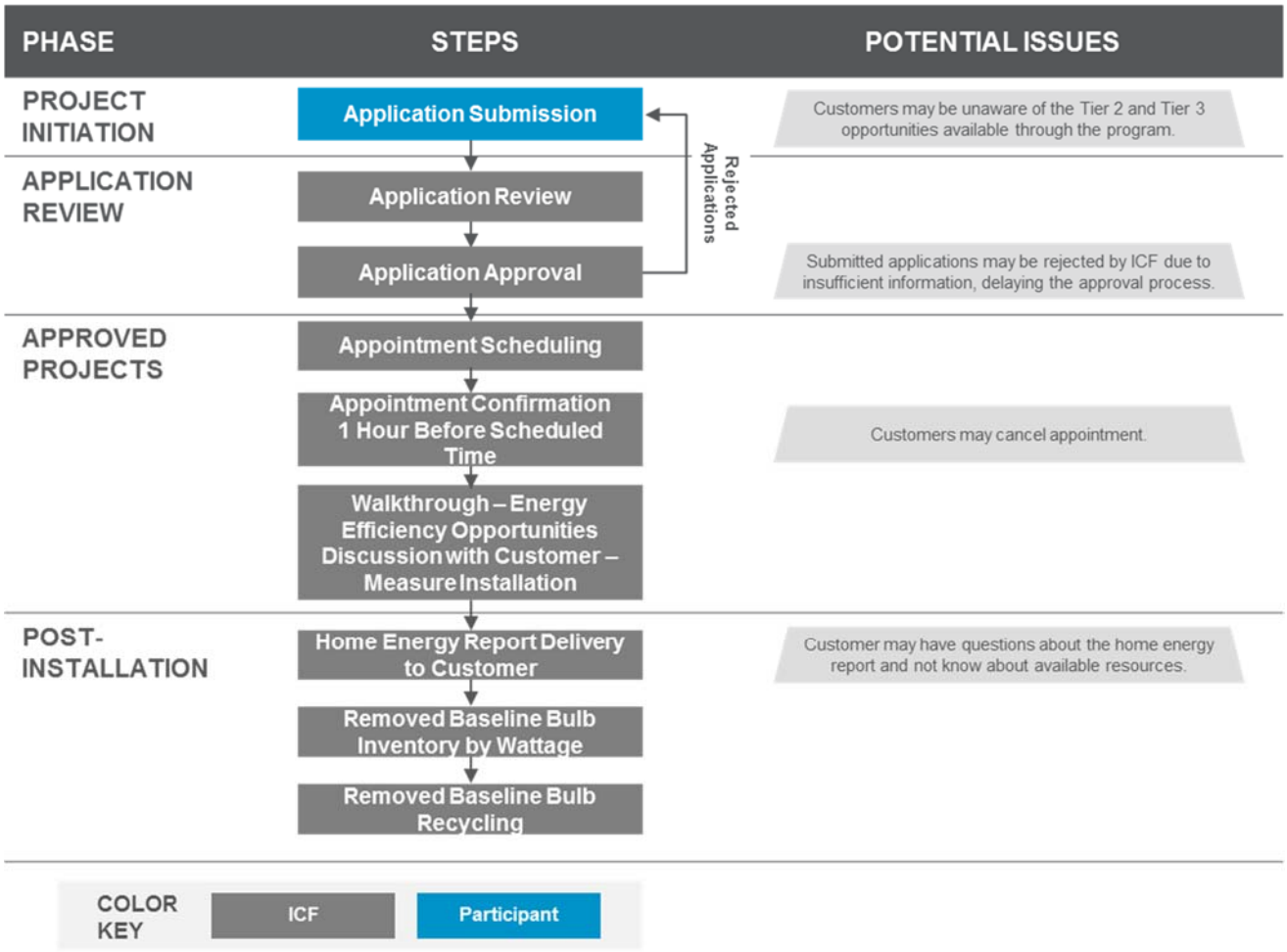
Figure B-7. Whole House Efficiency Process Map – Tier 1 Energy Savings Kit and Walkthrough



Source: Navigant

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Figure B-8. Whole House Efficiency Process Map – Tier 2 Building Shell Measures

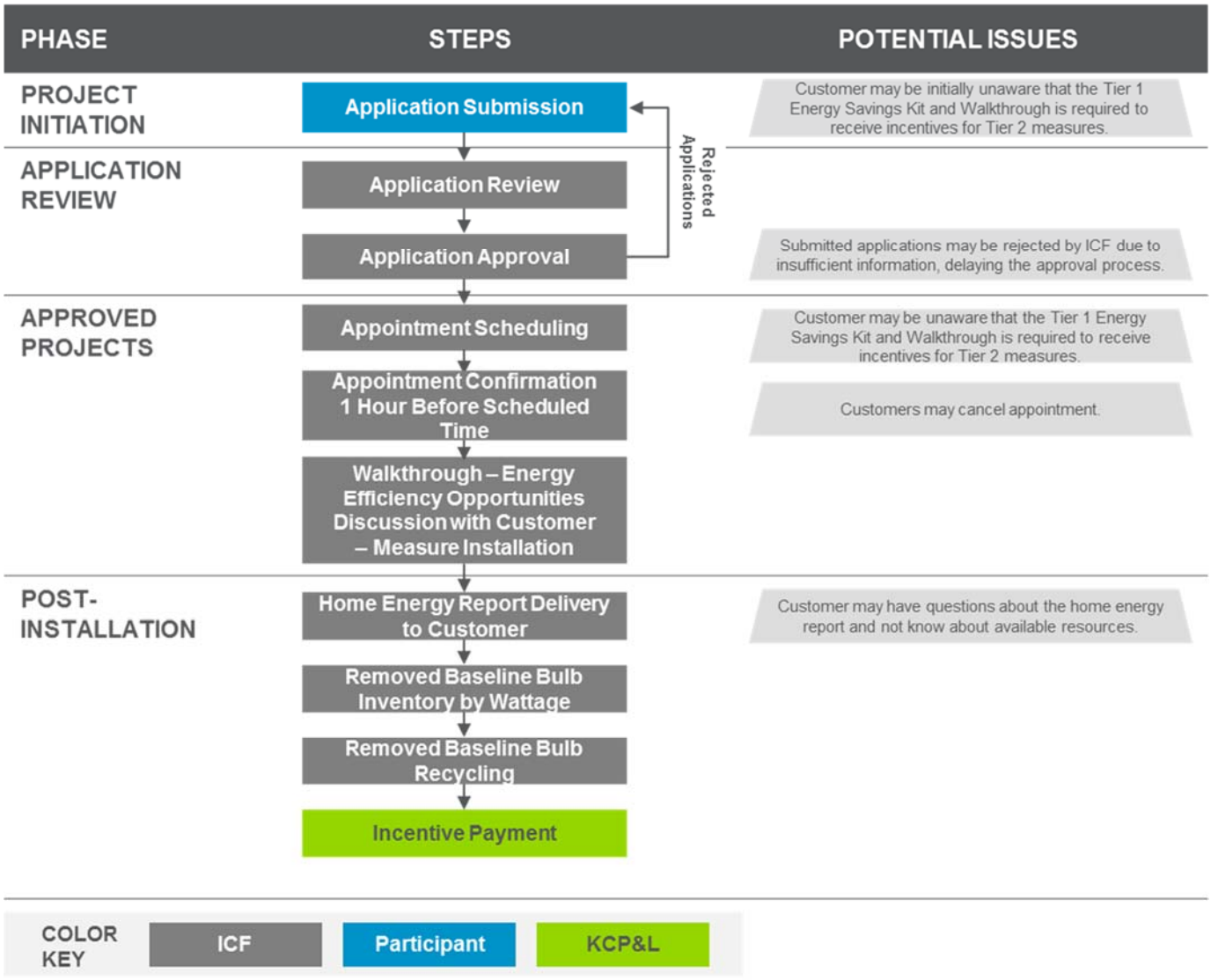

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Figure B-9. Whole House Efficiency Process Map – Tier 3 HVAC Measures

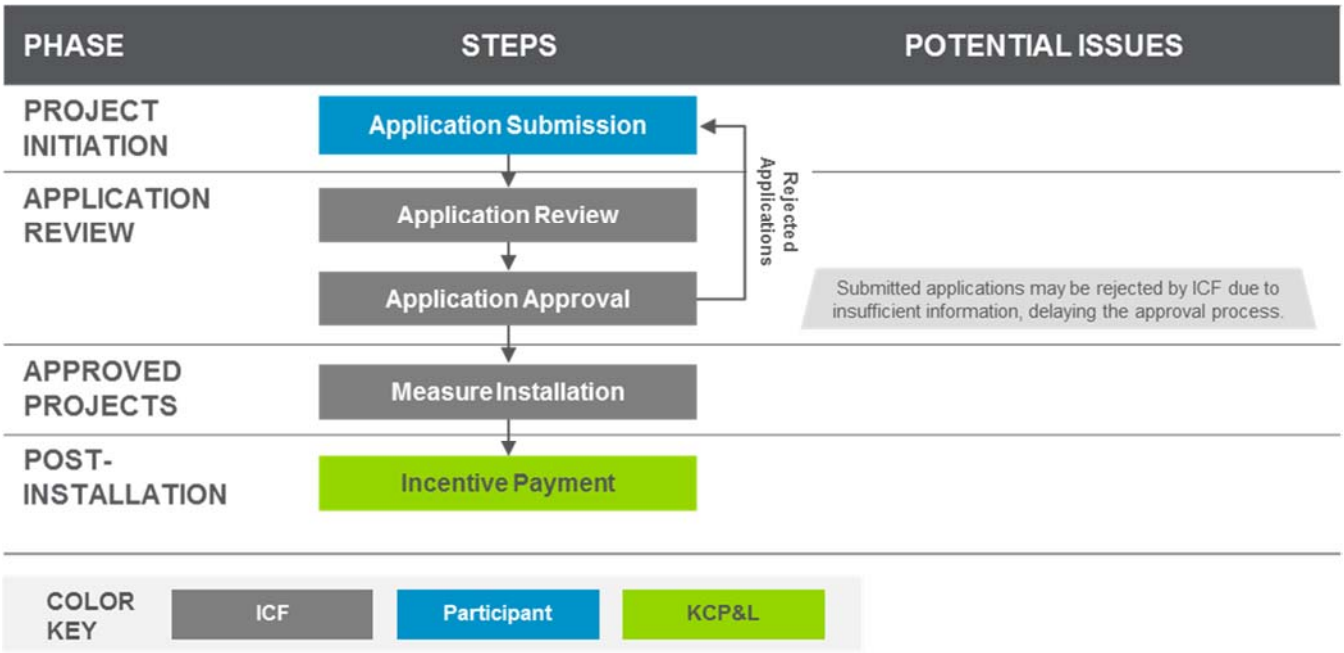

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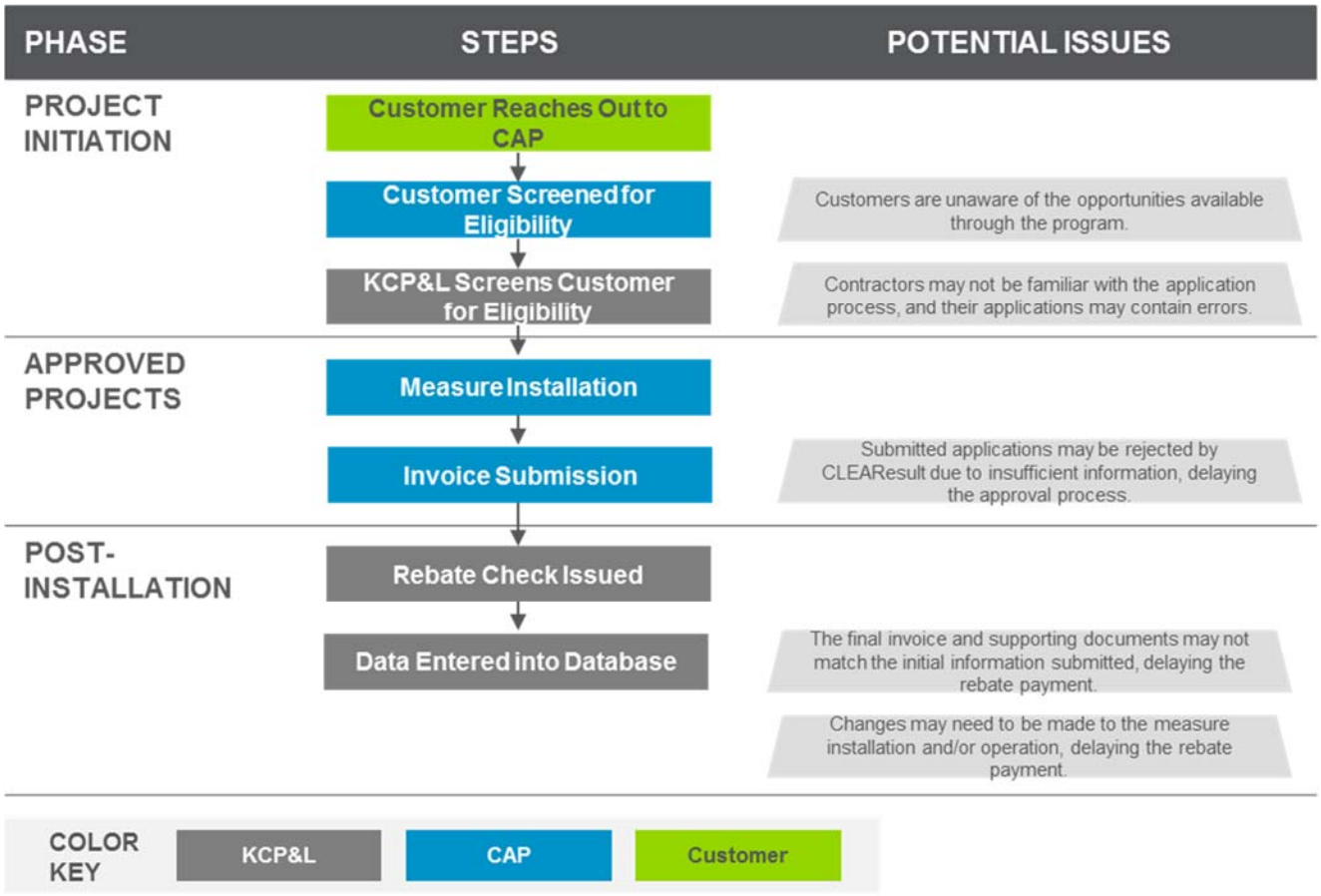
Figure B-10. Income-Eligible Multifamily Process Map



Source: Navigant

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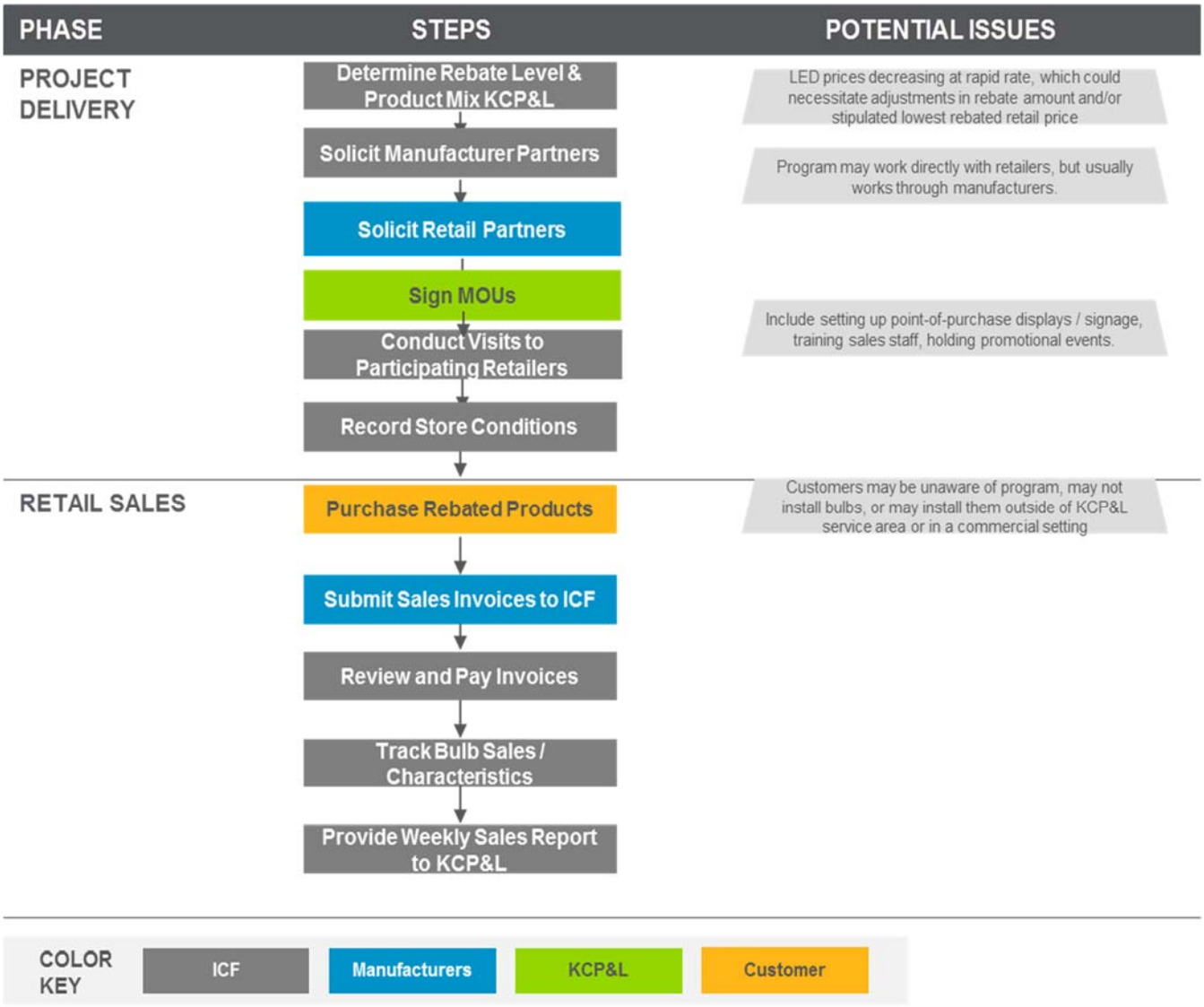
Figure B-11. Home Lighting Rebate Process Map



Source: Navigant

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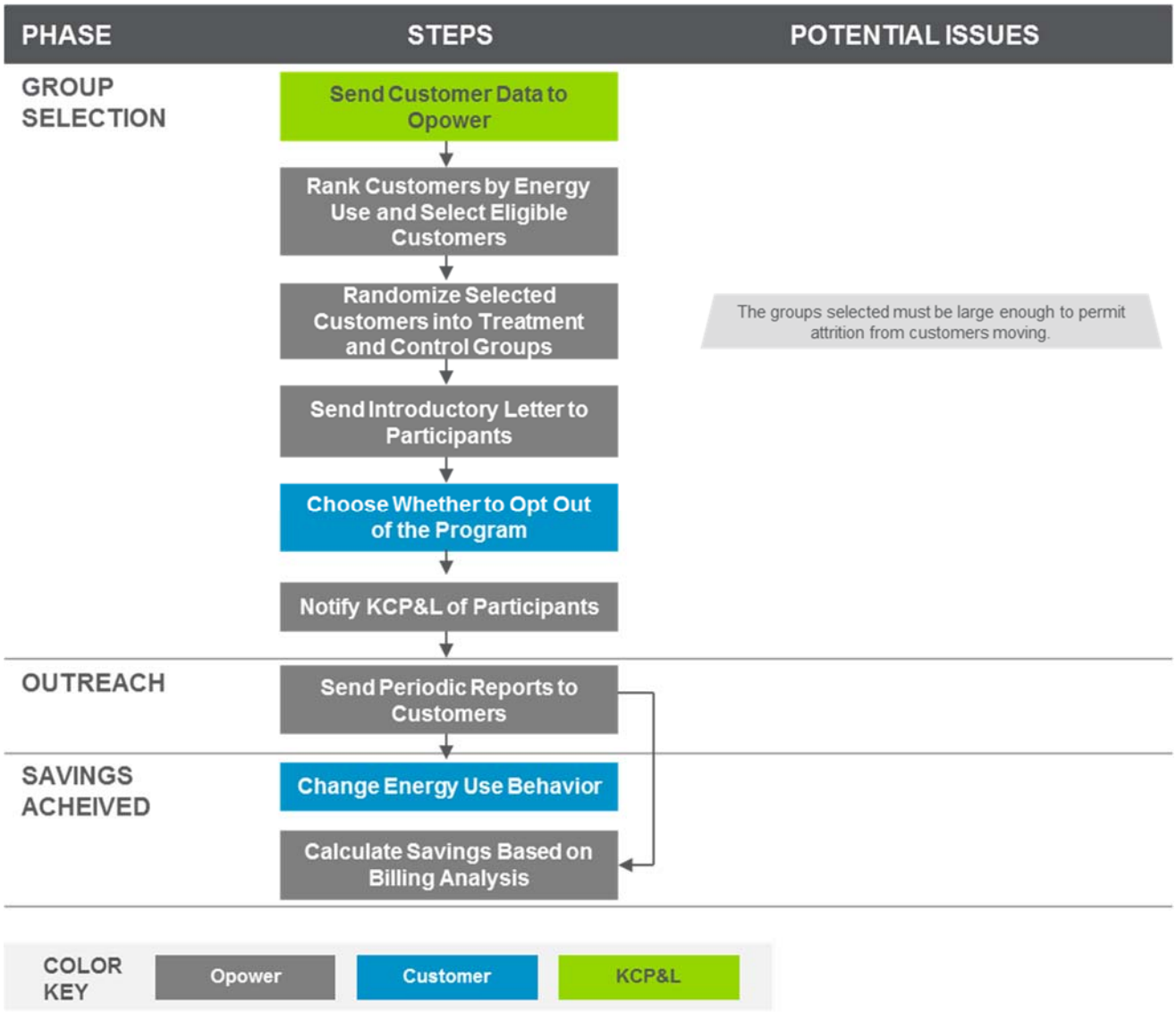
B.3 Educational Programs

Figure B-12. Home Energy Report and Income-Eligible Home Energy Report Process Map



Source: Navigant

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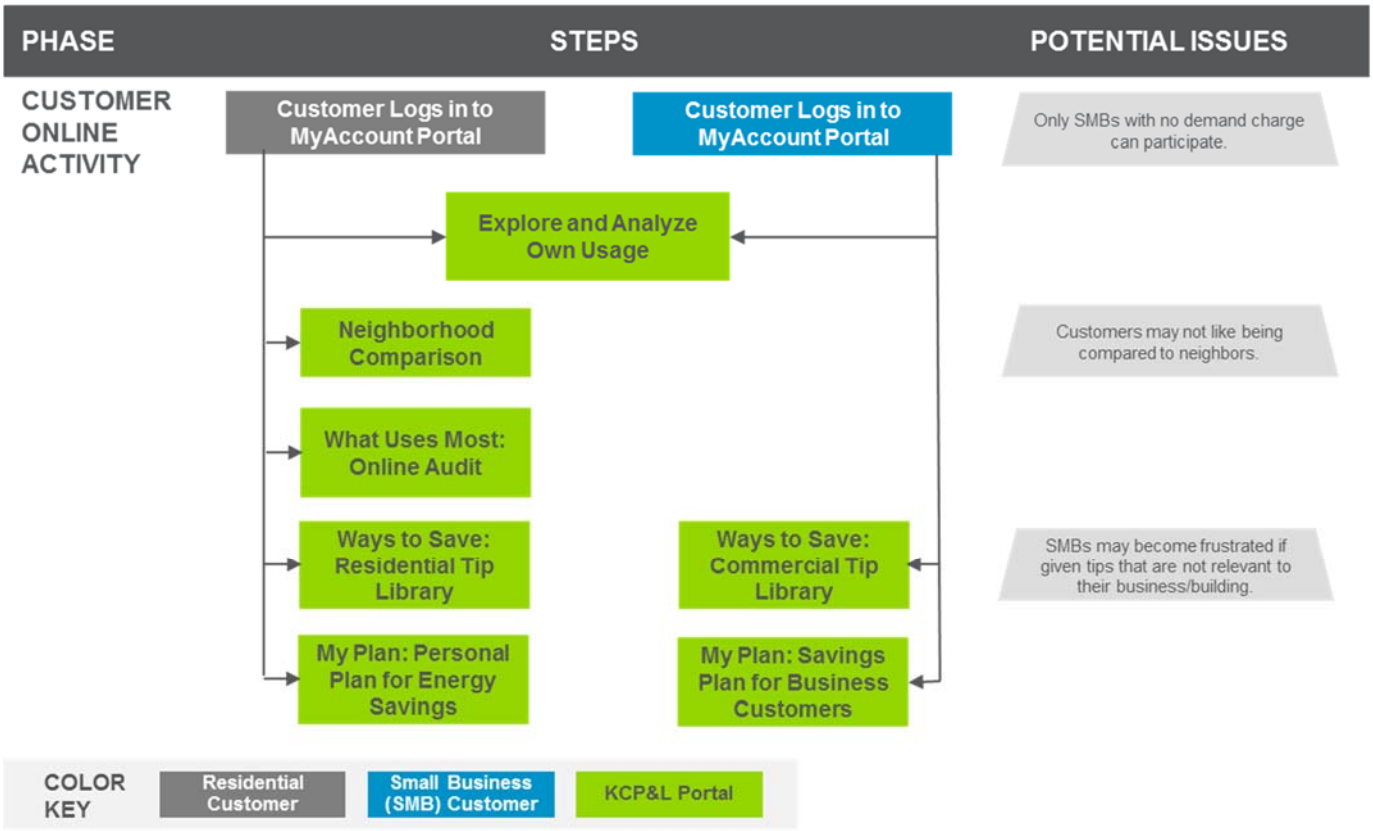
Figure B-13. Energy Analyzer and Small Business Energy Analyzer Process Map



Source: Navigant

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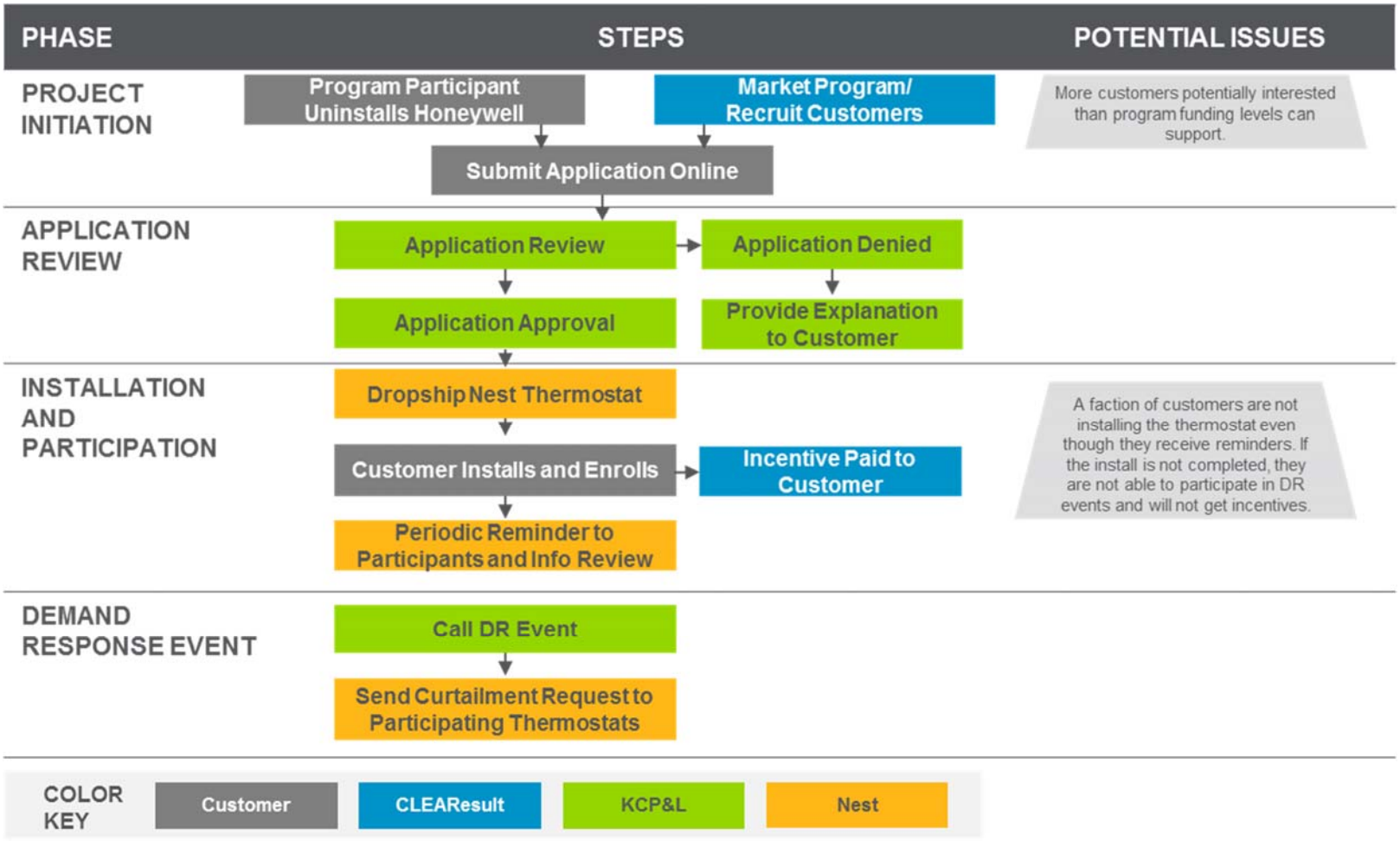
B.4 Demand Response Programs

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



Source: Navigant

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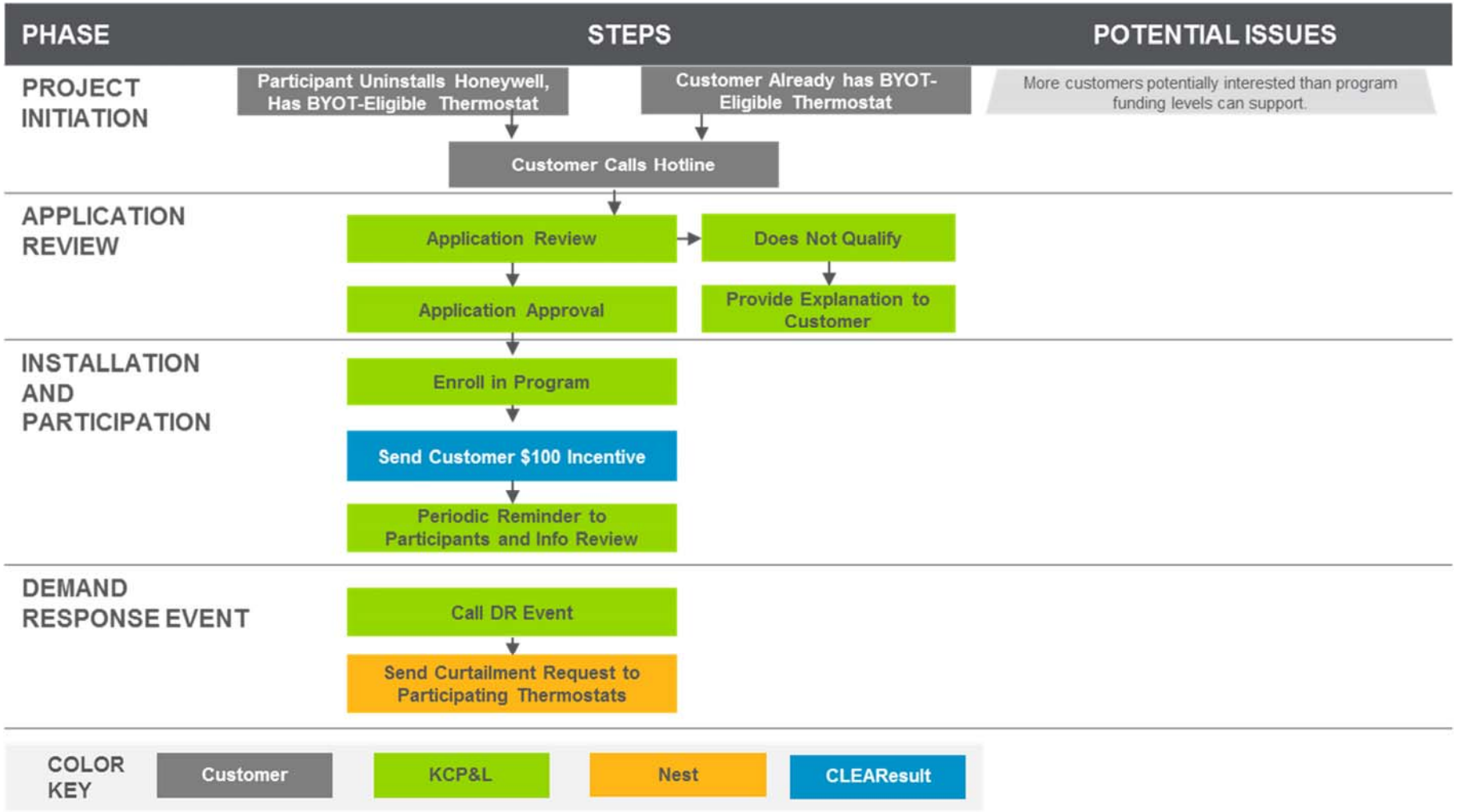
Figure B-15. Residential and Business Programmable Thermostat Process Map – BYOT



Source: Navigant

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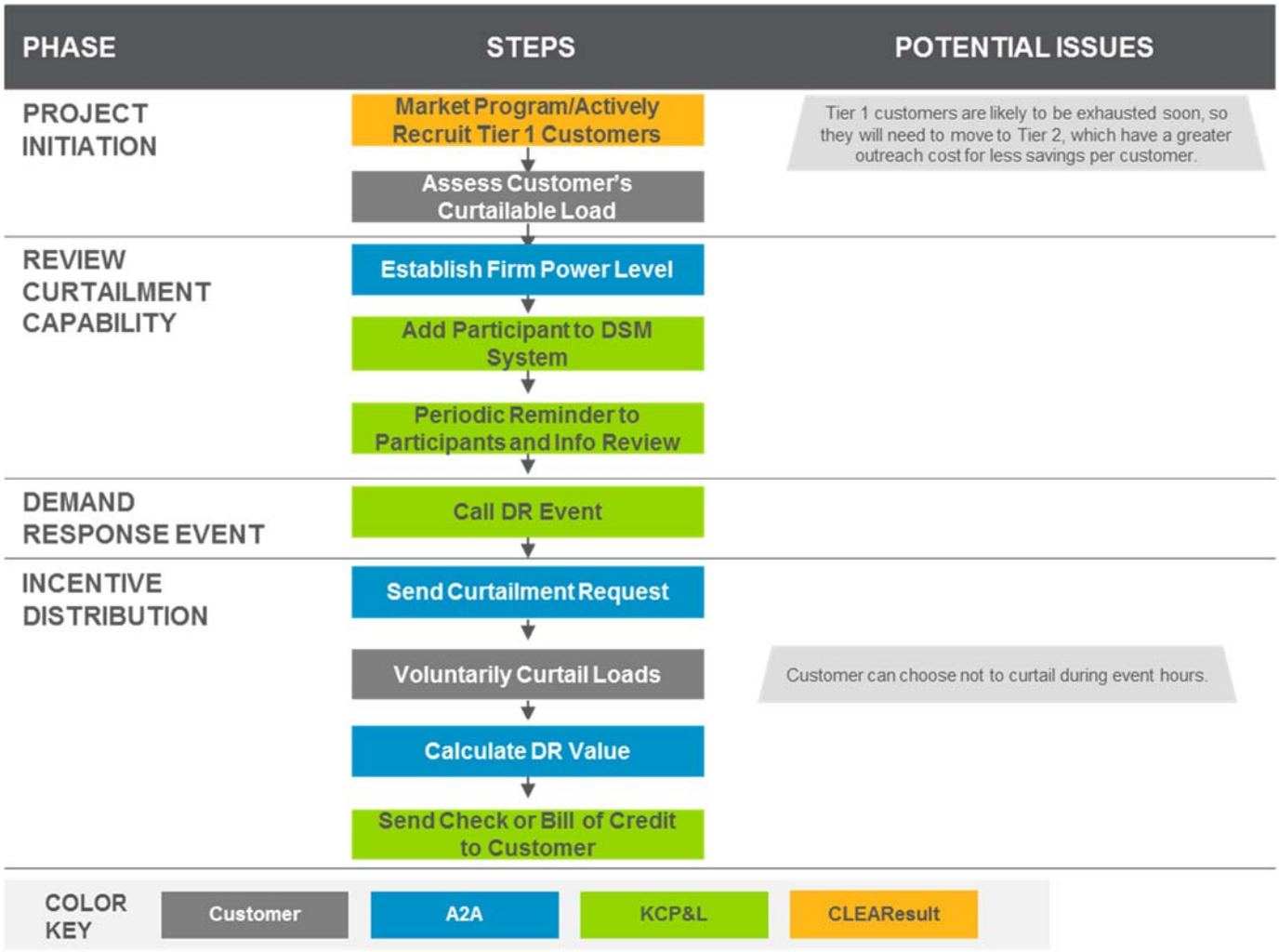
Figure B-16. DR Incentive Process Map



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 Q 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 five standard cost-benefit ratios: total resource cost (TRC) test, societal cost test (SCT), utility cost test (UCT), participant cost test (PCT), and ratepayer impact measure (RIM) test. Cost-benefit ratios are informative as they show the value of monetary benefits relative to the value of monetary costs as seen from various stakeholder perspectives. Navigant's 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] Navigant will provide KCP&L with the evaluated savings included in this analysis to support their performance incentive calculation.

Navigant's cost-benefit analysis explicitly accounts for the following cash flows:

- Avoided energy costs
- Avoided capacity costs
- Incentives
- Lost revenue/bill reductions
- Administrative costs[3]
- Participant equipment costs

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 GMO 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.

[3] Including portfolio-level costs related to energy efficiency and demand response (DR) programs, software development costs, evaluation, measurement, and verification (EM&V) costs, and educational program costs.

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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
Bill Savings/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 GMO. 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[4]	Source
Avoided energy costs	Provided by GMO
Avoided capacity costs	Provided by GMO
Retail rates	Provided by GMO
Load shapes	Navigant developed model load shapes with input from GMO.
Discount rates	Weighted average cost of capital (WACC) (provided by GMO and classified by GMO as highly confidential) used for TRC, UCT, and RIM tests. SCT used a value of 3%, whereas PCT used a value of 10% consistent with discount rates used by GMO in their cost-effectiveness analysis presented in their Annual Progress Report.
Participant equip. costs	Illinois Technical Reference Manual (TRM), GMO 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 GMO

[4] Navigant did not provide the avoided energy and capacity costs in this report as they are confidential to GMO.

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Data[4]	Source
Incentives	Program tracking database
Participation	Program tracking database
Administrative costs	Provided by GMO

Source: Navigant

C.1.2 Early Retirements

Navigant analyzed early retirement measures in the Whole Home Efficiency (WHE) program using a two-part savings stream (i.e., a dual baseline approach) and accounting for the adjustments in equipment investment timing due to early retirement of functional equipment. This approach was necessary to ensure that early retirement measures were fairly burdened with the full cost of the efficient equipment and to ensure the savings stream correctly accounted for differences in baseline assumptions over the lifetime of the measure.[5] The description below gives a high-level summary of this approach. The reader can refer to the referenced memo by Brailove et al. for additional detail.

The incremental cost assumed in the early retirement analysis consists of the full material and installation cost of the efficient equipment less a calculated deferred replacement credit. This approach contrasts with that of new or replace-on-burnout measures, whereby the incremental cost is assumed to be the difference between the full cost of the efficient equipment and the baseline equipment. The deferred replacement credit is calculated based on the present value of the difference between two infinite streams of replacement costs: one in which the baseline equipment is first replaced after the equipment's remaining useful life (RUL) and the other in which the baseline equipment replacement is deferred by the expected useful life (EUL) of the retrofit measure less the RUL of the early retired equipment. When replacement costs are not deferred at all (i.e., when the efficient EUL is equal to the early retired equipment's RUL), the deferred credit is zero and the participant costs for the retrofit measure are equal to the full costs of the efficient equipment. When the replacement costs are deferred by many years (i.e., when the efficient EUL is significantly large relative to the early retired equipment's RUL), the deferred credit is appreciable and the participant costs for the retrofit measure will be significantly less than the full costs of the efficient equipment.

A dual baseline approach is applied to energy and demand savings for retrofit measures to capture the impact of changing baselines, codes, and standards. The dual baseline approach is broken into two periods: a pre-RUL period and a post-RUL period, where RUL refers to the early retired equipment's remaining useful life. During the pre-RUL period, the efficient equipment is credited with savings that are incremental to the early retired equipment. In the post-RUL period, the efficient equipment is credited with savings that are incremental to a code-required baseline in the year that the early retired equipment would have needed to be replaced. This means that future code changes, occurring within the early retired equipment's RUL, are considered in the baseline for the post-RUL period.

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

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C.1.3 Operations and Maintenance Savings for Standard and Small Business Lighting Measures

Navigant analyzed the operations and maintenance (O&M) savings for lighting measures in the Standard and Small Business Lighting programs. Efficient LED lamps and luminaires tend to have much longer lifetimes than the baseline technology whether it is a metal halide high intensity discharge lamp, a T8 linear fluorescent lamp, or an incandescent lamp. Navigant assumed LED luminaire lifetimes are at least 50,000 hours based on the minimum requirement to be qualified as part of the Design Lights Consortium Technical Requirements V4.2. Navigant assumed that the lifetimes of LED lamps that would replace a screw in incandescent lamp in commercial applications are at least 25,000 hours. The most recent ENERGY STAR Program Requirements Version 2.1 does qualify lamps with lifetimes of only 15,000 hours. However, Navigant assumed that most commercial lighting installers consider operating cost over first cost of the lamp and would purchase the longer lifetime products with a minimum lifetime of 25,000 hours.

Navigant only estimated O&M costs for the top nine lighting measures for both the Standard and Small Business programs. These measures accounted for over 90% of savings across these programs.

Navigant also estimated the lamp lifetime for the baseline equipment for each measure. Metal halide lamps have a lifetime of approximately 21,000 hours. T8 linear fluorescent lamps have a lifetime of around 24,700 hours. Directional incandescent screw in bulbs have a lifetime of around 2,500 hours.

The lifetime in years is determined based on dividing the lamp lifetime by the annual operating hour assumption for that measure. The annual operating hour is based on the first-round of lighting logger data analysis. Navigant developed a maintenance schedule for the baseline equipment that repeats itself for the duration of the efficient technology. For example, if the efficient LED luminaire lifetime is 12 years and the T8 linear fluorescent baseline lifetime is 5 years, then the baseline lamp and labor cost would have been incurred twice during the efficient measure lifetime in the fifth and the tenth years.

Navigant estimated the baseline equipment labor cost after reviewing online documents on labor cost. Equipment and labor cost varies based on baseline technology type (metal halide, T8 linear fluorescent, or incandescent). Labor cost is also higher for exterior lighting measures. Navigant based the baseline lamp cost on online research of lamp pricing.

Navigant calculated the present value of the O&M savings throughout the lifetime of the efficient technology using a 6.58% discount rate provided by KCP&L. The present value of the O&M savings is added to the numerator of the applicable cost tests, including the Total Resource Cost test.

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-GMO portfolio of energy efficiency and demand response (DR) programs.

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The objective 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,[6] 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 PY2016 evaluation. The Navigant team conducted new NTG research for four programs in the PY2016 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.

[6] 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	Self-report				
Strategic Energy Management					X
Block Bidding			X		
Online Business Energy Audit					X
Small Business Lighting	Self-report				
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	Self-report				
Income-Eligible Multi Family			X		
Income-Eligible Weatherization			X		
Home Lighting Rebate	Demand elasticity modeling				
Residential Programmable Thermostat					

The remainder of this section describes the self-report method used for Business EER Standard, Small Business Lighting, and Home Lighting Rebate. The demand elasticity modeling method is described in the Home Lighting Rebate program-specific methodology.

C.2.1 Participant FR

This section presents the general FR methodology used for the Business Energy Efficiency Rebate (Business EER) Standard, Small Business Lighting (SBL), and Whole House Efficiency (WHE) programs. FR was assessed using a customer self-report approach following the Research Into Action and Energy Trust of Oregon (ETO) framework.[7] 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.

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

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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).

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. Table C-4 and Table C-5 summarize the FR intention calculation for the WHE program and the Business EER Standard and SBL programs, respectively, showing the possible response combinations to the questions described above and the intention score assigned to each unique combination.

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Table C-4. FR Intention Scores: WHE Program

Question	Response	Intention Score
Q1. If the rebate program had not been available, which of the following actions best describes what you would have done?	Canceled the project	0
	Postponed the project	0
	Purchased a less efficient product	25
	Purchased exactly the same product	Based on response to Q2
	Don't know	25
Q2. Does that mean you would have paid an additional [rebate amount] to purchase the exact same [measure]?	Yes	50
	Don't know	37.5
	No	25

Sources: Navigant analysis and Research Into Action and ETO Standard FR Protocol

Table C-5. FR Intention Scores: Business EER Standard and SBL

Question	Response	Intention Score
Q1. If the rebate program had not been available, which of the following actions best describes what you would have done?	Canceled the project	0
	Postponed the project	0
	Purchased a less efficient product	Based on response to Q2
	Purchased fewer energy efficient products*	Based on response to Q3
	Purchased exactly the same product	Based on response to Q4
	Don't know	25
Q2. How much less efficient would the [measure] you would have purchased instead been?	Almost as efficient	37.5
	Somewhat less efficient	25
	Much less efficient (minimal efficiency level available)	12.5
	Don't know	25
Q3. How many fewer [measure] would you have purchased?	Most of them (approximately two-thirds of the measures or more)	37.5
	Some of them	25
	Few of them (approximately one-third or the measures of fewer)	12.5
	Don't know	25
Q4. Does that mean your business would have paid an additional [rebate amount] to cover the entire cost of the [measure]?	Yes	50
	Don't know	37.5
	No	25

**Response option only available if the participant's measure quantity was greater than one.*

Sources: Navigant analysis and Research Into Action and ETO Standard FR Protocol

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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.

Table C-6. 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-7 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-7. 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

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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?
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 = 0%
- 3 = 50%
- 4 = 100% (full attribution)
- 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

$$\text{Participant SO} = \Sigma\text{Measure SO}$$

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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.[8] 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.

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 in the WHE, Business EER Standard, and SBL programs.

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-8 presents the question and resulting program volume influence scores.

[8] The strata for the WHE participant survey were based on the measures installed by the participant: Kit Only, HVAC, or Envelope. The strata for the Business EER Standard program were Lighting (Large), Lighting (Medium), Lighting (Small), and Non-Lighting.

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Table C-8. 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-9. Note that a high likelihood score converts into a low program influence score and vice versa.

Table C-9. 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-10. 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

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Table C-11. 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.

Trade Ally Direct Estimate of FR. The web surveys (see Section A.2) 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. In the Business EER Standard and SBL program trade ally survey, the trade allies were also asked to estimate upper and lower bounds on the number of units sold that were influenced by the program, which is another direct assessment of FR. 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

$$Trade\ Ally\ FR_{\ Measure} = \frac{\sum Trade\ Allies'\ Direct\ Estimate\ of\ Units\ Sold\ without\ Program}{\sum Program\ Incented\ Units}$$

Table C-12 below provides a summary of trade ally and participant free ridership (FR) estimates by measure type for the Whole House Efficiency (WHE) program. The evaluator used the trade ally free ridership as a cap on participant FR because trade allies have insight into changes in availability of higher efficiency products, while participants have a sense of what they, the participant can and cannot afford without incentives. For example, if a product was unlikely to be available or offered to a customer, or the trade allies wouldn't have had the qualified staff available to install high efficiency measures, participants

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are unlikely to be free riders, regardless of what the participant thinks they would have done without incentives.

Table C-12. Free Ridership by Measure Type and Program Actor (WHE Program Only)

Measure Type	Trade Ally Estimate of Free Ridership	Participant Estimate of Free Ridership
Air Conditioners	46%	47%
Heat Pumps	39%	44%
Air Sealing	19%	24%

Source: Navigant analysis

For the Standard and SBL program, the evaluation did not directly use the trade ally data in the free ridership analysis, only in non-participant spillover, per industry standard guidelines.

C.2.3.2 NPSO Methodology

The Business EER Standard and SBL 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%

Equation C-8. Attribution Factor

$$\text{Attribution} = \text{PITA Score}^* \text{ SO Influence Score}$$

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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,[9] the KCP&L GMO 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.

[9] 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)	N/A	N/A
	Small Business Lighting (SBL)	1a	2a and 2b
Residential Energy Efficiency Programs	Income-Eligible Weatherization** (IEW)	1a	2b
	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 did not conduct any impact evaluation activity for SEM in 2016 as it did not report any energy savings in 2016.*

***Savings are only claimed for IEW for GMO in 2016. Given that the program was evaluated in previous cycles with realization rates of close to 100%, Navigant recommends limiting impact evaluation for this program to ensure KCP&L's reported savings reflect values tracked in its program databases.*

****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 for PY2016:

- Gross impact evaluation (detailed in Section E.1)
- Process evaluation (detailed in Section E.2)
- NTG analysis (detailed in Section C.2)

E.1 Gross Impact Evaluation Methodology

The evaluation team conducted the bulk of the Standard program gross impact evaluation activities in PY2016, with smaller efforts planned 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 PY2016:

- Tracking database review
- Deemed measure savings review
- Verified savings analysis

E.1.1 Tracking Database Review

The evaluation team conducted a thorough review of the program tracking database in December 2016 for the tracking data for the first 8 months (April 2016-November 2016) of PY2016. Navigant reviewed the program tracking database to assess the availability of data fields that inform the impact and process evaluations, 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[10] levels
- Project costs (implementation cost and incremental equipment cost)
- Trade ally contact information

[10] 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 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 reviews 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.

E.1.3 Verified Savings Analysis

This section describes Navigant's methodology for the sampling, onsite verification, and analysis of the Business EER Standard projects in the PY2016 evaluation sample.

E.1.3.1 Sampling

Navigant selected a sample of projects completed through November 2016 for onsite EM&V during the January-February 2017 timeframe to enable the completion of this report in the required timeframe. This assumes that the population of projects through the end of November 2016 are representative of the entire PY2016 populations of the Business EER Standard program.

For the PY2016 sample, 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.

Table E-1: Business EER Standard Program Meter Count by Building Type

Strata	PY2016 Standard		PY2016 SBL		Cycle 1	Loggers	Total
	GMO	KMO	GMO	KMO	GMO	KMO	
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

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E.1.3.2 Onsite Verification and Metering

Navigant conducted onsite verification and monitoring of sampled projects for the Business EER Standard program in PY2016. The focus of this fieldwork is to obtain building type level parameters for HOUs and CFs for the lighting measures installed through the program. Navigant metered most of the sampled projects for the short-term duration (8 weeks, February 2017-April 2017). Based on feedback from the KCP&L team, Navigant selected three strata—school, warehouse, and office—for long-term (12 months) metering. "Warehouse" building type represents highest energy savings (32%) of the program level savings for PY2016. "School" building type has considerable seasonality through a typical year which Navigant aims to capture through the long-term metering. "Office" building type represents less than 5% of program level energy savings for PY2016 however KCP&L anticipates the 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, along with the other short-term sites, and used that data for the interim verification. Navigant used onsite verification to verify project implementation and to collect the operating parameters for installed lighting projects. Navigant used this metered data (lighting loggers, current data loggers, etc.) to develop building type level inputs for HOUs and CFs to be used in the verified savings calculations. Navigant will update the building type HOU and CF parameters for the three long-term metering strata in the first quarter of 2018 based on the findings from the long-term metering.

E.1.3.3 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 Illinois TRM Version 5.0 [11]which is industry standard algorithms for engineering review of the following measures implemented in PY2016

1) Lighting
2) Air Sourced Air Conditioners
3) Air Source Heat Pump
4) Compressed Air – No Loss Condensate Drain/Valve
5) ECM Motors Walk-in Coolers & Freezers
6) High Volume Low Speed Fans (20ft and 24ft Diameters)
7) Strip Curtains
8) Variable Speed Drive Compressor – 3 Shift Weekdays Plus Weekends

[11] Illinois TRM Version 5.0 is the updated version of the Illinois TRM, which was published on February 11, 2016. It can be accessed here: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final.pdf

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For the measures of Advanced Rooftop Unit Controls, Pool Pump VSD, and Variable Speed ECM Pump (<100 Watts Max Input, Domestic Hot Water Recirculation), Navigant evaluation team applied savings numbers from the program's identified deemed savings values. Navigant verified these savings numbers reasonable based on the provided sources.

Lighting Measures

Consistent with the evaluation team's approach in the MEEIA Cycle 1 evaluation, the team referenced the Illinois TRM Version 5.0 to obtain the calculation inputs.

Energy Savings

Equation E-1. Energy Savings for C&I Lighting Measures

$$\Delta kWh = \frac{(Watts_{base}\text{-}Watts_{ee}) * ISR * Hours * WHF_e}{1{,}000}$$

Where:

$Watts_{base}$ Wattage of actual baseline lighting fixture/lamp. The evaluation team used the following data sources (listed by priority)

i. Wattages from the onsite verification for the LED High Bay (176-350W) measure

ii. Wattages derived from the Illinois TRM Version 5.0, Illinois TRM Version 4.0[12], or Appendix B Table of Standard Fixture Wattages[13]

$Watts_{ee}$ Actual wattage of installed efficient lighting. The evaluation team used the following data sources (listed by priority):

1. Actual wattage from the onsite verification
2. Efficient wattage derived from the Illinois TRM Version 5.0, the Illinois TRM Version 4.0, 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)

Hours[14] Average HOU per year. The evaluation team used the following data sources to get the HOU (listed by priority):

1. Actual HOU from logged data
2. Self-reported HOU from the site contact, verified during the site visit
3. HOU according to space type from Section 4.5 of the Illinois TRM Version 5.0

WHF_e[15] Waste heat factor for energy to account for cooling energy savings from efficient lighting. The evaluation team will reference Section 4.5 from the Illinois TRM Version 5.0.

[12] Navigant used the Illinois TRM Version 4.0 for wattages of few measures which are not in the Illinois TRM Version 5.0.

[13] 2013-15 Statewide Customized Offering Procedures Manual for Business: http://www.aesc-inc.com/download/spc/2015SPCDocs/PGE/Customized%201.0%20Policy.pdf

[14] The current version of the MEEIA TRM uses annual HOU from the Illinois TRM Version 4.0 for the Office-Midrise space type for most interior lighting measures. There are three other sources referenced in the MEEIA TRM for lighting measures. The evaluation team is working with the KCP&L team to understand the rationale behind using different data sources for the lighting measures.

[15] Ibid.

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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. Actual CF derived from the logged data 2. CF according to space type from Section 4.5 of the Illinois TRM Version 5.0
WHF_d	Waste heat factor for demand to account for cooling energy savings from efficient lighting. The evaluation team will reference Section 4.5 from the Illinois TRM Version 5.0.

Air Sourced Air Conditioners

Navigant applied the International Energy Conservation Code (IECC) 2012 as the baseline for baseline SEER, EER, and other baseline energy efficiency ratings. For the installed energy efficiency equipment, Navigant confirmed energy efficiency ratings through field work verification and checking into the model numbers and manufacturers of products provided from the tracking database.

Energy Savings

Equation E-3. Energy Savings for Measure of Air Sourced Air Conditioners

For units with cooling capacities less than 65 kBtu/hr:

$$\Delta kWH = (kBtu/hr) * [(1/SEERbase) - (1/SEERee)] * EFLH$$

For units with cooling capacities equal to or greater than 65 kBtu/hr:

$$\Delta kWH = (kBtu/hr) * [(1/EERbase) - (1/EERee)] * EFLH$$

Where:

kBtu/hr	Capacity of the cooling equipment installed in kBtu per hour (1 ton of cooling capacity equals 12 kBtu/hr)
SEERbase	Baseline SEER from the Illinois TRM Version 5[16]
SEERee	Efficient case SEER value. The evaluation team used the following data sources (listed by priority): 1. Field work findings 2. Checking the model numbers and manufacturers of installed energy efficiency equipment, or, 3. Tracking data
EERbase	Baseline SEER from the Illinois TRM Version 5
EERee	Efficient case SEER value. The evaluation team used the following data sources (listed by priority):

[16] The Section 4.4.15 of the Illinois TRM Version 5 includes both IECC 2012 and IECC 2015 as the baseline. Navigant used the IECC 2012 for PY2016 evaluation.

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1. Field work findings
2. Checking the model numbers and manufacturers of installed energy efficiency equipment, or,
3. Tracking data

EFLH Equivalent Full Load Hours for Cooling are provided in Section 4.4 HVAC End Use of the Illinois TRM Version 5

Coincident Peak Demand Savings

Equation E-4. Coincident Peak Demand Savings for Measure of Air Sourced Air Conditioners

$$\Delta kW_{SSP} = (kBtu/hr * (1/EERbase - 1/EERee)) * CF_{SSP}$$

Where:

kBtu/hr Same as above.
EERbase Same as above.
EERee Same as above.
CF Summer peak coincident demand savings factor from the Illinois TRM Version 5 = 91.3%

Air Source Heat Pump

The evaluation team used the same approach to collect both baseline and efficient energy efficiency ratings, as stated above for measure of Air Sourced Air Conditioners.

Energy Savings

Equation E-5. Energy Savings for Measure of Air Source Heat Pump

For units with cooling capacities less than 65 kBtu/hr:

$$\Delta kWh = \text{Annual kWh Savings}_{cool} + \text{Annual kWh Savings}_{heat}$$
$$\text{Annual kWh Savings}_{cool} = (kBtu/hr_{cool}) * [(1/SEERbase) – (1/SEERee)] * EFLH_{cool}$$
$$\text{Annual kWh Savings}_{heat} = (kBtu/hr_{heat}) * [(1/HSPFbase) – (1/HSPFee)] * EFLH_{heat}$$

For units with cooling capacities equal to or greater than 65 kBtu/hr:

$$\Delta kWh = \text{Annual kWh Savings}_{cool} + \text{Annual kWh Savings}_{heat}$$
$$\text{Annual kWh Savings}_{cool} = (kBtu/hr_{cool}) * [(1/EERbase) – (1/EERee)] * EFLH_{cool}$$
$$\text{Annual kWh Savings}_{heat} = (kBtu/hr_{heat})/3.412 * [(1/COPbase) – (1/COPee)] * EFLH_{heat}$$

Where:

$kBtu/hr_{cool}$ Capacity of the cooling equipment actually installed in kBtu per hour
SEERbase Seasonal Energy Efficiency Ratio of the baseline equipment based on the IECC 2012
SEERee Seasonal Energy Efficiency Ratio of the installed energy efficient equipment.
$EFLH_{cool}$ Equivalent Full Load Hours for cooling are provided in Section 4.4 HVAC End Use of the Illinois TRM Verstion 5.0
HSPFbase Heating Seasonal Performance Factor of the baseline equipment based on the IECC 2012
HSPFee Heating Seasonal Performance Factor of the installed energy efficient equipment. If rating is COP, HSPF = COP * 3.413
$EFLH_{heat}$ Equivalent Full Load Hours for Heating are provided in section 4.4 HVAC End Use of the Illinois TRM Version 5.0
EERbase Energy Efficiency Ratio of the baseline equipment based on the IECC 2012

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	For units < 65 kBtu/hr, assume the following conversion from SEER to EER for calculation of peak savings:[17] EER = (-0.02 * SEER^2) + (1.12 * SEER)
EERee	Energy Efficiency Ratio of the installed energy efficient equipment
kBtu/hr$_{heat}$	Capacity of the installed heating equipment in kBtu per hour
3.412	Btu per Wh
COPbase	Coefficient of performance of the baseline equipment based on IECC 2012. If rating is HSPF, COP = HSPF / 3.413
COPee	Coefficient of performance of the installed energy efficient equipment

Coincident Peak Demand Savings

Equation E-6. Coincident Peak Demand Savings for Measure of Air Source Heat Pump

$$\Delta kW_{SSP} = (kBtu/hr * (1/EERbase - 1/EERee)) * CF_{SSP}$$

Where:

kBtu/hr	Same as above.
EERbase	Same as above.
EERee	Same as above.
CF	Summer peak coincident demand savings factor from the Illinois TRM Version 5 = 91.3%

Compressed Air – No Loss Condensate Drain/Valve

Navigant evaluation team utilized the calculation inputs from the Section 4.7.3 of the Illinois TRM Version 5.0.

Energy Savings

Equation E-7. Energy Savings for Measure of Compressed Air – No Loss Condensate Drain/Valve

$$\Delta kWh = CFM_{reduced} \times kW_{CFM} \times Hours$$

Where:

CFMreduced	Reduced air consumption (CFM) per drain 3 CFM
kWCFM	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 6136 hours

Coincident Peak Demand Savings

Equation E-8. Coincident Peak Demand Savings for Measure of Compressed Air – No Loss Condensate Drain/Valve

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

[17] Based on Wassmer, M. (2003). A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculations. Masters Thesis, University of Colorado at Boulder. Note this is appropriate for single speed units only.

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Hours Same as above
CF 0.95

ECM Motors Walk-in Coolers & Freezers
The Section 4.6.4 of the Illinois TRM Version 5.0 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.

High Volume Low Speed Fans (20ft and 24ft Diameters)
The Section 4.1.2 of the Illinois TRM Version 5.0 provides deemed savings for this measure. Navigant used the deemed savings summarized in Table E-2 and Table E-3 below.

Table E-2: Deemed kWh Savings for Measure of High Volume Low Speed Fans

Fan Diameter Site (feet)	kWh Savings
20	6,577
22	8,543
24	**10,018**

Source: Section 4.1.2 of the Illinois TRM Version 5.0

Table E-3: Deemed kW Savings for Measure of High Volume Low Speed Fans

Fan Diameter Site (feet)	kW Savings
20	2.4
22	3.1
24	**3.7**

Source: Section 4.1.2 of the Illinois TRM Version 5.0

Strip Curtains
The Section 4.6.7 of the Illinois TRM Version 5.0 includes deemed savings for Strip Curtain measure.

Energy Savings

Equation E-9. Energy Savings for Measure of Strip Curtains

$$\Delta kWh = 2{,}974 \text{ per freezer with curtains installed}$$
$$= 422 \text{ per cooler with curtains installed}$$

Coincident Peak Demand Savings

Equation E-10. Coincident Peak Demand Savings for Measure of Strip Curtains

$$\Delta kW = \Delta kWh / 8766 * CF$$
$$= 0.34 \text{ for freezers}$$
$$= 0.05 \text{ for coolers}$$

Where:
8766 Hours per year
CF 1.0

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Variable Speed Drive Compressor – 3 Shift Weekdays Plus Weekends
The evaluation team employed the calculation inputs from the Section 4.7.1 of the Illinois TRM Version 5.0.

Energy Savings

Equation E-11. 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-11. Coincident Peak Demand Savings for Measure of Variable Speed Drive Compressor

$$\Delta kW = \Delta kWh / HOURS * CF$$

Where:

CF	0.95

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, trade ally surveys, and participant surveys in PY2016 for the C&I Business EER Standard program.

Table E-4 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table E-4. 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 PY2016, and what changes are planned for PY2017?	• 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 • 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 • 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 • Trade ally surveys
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • 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 • Trade ally surveys • Participant surveys

Source: Navigant

E.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview on September 23, 2016. 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 Market Actor Surveys

Navigant deployed web-based market actor surveys from March 16, 2017 to April 21, 2017. The 19[18] market actor surveys (survey instrument available in Appendix A) also served the process evaluation. Navigant asked market actors about their opinions on the following topics:

- Types and effectiveness of training provided to trade allies

[18] Total for GMO and KCP&L-MO combined.

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- Program influence on trade allies' sales of high efficiency equipment
- Trade allies' comfort with the implementation contractor's field tool and application process
- Trade allies' target markets
- Trade allies' reasoning for applying for rebates using the SBL program versus the Business EER Standard program
- Satisfaction with the program overall
- Insights into future program improvements

E.2.3 Participant Surveys

Navigant deployed web-based participant surveys from April 3, 2017 to April 21, 2017.

Table E-5. Sample Design and Response Rate

	GMO & KCP&L-MO Total
Population	420
Customers Contacted	58
Web Completions	56
Response Rate	97

**This population is from the March 3rd 2017 tracking data and does not include all PY1 customers. Navigant combined the GMO and KCP&L-MO populations due to a need for a larger sample.*

Source: Navigant analysis

The surveys measured the following:

- Participant program awareness and decision-making process
- Participant FR and SO
- Participant satisfaction with the program overall
- Participant insights into future program improvements

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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 through a broad range of energy efficiency options that address all major end uses and processes. Equipment that does not qualify for a standard rebate is eligible for a custom rebate.

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 for PY2016:

- Gross impact evaluation (detailed in Section F.1)
- Process evaluation (detailed in Section F.2)

F.1 Gross Impact Evaluation Methodology

In MEEIA cycle 2, the Business EER Custom program had low participation for PY2016. Due to the lower energy/demand savings from low participation in PY2016, KCP&L and the evaluation team decided to undertake the bulk of the evaluation activities for the Custom program in PY2017. For PY2016, the evaluation team performed an abridged verification that included the following activities:

- Tracking database review
- Engineering desk review

F.1.1 Tracking Database Review

The evaluation team conducted a thorough review of the program tracking database in December 2016 as described in the section E.1.1.

F.1.2 Engineering Desk Review

This section describes Navigant's methodology for the sampling and engineering review of the Business EER Custom projects in PY2016 evaluation sample.

F.1.2.1 Sampling

In April 2017, the evaluation team requested the tracking data and drew a small evaluation sample for an engineering desk review. Navigant used a stratified ratio estimation sampling design to develop an efficient sample achieving 90/20 confidence/precision on the program-level realization rate. Navigant stratified the Custom program population by project size and divided them into large and small strata.

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Navigant evaluation team randomly selected projects proportionately with each stratum to ensure the following:

- The evaluation of the largest projects and contributors to the program performance; and
- The fair representation of smaller projects in the evaluation.

F.1.2.2 Engineering Review

The evaluation team requested the project files for the sampled projects and performed an engineering desk review. The goal of this review was to assess the algorithms, assumptions, and/or models used to estimate the reported savings. Specifically, from these reviews, Navigant accomplished the following:

- Confirmed the reasonability of the baseline energy and demand consumption
- Reviewed the algorithms and assumptions used in developing reported savings and adjusted those as necessary
- Recreated the verified savings utilizing Navigant's evaluation methodologies which depend on specific implemented project and energy efficient measures

The evaluation team developed a realization rate for the Custom program for PY2016 based on this engineering desk review.

F.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 for the Business EER Custom program in PY2016. The program is scheduled to receive its full-scale process evaluation in PY2017.

Table F-1 displays the evaluation team's key process research questions and the evaluation activities that will be conducted to address these questions.

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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 PY2016, and what changes are planned for PY2017?	• 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

F.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview in February 2017 as described in Section E.2.1.

F.2.2 Materials Review

Navigant conducted a review of the program description and documents available on the KCP&L website to understand the Custom program application process and program requirements.

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APPENDIX G. C&I BLOCK BIDDING PROGRAM-SPECIFIC METHODOLOGIES

The Block Bidding program seeks to purchase blocks of electric savings by issuing a request for proposal (RFP) to eligible customers and third-party suppliers. The RFP details the proposal requirements and the electric savings that must be achieved. 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 installing energy efficiency equipment or a bundle of projects across multiple sites and/or customers. This is a new program for the PY2016-PY2018 implementation cycle.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2b to evaluate the C&I Block Bidding program. This evaluation of the Block Bidding program consisted of the following activities for PY2016:

- Gross impact evaluation (detailed in Section G.1)
- Process evaluation (detailed in Section G.2)

G.1 Gross Impact Evaluation Methodology

The Business Energy Efficiency Block Bidding (Block Bidding) program is new and started in April 2016. In PY2016, there was only one winning auction participant. This participant's savings and project files were finalized after the end of PY2016 (March 2017). Thus, KCP&L and the evaluation team decided to undertake the bulk of the evaluation activities for the Block Bidding program in PY2017. For PY2016, the evaluation team performed an abridged verification that included following activities:

- Tracking database review
- Engineering desk review

G.1.1 Tracking Database Review

The evaluation team conducted a tracking database review of the Block Biding program in April 2017, in the same method as with the Custom program as detailed in Section F.1.1.

G.1.2 Engineering Desk Review

This section describes Navigant's methodology for the sampling and engineering review of the Block Bidding program projects in the PY2016 evaluation sample.

G.1.2.1 Sampling

In April 2017, the evaluation team requested the tracking data and found that only one Block Bidding project was completed in PY2016. So, Navigant reviewed the single PY2016 project.

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G.1.2.2 Engineering Review

The evaluation team requested the project files for the sampled projects and performed an engineering desk review. Since the population for Block Bidding for GMO in PY2016 included only one lighting project, Navigant calculated verified savings as described in the section E.1.3.3.

The only difference for the Block Bidding engineering review of this lighting project is that Navigant used the reported HOUs from the project file for the lighting system under consideration while calculating the verified energy savings.

The evaluation team developed a realization rate for the Block Bidding program for PY2016 based on this engineering desk review.

G.2 Process Evaluation

Navigant addressed the five Missouri-required questions for process evaluation through staff interviews and a program materials review for the Block Bidding program in PY2016. The program is scheduled to receive its full-scale process evaluation in PY2017.

Table G-1Table G-1 displays the evaluation team's key process research questions and the evaluation activities that will be 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
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

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G.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview in February 2017 as described in the section E.2.1.

G.2.2 Materials Review

Navigant conducted a review of the program description and documents available on the KCP&L website to understand the Block Bidding program application process and program requirements.

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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.

The SEM program did not report savings in PY2016; thus, it was excluded from the PY2016 impact evaluation.

H.1 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. The program is scheduled to receive its full-scale process evaluation in PY2017.

Table H-1 displays the evaluation team's key process research questions and the evaluation activities that will be conducted to address these questions.

Table H-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
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

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H.1.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview in February 2017. Specific process topics addressed included the following:

- Program operation, challenges, successes, and goals
- Qualifications for customers to participate in the SEM program

H.1.2 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.

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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. This is a new program for the PY2016-PY2018 implementation cycle.

Based on Missouri regulations (see Appendix D), the evaluation team used method 1a and protocol 2a and 2b to evaluate the SBL program. This evaluation of the SBL program consisted of the following activities for PY2016:

- Gross impact evaluation (detailed in Section I.1)
- Process evaluation (detailed in Section I.2)
- NTG analysis (detailed in Section C.2)

I.1 Gross Impact Evaluation Methodology

The evaluation team conducted the bulk of the SBL program evaluation in PY2016, with smaller efforts planned 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 PY2016:

- 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 December 2016 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 savings for the SBL program. 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.

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I.1.3 Verified Savings Analysis

This section describes Navigant's methodology for the sampling, onsite verification, and analysis of the SBL projects in the PY2016 evaluation sample.

I.1.3.1 Sampling

Navigant selected a midyear evaluation sample for onsite EM&V during the winter of 2016 to enable the completion of this report in the required timeframe. This is common in the industry and assumes that the populations of projects through the end of November 2016 are representative of the entire PY2016 populations of the SBL program.

Navigant used a stratified ratio estimation sampling design to develop an efficient sample achieving 90/20 confidence/precision on the program-level realization rate. For efficiencies, Navigant added SBL measures as its own stratum to the Standard program sample. 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.

I.1.3.2 Onsite Verification and Metering

Navigant partnered with Tierra to conduct onsite verification and monitoring of the sampled projects for the SBL program in PY2016. Navigant metered all sampled SBL projects for the short-term duration (8 weeks, February 2017-April 2017). The team retrieved short-term data for these sites in April 2017.

Navigant used onsite verification to verify project implementation and to collect the operating parameters for the installed projects. Additionally, the metered data (lighting loggers, current data loggers, etc.) provided inputs for the HOU and/or CF.

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

The evaluation team used industry standard algorithms to calculate the verified savings from the lighting measures discussed in Section E.1.3.3. These algorithms include WHFs, which account for cooling energy savings from efficient lighting. Consistent with the evaluation team's approach in the MEEIA Cycle 1 evaluation, the team referenced Illinois TRM Version 5.0[19] to obtain these values.

Energy Savings

The evaluation team used Equation E-1 to calculate energy savings for SBL measures.

[19] Illinois TRM Version 5.0 is the updated version of the Illinois TRM, which was published on February 11, 2016. It can be accessed here: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final.pdf

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Coincident Demand Savings

The evaluation team used Equation E-2 to calculate coincident demand savings for SBL measures.

I.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, ride-along visits, trade ally surveys, and participant surveys in PY2016 for SBL program.

Table I-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table I-1. Process Evaluation Research Questions and Approaches

Process Evaluation Research Question	Evaluation Activities
General Process Evaluation Questions	
1. How satisfied are trade allies and participants with the program overall?	• Trade ally surveys • Participant surveys • Ride-along visits
2. How do trade allies decide on pursuing a rebate through the SBL program as opposed to the Business EER Standard program?	• Program staff interviews • Trade ally interviews • Ride-along visits
Missouri-Required Questions for Process Evaluation	
1. What are the primary market imperfections that are common to the target market segment?	• Program staff interviews • Market actor surveys
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	• Program staff interviews • Market actor 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 • Market actor surveys
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?	• Program staff interviews • Market actor surveys • Ride-along visits • 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 • Market actor surveys • Ride-along visits • Participant surveys

Source: Navigant

I.2.1 Program Staff Interviews

Navigant conducted a program manager interview on September 27, 2016 and an implementation contractor interview on October 6, 2016 as described in the section E.2.1.

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I.2.2 Onsite Ride-Along Visits

Navigant conducted three onsite ride-along visits plus an in-depth interview with the implementation contractor on October 20-21, 2016. Specific process topics addressed in the ride-along visits and the interview included the following:

- Application process from qualification through rebate, including an overview of the implementation contractor's field tool
- Inspection process and circumstances for which inspections are required
- Adequacy of program offerings for meeting participant needs
- Participant decision-making regarding lighting purchases

I.2.3 Market Actor Surveys

Navigant deployed web-based market actor surveys from March 16, 2017 to April 21, 2017. The 12[20] market actor surveys (survey instrument available in Appendix A) also served the process evaluation. Navigant asked market actors about their opinions on the following topics:

- Types and effectiveness of training provided to trade allies
- Program influence on trade allies' sales of high efficiency equipment
- Trade allies' comfort with the implementation contractor's field tool and application process
- Trade allies' target markets
- Trade allies' reasoning for applying for rebates using the SBL program versus the Business EER Standard program
- Satisfaction with the program overall
- Insights into future program improvements

[20] Total for GMO and KCP&L-MO combined.

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I.2.4 Participant Surveys

Navigant deployed web-based participant surveys from April 3, 2017 to April 21, 2017.

Table I-2. Sample Design and Response Rate

	GMO & KCP&L-MO Total
Population	73*
Customers Contacted	29
Web Completions	21
Response Rate	73%

**This population is from the March 3, 2017 tracking data and does not include all PY1 customers. Navigant combined the GMO and KCP&L-MO populations due to a need for a larger sample.*
Source: Navigant analysis

The surveys measured the following:

- Participant program awareness and decision-making process
- Participant FR and SO
- Participant satisfaction with the program overall
- Participant insights into future program improvements

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APPENDIX J. INCOME-ELIGIBLE WEATHERIZATION PROGRAM-SPECIFIC METHODOLOGIES

GMO's Income-Eligible Weatherization (IEW) program provides energy efficiency services to its residential customers who meet the program's income eligibility requirements. The program assists low-income customers in reducing energy use and bills by weatherizing their homes. GMO partners with non-profit, low-income advocacy groups—called community action programs (CAPs)—to implement the program. Weatherization crews hired by CAPs perform site visits at the request of low-income customers to complete home energy audits, identifying drafts and other sources of inefficiency and evaluating needed heating and cooling system repairs. In response to audit findings, pending approval by the program manager, the program may finance air sealing, ceiling insulation, wall insulation, window replacement, and heating or cooling system repairs to effectively weatherize the home.

An official program implementation contractor does not manage this program; rather, customers apply through CAPs. Because these CAPs act as a liaison between participants and the program, they are considered a quasi-implementer for the program. CAPs recruit customers into the program, help customers through the application and screening process, and hire the weatherization crews that perform audits and install measures.

Based on Missouri regulations (see Appendix D), Navigant used impact evaluation method 1a and protocol 2b to evaluate the IEW program. This evaluation program consisted of the following activities for PY2016:

- Gross impact evaluation (detailed in Section J.1)
- Process evaluation (detailed in Section J.2)
- Cost-effectiveness (detailed in Section C.1)

J.1 Gross Impact Evaluation

To estimate gross savings for the IEW program, the evaluation team conducted the following activities during PY2016 to answer the impact evaluation questions:

- Tracking database review
- Desk review of a sample of projects

J.1.1 Tracking Database Review

The evaluation team completed a thorough tracking database review to determine the following:

- Has KCP&L implemented the recommendations that Navigant included in its PY2015 report, primarily providing data included in calculating the energy savings based on the NEAT report? Navigant recognizes that this change may not be cost-effective for this program.
- Does the tracking database include key items needed for measure-level evaluation? Such items include:

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- Measure description
- Measure savings (kW and kWh)
- Savings equations

J.1.2 Desk Review of a Sample of Projects

Navigant drew a sample of 15 projects in the small, medium, and large strata—5 in small, 5 in medium, and 5 in large—such that each contributed equally to the total savings. Within these strata, Navigant drew a random sample of projects to ensure the verified savings was within 20% of the actual savings at the 90% confidence interval.

Navigant stratified the population by savings to ensure a representative sample. For each of the 15 sampled projects, the evaluation team verified the savings output from the NEAT report. Further, the evaluation team noted the adopted measures and associated savings for each individual measure. Navigant used the tracking data from Section J.1.1 to compare the savings from the NEAT report to the savings given in the tracking database.

J.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.

Table J-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table J-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 PY2016, and what changes are planned for PY2017?	• 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

J.2.1 Program Staff Interviews

Navigant conducted a program manager interview and an implementation contractor interview toward understanding program operation and performance to date. Specific process topics addressed included the following:

- Program operation, challenges, successes, and goals
- Qualification process for rebates through the program
- Qualifications for participation in the program

J.2.2 Materials Review

Navigant conducted a review of the program description and documents provided by KCP&L to understand the program's design and communications.

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APPENDIX K. 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 PY2016, 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, water heater tank wrap, hot water pipe insulation, and energy efficient lighting. Tier 2 consisted of weatherization measures including air sealing, ceiling and wall insulation, and ENERGY STAR® windows. Tier 3 consisted of HVAC measures such as heat pump water heaters, ECM furnace fans, ductless mini-split heat pumps, and other efficient air conditioners and 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 PY2016:

- Gross impact evaluation (detailed in Section K.1)
- Process evaluation (detailed in Section K.2)
- Cost-effectiveness (detailed in Section C.1)
- NTG analysis (detailed in Section C.2)

K.1 Gross Impact Evaluation

To estimate gross savings for the WHE program, the evaluation team conducted the following activities during 2016 and 2017:

- Tracking database review
- Deemed savings review

K.1.1 Tracking Database Review

The evaluation team obtained program tracking data monthly from the WHE program management team beginning in June 2016. The team reviewed the program data to assess the following:

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- Ability to verify gross savings by the inclusion of data about the baseline units removed and efficient units installed
- 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.

K.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 analysis consisted of reviewing a sample of WHE project files to verify the following:

- Quantities and type of each measure installed
- Operating status of the measures
- Equipment nameplate data
- Operating schedules
- A careful description of site conditions
- Overall verification of the information contained in the program tracking system

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, it referenced the Illinois TRM Version 5.0[21] to obtain these values, except where otherwise noted. 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.

[21] Illinois TRM Version 5.0 is the updated version of the Illinois TRM, which was published on February 11, 2016. It can be accessed here: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final.pdf

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K.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 MEEIA cycle 1 evaluation, the team referenced Illinois TRM Version 5.0 to obtain these values, except where otherwise noted.

Low-Flow Faucet Aerator Energy Savings

Equation K-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 = 1.826
GPM_{ee}	Efficient Gallons per minute = 1.41 kitchen, 0.94 bathroom
L	Minutes per day = 4.5 kitchen, 1.6 bathroom
Household	Persons per household = 2.56
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 K-2. Low-Flow Faucet Aerator Coincident Demand Savings

$$\Delta kW = \frac{\left[\%ElectricDHW * \left(\left(L * (GPM_{base} - GPM_{low})\right) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR \right]}{Hours * CF}$$

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

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Low-Flow Showerhead Energy Savings

Equation K-3. Low-Flow Showerhead Energy Savings

$$\Delta kWh = \%ElectricDHW * \left(\left(L * \left(GPM_{base} - GPM_{low} \right) \right) \times Household * SCPD * 365.25/SPH \right) * EPG_{electric} * ISR$$

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%

Low-Flow Showerhead Coincident Demand Savings

Equation K-4. Low-Flow Showerhead Coincident Demand Savings

$$\Delta kW = \frac{\left[\left(\%ElectricDHW * \left(\left(L * \left(GPM_{base} - GPM_{low} \right) \right) \times Household * SCPD * \frac{365.25}{SPH} \right) * EPG_{electric} * ISR \right) \right]}{Hours * CF}$$

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 K-5. Advanced Power Strip Energy Savings

$$\Delta kWh_{5\text{-}plug} = 56.5$$
$$\Delta kWh_{7\text{-}plug} = 103$$

Where:

ΔkWh	Deemed energy savings = 56.5 kWh for 5-plug, 103 kWh for 7-plug

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Advanced Power Strip Coincident Demand Savings

Equation K-6. Advanced Power Strip Coincident Demand Savings

$$\Delta kW_{5\text{-plug}} = 0.00634$$
$$\Delta kW_{7\text{-plug}} = 0.0115$$

Where:

ΔkW	Deemed coincident demand savings = 0.00634 kW for 5-plug, 0.0115 kW for 7-plug

Water Heater Tank Wrap Energy Savings

Equation K-7. Water Heater Tank Wrap Energy Savings

$$\Delta kWh = \frac{\left(\left(\frac{A_{base}}{R_{base}} - \frac{A_{ee}}{R_{ee}}\right) * \Delta T * Hours\right)}{(3{,}412 * EffDHW)}$$

Where:

A	Surface area of tank, as defined in Table 1 of Section 5.4.7 of the Illinois TRM Version 5 for various tank capacities
R	Thermal resistance of tank (base) and tank wrap (ee), as defined in Table 1 of Section 5.4.7 of the Illinois TRM Version 5 for various tank capacities and resistance levels
ΔT	Temperature difference between the tank and outside air = 60°F
Hours	Hours in a year = 8,766
3,412	Conversion factor from Btu to kWh
EffDHW	Recovery efficiency of electric water heater = 98%

Water Heater Tank Coincident Demand Savings

Equation K-8. Water Heater Tank Wrap Coincident Demand Savings

$$\Delta kW = \frac{\left[\frac{\left(\left(\frac{A_{base}}{R_{base}} - \frac{A_{ee}}{R_{ee}}\right) * \Delta T * Hours\right)}{(3{,}412 * EffDHW)}\right]}{Hours * CF}$$

Where:

A	Same as above
R	Same as above
ΔT	Same as above
Hours	Same as above
3,412	Same as above
EffDHW	Same as above
CF	Coincidence factor = 1

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Hot Water Pipe Insulation Energy Savings

Equation K-9. 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)
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 K-10. Hot Water Pipe Insulation Coincident Demand Savings

$$\Delta kW = \frac{\Delta kWh}{\mathbf{8,766}}$$

LED Energy Savings

Equation K-11. LED Energy Savings

$$\Delta kWh = \frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Wattage of baseline bulb = 43W
W_{ee}	Wattage of efficient bulb from program tracking data = 9W
ISR	In-service rate = 96.9%
Hours	Average hours of use per year = 847
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.06

LED Coincident Demand Savings

Equation K-12. LED Coincident Demand Savings

$$\Delta kW = \left[\frac{(W_{base}\text{-}W_{ee})}{1{,}000} * ISR * WHF_d\right] * CF$$

Where:

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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 = 1.11
CF	Coincidence factor = 7.1%

K.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 Illinois TRM Version 5.0 to obtain these values, except where otherwise noted.

Air Sealing Energy Savings

Equation K-13. Air Sealing Energy Savings

$$\Delta kWh = \Delta kWh_{cooling} + \Delta kWh_{heating}$$

Equation K-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[22]
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 K-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 ORNL for Kansas City[23]

[22] http://web.ornl.gov/sci/buildings/tools/heating-data/

[23] http://web.ornl.gov/sci/buildings/tools/heating-data/

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0.018	Same as above
EffHeat	SEER of heating equipment = 1.7 for units before 2006, 1.92 for units between 2006 and 2014, 2.40 for units on or after 2015
3,412	Conversion factor from Btu to kWh

Air Sealing Coincident Demand Savings

Equation K-16. Air Sealing Coincident Demand Savings

$$\Delta kW = \left(\frac{\Delta kWh_{cooling}}{EFLH_{cool}}\right) \times CF$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 982 based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days
CF	Coincidence factor = 72% for heat pumps, 68% for air conditioners

Insulation Energy Savings

Equation K-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 ORNL for Kansas City[24]
DUA	Discretionary use adjustment factor = 0.75

[24] http://web.ornl.gov/sci/buildings/tools/heating-data/

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ηCool	Cooling efficiency SEER, from program tracking data when available or as defined in Table 2 of Section 5.6.4 of the Illinois TRM Version 5
Adj_{Cool}	Adjustment for cooling savings from basement wall insulation = 80%
HDD	Heating degree days = 5,155 per ORNL for Kansas City[25]
ηHeat	Heating efficiency, from program tracking data when available or as defined in Table 4 of Section 5.6.4 of the Illinois TRM Version 5
Adj_{Heat}	Adjustment for wall and attic insulation = 60%

Insulation Coincident Demand Savings

Equation K-18. Insulation Coincident Demand Savings

$$\Delta kW = \left(\frac{\Delta kWh_{cooling}}{EFLH_{cool}}\right) \times CF$$

Where:

$EFLH_{cool}$	Effective full load cooling hours = 982 based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days
CF	Coincidence factor = 72% for heat pumps, 68% for air conditioners

Window Energy Savings

Equation K-19. Window Energy Savings

$$\Delta kWh = Esav \times Area$$

Esav	Deemed electricity savings per the 2016 PA TRM[26] = 2.2395 for homes with heat pumps, 4 for homes with air conditioners
Area	Area of installed windows from program tracking data

Window Coincident Demand Savings

Equation K-20. Window Coincident Demand Savings

$$\Delta kW = Dsav \times CF \times Area$$

Dsav	Deemed demand savings per the 2016 PA TRM = 0.000602
CF	Deemed coincidence factor per the 2016 PA TRM = 64.7%

[25] http://web.ornl.gov/sci/buildings/tools/heating-data/

[26] Pennsylvania 2016 TRM with Errata Corrections, effective June 2016, updated February 2017. It can be accessed here: http://www.puc.pa.gov/Electric/docs/Act129/TRM-2016_Errata_Feb2017.docx

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K.1.2.3 Tier 3: HVAC Measures

The evaluation team used industry standard algorithms to calculate the verified savings from the HVAC measures. Consistent with the evaluation team's approach in MEEIA cycle 1 evaluation, the team referenced Illinois TRM Version 5.0 to obtain 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 K-21. Air Conditioner and Air Conditioner, Early Retirement Energy Savings

$$\Delta kWh = \frac{\left(EFLH_{cool} \times CAP_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)\right)}{1{,}000}$$

Where:

$EFLH_{cool}$ Effective full load cooling hours = 982. Based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days.

CAP_{cool} Cooling capacity from program tracking data

$SEER_{base}$ Baseline SEER from the Illinois TRM Version 5. The Early Retirement baseline SEER is an average of the 2015 program tracking data. A SEER of 6.82 was used.

$SEER_{ee}$ Installed SEER from program tracking data when available, or the average SEER of the installed units when not available for a specific project.

Air Conditioner and Air Conditioner, Early Retirement Coincident Demand Savings

Equation K-22. Air Conditioner and Air Conditioner, Early Retirement Coincident Demand Savings

$$\Delta kW = \left(\frac{CAP_{cool} \times \left(\frac{1}{EER_{base}} - \frac{1}{EER_{ee}}\right)}{1{,}000}\right) \times CF$$

Where:

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CAP_{cool}	Same as above
EER_{base}	The Early Retirement baseline EER is an average of the 2015 program tracking data and is equal to 6.00[27]. Baseline EER for New/Replacement units is sourced from the Illinois TRM Version 5 and is equal to 11.20.
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 Version 5's deemed value if neither is available.
CF	Summer peak coincidence factor = 68%

$EFLH_{Cooling}$ and $EFLH_{Heating}$ Approach Summary

To maintain consistency within the evaluation, Navigant leveraged the Illinois TRM (Version 5.0) to develop a more precise estimate (when compared to a weighted average based on housing units) of Full Load Hours Cooling (FLH_c) and Full Load Hours Heating (FLH_h). Using Cooling Degree Day (CDD)[28] and Heating Degree Day (HDD) data for each of the four regions presented in the Illinois TRM, Navigant developed a linear equation, shown below in Equation K-23, to estimate a normalized FLH_c and FLH_h for Kansas City, MO, using an HDD and CDD of 5154.5 and 1444.5, respectively.

Navigant used a simple linear slope equation to estimate the Normalized FLH_c and FLH_h, as presented below in Equation K-23:

Equation K-23. Normalized Full Load Hours – Cooling/Heating

$$y = mx + b$$

Where:

Y	Normalized Full Load Hours – Cooling/Heating
m	0.6032 FLH_c / 0.3605 FLH_h
b	110.93 FLH_c / 482.9 FLH_h
x	CDD or HDD for city or region of interest.

Table K-1 below shows a comparison of the $FLH_{c/h}$ presented in the Illinois TRM, Normalized $FLH_{c/h}$ based on Equation K-23, and Energy Star estimates for cooling hours and heating hours. Also shown in Table K-1, the evaluation team also reviewed Energy Star estimates for the cities presented in the Illinois

[27] Note – Navigant updated the EER_{base} of 6.71 from the KCP&L-GMO 2015 EM&V report to 6.00 in the PY 2016 evaluation based on an updated analytical methodology to maintain consistency with industry standards.

[28] http://web.ornl.gov/sci/buildings/tools/heating-data/

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TRM in addition to Kansas City and found that the normalized values used in the PY 2016 evaluation were conservative when compared to the values used by Energy Star.

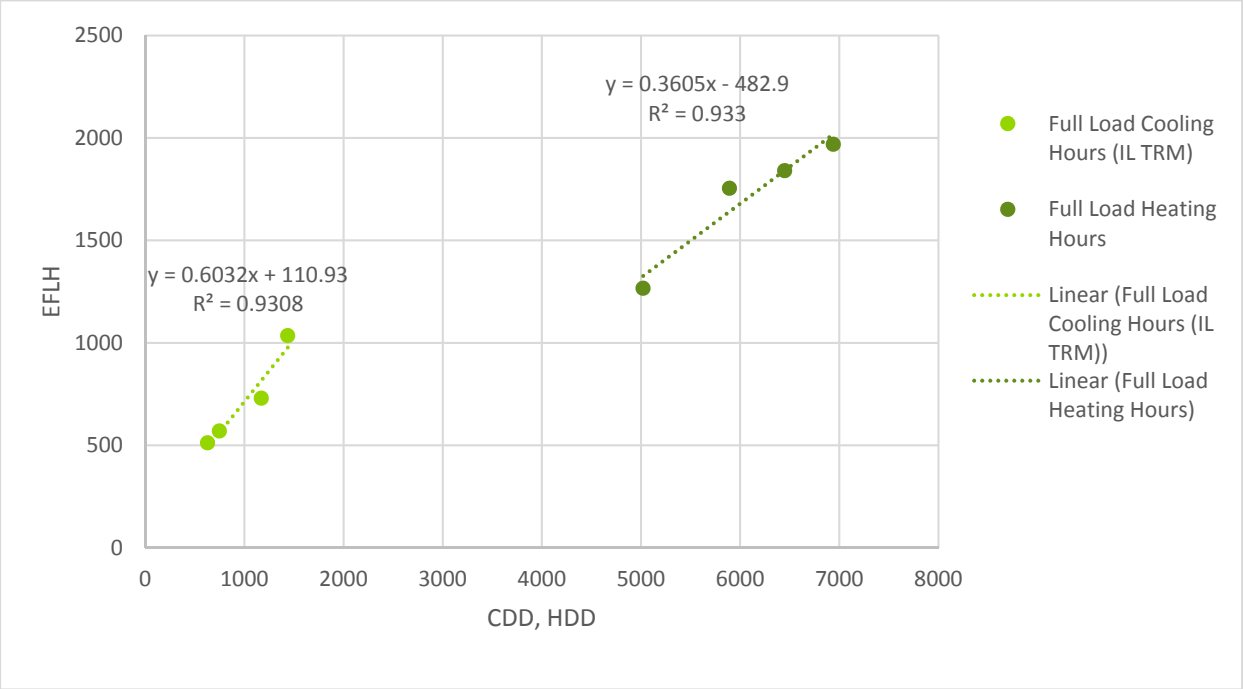
Table K-1. Full Load Hour - Cooling and Heating Comparison

City	Full Load Cooling Hours (IL TRM)	Normalized FLH Cooling Hours, per CDD 65	Energy Star Cooling Hours[29]	Full Load Heating Hours (IL TRM)	Normalized EFLH Heating Hours, per HDD 65	Energy Star Heating Hours	HDD 65	CDD 65
Rockford, IL	512	489.74	714	1969	2019.69	2418	6939.5	628
Chicago, IL	570	562.43	683	1840	1843.04	2459	6449.5	748.5
Springfield, IL	730	816.98	1036	1754	1642.07	2154	5892	1170.5
Belleville, IL / St. Louis, MO	1035	977.73	1215	1266	1328.07	2009	5021	1437
Kansas City, MO		**982.25**	**1032**		**1376.20**	**2149**	**5154.5**	**1444.5**

Source: Navigant Analysis

Inputting a CDD and HDD for Kansas City, MO of 1444.5 and 5154.5 respectively, yields a normalized FLH_c of 982.25 and FLH_h of 1376.20. Figure K-1 shows the FLH for each of the four cities presented in the Illinois TRM plotted against their corresponding CDD and HDD. Additionally, the linear equations for cooling and heating hours are presented with their corresponding R-Squared values.

Figure K-1. FLH Versus CDD,HDD



Source: Navigant Analysis

[29] https://www.energystar.gov/

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In conclusion, in the absence of primary field collected data, the PY 2016 FLHc and FLHh are more tailored to the local KCP&L markets compared to PY 2015, while also providing a more conservative estimate when compared to the Energy Star estimates.

Heat Pumps, Ductless Mini-Split, and Air Source

The air source heat pumps are split into 10 specific measures and four categories:

- **Heat Pump**
  - SEER 15
  - SEER 16
  - SEER 17
- **Heat Pump, Early Replacement**
  - SEER 15
  - SEER 16
  - SEER 17
- **Heat Pump, Replace Electric Resistance Heat**
  - SEER 15
  - SEER 16
  - SEER 17
- **Heat Pump, Ductless Mini-Split**
  - All SEER values

The savings algorithms and inputs are detailed below.

Heat Pumps, Ductless Mini-Split, and Air Source Energy Savings

Equation K-24. Heat Pumps, Ductless Mini-Split, and Air Source Energy Savings

$$\Delta kWh = \left(\frac{EFLH_{cool} \times CAP_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}} \right)}{1{,}000} \right) + \left(\frac{EFLH_{heat} \times CAP_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}} \right)}{1{,}000} \right)$$

Where:

$EFLH_{cool}$ Effective full load cooling hours = 982. Based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days.

CAP_{cool} Cooling capacity from program tracking data

$SEER_{base}$ Baseline SEER from the Illinois TRM Version 5. The Early Retirement baseline SEER is an average of the 2015 program tracking data = 9.12

$SEER_{ee}$ Installed SEER from program tracking data when available, or the average SEER of the installed units when not available for a specific project.

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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 Illinois TRM Version 5 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 Illinois TRM Version 5. The Early Retirement baseline HSPF is an average of the 2015 program tracking data.

$HSPF_{ee}$ Installed HSPF from program tracking data when available, or the average HSPF of the installed units.

Heat Pumps, Ductless Mini-Split, and Air Source Coincident Demand Savings

Equation K-25. Heat Pumps, Ductless Mini-Split, and Air Source Coincident Demand Savings

$$\Delta kW = \left(\frac{CAP_{cool} \times \left(\frac{1}{EER_{base}} - \frac{1}{EER_{ee}} \right)}{1{,}000} \right) \times CF$$

Where:

$EFLH_{cool}$ Effective full load cooling hours = 982. Based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days.

CAP_{cool} Same as above

EER_{base} Baseline EER from the Illinois TRM Version 5. The Early Retirement baseline EER 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.

CF Summer peak coincidence factor = 72%

Heat Pump Water Heater Energy Savings

Equation K-26. Heat Pump Water Heater Energy Savings

$$\Delta kWh = \left(\frac{\left(\left(\frac{1}{EF_{Base}} \frac{1}{EF_{new}} \right) \times GPD \times Household \times 365.25 \times \gamma Water \times (T_{out} - T_{in}) \right)}{3{,}412} \right) + kWh_{cooling} - kWh_{heating}$$

$$kWh_{cooling} = \left(\frac{\left(\left(\left(\frac{(GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}))}{3{,}412} \right) - \left(\left(\frac{1}{EF_{new}} \times GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}) \right) \right) \right) \times LF \times 27\% \right)}{3{,}412} \right) \times LM$$

$$COP_{cool}$$

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$$kWh_{heating} = \left(\left(\left(\left(\frac{(GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}))}{3{,}412} \right) - \left(\left(\frac{1}{EF_{new}} \right) \times GPD \times Hh \times 365.25 \times \gamma Water \times (T_{out} - T_{in}) \right) \right) \times LF \times 49\% \right) \right) \times \left(\frac{}{COP_{heat}} \right) \times (1 - \%\ NaturalGas)$$

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 K-27. 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 K-28. Efficient ECM Fan Energy Savings

$$\Delta kWh = \text{Heating Savings} + \text{Cooling Savings} + \text{Shoulder Season Savings}$$

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

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Efficient ECM Fan Coincident Demand Savings

Equation K-29. 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 = 982. Based on normalizing Kansas City's ENERGY STAR cooling hours to correlate with the Illinois TRM Version 5 effective full load cooling hours using cooling degree days.
CF	Summer peak coincidence factor = 68%

SEER Baseline Calculation Details

Navigant leveraged MEEIA Cycle 1 EER Baseline Operating data collected by the implementation contractor (Proctor Engineering) to develop KCP&L specific SEER estimates. The total number of Early Retirement HVAC units included 1,376 air conditioners for the GMO territory and 1,190 units for the KCP&L-MO territory.

For each operating EER provided in the implementation contractor tracking database, Navigant estimated baseline SEER values using the following three methodologies.

1. Navigant referenced the EER to SEER conversion algorithm presented in the Building America House Simulation Protocols (BAHSP)[30] which states:
   a. $EER = 1.12 \times SEER - 0.02 \times SEER^2$

   Therefore:

   b. $SEER = \frac{1.12 - \sqrt{1.2544 - 0.08 \times EER}}{0.04}$
2. Navigant also leveraged a PG&E[31] study which provides the following algorithm to convert EER to SEER:
   a. $SEER = \frac{EER}{0.9}$
3. Finally, Navigant used the below algorithm to estimate a conservative SEER value:
   a. $SEER = \frac{EER}{0.88}$

Once project level SEER values were developed, Navigant calculated a simple average program level SEER. The following table provides a summary of the results from the above three calculation

[30] www.nrel.gov/docs/fy11osti/49246.pdf

[31] https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/education/spc/2004manualsforms/spc_cooling_units.pdf

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methodologies. Navigant used the more conservative approach when assigning baseline SEER values, therefore, a program value of 6.82 was used.

Table K-2. Summary of SEER Calculation Methodology

Calculation Method	AVERAGE SEER
BAHSP	6.04
PGE	6.67
Navigant	**6.82**

K.1.3 Net-to-Gross

See Section C.2 for a detailed discussion of the evaluation team's NTG methodology.

K.2 Process Evaluation

Navigant addressed the five Missouri-required questions for process evaluation through several activities (listed below). Table K-3 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table K-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

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Research Questions	Evaluation Activity
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

K.2.1 In-Depth Product Manager and Implementer Interviews

Navigant and Illume staff conducted in-depth interviews with the program management team over the course of several in person and phone 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.

K.2.2 Ride-Along Visits

Navigant and Illume evaluation staff joined the WHE Energy Savings Kit implementation team on several visits to customer homes. The evaluation staff observed the interactions between the implementation technician and the customer, as well as how measures were installed in the home. The evaluation staff used a checklist to structure their field observations, which focused on:

- What activities does the technician conduct?
- What materials/equipment does the technician use?
- What kind of information is collected from the customer or site?
- What kind of information is offered to the customer?
- Does the technician leave any materials with the customer? What?
- Does the technician request that the customer carry out any follow-up activities? What?
- How is the customer treated?
- What types of questions does the customer ask?
- How does the customer respond to the technician's information?

These field observations helped the evaluation team better understand the day-to-day operations of the WHE program and its effects on customers. The team used the information gained from these field observations to inform the customer journey map and the design of the participant survey instrument.

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K.2.3 Tracking Database Review

Navigant reviewed the WHE tracking database to gauge customer participation in each of the measure categories offered through the program, as well as the amount of energy savings attributed to each of those measures. This allowed the evaluation team to better understand the measure mix installed through the program and to appropriately structure the participant and trade ally survey sample designs so they best captured the information needed to estimate FR, SO, and program satisfaction.

K.2.4 Participant Surveys

Navigant and its partner Blackstone conducted 120 telephone surveys with participating end-use customers. The objectives of the survey were to inform:

- ISRs (kit participants only)
- Baseline equipment types and early replacement status (HVAC only)
- FR estimates
- Participant SO estimates
- Assessment of the five Missouri process evaluation questions

Survey questions focused on the following topics:

- Motivations for participating in the program and for purchasing high efficiency equipment
- Confirmation of replaced equipment types and conditions (HVAC participants only)
- Status of installed equipment (kit participants only)
- Intended actions in the absence of the program (FR)
- Influence of various program elements (FR)
- Participation in other KCP&L programs
- Installation of additional energy efficiency equipment without rebates (SO)
- Intention to install additional energy efficiency equipment in the future
- Satisfaction with the overall program and with individual program processes and elements
- Opportunities for program improvements
- Demographics

K.2.5 Trade Ally Web Surveys

Navigant conducted 23 web surveys with participating trade allies (i.e., HVAC and envelope installation contractors). These surveys focused on the following topics:

- Market barriers
- Customer types who are likely and unlikely to participate in programs
- Reasons customers are replacing heat pumps with air conditioners

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- Satisfaction with the overall program and with individual program processes and elements
- Opportunities for program improvement
- Trade ally perspective on FR
- NPSO

K.2.6 Customer Journey Mapping

The evaluation team developed journey maps for the WHE program. Journey maps are designed to identify how customers move through an experience within a program, both in terms of process and their subjective experience of it. With an emphasis on design, they are also instructive for program improvements. These models are important tools in designing and implementing demand-side management programs, as they help to:

- Expand the understanding of customers' experience moving through program processes
- Identify barriers to program success due to processes or a lack thereof
- Identify appropriate pathways and resolutions to barriers in the program design
- Develop methods for delivering an exceptional customer experience across and between programs
- Identify issues to address in evaluation and program activities that may require additional research or to be resolved in the delivery of the programs

The journey maps were developed using four primary data sources:

1. Program manuals and other materials
2. Program staff and implementer interviews
3. Participant surveys
4. Ride-along visits

The participant survey and ride-along visit methodologies are described above.

The evaluation team met with KCP&L onsite to understand in-depth program processes and customer experiences. This meeting also gave the team time to explore KCP&L's priorities for the journey maps for the program. These priorities included: understanding pathways to programs within WHE as well as other programs; customer satisfaction; and opportunities for more cost-effective programming—e.g., through an increased rate of HVAC and insulation participation by home energy assessment participants. These priorities informed the participant survey, which included questions related to these topics.

Additionally, the evaluation team learned that the kit/assessment and rebate portions of the program operated as distinct entities. Therefore, the team created three separate journey maps for WHE to document the different experiences between the Energy Savings Kit, HVAC, and Weatherization Measures incentive offerings. Per KCP&L guidance, the maps primarily focus on processes and customer engagement throughout the program process, which are overlaid by customer perceptions, satisfaction, and emotional responses to various program components.

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APPENDIX L. 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 two tiers: one consisting of efficiency kits installed directly in residences, and the second installing efficiency measures into multifamily common areas. This section outlines Navigant's methodology for evaluating the savings and processes associated with this program.

Based on Missouri regulations (see Appendix D), Navigant used impact evaluation method 1a and protocol 2b to evaluate the IEMF program. This evaluation of the IEMF program consisted of the following activities for PY2016:

- Gross impact evaluation (detailed in Section L.1)
- Process evaluation (detailed in Section L.2)
- Cost-effectiveness (detailed in Section C.1)

L.1 Gross Impact Evaluation

To estimate gross savings for the IEMF program, the evaluation team conducted the following activities during PY2016 to answer the impact evaluation questions:

- Tracking database review
- Measure-level review

L.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

L.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 1 evaluation, the team referenced the Illinois TRM Version 5.0[32] to obtain these values. The team then

[32] Illinois TRM Version 5.0 is the updated version of the Illinois TRM, which was published on February 11, 2016. It can be accessed here: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final.pdf

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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.

L.1.2.1 Tier 1: Apartment Measures

Low-Flow Faucet Aerator Energy Savings

Equation L-1. Low-Flow Faucet Aerator Energy Savings

$$\Delta kWh = \%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{ee} * L_{ee}) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric resistance heating
GPM_{base}	Baseline Gallons per minute = 1.826
GPM_{ee}	Efficient Gallons per minute = 1.41 kitchen, 0.94 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 L-2. Low-Flow Faucet Aerator Coincident Demand Savings

$$\Delta kW = \frac{\left[\%ElectricDHW * \left((GPM_{base} * L_{base} - GPM_{ee} * L_{ee}) \times Household * 365.25 * \frac{DF}{FPH} \right) * EPG_{electric} * ISR \right]}{Hours * CF}$$

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
CF	Coincidence factor = 0.022

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Low-Flow Showerhead Energy Savings

Equation L-3. Low-Flow Showerhead Energy Savings

$$\Delta kWh = \%ElectricDHW*\left((GPM_{base}*L_{base} - GPM_{ee}*L_{ee}) \times Household*SPCD*365.25/SPH\right)*EPG_{electric}*ISR$$

Where:

%ElectricDHW	Proportion of water heating supplied by electric resistance heating
GPM	Gallons per minute = actual for energy efficient, 2.67 base
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 L-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
CF	Coincidence factor = 0.0278

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Hot Water Pipe Insulation Energy Savings

Equation L-5. 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)
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 L-6. Hot Water Pipe Insulation Coincident Demand Savings

$$\Delta kW = \frac{\Delta kWh}{\mathbf{8,766}}$$

Advanced Power Strip Energy Savings

Equation L-7. Advanced Power Strip Energy Savings

$$\Delta kWh_{5\text{-}plug} = 56.5$$
$$\Delta kWh_{7\text{-}plug} = 103$$

Where:

ΔkWh	Deemed energy savings: 56.5 kWh for 5-plug, 103 kWh for 7-plug

Advanced Power Strip Coincident Demand Savings

Equation L-8. Advanced Power Strip Coincident Demand Savings

$$\Delta kW_{5\text{-}plug} = 0.00634$$
$$\Delta kW_{7\text{-}plug} = 0.0115$$

Where:

ΔkW	Deemed coincident demand savings: 0.00634 kW for 5-plug, 0.0115 kW for 7-plug

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LEDs Energy Savings

Equation L-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)
W_{ee}	Wattage of efficient bulb (9W)
ISR	In-service rate = 96.9%
Hours	847
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.04

LEDs Coincident Demand Savings

Equation L-10. LEDs Coincident Demand Savings

$$\Delta kW = \frac{\left[\frac{(W_{base}-W_{ee})}{1{,}000} * ISR * WHF_e\right]}{CF}$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
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 = 8.1% (assumed “Unknown Location”)

L.1.2.2 Tier 2: Common Area Measures

Lighting Energy Savings

Equation L-11. LEDs Energy Savings

$$\Delta kWh = \frac{(W_{base}-W_{ee})}{1{,}000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	In-service rate = 96.9%
Hours	6,138 for fixture, 5,950 for screw-base, 4,903 for exterior
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.14 interior, 1 exterior

Lighting Coincident Demand Savings

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Equation L-12. LEDs Coincident Demand Savings

$$\Delta kW = \frac{\left[\frac{(W_{base}-W_{ee})}{1,000} * ISR * WHF_e\right]}{CF}$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
ISR	Same as above
Hours	Same as above
WHF_e	Same as above
CF	Coincidence factor = 0.64 interior, 0 exterior

CFL Energy Savings

Equation L-13. LEDs Energy Savings

$$\Delta kWh = \frac{(W_{base}-W_{ee})}{1,000} * ISR * Hours * WHF_e$$

Where:

W_{base}	Wattage of baseline bulb (43W)
W_{ee}	Wattage of efficient bulb (13W)
ISR	In-service rate = 83% (assumed “Distribution”)
Hours	847
WHF_e	Waste heat factor to account for cooling savings from efficient lighting = 1.04

CFL Coincident Demand Savings

Equation L-14. LEDs Coincident Demand Savings

$$\Delta kW = \frac{\left[\frac{(W_{base}-W_{ee})}{1,000} * ISR * WHF_e\right]}{CF}$$

Where:

W_{base}	Same as above
W_{ee}	Same as above
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 = 8.1% (assumed “Unknown Location”)

L.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 L-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table L-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 are planned for the program in PY2017?	• 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

L.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

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L.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 M. HOME LIGHTING REBATE PROGRAM-SPECIFIC METHODOLOGIES

The KCP&L Home Lighting Rebate 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 supports standard A-line LEDs and A-line, general service, medium screw base lamps and specialty LEDs (reflectors, floods, candelabras, and globe lamps, among others). In PY2016, the GMO Home Lighting Rebate (HLR) program has paid an average markdown discount of about $2.26 per standard LED bulb and $3.43 per specialty LED bulb; the program also provided educational and promotional support. In PY2016 13 manufacturers and 13 retailers sold 305,375 standard LEDs and 77,411 specialty LEDs through the program.

Based on Missouri regulations (see Appendix D), Navigant used impact evaluation method 1a (modified to reflect the upstream nature of the program) and 2b to evaluate the HLR program. This evaluation program consisted of the following activities for PY2016:

- Gross impact evaluation (detailed in Section M.1.1)
- NTG analysis (detailed in Section M.1.2)
- Process evaluation (detailed in Section M.2)

The team estimated program load impacts through a combination of audit and survey data of lighting products sold through the program, demand elasticity analysis, and lighting products found in customers' homes. In-depth interviews with program and implementation staffs and suppliers, onsite saturation visits, and consumer surveys provided information on program processes.

M.1 Impact Evaluation

Navigant focused the impact evaluation activities the evaluation team conducted in PY2016 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?
- Are the current assumptions about ISRs, HOU, WHF, and CF accurate? If not, what are more proper assumptions?
- 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.

M.1.1 Gross Impact Evaluation

To estimate the gross savings for the HLR program, the evaluation team conducted the following activities during 2016 and 2017 to answer the impact evaluation questions:

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- Tracking database review
- Engineering desk review
- Onsite saturation visits (n=100)

M.1.1.1 Tracking Database Review

The evaluation team requested and obtained two deliveries of program tracking data from the HLR program implementer ICF. The first delivery contained data from April 2016 through September 2016 (the first 6 months of the 2016 program), while the second delivery contained information for the full 2016 program year.

Navigant reviewed the program tracking data to assess the following (some of which informed the process evaluation as well):

- 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 shift in program emphasis to ENERGY STAR Version 2.0 bulbs with 15,000 measure life as opposed to Version 1.2 bulbs with 25,000 measure life
- 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 the service territory and by retail channel
- Dates of bulb sales and invoices
- Memorandum of understanding (MOU) under which bulbs were sold

Navigant held a meeting with HLR and ICF program staff to discuss the results of the review.

M.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. The team next calculated verified energy and demand savings based on the number and characteristics of LEDs sold through the program in the 2016 program year as described above in Section M.1.1.1.

The first step of the engineering desk review involved Navigant reviewing the equations used by KCP&L align with those the evaluation team uses to estimate gross energy and demand savings for each LED sold through the program. The evaluation team used Equation M-1 and Equation M-2 to calculate gross energy and demand savings, respectively.

Equation M-1. Annual Residential Lighting Energy Savings

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$$\Delta kWh = \frac{(Watts_{base} - Watts_{ee})}{1{,}000} \times Annual\ HOU \times ISR \times WHF_e$$

Equation M-2. Annual Residential Lighting Demand Savings

$$\Delta kW = \frac{(Watts_{base} - Watts_{ee})}{1{,}000} \times ISR \times WHF_d \times CF$$

Where:

$Watts_{base}$	Wattage of baseline bulb = 43 watts based on halogen equivalent to average of bulbs sold in program
$Watts_{LED}$	Wattage of program-supported LED = 9.29 watts for standard LEDs and 8.39 watts for specialty LEDs (Source: Program Tracking Database)
HOU	Annual hours of use = 840 (Source: Illinois TRM V5)
ISR	In-service rate = 94.2% (Source: Navigant research)
WHF	Waste heat factor = 1.06 for energy and 1.11 for demand (Source: Illinois TRM V5)
CF	Peak coincidence factor = 0.08 (Source: Illinois TRM V5)

The team used five main sources for these updates:

1. Current evaluation results (for ISR)
2. Review of tracking data base (for wattage of program-supported LEDs)
3. Market research (for wattage of baseline bulb)
4. Illinois TRM V5 (for HOU, WHF, CF)

The team also reviewed assumptions for leakage and cross-sector sales (i.e., retail purchases by C&I customers) from MEEIA I, opting to retain leakage estimates of 12% and cross-sector sales of 4% until additional research is conducted to update these values. The team adjusted total program sales downwards by 12% for leakage and 4% for cross program sales.

To account for C&I cross-sector sales, we then recalculated Equation M-1 and Equation M-2 using the listed assumptions for the 4% of program sales. The alternative values result from Navigant Research on omnidirectional LEDs installed in the retail, small business, and “other” C&I locations. 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 based on halogen equivalent to average of bulbs sold in program
$Watts_{LED}$	Wattage of program-supported LED = 9.29 watts for standard LEDs and 8.39 watts for specialty LEDs (Source: Program Tracking Database)
HOU	Annual hours of use = 3306 (Navigant Research)
ISR	In-service rate = 94.2% (Source: Navigant research)
WHF	Waste heat factor = 1.23 for energy and 1.31 for demand (Source: Navigant research)
CF	Peak coincidence factor = 0.6 (Source: Navigant research)

Navigant 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.

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The ISR for both energy and demand savings serves as the single input primarily derived from current evaluation activities.[33] The team estimated the first-year and 4-year ISRs based on information gathered during the onsite saturation visits. This involved counting the number of LEDs found in the homes that had likely been purchased through the HLR program in PY2016. Then, Navigant determined the proportions of these LEDs that were installed or in storage, calculating a first-year installation rate. Finally, Navigant calculated the 4-year ISR for LEDs obtained through the HLR.[34] Navigant calculated the net present value for delayed bulb installations using the WACC for GMO[1] as a discount rate for two scenarios. The first scenario considers the delayed installations, while the second scenario represents all installations occurring in the first year.

After computing energy and demand savings using these updated inputs, we compared KCP&L's deemed savings and assumptions based on actual program sales and input values, calculating realization rates as verified savings divided by reported savings.

M.1.1.3 Onsite Saturation Visits

Conducting onsite saturation visits to customers' homes provided the evaluation team with the necessary information to update current assumptions about ISRs. To increase the reliability of results, the estimation of ISRs drew upon data from both the GMO and KCP&L-MO service territories (reported jointly and separately), which is described below.

To conduct the onsite saturation visits, technicians visited 100 homes in the KCP&L service territory, split evenly between the GMO and KCP&L-MO service territories. Navigant identified these households through the lighting consumer survey (see A.1.3). While onsite, technicians counted the number of light bulbs installed in these homes and noted the type of bulb, fixture, control, and base. They also counted bulbs in storage and noted the type. For LEDs, the technicians collected information on model number, when purchased/obtained, and where purchased/obtained, including whether households obtained LEDs through a KCP&L direct install program. The analysis phase involved comparing LED model numbers and customer-reported details of the purchase to identify likely HLR program-supported purchases, direct installations from KCP&L programs, and the first-year ISR (from which Navigant projected 4-year ISRs).

The onsite saturation visits also yielded information on the following topics, which provide information on the context surrounding program impacts:

- Percentage of households using at least one LED
- Percentage of sockets holding LEDs, overall and by room type
- Percentage of bulbs in storage that are LEDs
- Market share of program-supported versus other LEDs and ENERGY STAR versus non-ENERGY STAR LEDs among all LEDs obtained during PY2016

The onsite saturation visits also supported process evaluation questions, as described in Section M.2.

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[33] The evaluators estimate baseline and program bulb wattages from review of program tracking databases, not from primary evaluation research.

[34] The calculation was guided by *Chapter 21: Residential Lighting Evaluation Protocol, The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures,* February 2015.

[1] Provided by GMO and classified by GMO as Highly Confidential

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M.1.2 NTG Analysis

Navigant estimated savings net of free riders using demand elasticity modeling (DEM). Because this approach relies on sales information from program tracking data, prices, and details of promotional activities; it cannot estimate spillover.

DEM uses program tracking information to estimate the lift in program sales attributed to program incentives and activities through the estimation of customer sensitivity to prices, also known as price or demand elasticity. The more sensitive customers are to pricing—determined by changes in program sales as prices change—the lower the free ridership.

The model form used to generate estimates of the elasticity of demand for LED bulbs is a Poisson regression. The unit of analysis is observations derived from invoice records of the HLR program. The dataset records HLR sales separately for each LED lighting product, at each store location, and for each invoice period. In the model, bulb sales serves as the dependent variable. The Poisson regression form is selected because it estimates effects in log-linear form, and so converting the independent variable of interest, $Price_{i,t,s}$, to its ln($Price_{i,t,s}$) form results in the coefficient estimate being a measure of elasticity. Additionally, the Poisson regression function allows for the inclusion of an *exposure option*, which in this case allows us to specify the length of exposure for each invoice observation (since invoices reflect time-periods of varying lengths within the dataset). The Poisson model form,[35] including the exposure option, is:

Equation M-3. Poisson Model Form

$$Bulbs_{i,t,s} = InvoiceDays_{i,t,s} e^{\alpha+\beta_1*ln(Price)_{i,t,s}+\beta_2*Lumens_i+\beta_3*Promo_{t,s}+\epsilon_{i,t,s}}$$

Where:

$Bulbs_{i,t,s}$	Program bulbs sold by LED product *i*, during period *t*, and store location, *s*
$ln(Price_{i.t,s})$	The natural log of the price per bulb, differentiated by each product, *i*, period, *t*, and store location, *s*.
$Lumens_i$	A measure of brightness for each bulb, *i*.
$Promo_{t,s}$	An indicator for promotional events held during period, *t,* at store location, *s*.
$InvoiceDays_{i,t,s}$	The exposure, in number of days, each invoiced bulb, *i*, in period, *t*, at store location, *s*, was offered for sale

The term *InvoiceDays*, reflects the number of days over which the invoice period was valid, and is used as an exposure variable so that invoice periods of differing lengths are treated appropriately. The term *α* is the constant term in the model, and the *β* terms are the coefficients associated with each of the independent variables: β_1 is the coefficient of primary interest, the estimated value of which is the elasticity estimate generated by the model interpreted as a percentage change in quantity (bulbs sold) over a percentage change in price. The number *e* is the base of the natural logarithm (≈2.718), *ln* is the natural logarithm, and ε is the error term.

The model is used to describe sales of LED bulbs for the market overall, segmented by product type (A-line bulbs or specialty), and by retail channel (home improvement, mass merchandise, membership clubs, or other). When estimating elasticities separately by market segment, the resulting predicted sales values

[35] Adapted from http://www.stata.com/manuals13/rpoisson.pdf, page 3.

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are then summed to generate the estimated net of free ridership values. Free ridership in this model-based approach is defined as:

Equation M-4. DEM Free Rider Estimation

$$Freeriders = \frac{Modeled\ Sales\ without\ Incentives}{Modeled\ Sales}$$

And net of free riders is:

Equation M-5. DEM Net of Free Rider Estimation

$$Net\ of\ freeriders = (1 - Freeriders) = \left(1 - \frac{Modeled\ Sales\ without\ Incentives}{Modeled\ Sales}\right)$$

M.2 Process Evaluation

The evaluation team addressed five process research questions and the five Missouri-required questions for process evaluation through several evaluation activities. Table M-1 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table M-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?	• In-depth supplier interviews
2. How influential are non-ENERGY STAR LEDs in the market and for the program?	• Discussions with program and implementation staffs • In-depth supplier interviews • Consumer surveys • Onsite saturation surveys
3. What types of training do manufacturers and retailers provide to retail sales staff?	• In-depth supplier interviews
4. 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?	• In-depth supplier interviews
5. What changes have been made to the program in PY2016 and what changes are planned for PY2017?	• Discussions with program and implementation staffs • In-depth supplier interviews • Consumer surveys • Onsite saturation 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 • 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
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 • In-depth supplier interviews • Consumer surveys • Onsite saturation surveys

Source: Navigant

M.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:

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- 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, changes from prior program cycle, relationship with and breadth of partnering manufactures and retailer partners

M.2.2 Materials Review

Navigant obtained program marketing and point-of-purchase display information from both KCP&L and ICF. The materials included signs placed on displays of program-supported LEDs, attached to shelves next to the supported products, audio and visual examples of internet, radio, newspaper, and other mass media sources, and descriptions of additional campaigns, particularly KCP&L's participation in Zombie Night at the August 19, 2016 Kansas City Royals game.

As in the MEEIA I evaluation, the team assessed these materials against the marketing and outreach best practices benchmarks as outlined in the *California Best Practices Benchmarking for Energy Efficiency Programs Tool.*[36] We drew on marketing and outreach best practices for programs overall and for residential lighting programs specifically.

M.2.3 Supplier Interviews

Navigant completed in-depth interviews with eight suppliers (i.e., six manufacturers and two high level retail contacts) that participated in the program to gain their insights into program processes. The evaluation team identified the suppliers through a contact list provided by ICF, the HLR program implementer. The team developed a sample design that balanced how many LEDs a supplier sold, the number of program-supported LEDs interviewing manufacturers and retailers with the largest share of program-supported sales, reflected s diverse retail channels, manufacturers, and retailers. The final sample of suppliers included the following:

- Six manufacturers
- Two retailers
- Representatives of home improvement, membership, mass merchandise, and independent hardware stores
- Coverage of 88% of GMO program sales (for both standard and specialty LEDs)

Navigant asked suppliers about their opinions on the following topics:

- Program influence on LED sales
- Influence that non-ENERGY STAR LEDs have in the market in general and the HLR program in particular
- Types of training provided to sales staff

[36] Available at http://www.eebestpractices.com/.

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- Satisfaction with the program overall
- Perceptions of the adequacy of program offerings and the types of retailers working with the program
- Insights into future program improvements

M.2.4 Onsite Saturation Visits

The 100 onsite saturation visits described in Section M.1.1.3 also served the process evaluation. Specific process topics addressed in the onsite visits included the following:

- Adequacy of program offerings for meeting consumer needs
- Consumer decision-making regarding lighting purchases, use, and storage
- Proportion of LEDs obtained in the past year that are program-supported and that are ENERGY STAR

M.2.5 Consumer Surveys

The evaluation team completed web and telephone surveys with 250 GMO customers. KCP&L provided a list of 2,411 GMO customers along with their addresses, phone numbers, and email addresses (if available). KCP&L removed any households that appeared on the “do not contact” list and included both service and mailing addresses to identify any possible rental properties. The list also included a general income category, if available, to assist in the identification of low-income households.

Navigant sent advance letters to the GMO customers on the provided lists with usable mailing addresses, notifying them of the study and inviting the customer to respond to a web survey using a unique pin number. The letter also explained that Navigant team members would follow up with a phone call if they did not answer the survey via the web. The letter provided customers with the phone number to the KCP&L Home Energy Programs line staffed by the HLR program implementer (ICF) and alerted customers to the possibility of being included in the onsite saturation study.

Table M-2 shows the final completed design, together with the sampling error and response rate. The sampling error is calculated for 90% confidence, assuming a 50% break in responses (i.e., the conservative assumption that a respondent is equally likely to answer “yes” or “no” to a binary question). The response rate follows procedures set forth by the American Association for Public Opinion Research, adjusted for the inclusion of a web-based survey option.

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Table M-2. Sample Design, Response Rate, and Sample Error

	Indicators
Population	2,402
Customers Contacted	1,323
Web Completions	176
Phone Completions	74
Response Rate	4.1%
Sample Error	4.9%

Source: Navigant analysis

The surveys measured the following:

- Customer familiarity with and self-reported use of LEDs and other bulb types
- Preferences for and self-reported purchases of LEDs compared to other bulb types
- Recollection of and opinions about in-store and other program marketing
- Types of information customers look for when buying bulbs (including price, the ENERGY STAR label, and other factors)

The consumer survey also collected detailed demographic characteristics on participants and recruited households for the onsite saturation visits.

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APPENDIX N. HER PROGRAM-SPECIFIC METHODOLOGIES

Through the Home Energy Reports (HER) Program 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-GMO sends reports to three waves of customers. The waves started receiving reports in 2013, 2015, and 2016 respectively.

Based on Missouri regulations (see Appendix D), Navigant used method 1b and protocol 2a to evaluate the HER program. This evaluation program consisted of the following activities for PY2016:

- Impact evaluation (detailed in Section N.1)
- Process evaluation (detailed in Section N.2)

N.1 Impact Evaluation

The HER program is a randomized control trial (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.
- **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.
- **Demand reductions**: Monthly billing data do not have sufficient granularity to estimate demand impacts. Modeling demand impacts requires hourly or shorter-interval meter data. To obtain estimates of the demand impacts consistent with our statistical estimates of verified energy impacts, Navigant multiplied the verified energy savings we obtained from our regression analyses by the ratio of KCP&L-GMO's reported PY2016 coincident demand savings to reported PY2016 energy savings.

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N.1.1 Data Cleaning

The evaluation team cleaned the billing data to ensure data used in the billing analysis contained sufficient pre-period and program period months, 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.

N.1.2 Equivalency Check

The HER program is an RCT, 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 2013 and 2015 waves. The Navigant team checked the equivalency of the 2016 expansion wave for the current evaluation cycle.

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[37] 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.

N.1.3 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.

[37] 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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N.1.3.1 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-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 N-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.[38]
$ADCLag_{kt}$	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.

N.1.3.2 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-period usage data. The regression essentially compares the pre- and post-period 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 N-2. Linear Fixed-Effects Regression

$$ADC_{kt} = \beta_{0k} + \beta_1 Post_t + \beta_2 Treatment_k Post_t + \varepsilon_{kt}$$

Where:

[38] If there are T post-period 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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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-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.

N.1.4 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 treatment 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 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.

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For each energy efficiency program, Navigant used the POD method to calculate double-counted savings separately. To obtain the net energy impact, Navigant subtracted these savings from the estimate obtained from the billing analysis.

N.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 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 PY 2016, and what changes are planned for PY 2017?	• 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

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N.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 member, Lisa Farley, to better understand the HER program and to try and investigate the key considerations of the 5 MO questions, namely:

- Program's performance to date
- Any issues or challenges faced
- Potential opportunities for improvement
- Effectiveness of program communication

N.2.2 Materials Review

Navigant reviewed the following program planning and marketing materials to investigate the key considerations of the 5 MO questions, namely:

- HER Report examples
- Samples of marketing modules included on the HERs in 2016
- Implementer's program design and report schedule documents
- Implementer reporting of CET results
- KCP&L-GMO program description documents
- KCP&L Report on 2016 marketing efforts

N.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 between August 15, 2016 and September 10, 2016. Respondents included 700 HER recipients and 302 non-recipient control group customers randomly selected from six KCP&L deployment waves from both KCP&L-MO and KCP&L-GMO territories.

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APPENDIX O. 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.

This evaluation program consisted of the following activities for PY2016:

- Impact evaluation (detailed in Section O.1)
- Process evaluation (detailed in Section O.2)

O.1 Impact Evaluation

KCP&L does not claim energy savings for the Energy Analyzer tools. Therefore, for the evaluation, the Navigant team assessed the impact of the program on participation in KCP&L energy efficiency programs rather than the impact on energy savings. This Navigant team assessed the extent to which the HOEA tools channeled customers to energy efficiency programs, resulting in an uplift in participation in those programs. To have enough customers to complete the analysis, the evaluation team combined customers from the KCP&L-MO and KCP&L-GMO territories. The impact evaluation consisted of the following activities:

- Data cleaning
- Comparison group selection
- Participation analysis

O.1.1 Data Cleaning

The evaluation team received the following data from KCP&L:

- HOEA activity data: August 2013-October 2016
- Energy efficiency program participation data: Customer-level participation dates and measures installed for:
    - Appliance Recycling:
        - KCP&L-GMO: January 2015-January 2016
        - KCP&L-MO: August 2014-January 2016
    - Cool Homes:
        - KCP&L-GMO: January 2015-December 2015
    - Home Performance with ENERGY STAR (HPWeS):

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        - KCP&L-GMO: January 2015-December 2015
    - Lighting and Appliances:
        - KCP&L-GMO: January 2015-February 2016
    - Air Conditioning:
        - KCP&L-MO: July 2014-December 2015
    - Thermostat:
        - August 2015-March 2017
    - Whole Home Efficiency:
        - June 2016-March 2017
- MyAccount Data:
    - Customer level:
        - MyAccount enrollment date – Grouped by account number, premise ID, and service territory (KCP&L-GMO and KCP&L-MO): March 2001-February 2017

For each dataset, the evaluation team checked for and addressed the following:

- Duplicate records
- Multiple participation dates for one program for one account/address combination
    - Where this occurred, the team selected the earliest of the multiple participation dates
- Removed all Kansas residents as they were out of scope for this evaluation
- Removed observations missing account numbers

The evaluation team linked the datasets using valid account IDs and addresses. The team conducted its analysis at the account ID level rather than premise or address, as the HOEA data specified participation in the "What Uses Most" (WUM) section of the HOEA at the account level only. That is, if multiple addresses associated with one account and each participated in a separate program, the account itself was credited with each participation. Notably, even with this approach, no individual account displayed excessive levels of participation (participation in more than four programs).

O.1.2 Participant and Comparison Group Definition

HOEA and BOEA are opt-in tools. As such, they do not have randomly assigned treatment and control groups. To assess the effect of HOEA on participation in other energy efficiency programs, the Navigant team first defined participation in HOEA as having completed the WUM section. KCP&L marketing materials encouraged customers to complete this section as a first step in using HOEA. Completion of this section requires more time and engagement than simply viewing comparisons of energy usage on other tabs of the tool.

Next, the team selected a comparison group from customers who had not completed WUM but had enrolled in KCP&L's online account manager "My Account" within the same period that other customers

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had completed the WUM[39] section (July 2015-June 2016). The evaluation team applied this comparison group selection criteria based on the premise that My Account customers were like HOEA participants in that they were actively engaged with the KCP&L website and had access to information regarding KCP&L's energy efficiency offerings. The evaluation team applied further matching criteria based on whether customers had participated in energy efficiency programs within six months prior to their participation in My Account or WUM. Table O-1 shows counts of customers in each group.

Table O-1. Counts of Energy Efficiency Program Participation

Customer Type	WUM	My Account
Total Number of Customers	13,336	42,310
Customers who Participated in Energy Efficiency Programs Prior to WUM/My Account	570	263
Customers who did not Participate in Energy Efficiency Programs Prior to WUM/My Account	12,766	42,047

Source: Navigant Analysis

O.1.3 Participation Analysis

To assess the extent to which the HOEA channels customers into other energy efficiency programs, the Navigant team used four approaches:

1. **POD approach**. To calculate the POD statistic, the evaluation team calculated the difference in cumulative participation in any energy efficiency program in the 12 months immediately following (post-period) enrollment for the treatment and comparison groups. Then the team subtracted the comparison group participation rate from the treatment group participation rate to arrive at the POD statistic. The team chose to focus on cumulative program participation in the post-period rather than changes from pre- to post due to KCP&L's restructuring of its residential energy efficiency offerings during the evaluation period. Programs as defined in each cycle have different offerings and approaches and are thus not directly comparable.
2. **Trends over time.** To observe program participation trends over time, Navigant evaluated individual customers' program participation relative to when they enrolled in each respective online tool to explore if there was any increase (or decrease) in program participation at varying times post-enrollment.
3. **WUM participation paths.** Beyond simply looking at raw participation numbers, the team looked at the varying paths a customer might take before or after enrollment to understand which programs customers engage with before and after participation in WUM.
4. **Energy-saving tips.** HOEA and BOEA offer customers a wide range of energy-saving tips. Customers can tag the tips as "I'll do it", "Already do it", or "No thanks". The team analyzed responses to assess which tips are most and least popular with customers.

[39] All customers that completed WUM were previously enrolled in My Account.

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O.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 CET survey, which included questions about the HOEA[40].

Table O-2 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table O-2. 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 PY2016, and what changes are planned for PY2017?	• 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? Does this tool 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

O.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 member, Lisa Farley, to better understand the HOEA/BOEA program and to try and investigate the key considerations of the 5 MO questions, namely:

- Program's performance to date

[40] The survey did not include businesses and so did not include any questions on BOEA.

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- Any issues or challenges faced
- Potential opportunities for improvement
- Effectiveness of program communication

O.2.2 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-GMO program description documents
- KCP&L Report on 2016 marketing efforts

O.2.3 CET Survey

As noted in Appendix N, 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 between August 15, 2016 and September 10, 2016. Respondents included 700 HER recipients and 302 non-recipient control group customers randomly selected from six KCP&L deployment waves. While most of the questions pertained to HERs, several questions asked respondents about the HOEA.

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APPENDIX P. RESIDENTIAL AND BUSINESS THERMOSTAT PROGRAM-SPECIFIC METHODOLOGIES

The Residential and Business Programmable Thermostat (PT) programs are direct load control (DLC) programs. KCP&L calls 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. The programs operate the same between KCP&L-MO and GMO.

Based on Missouri regulations (see Appendix D), Navigant used method 1b and protocol 2b to evaluate the Residential and Business PT programs. This evaluation program consisted of the following activities for PY2016:

- Impact evaluation (detailed in Section P.1)
- Process evaluation (detailed in Section P.2)

The team also estimated program demand impacts and energy savings using deemed savings found during Navigant's 2014 evaluation.[41] A full billing analysis will take place in PY2017.

P.1 Impact Evaluation

The PT Program is a DLC program. KCP&L calls 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. The program operates the same between KCP&L-MO and GMO. The following section discusses the methodology for evaluating this program for residential and business customers.

To estimate the impacts of the Residential PT program, the evaluation team relied on the deemed demand impact found during Navigant's 2014 evaluation. The methodology for the deemed energy savings follows Table P-1. The team used energy consumption found in a Navigant potential study for KCP&L and assumed a consumption mix of 95% gas and AC and 5% heat pumps. Then, based on a Cadmus thermostat evaluation,[42] the team assumed 10% savings from heating and 13% savings from cooling. In total, this calculation provides a deemed energy savings of 462 kWh. The deemed savings used for Seasonal Savings customers was provided by Nest and verified by Navigant.[43] A full billing analysis will take place in PY2017.

[41] GMO Evaluation, Measurement, and Verification Report, Program Year 2014, Section 13.2.3

[42] *Evaluation of the 2013-2014 Programmable and Smart Thermostat Program*; prepared for Vectren Corporation; prepared by Cadmus Group, January 29, 2015, p.3.

[43] "Seasonal Savings Impacts: KCP&L Summer 2016, Nest Memo," provided by KCP&L Product Manager, Tyson Brown

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Table P-1. Savings Key Values Summary

	Heating Consumption		Cooling Consumption	
HVAC Type	Gas/AC	Heat Pump	Gas/AC	Heat Pump
Consumption (kWh)	440	9,338	2,876	2,821
Percent Mix Assumption	95%	5%	95%	5%
Percent Savings	10%	10%	13%	13%
Resulting Savings (kWh)	41.80	46.69	355.19	18.34
Summed Total of Savings (kWh)		462		

Navigant answered the research questions in Table P-2 during the Residential Thermostat program impact evaluation for PY2016. Figure P-1 outlines the impact evaluation activities that will be conducted in 2017 to answer these questions. As outlined below, the PY2016 will include a deemed savings analysis and a full billing analysis will be conducted in PY2017. These questions represent those addressed through evaluation best practices and provide input on the critical impact information needed for residential programs: What are the gross energy savings that can be attributed to the Residential Thermostat program, and how closely do those align with program assumptions?

Table P-2. Impact Evaluation Research Questions

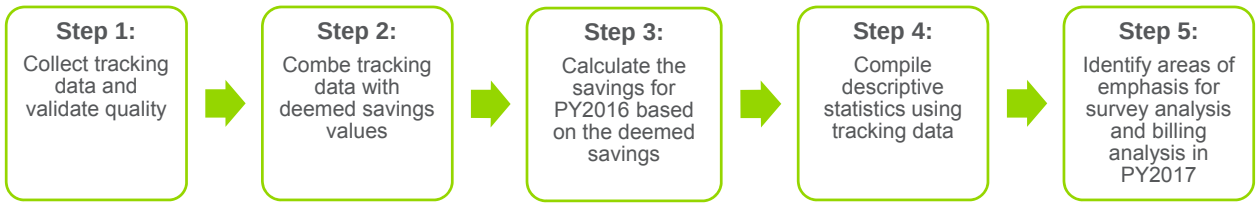
	Research Questions
1	Do the reported energy and demand savings accurately characterize program impacts? And if not, what are the gross savings associated with the program?
2	What are the verified energy and demand savings associated with the program?

Source: Navigant analysis

P.1.1 Gross Analysis

Navigant conducted the following steps to calculate gross impacts and savings for the Residential Thermostat program:

Figure P-1. Steps in Impact Evaluation



Source: Navigant analysis

- **Step 1:** Ensure that tracking data is complete (no missing data). Navigant followed the following parameters to verify thermostat activation as to include only activated thermostats in analysis:
    - If tracking data includes activation date, verification confirmed.

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  - If do-it-yourself (DIY) thermostat was ordered before the DIY portal went live–December 2016, thermostat could have been installed but not activated for Rush Hour Rewards. Thus, for DIY thermostats ordered before December 2016, that lack activation date, Navigant uses Nest data to confirm installation date. The thermostats that have an installation date in the Nest data are included in the energy savings analysis but not the DR impact analysis.
  - If activation date not included in tracking data or Nest data, do not include thermostat analysis.

- **Step 2:** Merge in flag, provided by Nest, that indicates whether customer is a Seasonal Savings customer.
- **Step 3:** Merge tracking data with deemed savings values.
- **Step 4:** Multiply deemed savings for kilowatt-hours and kilowatts by the number of participating customers.
- **Step 5:** Investigate tracking data by characterizing customers. For example:
  - Identifying the distribution of high usage customers versus low usage customers
  - Characteristics of direct installations versus DIY installations
  - Frequency of new program customers versus previously participating customers
- **Step 6:** Use characterizations from Step 4 to improve survey instrument that will be distributed in the summer of 2017 and inform the PY2017 billing analysis. For example, if Navigant would like to further characterize customers beyond the tracking data, this step will provide the opportunity to do so in the survey instrument.

P.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.

Table P-3 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

Table P-3. 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 PY2015 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 PY2017?	• Program Staff Interviews

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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
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

P.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Tyson Brown, to better understand the Residential and Business PT programs and to try and investigate the key considerations of the five Missouri questions, namely:

- Transition from Honeywell to Nest thermostats
- 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 Thermostat Program Operating Plan-Public Facing document provided to Navigant by product manager, Tyson Brown.
- Business Thermostat Program customer website: https://www.KCP&L.com/save-energy-and-money/for-business/earn-rebates-and-incentives/thermostat
- Residential Thermostat Program customer website: https://www.KCP&L.com/save-energy-and-money/for-home/upgrade-your-home/thermostat

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APPENDIX Q. 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. This evaluation program consisted of the following activities for PY2016:

- Impact evaluation (detailed in Section Q.1)
- Process evaluation (detailed in Section Q.2)

The evaluation team also estimated program load impacts through hourly load data supplied by automated meter reading (AMR) and advanced metering infrastructure (AMI)—described in more detail below.

Q.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 Q-1 during the DRI program impact evaluation for PY2016. These questions represent those addressed through evaluation best practices and provide input on the critical impact information needed for residential programs.

Table Q-1. Impact Evaluation Research Questions

	Research Questions
1	Do the reported energy and demand savings accurately characterize program impacts? And if not, what are the gross savings associated with the program?
2	What are the verified energy and demand savings associated with the program?

Source: Navigant Analysis

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Q.1.1 Gross Analysis

Navigant utilized the following approaches to estimate the gross impacts of the DRI program:

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. 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:

- **Step 1:** Collected billing and tracking data.
  - Ensured that tracking data is complete and consistently formatted.
  - For billing data, ensured data is complete and identified any outliers (high usage, no usage, etc.).
- **Step 2:** Created dummy variables and calculated variables in dataset
  - Dummy variables for event periods and calendar-related effects (i.e., days of the week, month, etc.)
  - Calculated variables for weather data (i.e., cooling degree hours, etc.).
- **Step 3:** Examined the load profiles of each customer to determine which customers are weather sensitive and 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.
- **Step 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 Q-1. The specific model for each customer varied based on the significance of each factor in estimating their load. For example, weather-related terms are removed for customers that have loads that are not sensitive to weather conditions. After running the regression model for each customer, the following diagnostic steps were taken:
  - Tested for statistical significance of coefficients to determine whether their estimated impact is significantly different from zero.
  - Computed and plotted the leverage of each observation to determine if there are observations with a large influence on the model estimates. Further analysis was then conducted to identify influential observations that were outliers. This was done by calculating the Cook's Distance for influential observations.
  - Identified the coefficient estimates for each customer and event.

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- Summarized the coefficients for each event and customer to provide a cumulative impact for each event across all customers.

Equation Q-1. DRI Program Regression Model

$$kW_t = \beta_0 + \beta_1 * CDH_t + \beta_3 * DOW + \beta_4 * Hour_t + \beta_5 * PreEvent + \beta_6 * Event + \beta_7 * Snapback + \beta_8 * PreUsage + \varepsilon$$

Where $\beta_{1\text{-}7}$ are parameters to be estimated by the model and:

t	Index for hourly time intervals
kW	Average hourly kW
CDH	Cooling degree hours
PreEvent	Binary variable for pre-event hours, the 2 hours prior to an event
Event	Binary variable for event hours
Snapback	Binary variable for snapback hours, the 3 hours following an event
PreUsage	Daily average usage from 8am to 10am
ε	Error term

- **Step 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.
  - Identified the baseline (non-event) days preceding each event.
    - Baselines were calculated with 10 days and 5 days for each customer to determine the number of days necessary to calculate an appropriate baseline.
    - Based on our analysis, we chose 10 days for the baselines.
  - Determined if an event-day adjustment is needed for each customer.
    - After selecting the number of days in the baseline, we assessed whether there 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.
    - 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.
  - Calculated the average usage for each hour of the day during the day-matching baseline for each customer.
  - Calculated impact estimates from the difference between event-day usage and the baseline average.
- **Step 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

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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 approaches differed in their estimates, it was always due to insignificant coefficients in the regression model. The regression models were rerun in each case to determine if the statistically insignificant coefficients were the cause of the differences between the regression and day-matching impact estimates. In each case, the difference remained between the regression and day-matching approaches. This indicated that the customer's usage in the time preceding the event was not exhibiting predictable usage patterns. 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.

- **Step 7:** Reported impacts by event.

Q.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 review program materials.

Table Q-2 displays the evaluation team's key process research questions and the evaluation activities conducted to address these questions.

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Table Q-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 PY2015 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 PY2017	• 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

Q.2.1 Program Staff Interviews

Navigant conducted in-depth interviews with KCP&L's lead staff member, Tyson Brown, 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

Q.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, Tyson Brown.

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- DRI customer website: https://www.KCP&L.com/save-energy-and-money/for-business/earn-rebates-and-incentives/demand-response-incentive

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