COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR REVIEW, MODIFICATION, AND CONTINUATION OF CERTAIN EXISTING DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAMS	)	**CASE NO. 2017-00441**

DIRECT TESTIMONY OF
GREGORY S. LAWSON
MANAGER, ENERGY EFFICIENCY PLANNING & DEVELOPMENT
LG&E KU SERVICES COMPANY

Filed: December 6, 2017

Q. Please state your name, position and business address.

A. My name is Gregory S. Lawson. I am the Manager, Energy Efficiency Planning, & Development, for LG&E KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you ever testified before the Commission?

A. No, but I have assisted with preparing responses to requests for information and reports to the Kentucky Public Service Commission ("Commission") and the Virginia State Corporation Commission in previous rate cases and integrated resource plan cases.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the historical performance of the Companies' DSM-EE programs and the Companies' proposed modifications to those programs to assist customers with their energy usage. Also, I describe the processes and studies the Companies used to evaluate the Companies' DSM-EE programs, determine the potential DSM-EE opportunities in the Companies' service territories, and develop the proposed modifications.

Q. Are you sponsoring any exhibits to your testimony?

A. Yes, attached to my testimony are Exhibits GSL-1, GSL-2, and GSL-3. Exhibit GSL-1 is the Companies' 2019-2025 Demand-Side Management and Energy Efficiency Program Plan ("Proposed DSM-EE Program Plan"), which discusses the historical performance of the Companies' DSM-EE programming, describes the process by which the Companies developed the Proposed DSM-EE Program Plan, and presents the analyses supporting the plan. David E. Huff is co-sponsoring Exhibit GSL-1.

Exhibit GSL-2 is the *DSM Program Review* ("*Program Review*") by The Cadmus Group, Inc. ("Cadmus"). The Companies engaged Cadmus for the purpose of providing an independent review of the Companies' existing DSM-EE portfolio and providing recommendations about economical portfolio enhancements. The *Program Review* provides analysis that independently supports modifying some DSM-EE programs and allowing others to expire. The recommendations from the *Program Review* do not take into consideration cost-effectiveness at the program level, but rather look at cost-effectiveness of measures based on achievable potential. DSM-EE programming included in the Proposed DSM-EE Program Plan is based on cost-effectiveness at the program level that includes various costs to run programs.

Exhibit GSL-3 is the *Residential and Commercial Energy and Efficiency Potential Study* ("*EE Residential and Commercial Potential Study*"), also by Cadmus. The *EE Residential and Commercial Potential Study* explores the potential of energy efficiency programming in the Companies' service territory and quantifies the amount of energy and demand that could be saved in the Companies' service territory from 2019 to 2038.

Demand-Side Management and Energy Efficiency Programs Review

Q. What are the Companies' current DSM-EE programs?

A. Today, the Companies have a suite of successful DSM-EE programs, which the Commission approved through the end of calendar year 2018 in Case No. 2014-00003:[1]

- Smart Energy Profile
- Residential Refrigerator Removal Program
- Residential Incentives Program
- Program Development and Administration
- Residential Conservation Program/Home Energy Performance Program
- Residential Low Income Weatherization Program ("WeCare")
- Residential and Commercial Load Management/Demand Conservation Program
- Commercial Conservation/Commercial Incentives Program
- Customer Education and Public Information Program
- School Energy Management Program (approved through the end of Kentucky School Boards Association Fiscal Year 2018, i.e., June 30, 2018)

In addition, the Companies offer and operate through their DSM-EE portfolio the Advanced Metering Systems ("AMS") Customer Service Offering, which the Commission also approved in Case No. 2014-00003.

Q. How have the Companies' current DSM-EE programs performed to date?

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[1] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Review, Modification, and Continuation of Existing, and Addition of New Demand-Side Management and Energy-Efficiency Programs*, Case No. 2014-00003, Order (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

A. Through October 2017, the Companies' DSM-EE programs have produced cumulative energy and gas savings of approximately 1,077 GWh and 5.9 million Ccf, along with a cumulative demand reduction of over 450 MW.[2] The success of the Companies' DSM-EE programs, in addition to independent energy-efficiency measures taken by customers, is commendable. But as Mr. Huff's testimony describes, the significant decreases in projected customer loads over the next 30 years resulting from energy efficiency, both utility-run and otherwise, as well as lower avoided energy costs and increasing energy-efficiency baselines in the marketplace, have created a situation where additional cost-effective DSM-EE measures have become more difficult to identify and implement.

Q. Have the Companies reviewed their DSM-EE programming on an ongoing basis?

A. Yes, the Companies have continued to evaluate their current DSM-EE programming and actively engage in a continuous improvement process for programming. Furthermore, the Companies commissioned Cadmus to evaluate the impacts of current DSM-EE programming and future DSM-EE potential in the Companies' service territories.

Q. Please describe the *Program Review*.

A. The Companies engaged Cadmus to provide an independent review of the Companies' existing DSM-EE portfolio and providing recommendations about

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[2] 450 MW is a gross demand reduction number. For purposes of generation planning, the Companies most recently used 331 MW in demand reduction attributable to DSM-EE programs. This reduced number takes into account two estimates regarding the Companies' Demand Conservation Programs: (1) an estimate of switches that have been disconnected, and (2) an estimate of compressors that are not running when a Load Control Event is triggered. When applied to the cumulative demand reduction figure of 450 MW, these estimates result in the demand reduction figure of 331 MW.

economical enhancements. The review's objective was to provide the Companies with options to improve program delivery efficiency, capture available cost-effective energy savings potential, and support the Companies' efforts to expand or contract their programs. Cadmus performed the program review contemporaneously with the *Residential and Commercial EE Potential Study*, with input from the Companies and their DSM Advisory Group. As part of this review, Cadmus compared the Companies' existing program portfolio with the potential study findings, conducted a gap analysis, and recommended program modifications and enhancements to help align the portfolio with areas of greatest cost-effective potential and the Companies' resources.

The results of the Program Review reveal that some programs that originally passed cost-benefit tests in 2014 no longer merit continued funding. Consequently, on November 29, 2017, the Companies proposed to significantly reduce the DSM-EE budget for 2018, which will reduce charges to customers through the Demand-Side Management Cost Recovery Mechanism.

Q. Please describe the studies the Companies commissioned to understand the market potential for energy-efficiency programming in the service territory.

A. The Companies commissioned Cadmus to conduct the *EE Industrial Potential Study* as ordered by the Commission in Case No. 2014-00003.[3] The Companies further commissioned Cadmus to conduct the *EE Residential and Commercial Potential Study*, which is similar to a study the Companies commissioned Cadmus to perform

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[3] Case No. 2014-00003, Order at 32 (Nov. 14, 2014).

in response to the Commission's final order in Case No. 2011-00375.[4] These studies explored the potential of energy efficiency programming in the Companies' service territory and quantified the amount of energy and demand that could be saved by the Companies. The *EE Industrial Potential Study* examined a 20-year planning horizon from 2016-2035, while the *EE Residential and Commercial Potential Study* examined a 20-year planning horizon from 2019-2038. These studies focused primarily on efficiency technologies and practices widely available at the time of the assessment, while accounting for known changes in codes and standards, technical limitations, total resource cost effectiveness, and customers' willingness to adopt efficiency measures.

Q. Please briefly describe the results of the studies and the impact on future energy-efficiency programming by the Companies.

A. The following table summarizes the results of the *EE Industrial Potential Study* and *EE Residential and Commercial Potential Study* that have been completed as part of the LG&E/KU DSM-EE Program Planning Process:

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[4] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for a Certificate of Public Convenience and Necessity and Site Compatibility Certificate for the Construction of a Combined Cycle Combustion Turbine at the Cane Run Generating Station and the Purchase of Existing Simple Combustion Turbine Facilities from Bluegrass Generation Company, LLC in LaGrange, Kentucky*¸ Case No. 2011-00375, Order at 18-21 (May 3, 2012) ("[The Companies] shall file with the Commission the [DSM-EE] potential or market characterization study as recommended in the ICF Report.").

Medium Scenario - 20-year Cumulative Achievable Potential	**Residential**	**Commercial**	**Industrial**
Study Period	*2019-2038*	*2019-2038*	*2016-2035*
Energy (% of baseline)			
LGE	5.5%	5.4%	7.3%
KU	5.5%	6.7%	6.5%
Total	5.5%	6.1%	6.7%
Demand (MWs)			
LGE	26	47	24
KU	48	65	51
Total	74	112	74

Program planning relies on assumptions about future market conditions, achievable potential, and consumers' behavior. As explained more fully in the testimony of Mr. Huff, these phenomena can and do affect the Companies' load-forecasting projections. But as the programs continue to operate, the Companies will perform ongoing impact evaluation focusing on quantifying the energy and demand savings and other economic benefits of the DSM-EE portfolio. Therefore, the Companies will continue to monitor marketplace changes and, after evaluation, request approval for additional or revised programming as such programming becomes cost-effective or ceases to be cost-effective.

Review of the Companies' Current and Proposed DSM-EE Portfolio

Q. Do the Companies consult with other parties when determining which DSM-EE programs to propose and implement?

A. Yes. As noted above, the Companies retained Cadmus to conduct the *Program Review* to identify possible enhancements, additions, or revisions. Cadmus performed its analysis contemporaneously with the *EE Residential and Commercial Potential Study* and with input from the Companies and their DSM Advisory Group.

In addition, the Companies met with their DSM Advisory Group to obtain feedback about existing, proposed, and new programming concepts. The DSM Advisory Group includes representatives from the Department of Energy Development and Independence, the Kentucky Attorney General, the Kentucky Industrial Utility Customers, Inc., community-action agencies, educational institutions, governmental environmental protection agencies, and businesses.[5] The Companies met with the DSM Advisory Group three times in 2016 and twice in 2017. These meetings, each of which was several hours long, were held in 2016 on June 23, August 24 and October 13, and in 2017 on September 26 and October 26. During the first meeting, the results of the *EE Industrial Potential Study* were presented and the impact those findings might have on future DSM-EE programs was discussed. Discussions ensued on industrial exemption from DSM-EE charges and how the current state law (KRS 278.285) defines industrial opt-out.

As requested by the customer-stakeholders, the second meeting included a representative from Midwest Energy Efficiency Alliance ("MEEA") to present a review of DSM-EE opt-out rules in MEEA states and then opt-out rules in states surrounding Kentucky were presented and discussed. Next, in compliance with the Commission's final orders in Case Nos. 2014-00371 and 2014-00372, there was a

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[5] The Companies invited all members to attend all DSM Advisory Group meetings, although not all members were able to attend all meetings.

discussion on the definition of "industrial" and whether the North American Industry Classification System ("NAICS") codes should be used to define "industrial."[6]

At the final meeting of 2016, the current and proposed "industrial" definitions were presented. The proposed definition would remove the NAICS codes. The definition of "energy intensive" was discussed and current characteristics of industrial customers were shown by tariff. Finally, the steps required to achieve DSM-EE exemption were presented. Mr. Huff explains the opt-out process in his testimony.

During the first meeting of 2017, the historical performance of the Companies' DSM-EE programming was presented. And during the final meeting of 2017, the Proposed DSM-EE Program Plan was presented.

In addition to consulting with Cadmus and the DSM Advisory Group, the Companies are members of E Source, a research organization focused on energy efficiency, utility customer satisfaction, program design, marketing, customer management, and sustainability.[7] I recently attended the E Source Forum 2017 and participated in the DSM Council, which provided an opportunity for utilities and DSM-EE vendors to share information about best practices, critical issues, and emerging technologies.

The Companies' Proposed DSM-EE Program Plan is therefore the product of the combined efforts of the Companies and all the parties with whom they consulted.

Q. Do the Companies take into account their Integrated Resource Plan when formulating DSM-EE proposals?

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[6] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates*, Case No. 2014-00371, Order at 9 (June 30, 2015); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates*, Case No. 2014-00372, Order at 9-10 (June 30, 2015).

[7] Additional information available at https://www.esource.com/.

A. Yes, the Companies have presented DSM-EE program opportunities as part of their Integrated Resource Plan ("IRP"). In the last IRP the Commission Staff supported the Companies' continuation of their DSM-EE portfolio.[8] The Companies' current DSM-EE Program Plan, which the Commission approved in 2014, further increased program-participation opportunities for customers and supported the Companies in meeting their IRP cumulative-demand-reduction projection. But as Mr. Huff discusses in his testimony, significant changes in customer load projections since the Companies filed their 2014 IRP now require broad changes to the Companies' DSM-EE programs.

The Proposed DSM-EE Program Plan

Q. What changes are the Companies proposing to their DSM-EE portfolio?

A. For the 2019-2025 period, the Companies are proposing to continue the following programs: Low Income Weatherization Program (WeCare) (previously filed as Residential Low Income Weatherization Program), Residential and Small Nonresidential Demand Conservation Program (previously filed as the Residential Load Management/Demand Conservation Program), Large Nonresidential Demand Conservation Program (previously filed as Commercial Load Management/Demand Conservation Program), Nonresidential Rebates Program (previously filed as Commercial Conservation/Commercial Incentive Program), School Energy Management Program, and the Advanced Metering Systems Customer Service Offering.

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[8] *In the Matter of: 2014 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company*, Case No. 2014-00131, Staff Report at 31 (Ky. Pub. Serv. Comm'n March 1, 2016) ("Staff is satisfied that the Companies have continued to review new possible DSM/EE programs and seek ways to expand the current approved DSM/EE plan has evident in their last DSM application.").

Q. What challenges did the Companies face in preparing their DSM-EE portfolio?

A. Cost-effectiveness challenges posed the most difficulty to the Companies. As discussed in the testimony of Mr. Huff, shrinking avoided capacity costs and falling avoided energy costs reduced the overall benefits (reflected in the numerators of the cost-effectiveness tests) of the programs. Further, increasing labor, project, and program costs in the denominator of the cost-effectiveness tests offset decreasing measure costs (i.e. LEDs). In addition, the success of the Companies' DSM-EE programs and customers' independent energy-efficiency measures has reduced the amount of cost-effective DSM-EE potential. These factors combined to create challenges to existing and new DSM-EE programs.

Q. What changes have the Companies already proposed to their DSM-EE portfolio?

A. On November 29, 2017, the Companies filed revisions to their existing DSM-EE portfolio. Based on the results of the *Program Review*, which evidenced diminishing achievable potential in the residential sector, the Companies determined it was prudent to propose the following revisions to their existing Commission-approved DSM-EE Programs:

- Residential Load Management/Demand Conservation. Monthly bill credit for June-September per air conditioning unit or heat pump on single family home decreases from $5 to $3; no property owner incentive for multi-family option.
- Commercial Load Management/Demand Conservation. Incentive to customer decreases from $25/kW to $15/kW on Customer Equipment

Interface Option; monthly bill credit for June-September per air conditioning unit up to 5 tons decreases from $5 to $3.

  - Commercial Conservation/Commercial Incentives. Incentives available to customers will be based on $0.03/kWh instead of $100/kW.
  - Residential Conservation/Home Energy Performance Program. The Companies will no longer provide an incentive for the follow-up test portion of program for audits scheduled on or after April 1, 2018; full certified audits will still be available for $25. The follow-up test must be scheduled by September 1, 2018.
  - Smart Energy Profile. No further profiles will be issued after March 31, 2018.
  - Residential Incentives Program. A customer desiring an incentive must purchase a qualified item and request an application prior to April 1, 2018. All incentive applications, including proofs of purchase, must be received by September 1, 2018. No incentives will be paid after December 31, 2018.

Although these programs were approved through the end of 2018, the Companies determined that it was prudent to revise these programs early due to changed circumstances and reduced cost-effectiveness.

Q. What additional changes are the Companies proposing to their DSM-EE portfolio in the Proposed DSM-EE Program Plan?

A. The Companies are proposing changes to the following programs:

- Low Income Weatherization Program (WeCare) (previously filed as Residential Low Income Weatherization Program)
- Residential and Small Nonresidential Demand Conservation Program (previously filed as the Residential Load Management/Demand Conservation Program)
- Large Nonresidential Demand Conservation Program (previously filed as Commercial Load Management/Demand Conservation Program)
- Nonresidential Rebates Program (previously filed as Commercial Conservation/Commercial Incentive Program)
- School Energy Management Program
- AMS Customer Service Offering

The Companies are also proposing to let some DSM-EE programs expire.

Q. Why are the Companies proposing to allow certain programs to expire at the end of 2018?

A. Along with the programs terminated in early 2018, the Companies will allow the following programs to expire at the end of 2018 because they will have reached the end of their approval cycle and now fail to meet the cost-benefit thresholds:

- Residential Conservation Program/Home Energy Performance Program
- Residential Refrigerator Removal Program
- Customer Education and Public Information Program

Q. Please explain the Residential Conservation Program/Home Energy Performance Program and the Companies' decision to let the program expire.

A. The Commission approved the Residential Conservation Program/Home Energy Performance Program in Case Nos. 2011-00134 and 2014-00003.[9] The program provides an onsite energy audit by a certified energy analyst who assesses the home's efficiency and provides a report with energy saving improvement recommendations; customers who achieve efficiency through the improvements are eligible for incentives to partially offset the cost of the improvements. However, the majority of measures are no longer cost-effective. And due to the diminishing achievable potential of the offering within the residential sector, there is no longer a need to continue to fund this program beyond the approved 2018 budget cycle. But the Companies will still provide full certified audits for $25 through the end of 2018, though incentives will not be available for measures implemented as a result of any audit scheduled on or after April 1, 2018, and a customer's follow-up test must be scheduled by September 1, 2018.

Q. Please explain the Residential Refrigerator Removal Program and the Companies' decision to let the program expire.

A. The Commission approved the Residential Refrigerator Removal Program in Case Nos. 2011-00134 and 2014-00003.[10] The program provides rebates to customers for the removal, recycling, and replacement of inefficient refrigerators and freezers. However, the declining age in the removed appliances made this program no longer cost-effective. And due to the diminishing achievable potential of the offering within

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[9] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Review, Modification, and Continuation of Existing, and Addition of New Demand-Side Management and Energy-Efficiency Programs*, Case No. 2011-00134, Order (Ky. Pub. Serv. Comm'n Nov. 9, 2011); Case No. 2014-00003, Order (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

[10] *Id.*

the residential sector, there is no longer a need to continue to fund this program beyond the approved 2018 budget cycle.

Q. Please explain the Customer Education and Public Information Program and the Companies decision to let the program expire.

A. The Commission approved the Customer Education and Public Information Program ("CEPI") in Case Nos. 2007-00319 and 2014-00003.[11] The program provides education and increased public awareness and understanding of the urgent need for more efficient use of energy and the financial impacts created by increased usage. Because the Companies are scaling back their DSM-EE programs to reflect changed conditions, it is also prudent to discontinue the CEPI in DSM-EE, which was largely used to highlight and advertise the Companies' DSM-EE programs. Although the Companies propose to let the program expire, the Companies are committed to continuing education efforts regarding the benefits of reduced energy consumption, though not as a DSM-EE program in the Proposed DSM-EE Program Plan. In addition, program-specific advertising costs are included in each program's budget. Though at reduced levels, the Companies propose to retain program-specific advertising in the budgets for programs remaining in the 2019-2025 DSM-EE Program Plan.

Q. Do the Companies use cost-benefit tests to help determine which DSM-EE programs to propose to continue or implement?

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[11] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company Demand-Side Management for the Review, Modification, and Continuation of Energy Efficiency Programs and DSM Cost Recovery Mechanism*, Case No. 2007-00319, Order (Ky. Pub. Serv. Comm'n March 31, 2008); Case No. 2014-00003, Order (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

A. Yes, the Companies rigorously analyze existing and potential DSM-EE programs using the industry-standard cost-benefit tests set out in the California Standard Practice Manual,[12] which the Commission has required utilities to apply for almost 20 years: "Any new DSM-EE program or change to an existing DSM-EE program shall be supported by … [t]he results of the four traditional DSM-EE cost-benefit tests [Participant, Total Resource Cost, Ratepayer Impact, and Utility Cost tests]."[13] The Manual defines the four tests as follows:

- **The Participant Test:** The Participants Test is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.[14]

- **The Ratepayer Impact Measurement Test:** The Ratepayer Impact Measure (RIM) test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementations are less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.[15]

- **The Total Resource Cost Test:** The Total Resource Cost Test measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. … This test represents the combination of the effects of a program on both the customers participating and those not participating in a program. In a sense, it is the summation of the benefit and cost terms in the Participant and the Ratepayer Impact Measure tests, where the revenue (bill)

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[12] The Manual is available online at: http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF.

[13] *In the Matter of the Joint Application of the Members of the Louisville Gas and Electric Company Demand-Side Management Collaborative for the Review, Modification, and Continuation of the Collaborative, DSM Programs, and Cost Recovery Mechanism*, Case No. 1997-00083, Order at 20 (Ky. Pub. Serv. Comm'n Apr. 27, 1998).

[14] Manual at 8.

[15] Manual at 13.

change and the incentive terms intuitively cancel (except for the differences in net and gross savings).[16]

- **The Program Administrator Cost Test (or "Utility Cost Test"):** The Program Administrator Cost Test measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC [Total Resource Cost] benefits. Costs are defined more narrowly.[17]

The Companies performed the four traditional DSM-EE cost-benefit tests for each of the DSM-EE programs in the Proposed DSM-EE Program Plan. The results of the cost-benefit tests for all of the programs in the Proposed DSM-EE Program Plan are shown below. Note, a score of 1.0 or greater is "passing," meaning that the value of program's benefits is equal to or greater than the cost of the program:

Program	TRC	PCT	RIM	PAC
Nonresidential Rebates	1.14	2.14	0.49	4.23
PD&A	0.00	N/A	0.00	0.00
Total Energy Efficiency and PD&A	**1.06**	**2.14**	**0.47**	**3.31**
Residential and Small Nonresidential Demand Conservation	0.00	N/A	0.00	0.00
Large Nonresidential Demand Conservation	0.01	1.62	0.01	0.01
WeCare	0.44	N/A	0.19	0.44
SEMP/KSBA	0.30	N/A	0.19	0.30
AMS Customer Service Offering	0.00	N/A	0.00	0.00
Total Portfolio	**0.67**	**2.96**	**0.33**	**1.01**

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[16] Manual at 18.

[17] Manual at 23.

Q. Why are the cost-benefit tests set out in the California Standard Practice Manual important?

A. These tests provide an independent assessment of the value of the program to the various entities that are impacted by them individually, such as participants, the utility, and ratepayers, or together for all of the above. But the cost-benefit tests provided in the California Standard Practice Manual are not the only reasonable means of determining cost-effectiveness, as Mr. Huff discusses in his testimony concerning the Companies' Demand Conservation Programs.

Q. Why are the Companies proposing programs in the DSM-EE portfolio that do not pass the cost-benefit tests?

A. The Companies are proposing to continue some programs that do not pass the cost-benefit test, but are nevertheless reasonable, for reasons that are not accounted for within cost-effectiveness screening. The WeCare Program serves a need among the low-income population in the Companies' service territories. Although the WeCare Program does not pass the California cost-effectiveness tests, it serves some of the Commonwealth's most vulnerable customers and the Companies are proposing to continue administering this program. Mr. Huff provides additional testimony regarding the importance of continuing the WeCare Program.

The Residential and Small Nonresidential Demand Conservation Program and the Large Nonresidential Demand Conservation Program are not currently cost-effective under the California cost-effectiveness tests because of very low avoided capacity costs. But as Mr. Huff describes in his testimony, these Demand

Conservation Programs provide reliability benefits that merit their continued operation as cost-effective at the levels proposed by the Companies.

Q. What are the projected overall costs and benefits of the DSM-EE program portfolio the Companies are proposing in this proceeding?

A. The table below shows the annual energy, demand, and gas savings the proposed DSM-EE program portfolio is projected to produce:[18]

	Unit	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023	Year 6 (2024)	Year 7 (2025)
Energy	MWh	38,120	38,120	30,893	30,893	31,017	31,017	31,017
Demand	MW	189.8	181.6	172.2	164.8	157.9	151.1	144.7
Gas	Ccf	79,605	79,605	79,605	79,605	79,605	79,605	79,605

To achieve these benefits, the Companies project a total DSM-EE portfolio cost of $98.25 million from 2019 to 2025. The proposed annual budget per program per year is provided in the following table:

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[18] Note that the demand savings shown in the table above do not reflect the entirety of the demand savings that will continue to persist from past DSM-EE investments; rather, they reflect only the demand savings related to DSM-EE measures supported by the Proposed DSM-EE Program Plan, including all demand savings related to the Companies' Demand Conservation Programs.

Program ($000)	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Nonresidential Rebates	2,835	2,856	2,774	2,543	2,543	2,550	2,557
WeCare	6,335	6,341	6,347	6,667	6,359	6,366	6,373
Large Nonresidential Demand Conservation	939	843	847	1,003	854	859	863
Residential and Small Nonresidential Demand Conservation	3,586	2,378	2,600	2,365	2,359	2,353	2,348
AMS Customer Service Offering	894	489	474	510	500	512	524
School Energy Management Program	725	725	-	-	-	-	-
Program Development & Administration (PDA)	724	733	742	751	760	770	780
O&M Total	**15,609**	**14,373**	**14,115**	**14,169**	**13,703**	**13,703**	**13,703**
Large Nonresidential Demand Conservation	-	-	-	-	-	-	-
Residential and Small Nonresidential Demand Conservation	-	-	-	-	-	-	-
AMS Customer Service Offering	500	61	63	65	67	69	71
Capital Total	**500**	**61**	**63**	**65**	**67**	**69**	**71**
Grand Total	**16,039**	**14,365**	**13,783**	**13,839**	**13,375**	**13,408**	**13,444**

Q. What monthly bill impact will the Companies' proposed DSM-EE portfolio have on an average residential customer?

A. The Companies project that the monthly bill impact of the new DSM-EE programs and program revisions will be $1.47 for an LG&E residential electric customer with average usage of 957 kWh per month and $1.23 for a KU residential electric customer with average usage of 1,179 kWh per month. For the same average-usage customers, the current DSM-EE charge for LG&E residential electric customers is $3.31 and $3.42 for KU residential electric customers. In other words, an LG&E electric customer using 957 kWh per month will see a DSM-EE-related bill decrease of $1.84 per month and a KU electric customer using 1,179 kWh per month will see a DSM-EE-related bill decrease of $2.19 per month.

The Companies project that the monthly gas bill impact of the new DSM-EE programs and program enhancements will be $0.05 for an LG&E residential gas customer with average usage of 55 Ccf per month. For the same average-usage customers, the current DSM-EE charge for LG&E residential gas customers is $1.03. In other words, an LG&E gas customer using 55 Ccf per month will see a DSM-EE-related bill decrease of $0.98 per month.

Summaries and Evaluations of Existing Programs to Be Continued with Modifications

Q. Please describe the Residential and Small Nonresidential Demand Conservation Program and the Large Nonresidential Demand Conservation Program and the changes the Companies propose to make to them.

A. The Residential and Small Nonresidential Demand Conservation Program is a voluntary program that reduces peak demand when energy consumption is at its highest. The program currently uses switches to cycle central air conditioning systems, heat pumps, electric water heaters, and pool pumps in residential and small commercial properties.

The Companies are proposing to maintain the Residential and Small Nonresidential Demand Conservation Program in a maintenance mode, ceasing to invest in or deploy new load-control devices. The program will allow new participants to enroll to the extent existing devices are available to deploy from the premises of customers who no longer desire to participate. The program will also pay a reduced incentive for participation. For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load

Control Event that season. (A Load Control Event provides load reduction by splitting the population of load-control devices into three segments, where each segment is scheduled to be off for 10-15 minutes in each 30 minute increment for the duration of the Load Control Event, which usually lasts up to four hours.) If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit or heat pump enabled with a switch. The Companies will no longer pay additional incentives for increased tonnage for small nonresidential participants and will no longer install switches on water heaters or pool pumps.

Previously, bill credits for multifamily customers were split evenly between the property owner and the tenant. The Companies plan to discontinue paying the property owner and pay only the tenant who is participating in a Load Control Event.

Also, the Companies will discontinue quality assurance and quality control checks on installed devices, a process that currently ensures 10% of all installed devices are inspected on an annual basis.

In 2013, the Companies launched the Commercial Load Management / Demand Conservation Program (to be renamed the Large Nonresidential Demand Conservation Program), a large commercial load management program. It now has forty-eight (48) large commercial accounts participating, which represent over two hundred (200) sites across the service territory. Sites participating in the program include retail, schools, utilities, local government, and distribution facilities. In addition to the benefits of delaying new generation assets, customers who participate in this program will benefit from equipment installation that provides real-time monitoring capabilities to educate customers on day-to-day energy use. This information can help customers identify additional opportunities to use energy more efficiently.

Similar to the Residential and Small Nonresidential Demand Conservation Program, the Companies are proposing to maintain static level of participation in the Large Nonresidential Demand Conservation Program and pay a reduced incentive. However, the eligibility of the program will be expanded to include industrial customers. The incentive will be reduced from $25/kW to $15/kW. As with the Residential and Small Nonresidential Demand Conservation Program, for each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season.

To continually assess the effectiveness of the Companies' load-control switches, the Companies will periodically test the load-control switches and conduct other short-duration (i.e., no longer than 10 minutes) activations of load-control devices (such activations are called SCRAMs) as needed. The Companies will not pay an incentive for these tests and SCRAMs, which are not Load Control Events.

Q. Please describe the Nonresidential Rebates Program (previously filed as the Commercial Incentives/Commercial Rebates Program) and the changes the Companies propose to make to it.

A. As currently approved, the Commercial Conservation/Commercial Incentives Program provides participating customers the opportunity to apply for financial rebates to assist with replacing aging and less-efficient equipment through prescriptive or customized rebates. Also, the Companies offer two types of new construction incentives. The first type of incentive is LEED New Construction rebates based on LEED certification points. The second type of incentives is new construction rebates based on building above current state code.

The Companies seek to change this program, now called the Nonresidential Rebates Program, in several ways: (1) industrial customers will be eligible to participate in the program, subject to the opt-out process described more fully in Mr. Huff's testimony; (2) for prescriptive and custom rebates, the rebated amount will be based on first year annual energy savings rather than basing the incentive on reducing demand; and (3) new construction rebates will also be adjusted to reflect reduced energy savings. But no changes are currently proposed to the LEED New Construction Rebates.

Q. Please describe the Low Income Weatherization (WeCare) Program and the changes the Companies propose to make to it.

A. Since 1994, the Low Income Weatherization (WeCare) Program has been providing energy audits, energy education, and the installation of weatherization and energy conservation measures in residential homes where the account holder meets specific income requirements.

The Companies are requesting to modify the program in three ways. First, the Companies propose a revision to the incentive structure to offer an average amount of funds per home, effectively eliminating the current "tier" structure. These tiers dictate the level of allowable incentives to each participant and are based on a customer's annual energy consumption, with those consuming the most receiving the largest incentive benefit. As described in Mr. Huff's testimony, a thorough analysis of the program's savings and costs, along with customer feedback, has shown that all participants would benefit from an average level of incentives per customer.

Secondly, the Companies are requesting to increase the maximum income requirement of the WeCare program (currently at the LIHEAP level) so that it matches that of the Weatherization Assistance Program (WAP), which is 200% of the poverty level. This will allow more low-income customers to participate in the program.

Lastly, it will allow master-metered multifamily buildings to qualify for program services. Over the years, the Companies have seen an interest to participate in WeCare from residential customers whose electric service is metered on a nonresidential rate. These occurrences are typically the result of electric and gas services across many multifamily dwellings being aggregated to one "master" meter, and being classified as nonresidential, they have previously not been eligible for participation in the program even though the end use is effectively residential. To broaden the availability of WeCare services to all income-qualified customers, regardless of their home's service configuration, we are proposing the inclusion of nonresidential, master-metered multi-family buildings. The Companies will ensure there is no cross-subsidization between the residential and nonresidential customers resulting from the inclusion of master-metered multi-family complexes in the WeCare program.

Q. Please describe the School Energy Management Program and the changes the Companies propose to make to it.

A. The School Energy Management Program ("SEMP") was first approved in Case No. 2013-00067 and assists schools by funding energy management programs. In Case Nos. 2014-00371 and 2014-00372, the Commission approved an extension of SEMP through June 30, 2016,[19] and in Case No. 2015-00398, the Commission approved an additional extension through June 30, 2018.[20] In accordance with the Commission-approved Stipulation and Recommendation in Case Nos. 2016-00370 and 2016-00371, the Companies are now proposing a two-year extension of SEMP for July 1, 2018, through June 30, 2020, with a total annual level of funding to be proposed at $725,000 (to be allocated $362,500 KU and $362,500 LG&E unless otherwise requested by Kentucky School Boards Association as the SEMP administrator). Therefore, this program will continue to facilitate the hiring and retaining of qualified energy specialists by public, private, and independent school districts. As noted in the Companies' Application, the Companies request that the Commission enter an order by June 1, 2018, approving the SEMP, thereby permitting the program to continue uninterrupted.

Below are the contractual responsibilities and reporting requirements by districts and their energy managers in order to receive SEMP funding:

Energy Manager Responsibilities

- Assist district energy committee with implementation and maintenance of district Energy Management Plan (EMP)

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[19] Case No. 2014-00371, Order at 11 and Appendix A at 8-9 (June 30, 2015); Case No. 2014-00372, Order at 12 and Appendix A at 8-9 (June 30, 2015).

[20] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for the Review and Modification of the School Energy Management Program,* Case No. 2015-00398, Order (Mar. 31, 2016).

- Analyze utility bill for accuracy and develop baselines to facilitate computation of ongoing energy savings
- Facilitate or conduct building energy assessments and identify actions to enhance efficient use of energy
- Review existing building operation procedures and implement revised procedures to facilitate more efficient energy use practices
- Implement and support Energy Teams at the individual school level
- Maintain accurate records and databases for efficient program monitoring and evaluation
- Communicate efficient energy usage practices and achievements to faculty, staff, students, and the community
- Evaluate opportunities for ENERGY STAR Certification and develop and implement practices to achieve such certification
- Participate in Professional Development opportunities to better understand relationship between energy management and school districts, and its relationship to educational, financial, and environmental goals and objectives
- Collaborate with teachers in developing energy efficiency as a core curriculum event

Reporting Requirements to the Kentucky School Boards Association

- An Energy Management Plan ("EMP") and identify anticipated savings as consistent with KRS 160.325
- An Energy Management Report ("EMR") consistent with KRS 160.325

- An Energy Management Work Plan which details the activities to achieve an annual 2.5 percent Energy and Demand Reduction
- A work plan developed by:
    - Auditing the district's facilities and identifying energy efficiency improvements which will improve the districts energy utilization
    - Developing a comprehensive list and cost of the identified Energy Conservation Measures ("ECMs")
    - Prioritizing and creating a timeline for implementation of the ECMs;
    - Presenting for approval by the District Energy Team the ECMs into scheduled short-term and long-term activities to be recommended to the Superintendent and Board of Education for budget inclusion and action

Q. Please describe the Advanced Metering System Customer Service Offering and any changes the Companies propose to make to it.

A**.** The Advanced Metering System ("AMS") Customer Service Offering was first approved in Case No. 2014-0003 and provides customers an opportunity to request and receive an advanced meter, which allows customers to access individual daily consumption data through a website. Customers can use this information to better understand their consumption patterns and identify additional opportunities for energy-efficiency savings. The authority previously provided by the Commission would permit up to 10,000 total meters to be installed (5,000 for each of the Companies); as of November 30, 2017, 7,125 customers have enrolled, with over 5,500 AMS meters now deployed. Due to the significant customer interest in this offering, the Companies propose to continue the offering without change and subject to the existing 10,000 meter limit in the Proposed DSM-EE Program Plan. But as Mr. Huff explains in his testimony, if the Companies receive approval for the full AMS deployment in future proceedings, the Companies will simultaneously request to phase out the AMS Customer Service Offering.

Ensuring the Value and Performance of the Companies' DSM-EE Programs

Q. How do the Companies ensure that their DSM-EE programs remain effective after they are approved and implemented?

A. The Companies recognize the value in having a continuous improvement process for programming. Currently, the Companies use a third-party contractor to examine program design, delivery, impacts, processes, and return on investment. This contractor ensures quality and effectiveness of the programs, optimal use of resources, and responsiveness to customers' needs.

The Companies will use the results and guidance to ensure that all of the programs contained in this filing remain prudent, demonstrate continuous improvement, and remain a good application of customer dollars. The Companies typically evaluate their DSM-EE programs in two phases, process evaluation and impact evaluation. Process evaluation is a systematic assessment of an energy efficiency program for the purposes of improving its design, delivery, and perceived quality and usefulness to customers. Impact evaluation focuses on quantifying the energy and demand savings and other economic benefits of the program. The Companies plan to engage in this evaluation on a regular basis in order to quickly make changes necessary to ensure the continued cost-effectiveness of the Companies' DSM-EE programming.

Recommendation and Conclusion

Q. What is your recommendation concerning the Companies' Application for their Proposed DSM-EE Program Plan?

A. I recommend that the Commission approve the Companies' Application. The Companies have seen impressive results from their DSM-EE programs to date, and they can continue to achieve effective results in the contracted portfolio. Although the Companies are proposing reductions in their overall DSM-EE portfolio, the Companies remain committed to actively identifying and pursuing cost-effective DSM-EE measures.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Gregory S. Lawson**, being duly sworn, deposes and says that he is Manager Energy Efficiency Planning and Development for Louisville Gas and Electric Company and Kentucky Utilities Company, an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Gregory S. Lawson

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 6th day of December 2017.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:
JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Gregory S. Lawson
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202

Education

Bachelor of Science in Mathematics:	
Centre College	August 1989
Master of Business Administration:	
University of Louisville	May 1998

Professional Experience

Louisville Gas and Electric Company and Kentucky Utilities Company

Manager, Energy Efficiency Planning & Development	January 2016 – Present
Manager, Sales Analysis & Forecasting	January 2011 – January 2016
Manager, Trading Controls	December 2000 – July 2007
Senior Market Analyst/Senior Trading Controls Analyst	June 1997 – December 2000

Schneider Electric

Manager, Forecasting & Analysis/Risk Manager	July 2007 – January 2011

Humana, Inc.

Actuarial Analyst	November 1991 – June 1997

Professional Memberships

Kentucky Energy Efficiency Working Group	January 2016 – Present
E-Source Technology Leadership Council	January 2016 – Present
Midwest Energy Efficiency Alliance (MEEA)	January 2016– Present

Louisville Gas and Electric Company and Kentucky Utilities Company 2019-2025 Demand-Side Management and Energy Efficiency Program Plan

Exhibit GSL-1

Table of Contents

1. Executive Summary

1.1. Introduction

As Kentucky's largest utilities, Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively "Companies") serve more than 1.2 million customers. The Companies seek to provide safe and reliable energy resources to their customers at reasonable costs. The Companies have offered a comprehensive portfolio of demand-side management and energy-efficiency ("DSM-EE") programs since 1994, aimed to achieve the following objectives:

- Provide customers with a diverse range of tools and information on the benefits of energy efficiency and assist them in using energy wisely;
- Emphasize best-in-class customer experience;
- Make a long-term commitment to offset the need for additional capacity and save energy in a cost-effective manner;
- Ensure a balanced approach to meeting the anticipated resource needs of the Companies and their customers;
- Collaborate with stakeholders (e.g., customers, federal or state officials, industry experts, low-income customer advocates, and utility associations) on energy efficiency matters;
- Stimulate economic benefits in Kentucky;
- Facilitate energy security for Kentucky's disadvantaged populations; and
- Improve the comfort and indoor health of homes and buildings throughout the Companies' territories.

Through October 2017, the Companies' DSM-EE programs have avoided the need for more than 450 MW of capacity and achieved energy savings of 100,000 MWh to almost 200,000 MWh per year. In short, the Companies' DSM-EE programs have been highly successful. However, in light of the changing conditions discussed below, and in anticipation of this filing, the Companies took steps to reduce program expenditures in 2018 on those programs that no longer proved to be cost effective. The Companies' significant reduction in the DSM-EE budget for 2018 will reduce charges to customers through the Demand-Side Management Cost Recovery Mechanism.

This reduction in 2018 planned expenditures means that the Companies will most likely fall short of the demand and energy reductions the Companies set as goals in Case No. 2014-00003.[1] Figures 1

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[1] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Review, Modification, and Continuation of Existing, and Addition of New Demand-Side Management and Energy-Efficiency Programs*, Case No. 2014-00003, Order at 13 (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

and 2 below show the cumulative demand and energy reductions, respectively, from the DSM-EE programs with actuals through 2016 and forecasts through 2018.

<u>Figure 1. – Demand Reduction</u>

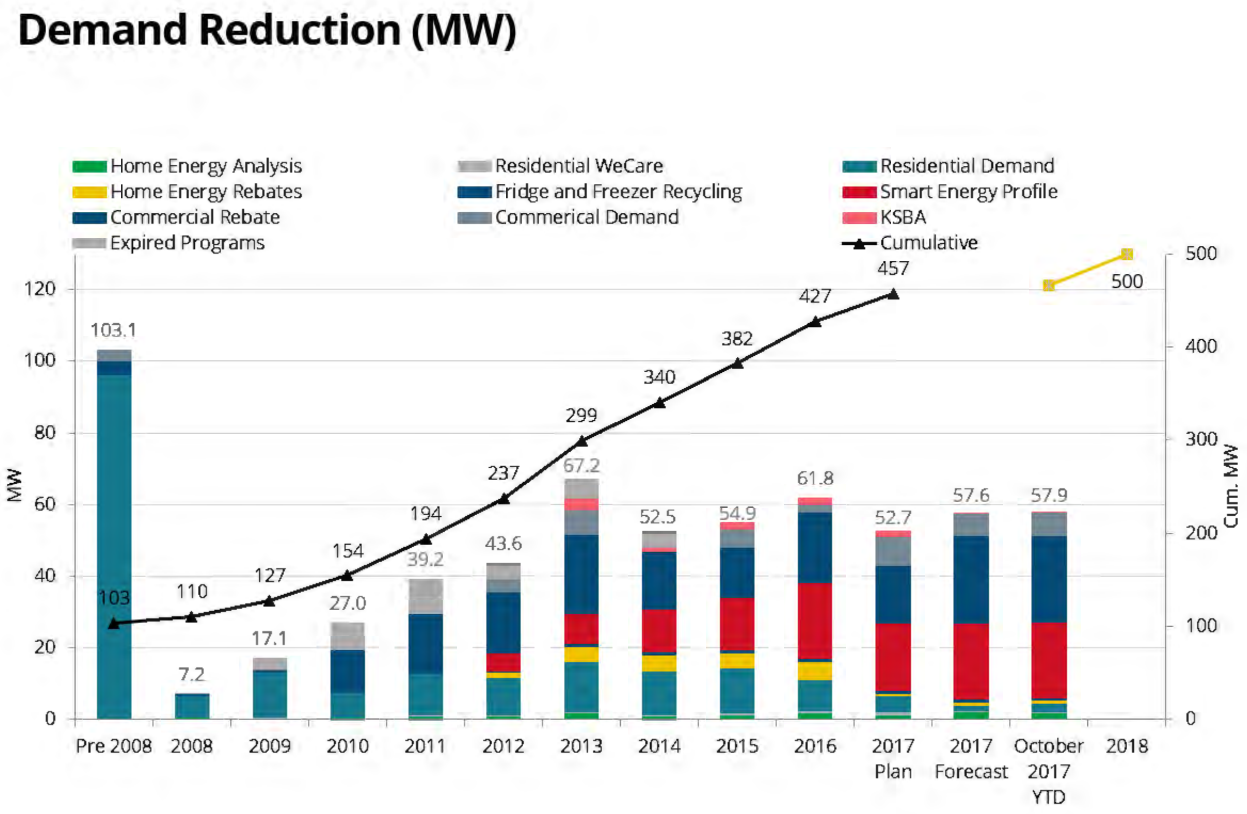
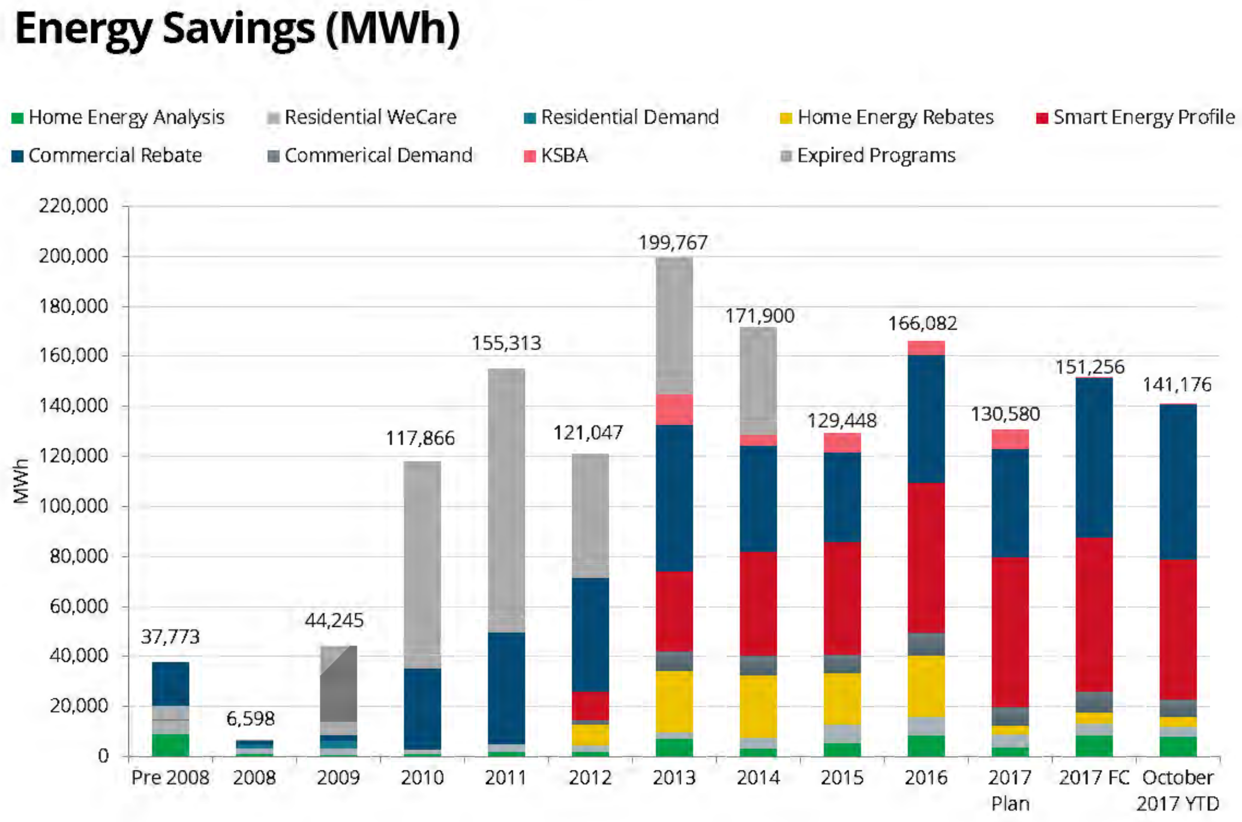


Figure 2 – DSM Energy Savings (MWh)



The four years since the Commission approved the current DSM-EE Program Plan has afforded the Companies greater insight into the challenges and obstacles associated with the metrics outlined within that program plan. Since the first DSM-EE program offerings in 1994, the Companies have offered and received approval for DSM-EE offerings in 1996, 1998, 2001, 2008, 2011, and most recently in 2014.

Since the Commission approved the current DSM-EE Program Plan in Case No. 2014-00003, the Companies have experienced changing market conditions, including declining load growth projections, very low fuel costs, and consequently low production costs.[2] Additionally, the Companies' most recent annual 30-year demand and energy forecast and resource plans project relatively flat demand and sufficient generating capacity. Therefore, the Companies project no significant investment in new generation over the next 30 years. Similar conditions are being felt in utility jurisdictions across the country, driven by the adoption of new building codes and equipment

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[2] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00370, KU Response (Ky. Pub. Serv. Comm'n Sep. 20, 2017).

standards, improvement in the efficiency of existing building stock as more consumers adopt efficient behaviors and install new efficient technologies, and the declining cost of some energy efficiency measures such as lighting. These changing conditions add considerable complexity and difficulty to the Companies' ability to design a cost-effective DSM-EE portfolio.

The Companies' proposed 2019-2025 DSM-EE Program Plan ("Proposed DSM-EE Program Plan") and the assumptions made herein, reflect the considerable challenges these changes introduce in the design and delivery of conservation programs. For example, because the Companies are experiencing very low load growth and have no capacity constraints, the Proposed DSM-EE Program Plan uses zero avoided capacity costs, which has significant impact on program and portfolio cost-effectiveness. In addition, the declining cost of natural gas reduces the avoided energy cost associated with variable cost of generation, further negatively impacting the cost-effectiveness of energy efficiency measures. As a result, some of the energy efficiency measures offered in past DSM-EE Program Plans are no longer cost-effective; therefore, they have not been included in the Proposed DSM-EE Program Plan. In light of these significant and complex challenges, the Companies have prepared a smaller portfolio of program offerings that save energy and meet customers' needs and the Companies' objectives for providing safe and reliable energy in addition to customer service.

In addition, the Proposed DSM-EE Program Plan recognizes changes in the Companies' approach to working with industrial customers by making nonresidential programs available to all commercial and industrial customers.[3] Going forward, industrial customers will be included in the Companies' DSM rate recovery mechanism, and will be eligible for all nonresidential programs offerings, unless they meet the Companies' opt-out criteria and formally follow the Companies' opt-out process. Additional details regarding this change and other conditions that impact the Proposed DSM-EE Program Plan are presented in the Plan Development Process section below.

In developing this Plan, the Companies sought input on key elements of the plan from stakeholders, expanded historically commercial offerings to include industrial customers, and aligned their programs more closely with the findings in their 2017 Energy Efficiency Potential Study.[4] This Plan places great emphasis on measure-, program-, and portfolio-level cost-effectiveness but retains three DSM-EE programs that are not cost-effective to help the Companies manage risk associated with system disruptions and maintain customer service offerings. In addition, this Plan includes a two-year extension for the School Energy Management Program ("SEMP") as stipulated in the

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[3] This change in approach was due in part to the Commission's final orders in the Companies' 2014 base-rate cases. *See In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2014-00371, Order at 8-9 (June 30, 2015); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates,* Case No. 2014-00372, Order at 8-10 (June 30, 2015)

[4] Attached to the Testimony of Gregory S. Lawson as Exhibit GSL-3.

Companies' 2016 base-rate cases.[5] Collectively, the programs outlined in this Proposed DSM-EE Program Plan continue the Companies' history of offering customers a portfolio of flexible and inclusive energy efficiency options with programmatic choices and incentives for the residential and nonresidential customer classes.

The Companies have established the seven-year electricity savings goals of 214,667 MWh of electric energy savings, and 557,143 CCF of gas savings. This Plan also anticipates preserving an average estimated 178.9 MW of coincident peak demand reduction over the seven-year planning horizon.[6] These savings goals are based on rigorous research and analysis and informed by an objective, third-party assessment of potential. The Companies intend to achieve these savings goals by offering incentives on commercially available technologies with the highest cost-effective achievable energy savings potential.

1.2. Plan Development Process

History and Current Context

The Companies began negotiations with interveners in 1992 regarding the implementation of DSM-EE programs for the benefit of their customers and the recovery of the costs associated with such programs. This collaborative effort, then known as the DSM Collaborative (now called the EE Advisory Group) resulted in a request to the Commission in November 1993 to approve "The Joint Application for the Approval of Demand-Side Management Programs, a DSM Cost Recovery Mechanism, and a Continuing Collaborative Process on DSM for Louisville Gas and Electric Company" (Case No. 93-150). Initial DSM-EE programs were implemented in 1994.

The Companies continued to offer DSM-EE programs throughout the 1990s and 2000s. During this time, the Companies proposed, and were granted approval by the Commission, various modifications, new programs, and ongoing research. With each DSM-EE Program Plan, the Companies aimed to improve efficiency programming, provide customers with appropriate tools and resources to help them make better use of energy resources, address changing market conditions, explore opportunities to manage peak loads, and ensure the overall cost-effectiveness of their programs. In 2014, the Commission approved the Companies' latest DSM-EE Program Plan in Case

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[5] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00370, Order Appendix A at 16 (Ky. Pub. Serv. Comm'n Sep. 22, 2017); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00371, Order Appendix A at 16 (Ky. Pub. Serv. Comm'n Sep. 22, 2017)

[6] Note that these demand savings do not reflect the entirety of the demand savings that will continue to persist from past DSM-EE investments; rather, they reflect only the demand savings related to DSM-EE measures supported by the Proposed DSM-EE Program Plan, including all demand savings related to the Companies' Demand Conservation Programs.

No. 2014-00003. The approved portfolio included enhancements to many of the existing programs previously approved in Case No. 2011-00134, and represented a significant expansion of and emphasis on customer energy efficiency. The Companies supported their 2015-2018 DSM-EE Program Plan with a residential and commercial energy-efficiency potential study by The Cadmus Group ("Cadmus"),[7] an independent third-party energy efficiency planning and evaluation company.[8] (Cadmus did not include industrial energy-efficiency potential in its study because the Companies did not offer DSM-EE programs to industrial customers at that time due to such customers' expressed lack of interest in participating.) That study showed the Companies were then on track to achieve by 2018 all achievable energy-efficiency potential. Also, the Companies had Cadmus perform a program review to ensure the Companies were proposing a program plan comprising cost-effective programs and that the Companies were not overlooking potentially promising programs.[9]

In response to Commission orders in 2014 and 2015,[10] the Companies contracted with Cadmus to conduct an industrial potential and market-characterization study that could help identify technologies and programs that offer significant, cost-effective energy savings potential and inform the Companies' approach to capturing energy savings from their industrial sector customers. The study provides an assessment of achievable energy efficiency and demand reduction potential for industrial customers and characterizes the costs, savings, and applicability of industrial energy efficiency measures and demand reduction strategies. The Companies filed this report with the Commission on May 26, 2016, and subsequently met with the Companies' DSM Advisory Group to discuss and decide how to include industrial customers in the Companies' DSM-EE programs subject to an opt-out process compliant with KRS 278.285(3).[11]

In 2016 and 2017, the Companies worked again with Cadmus to conduct a broader study of residential and commercial achievable potential over a 20-year time horizon, from 2019 to 2038. (See Exhibit GSL-3 to the Testimony of Gregory S. Lawson.) The Companies used these studies to inform the development of the Proposed DSM-EE Program Plan.

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[7] Cadmus is a leading provider of consulting services to suppliers of electricity and natural gas throughout North America, specializing in energy efficiency, demand reduction, and climate change, among other areas. More information about Cadmus is available online: http://www.cadmusgroup.com

[8] Case No. 2014-00003, Direct Testimony of Michael E. Hornung Exh. MEH-3 (Jan. 17, 2014).

[9] Case No. 2014-00003, Direct Testimony of Michael E. Hornung Exh. MEH-2 (Jan. 17, 2014).

[10] Case No. 2014-00003, Order at 32 (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

[11] More detailed information concerning the DSM Advisory Group and its activities, including recent attendee lists, presentations, and meeting minutes, are available on the Companies' website at https://lge-ku.com/dsm.

Since implementing their 2015-2018 DSM-EE Program Plan, the Companies have experienced significant changes in the Kentucky marketplace similar to changes across the United States. For several years, the Companies have seen declining residential and commercial usage per customer, resulting from higher awareness of the benefits of energy efficiency and governmental intervention aimed at increasing the efficiency of energy using systems. Though these changes represent progress toward greater overall efficiency and cost savings, they have also brought new challenges associated with the Companies' ability to maintain their energy-savings trajectory within the confines of their commitment to delivering cost-effective energy efficiency to Kentucky customers. Some of these issues are highlighted below.

- **Zero avoided capacity benefits**. The Companies' avoided cost of capacity is based on resource needs to meet peak load which is materially different than the capacity cost used by other utilities. The Companies annually update their long-term load forecast to reflect the most recent information regarding future economic conditions, demographics, major account activities, and energy efficiency developments. The Companies most recent annual 30-year demand and energy forecast and resource plans project relatively flat demand and sufficient generating capacity over the next 30 years. Therefore, the Companies project no significant investment in new generation, which indicates zero avoided capacity cost benefits from DSM-EE programs.[12] Avoided capacity cost is a key factor in the calculation of program cost-effectiveness and therefore significantly impacts the ability to offer cost-effective energy-efficiency programs. Between 2013, when the Companies' first commercial and residential potential study was conducted, and the 2017 commercial and residential potential study, the Companies' avoided capacity costs declined from approximately $100/kW-year to zero.
- **Lower avoided energy costs**. In addition to lower capacity costs, lower avoided energy costs have impacted the economics of available cost-effective energy efficiency. In the three years between the 2013 and 2017 commercial and residential potential studies, avoided energy costs have declined by approximately 35%, largely due to decreased natural gas costs; natural gas spot prices declined by approximately 32% between January 2013 and January 2016. For comparison, the 2013 commercial and residential potential study had a 20-year average marginal energy cost of $0.043/kWh, whereas the Companies' current avoided marginal energy costs declined to a 20-year average of $0.028/kWh. As indicated in the 2017 commercial and residential potential study, the lower avoided costs had less of an impact on the commercial sector than on the residential sector in-part due to the availability of new cost-effective commercial measures (such as linear LEDs and fixtures). The impact from the lower avoided costs on the residential sector is reflected in the 2019-2025 DSM-EE Program Plan, and the Companies moved quickly to address these issues in their 2018 annual program

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[12] Case No. 2016-00370, KU Response (Ky. Pub. Serv. Comm'n Sep. 20, 2017).

plan filing, markedly reducing incentives and program expenditures based on lack of cost-effectiveness.

- **Changes in equipment standards.** Increasingly stringent equipment standards and other governmental intervention aimed at moving toward more efficient products and equipment are changing the efficiency baseline of many measures. As a result of new and impending efficiency standards for lighting, furnaces, boilers, and appliances, energy savings available from utility based programs for these measures has decreased. As a result, the Companies have not included some popular energy efficiency measures, such as nonresidential T8 lighting and residential appliances, in this DSM-EE Program Plan. For example, in 2012 the standard of a 4-foot linear commercial fluorescent lamp was 89 lumens per watt, in 2018, the standard will be 92 lumens per watt. Per The Energy Independence and Security Act (EISA) of 2007, starting in 2020, even higher efficiency standards are required for most light bulbs. While lumens quantify the brightness of a light bulb, Watts quantify how much energy the light bulb uses. Further, while the standard 60 Watt incandescent light bulb provides up to 14 lumens per Watt, an equivalent CFL provides up to 70 lumens per watt and an equivalent LED can provide up to 100 lumens per Watt.
- **Cost of savings.** While natural gas costs have decreased, the cost of capturing energy savings has increased over the past several years. In part, increasing market adoption and saturation of high efficiency measures has left fewer opportunities to capture energy savings through adoption of common measures such as ENERGY STAR qualified appliances. Additional factors include increasing product and labor costs, which are compounded by continuing economic conditions that may limit some customers' spending.
- **Approaching the efficiency ceiling.** In many cases, increasing energy efficiency standards mean that energy consuming equipment and systems are reaching the cost-effective limit of achievable efficiency. At the same time, some promising new technologies (e.g., heat pump water heaters and heat pump clothes dryers) have not reached a price point that would produce large scale market adoption or contribute to measurable cost-effectiveness. For other measures, adoption of higher efficiency technologies is taking place irrespective of utility intervention. According to the 2017 potential study, the Companies' existing DSM-EE programs, combined with the natural adoption of efficiency measures, has led to an increase in the saturation of cost-effective DSM-EE measures over the last three years. This transition to higher efficiency equipment increases the baseline from which energy savings are measured and reduces the resulting impacts, thereby lowering cost-effectiveness of current or new DSM-EE programs.
- **Lower energy saving potential.** Each of the factors discussed in this section played a role in the Companies' potential studies showing declining cost-effective energy savings potential. Please refer to Exhibit GSL-3 for a comparison of the potential study findings.

The cumulative effect of these changing conditions is a reduced cost-effectiveness of energy efficiency programs approved in past plan filings and a lack of new cost-effective programs. The Companies' Proposed DSM-EE Program Plan is a substantially smaller portfolio of programs than past plans due to the impacts of the changes discussed above on cost-effective program offerings.

Stakeholder Collaboration and Third-Party Input

Throughout the past several years, the Companies have maintained a careful focus on ensuring energy efficiency and demand conservation efforts continue to achieve objectives. As part of this effort, and to inform their next generation of DSM-EE Program Plan, the Companies worked closely with their DSM Advisory Group. The Companies established the DSM Advisory Group in 2000 to provide a forum for open communication and sharing of information to benefit the customers served by the Companies' DSM-EE Program Plan. The DSM Advisory Group comprises representatives of the Office of the Attorney General and various customer groups including residential, commercial, industrial, and low-income, as well as representatives of environmental advocacy organizations.[13] Specific activities of the DSM Advisory Group include:

- Reviewing the potential study results;
- Discussions and collaboration regarding the inclusion of industrial customers in the DSM-EE Program Plan;
- Reviewing the progress and performance of the current energy efficiency programs; and
- Offering suggestions to improve the programs' productivity and effectiveness and consult on potential future programs.

In preparation for the development of this DSM-EE Program Plan, the Companies convened five advisory group meetings throughout 2016 and 2017. These meetings focused on both integration of industrial customers and general program and portfolio planning. Table A provides an overview of these stakeholder meetings.[14] The attendee lists, presentations, and meeting minutes of these five meetings are attached collectively as Appendix A hereto.

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[13] More detailed information concerning the DSM Advisory Group and its activities, including recent attendee lists, presentations, and meeting minutes, are available on the Companies' website at https://lge-ku.com/dsm.

[14] The meeting minutes from these stakeholder meetings are available online: https://lge-ku.com/dsm

Table A. Summary of Stakeholder Engagement

Date	Number of Stakeholder Groups Represented	Topics Covered
Stakeholder Meetings Focused on Industrial Participation in DSM-EE Programs and Industrial Opt-Out		
June 23, 2016	12	• Industrial potential study results o Achievable potential o Energy efficiency program examples • Industrial exemption/DSM opt-out (KRS 278.285) • How to define and interpret the law's language
August 24, 2016	10	• Review of opt-out rules in other states (presentation from Midwest Energy Efficiency Alliance [MEEA]) • DSM opt-out in surrounding states (not covered in MEEA) • Review of Kentucky state law and current tariff • Energy intensive definition/cost-effective energy efficiency measures • Analysis of industrial exemption impact
October 13, 2016	11	• Review of KRS 278.285 regarding opt-out o Definition of industrial o Definition of energy intensive • DSM opt-out criteria proposed to meet KRS 278.285
Stakeholder Meetings Focused on Program Planning		
September 26, 2017	11	• Discussion of history and success of DSM programs • Discuss challenges of continued DSM programs with excess generation capacity, low load growth, and low energy costs
October 26, 2017	12	• Review of proposed 2018 budget filing for DSM programs filed in November 2017 • Review of planned DSM filing in December 2017

Plan Development

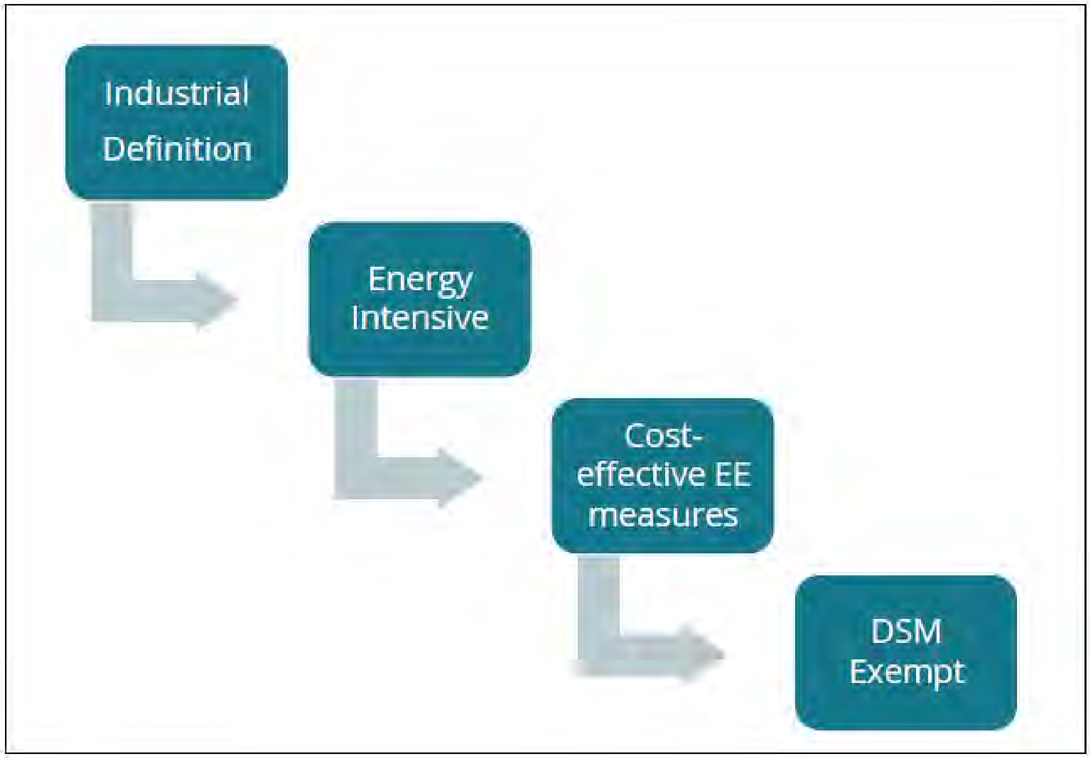
To develop this Proposed DSM-EE Program Plan, the Companies were largely guided by the findings of their potential studies. Since the 2015-2018 DSM-EE Program Plan, Cadmus has performed two studies— an industrial sector study in 2015-2016 and a residential and commercial study in 2017—to estimate the long-run technical, economic, and achievable potential of electric and natural gas energy efficiency in the Companies' service territories. In conjunction with the residential and commercial potential study, Cadmus conducted a gap analysis, which compared end use potential to the Companies' existing programs to identify programmatic gaps or untapped energy-savings potential and identify delivery options that would best align with identified achievable potential from the study (see Exhibit GSL-3). Based on Cadmus's analysis, the Companies compiled measures with significant cost-effective achievable potential and aggregate them into appropriate programs based on sector and equipment type. The Companies worked with Cadmus to develop program concepts, incorporating a best practice review of DSM-EE programs in other utility jurisdictions, and assess those that represent the best mix of programmatic offerings for the Companies and their customers.

The Companies conducted additional research on market trends and reviewed internal and external conditions that could substantially impact economic, temporal, market, and administrative conditions associated with delivery of their programs.

The Companies evaluated the inclusion of industrial customers in DSM program by carefully reviewing KRS 278.285 and its implications for their energy efficiency and demand conservation programs and savings potential. The relevant portion of the statute reads as follows:

> (3) The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual industrial customers with energy intensive processes to implement cost-effective energy efficiency measures in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs.

The Companies convened three meetings with their DSM Advisory Group in 2016, specifically to discuss ideas and offerings, and how they might relate to the law, its interpretation, and implications for the Companies' programs and upcoming DSM-EE Program Plan (see Table A for a summary of these stakeholder meetings). Visually, the steps for DSM exemption can be seen in the chart below:

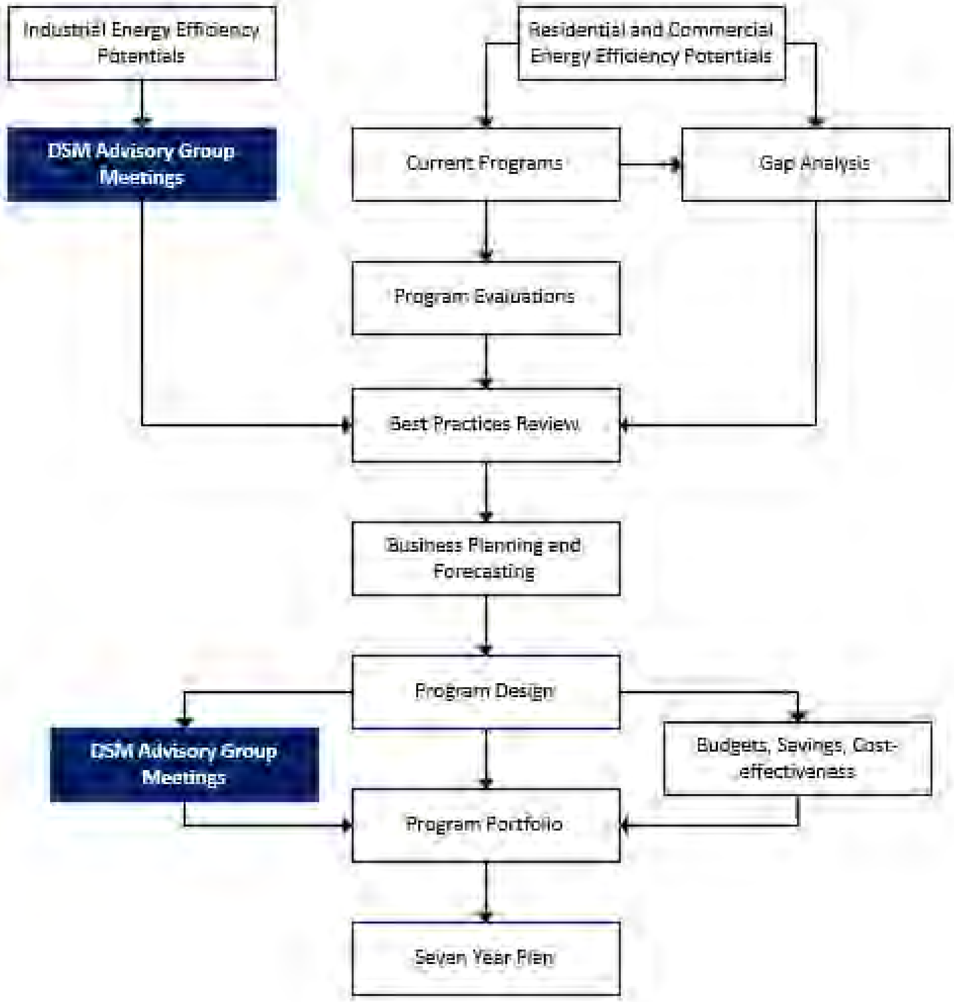


KRS 278.285 establishes the parameters for industrial customers to opt-out of participation in DSM. Specifically, an industrial customer may opt out of DSM Mechanism charges and DSM-EE program participation for individual meters served under energy-intensive rates if the customer has installed cost-effective energy-efficiency measures not subsidized by other rate classes for the loads served by such meters. The DSM Advisory Group discussed the definition of "energy-intensive" through the meetings listed in Table A. The DSM Advisory Group settled on defining Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), and Time-of-Day Primary Service (Rate TODP) to be energy-intensive. The Companies are also defining Industrial Gas Service (Rate IGS), As-Available Gas Service (Rate AAGS), Substitute Gas Sales Service (Rate SGSS), and Firm Transportation Service (Rate FT) to be energy-intensive for industrial gas customers. An industrial customer electing to opt-out eligible meters must submit to the Companies a completed opt-out form (see Exhibits REL-8 and REL-9 attached to the Testimony of Rick E. Lovekamp). Industrial customers must identify which meters are eligible to opt out by providing meter identification and the rate schedule applicable to each eligible meter, and by certifying the customer has implemented non-subsidized cost-effective energy-efficiency measures for the load served by each eligible meter. Therefore, (1) an industrial customer with multiple meters will be able to opt out of DSM-EE programs and charges for individual eligible meters, but will not be able to opt out of DSM-EE programs and charges for individual ineligible meters, e.g., meters served on rates other than energy-intensive rates; (2) energy-efficiency measures deployed at a facility served by one meter cannot be used to satisfy the opt-out criteria for a facility served by another meter; and (3) participation in the Companies' DSM-EE programs with regard to the load served by one meter will not preclude a customer from seeking an opt-out for other eligible meters.

Once approved, the customers' eligible meters will be exempt from DSM participation for a minimum of one year, and will remain exempt until the customer affirmatively opts back into charges under the DSM Mechanism. Also, if an industrial customer opts out a meter and subsequently opts the meter back into DSM-EE charges, the customer will be billed under the DSM Mechanism for that meter for a period of three years from the opt-in date or the last date in which the customer participated in DSM-EE programming with respect to the load served by the meter, whichever is later, before being eligible to opt out again. This three-year requirement mitigates the risk of customers opting into the DSM Mechanism to participate in a program only to opt back out and avoid future charges.

At several points during the planning process, the Companies coordinated with the DSM Advisory Group to present ideas, gather feedback, and report on the development of this DSM-EE Program Plan. The Companies carefully considered feedback from their stakeholder engagement efforts and integrated appropriate recommendations into the design of specific programs and the portfolio. Finally, the Companies worked with Cadmus to determine the costs, savings, and avoided cost benefits of each measure to compute cost-effectiveness and construct budgets and savings projections, as presented in this DSM-EE Program Plan. (A description of the step-by-step process Cadmus used is provided below in Figure 1; a detailed discussion of the cost-effectiveness analysis process is provided in the Program Benefit/Cost Calculations section, below.) Figure 1 illustrates the process the Companies used to derive the programs outlined in this DSM-EE Program Plan.

Figure 1. Plan Development Process



The Companies used a five-step process to develop their plan and constituent programs, as described below.

Step 1: Compile a list of energy efficiency and conservation measures and practices. Only measures based on proven, commercialized technologies were considered. For each measure, the Companies compiled data on technical specifications, potential end-use energy and demand impacts, and costs from the 2017 potential study and other secondary sources.

Step 2: Determine the costs, savings, and avoided cost benefits for each measure to compute the measure's cost effectiveness from a total resource cost perspective. (See section 1.4. Program Benefit/Cost Calculations for details on the cost effectiveness tests.) Screening measures based on achieving the cost-effectiveness threshold of 1.0 allowed the Companies to identify those measures that would materially contribute to their overall portfolio. The Companies considered each measure individually based on its cost-effectiveness, economic potential, market conditions, historical participation rates (for existing measures), and other factors, and eliminated those that did not offer significant benefit either in terms of cost-effective savings, reduced maintenance costs, or commitment to safe and reliable energy.

Step 3: Estimate the market saturation of each measure. The Companies derived their estimate of market saturation (i.e., number of installations) for existing measures based on participation in their 2015-2018 programs, then projected those rates over the 2019-2025 program delivery period. For new measures, the Companies derived participation rates from the potential study and other market research.

Step 4: For each measure in the DSM-EE Program Plan, calculate program level savings. The Companies calculated savings as the sum of each measure's annual energy savings estimate and expected market saturation over the entire DSM-EE Program Plan.

Step 5: Finalize the DSM-EE Program Plan. Finally, the Companies adjusted the expected number of participants, customer incentive levels, budgets, and savings in each program to optimize cost-effectiveness and benefits to the DSM-EE Program Plan. The objective is to provide a reasonable mix of programs that meet the Companies' objectives for a diverse plan with program offerings for each customer class.

1.3. Plan Overview

Energy efficiency initiatives are an important element of the overall corporate strategy to provide safe, reliable, and affordable energy to the Companies' customers. The Companies' Proposed DSM-EE Program Plan seeks to offer opportunities to customers to help them manage their energy consumption, provide a satisfying program experience, and achieve energy savings. The Companies conducted a careful, bottom-up review of the savings potential and cost-effectiveness associated with hundreds of energy efficiency technologies to determine those offering the greatest advantages to the Companies and their customers. The Companies also carefully considered other factors, such as administrative costs, qualitative objectives, and customer service needs associated with their existing portfolio of programs. Reflecting these considerations along with the safety and needs of our low income customers, this DSM-EE Program Plan proposes to offer a streamlined portfolio for residential and nonresidential customers with fewer prescriptive energy efficiency measures and programs than were offered in prior DSM-EE Program Plans. However, the Companies are proposing to continue three legacy programs despite not meeting cost-effective tests according to the California Standard Practice Manual (see Section 1.4. Program Benefit/Cost Calculations for a detailed explanation of the manual definitions).

Plan Composition

The Proposed DSM-EE Program Plan is composed of six programs. The Companies will continue some programs included in their current DSM-EE Program Plan, but with modifications. Chief among these modifications are the addition of industrial customers to the revised nonresidential programs and the addition of a master-metered multifamily component to the low-income program as a result of various stakeholder interactions. However, where previously offered program measures did not achieve a sufficient level of cost-effective savings potential, budgets and energy savings are expected to decrease in recognition of declining achievable energy efficiency savings potential.

Finally, the Companies are proposing to allow several programs to expire at the end of the current 2018 program cycle due to lack of sufficient cost-effective qualifying measures or lack of anticipated energy savings and capacity benefits. Table B provides a summary of proposed changes to the Companies current DSM-EE programs, including the justifications for allowing certain programs to expire.

Table B. Proposed DSM-EE Program Plan Changes

Program	Continuing unchanged	Modifications Proposed	Expiring	Details
Energy Efficiency Programs				
Low Income Weatherization Program (WeCare)		◆		• Revise the program by offering an average amount of funds per residence • Raise the maximum income requirements of the WeCare program (currently at the LIHEAP level) so that it matches that of the Weatherization Assistance Program (WAP) which is 200% of the poverty level • Allow eligible multifamily buildings regardless of rate class to qualify for program services*
Residential Conservation Program/Home Energy Performance Program			◆	The Residential Conservation Program/Home Energy Performance Program achieved great success allowing customers to upgrade their homes with energy efficient measures. However, the majority of measures are no longer cost-effective. Due to the diminishing achievable potential of the offering within the residential sector, there is no longer a need to continue to fund this program beyond the approved 2018 budget cycle.
Residential Refrigerator Removal Program			◆	The Residential Refrigerator Removal Program was extremely successful in removing older, less efficient refrigerators and freezers from participants' homes. However, the declining age in the removed appliances made this program no longer cost-effective. Due to the diminishing achievable potential of the

Program	Continuing unchanged	Modifications Proposed	Expiring	Details
				offering within the residential sector, there is no longer a need to continue to fund this program beyond the approved 2018 budget cycle.
Nonresidential Rebates Program (formerly called Commercial Conservation/Commercial Incentive Program)		◆		• Expand eligibility to include industrial customers • Remove prescriptive measures that are no longer cost-effective and add new measures offering cost-effective energy saving potential • Revise the prescriptive and custom incentive structures, basing rebates on only energy savings • Revise the small business offering
Residential Incentives Program			◆	The Residential Incentives Program achieved its objective of encouraging residential customers to purchase high-efficiency products, with the Companies issuing more than 150,000 incentives since the program's launch in 2011. However, the 2017 potential study revealed that most measures offered through the program (e.g., refrigerators, dishwashers, heat pumps) did not offer cost-effective energy efficiency potential beyond 2018. Only two measures (front loading clothes washers and high efficiency freezers) remained cost effective, accounting for only 2% of the total residential achievable potential. Due to the diminishing achievable potential of the offering within the residential sector, there is no longer a need to continue to fund this program beyond the approved 2018 budget cycle.
Customer Education and Public Information			◆	The Customer Education and Public Information Program (CEPI) offered elementary and middle-school energy education curriculum, professional development and innovative materials to K-8 teachers. Additionally, the Companies implemented a mass media education campaign, including public-service advertisements to encourage customers to take easy but effective steps to reduce their energy usage. The CEPI campaign will be discontinued as part of DSM-EE to reflect the scaled down program offerings. Nonetheless, the Companies will continue to provide energy-efficiency messages to customers, albeit not as part of a DSM-EE program. Also, the Companies propose to retain program-specific advertising in the budgets for programs remaining in the 2019-2025 DSM-EE Program Plan.
Smart Energy Profile Program			◆	Through the Smart Energy Profile Program, the Companies provided select residential customers with a customized home energy report comparing usage to similar customers and providing tips, tools, and energy efficiency programming recommendations. Despite the 2017 Cadmus potential study

Program	Continuing unchanged	Modifications Proposed	Expiring	Details
				indicating achievable potential for home energy reports, due to adjustments to the home energy report's measure life assumption (from three years in the potential study to one year for planning purposes), the program is no longer cost-effective. As such, the Companies will no longer fund this program beyond the approved 2018 budget cycle.
School Energy Management Program		◆		The Companies are asking for an extension of the School Energy Management Program (SEMP) to facilitate the continuation of hiring and retaining qualified energy specialists by public, private and independent school districts through June 2020 as agreed in the rate case stipulation agreement.
Advanced Metering Systems Customer Service Offering	◆			Advanced Metering Systems (AMS) Customer Service Offering, launched in 2015, sought to provide customers an opportunity to request and receive an advanced meter, which allowed them to access individual daily consumption data through a website. The Companies propose to continue this offering in its current form. If during the DSM Program Period a full-deployment AMS offering is initiated, this program will be transferred outside of DSM-EE to the full deployment project. The Companies presently anticipate filing with the Commission in January 2018 an application seeking approval for full AMS deployment.
Demand Conservation Programs				
Residential and Small Nonresidential Demand Conservation Program (formerly Residential Load Management / Demand Conservation Program)		◆		Although demand conservation programs are not cost-effective under the Commission-required California Standard Practice Manual cost-benefit tests because of zero avoided capacity cost benefits, they are cost-effective for reliability purposes if incentives paid to participating customers are sufficiently reduced. The incentive structure will be revised to reflect the lower benefits.
Large Nonresidential Demand Conservation Program (formerly Commercial Load Management / Demand Conservation		◆		For the reasons described above, the Companies will maintain their Large Nonresidential Demand Conservation Program, but will incorporate the following program modifications: • Expand eligibility to include industrial customers • Revise the program incentive structure. • Reduce program savings targets to align with lower available potential and to maintain static participation rates over the program cycle

Program	Continuing unchanged	Modifications Proposed	Expiring	Details
Program)				

* Some multifamily buildings are master-metered through nonresidential rates and were previously ineligible for WeCare services.

Additionally, Program Development and Administration is an administrative function, allowing the Companies to capture costs incurred in the development and administration of their energy efficiency initiatives that are difficult to assign to an individual program. This includes program review and evaluation management and support, portfolio management, and DSM-EE tariff filings. This function will remain unchanged from previous filings, though the assumed labor cost is reduced to reflect the Proposed DSM-EE Program Plan.

1.4. Program Benefit/Cost Calculations

The Companies, in conjunction with Cadmus, performed the benefit/cost ratio tests outlined in the California Standard Practice Manual (described below) and required by the Commission for each of the proposed DSM-EE programs in this Plan.[15] The Companies used PortfolioPro, a PC-based software package developed by Cadmus, to conduct the benefit/cost analysis for this DSM-EE Program Plan. Though prior plans utilized the DSMore® software tool purchased from Integral Analytics, Cadmus' in house tool, DSM Portfolio Pro (PortfolioPro), offers greater flexibility, allowing users to integrate individual measures into programs and combine programs into portfolios to calculate cost effectiveness. As a complete portfolio assessment tool, PortfolioPro uses hourly (8,760) avoided costs and end-use load-shape data to capture the full value of energy savings and the avoided capacity need. The PortfolioPro input summary reports for the programs are included in Section 4, and the output reports are included in Section 5.

Benefit/Cost Ratios for California Standards Tests

The set of four cost/benefit tests the Commission currently employs (i.e., the set contained in the *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects* [Manual]), consider a program's cost effectiveness from four different perspectives. These analyses

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[15] *In the Matter of the Joint Application of the Members of the Louisville Gas and Electric Company Demand-Side Management Collaborative for the Review, Modification, and Continuation of the Collaborative, DSM Programs, and Cost Recovery Mechanism*, Case No. 1997-00083, Order at 20 (April 27, 1998).

represent the best collection of tests for determining the cost-effectiveness of potential DSM-EE programs.[16] A definition of each test, as per the Manual, follows:

- **The Participant Cost Test (PCT):** The Participant Cost test is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.
- **The Ratepayer Impact Measurement (RIM) Test:** The Ratepayer Impact Measure test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs (i.e., if the benefit/cost ratio is greater than 1.0). Conversely, rates or bills will go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.
- **The Total Resource Cost (TRC) Test:** The Total Resource Cost test measures the net costs of a DSM-EE program as a resource option based on the total costs of the program, including both the participants’ and the utility’s costs. This test represents the combination of the effects of a program on both the customers participating and those not participating in a program. In a sense, it is the summation of the benefit and cost terms in the Participant and the Ratepayer Impact Measure tests, where the revenue (bill) change and the incentive terms intuitively cancel (except for the differences in net and gross savings).
- **The Program Administrator Cost (PAC) Test (or Utility Cost Test):** The Program Administrator Cost test measures the net costs of a DSM-EE program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the Total Resource Cost benefits. Costs are defined more narrowly.

Table C summarizes the four tests’ components.

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[16] The Manual is available online at: http://www.calmac.org/events/spm_9_20_02.pdf

Table C. Benefits and Costs Included in Various Cost-Effectiveness Tests

Benefit/Cost		TRC	PAC	RIM	PCT
Benefits	Present value of electric avoided energy and capacity costs*	◆	◆	◆	
	Present value of and gas avoided costs*	◆	◆	◆	
	Present value of bill savings and incentives received				◆
Costs	Program administrative and marketing costs	◆	◆	◆	
	Incremental measure costs incurred by participants	◆			◆
	Incentive costs		◆	◆	
	Present value of utility lost revenues			◆	
	Installation costs				◆

* The present value of electric avoided energy and capacity costs includes avoided line losses occurring from reductions in customer electric use. Present value also includes avoided transmission and distribution benefits.

The Commission has not expressed a preference for one test over another. The Companies, however, have historically offered energy saving programs that pass both the TRC and PCT tests. The TRC test is particularly important because it is the most comprehensive indicator of whether a potential DSM-EE program will create net benefits for customers and the utilities. A program is considered cost-effective if its total resource cost benefits are positive, in other words, the ratio of the net present value of the program’s benefits as compared to costs is greater than 1.0. The Companies have also placed special emphasis on the PCT because of the voluntary nature of DSM-EE programs in Kentucky; if a potential DSM-EE program does not benefit its participants, participation will be limited and the program would likely be discontinued.

Portfolio Benefit/Cost Ratios

As noted earlier, this DSM-EE Program Plan uses zero avoided capacity costs and avoided energy costs that are lower than in past DSM filings. Combined, these two factors significantly impact program and portfolio cost-effectiveness. Because of this, some programs offered during the 2015-2018 program cycle no longer pass a majority of the cost-effectiveness tests (a score of greater than 1.0) and are not being proposed for renewal. However, the Companies are proposing to continue some programs despite not meeting this threshold. In developing the DSM-EE Program Plan, the Companies considered a program’s strategic benefits that are not accounted for within cost-effectiveness screening. For example, customers have paid to build approximately 200 MW of direct load control and since 2012 customers have only had to pay a portion of these costs as the devices are being capitalized because of their usefulness over multiple years. Therefore, it is appropriate to maintain these assets for the long-term benefit of our customers. Additionally, the WeCare Program serves a need among the low-income population in the Companies’ service territories. Although the WeCare Program does not pass the California cost-effectiveness tests, it serves some of the Commonwealth's most vulnerable customers and thus, the Companies propose continuation of the WeCare Program.

The Companies performed the benefit/cost tests described above for the proposed DSM-EE Programs included in this filing, as shown in Table D.

Table D. Cost-Effectiveness using Commission-Required Cost-Benefit Tests

Program	TRC	PCT	RIM	PAC
Nonresidential Rebates	1.14	2.14	0.49	4.23
PD&A	0.00	N/A	0.00	0.00
Total Energy Efficiency and PD&A	**1.06**	**2.14**	**0.47**	**3.31**
Residential and Small Nonresidential Demand Conservation	0.00	N/A	0.00	0.00
Large Nonresidential Demand Conservation	0.01	1.62	0.01	0.01
WeCare	0.44	N/A	0.19	0.44
SEMP/KSBA	0.30	N/A	0.19	0.30
AMS Customer Service Offering	0.00	N/A	0.00	0.00
Total Portfolio	**0.67**	**2.96**	**0.33**	**1.01**

1.5. Implementation Plan and Timeline

Implementation of this DSM-EE Program Plan will require support of additional personnel within the Companies, such as procurement, marketing, and communications staff. These staff will support necessary contract work as well as development of marketing and communications plans to encourage customers to participate in new and enhanced programs.

While this case is pending with the Commission, the Companies intend to move forward with the Request for Proposal process to seek qualified contractors and third-party vendors for the programs. The Companies expect to contract with the successful bidders, which will be contingent upon the Commission's approval of the respective programs and corresponding cost recovery. Prior program planning periods have been as long as seven years. Changing economic conditions (avoided capacity and energy costs) and technology advancements must be balanced against beneficial multi-year contract pricing (typically contract prices are higher for single year contracts than multi-year contracts). Although the Companies are proposing a seven-year plan, the Companies recognize the increased uncertainty in economic conditions and will continue to review changing conditions on an annual basis and recommend changes as necessary through the Companies' regular November budgetary filings.

1.6. Plan Savings

To support accurate calculation of the energy savings and demand reductions anticipated for the proposed programs, the Companies consulted with Cadmus to assess the validity of the proposed energy and demand reduction budgets. Table E and Table F illustrate the projected energy savings and demand impacts expected to accrue from the programs contained in this filing.

Table E. Annual Impacts

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Energy	MWh	38,120	38,120	30,893	30,893	31,017	31,017	31,017
Demand	MW	189.8	181.6	172.2	164.8	157.9	151.1	144.7
Gas	CCF	79,605	79,605	79,605	79,605	79,605	79,605	79,605

Table F. Cumulative Impacts

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Energy	MWh	38,120	68,689	92,030	122,599	153,292	183,979	214,667
Demand	MW	189.8	187.3	183.6	181.9	180.6	179.5	178.9
Gas	CCF	79,605	159,209	238,814	318,418	398,023	477,583	557,143

The projected energy savings and demand impacts that the proposed portfolio of DSM-EE programs is projected to achieve through the end of 2025 are 221,903 MWh, 557,232 CCF, and 178.9 MW, respectively.

1.7. Program Budgets

The Companies consulted with Cadmus to support the development of operational budgets for the proposed programs. Table G summarizes the proposed budget by expense type, program, and rate class.

Table G. Annual Program Budgets

Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	1,425	1,462	1,499	1,539	1,577	1,618	1,660	**10,780**
Implementation	13,481	11,748	10,693	10,701	10,705	10,707	10,709	**78,744**
Incentives	1,133	1,131	1,110	1,109	1,093	1,083	1,075	**7,734**
Miscellaneous	-	24	481	490	-	-	-	**995**
Total	**16,039**	**14,365**	**13,783**	**13,839**	**13,375**	**13,408**	**13,444**	**98,253**

1.8. Program Development and Administration

Overview

The Companies developed the Program Development and Administration to capture the following costs incurred in the development and administration of energy efficiency initiatives that are difficult to assign to an individual program:

- New program concept and initial design
- Market research related to new programming
- Research and technical evaluation of new technologies and programs, including potential studies
- Research and development for pilot programs
- Oversight and management program review and evaluation

- Development and submission of tariffs to the Commission
- Overall program tracking and management
- Attendance at energy efficiency and DSM conferences and workshops to gain insight into potential programs, costs, and benefits from other utilities.
- Development of key personnel
- Membership in associated trade organizations
- Subscriptions to educational and trade publications
- Office supplies and equipment related to general management of the energy efficiency organization

As in previous budget cycles, the Companies will not be required to spend the full amount of this program’s budget. The Companies are seeking to decrease the current head count of the Program Development and Administration infrastructure from six full-time positions to two based upon the lower program offerings proposed in this filing. Currently, the plan for the two positions consists of a manager and an analyst to track program metrics, produce the DSM Tariff Filings, and manage evaluation, measurement, and verification of program performance. The manager will also have responsibility for the DSM-EE program operations.

Rationale for Request

Due to program maturation, the Companies are proposing decreased budgets and participation targets for many of their DSM-EE offerings. As such, the Companies require fewer staff to support efforts associated with each of the programs in the DSM-EE portfolio.

Implementation Plan

Program Development and Administration is an ongoing daily activity; there is not a specific implementation strategy. Expenditure activity proposed in this filing will not commence until the filing is approved by the Commission.

Annual Budget

The annual budget for Program Development and Administration is presented in Table H.

Table H. Program Development and Administration Annual Budget

Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	500	509	518	527	536	546	554	**3,690**
Implementation	224	224	224	224	224	224	224	**1,568**
Total	**724**	**733**	**742**	**751**	**760**	**770**	**778**	**5,258**

Budgetary Assumptions

The Companies will continue to maintain the Program Development and Administration with a reduced budget to account for fewer DSM-EE offerings compared to previous program years.

Program Development and Administration labor assumes a total of 1.6 full-time equivalent employees.

The Program Development and Administration represents approximately 5% of total DSM-EE expenditures.

2. Energy Efficiency Programs

2.1. Low Income Weatherization Program (WeCare)

Program Overview

The Low Income Weatherization Program (WeCare) is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. The program began in 1994 and has served 19,677 customer households since its inception with weatherization services that help these at-risk customers better meet their energy needs.

The Companies propose to modify the program in the following ways:

- Revise the incentive structure to offer an average amount of funds per home (rather than tiered structure based on energy use)
- Raise the maximum income requirements of the WeCare program (currently at the LIHEAP level) so that it matches that of the Weatherization Assistance Program (WAP) which is at 200% of the poverty level.
- Allow master-metered multifamily buildings to qualify for program services

Rationale for Request

To address the need for assistance among the low-income customer segment, the Companies propose updating the allowable measure cost per participant, as shown in Table I. The previous WeCare budget allocated implementation costs per participant based on their energy usage. Revising the incentive structure to an average of $1,500 per single family participant and $750 per multifamily participant will help a wider range of eligible customers to benefit from deeper, more comprehensive energy improvements. Since each residence can present a unique set of challenges, from the housing envelope to the HVAC system, a higher Allowable Measure Cost will allow flexibility to address each customer optimally. Encouraging deeper energy savings per household increases program benefits and therefore improves program cost-effectiveness.

Increasing the maximum income level for the program to the WAP level (from the LIHEAP level) allows more customers to be eligible to participate in the program and has the added benefit of streamlining the application process for any customers who might already be WAP eligible.

Table I. Current and Proposed Measure Cost Allocation

Tier	Annual Energy Consumption	Allowable Measure Cost: Current	Allowable Measure Cost: Proposed
A	Up to 1,299 Ccf or Up to 11,499 kWh	$350	$1,500 average per single family dwelling $750 average per multifamily unit
B	1,300 to 1,800 Ccf or 11,500 to 16,000 kWh	$1,000	
C	Greater than 1,800 Ccf Greater than 16,000 kWh	$2,100	

Finally, while low-income customers living in individually metered multifamily buildings were previously eligible for WeCare services on an individual income-verified basis, the Companies propose to expand program offerings to allow nonresidential master-metered multifamily buildings to qualify for program services. Verifying income eligibility on a whole-building basis by targeting properties that qualify for government subsidies (e.g., Section 8 housing) will broaden the availability of energy-efficiency program services to a wider group of customers and alleviate the administrative burden of verifying customer eligibility on an individual basis.

Program Audience

Depending on the building's utility meter structure, the program will provide energy and demand savings for residential (e.g., individually metered units) and nonresidential (e.g., master-metered buildings) customers. WeCare will target residential customers who qualify for either the Federal Low Income Weatherization Assistance Program or WAP (i.e., income up to 200% of the poverty-level) and multifamily property managers and owners serving low-income tenants, including those in Section 8 housing. Eligible homes with fewer than four units will qualify as single-family homes, while multifamily buildings will be defined as dwellings with four or more units.

Program Benefits

Through WeCare, low-income customers receive energy efficiency education and benefit from increased comfort and savings on their monthly energy costs. The expanded multifamily offering for master-metered buildings will allow energy saving benefits to reach a wider share of the low-income customer segment. Additionally, the program will provide necessary support to multifamily property managers and owners serving low-income communities that otherwise may not have the resources (e.g., capital budget, staffing, energy efficiency knowledge) to implement energy-saving improvements for their tenants. Through the educational component of the program, customers gain a better understanding of how to keep utility bills as low as possible through improved energy-use habits. Over the long term, customers will benefit from the educational information in future homes or new service territories.

Participation Goals

Projected annual and cumulative participation goals for WeCare are presented in Table J. The Companies anticipate an average of up to 20% of participants will reside in multifamily housing, though both housing types will be administered jointly.

Table J. WeCare Participation Goals

Participants	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Annual Participation								
LG&E	2,000	2,000	2,000	2,000	2,000	2,000	2,000	**14,000**
KU	2,000	2,000	2,000	2,000	2,000	2,000	2,000	**14,000**
Total	**4,000**	**4,000**	**4,000**	**4,000**	**4,000**	**4,000**	**4,000**	**28,000**
Cumulative Participation								
LG&E	2,000	4,000	6,000	8,000	10,000	12,000	14,000	**14,000**
KU	2,000	4,000	6,000	8,000	10,000	12,000	14,000	**14,000**
Total	**4,000**	**8,000**	**12,000**	**16,000**	**20,000**	**24,000**	**28,000**	**28,000**

Energy and Demand Impacts

The goal of the WeCare enhancements is to provide comprehensive energy-saving improvements to a wide array of low-income customers (independent of usage or meter structure). By providing additional energy-efficient weatherization and energy management techniques, program participants gain greater control over their utility bills.

Projected annual and cumulative energy savings and demand reductions for WeCare are presented in Table K.

Table K. WeCare Annual and Cumulative Energy and Demand Impacts

Usage Reductions	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Annual Reductions									
Energy	MWh	5,077	5,077	5,077	5,077	5,077	5,077	5,077	**35,538**
Demand	MW	0.4	0.4	0.4	0.4	0.4	0.4	0.4	**3.0**
Gas	CCF	57,197	57,197	57,197	57,197	57,197	57,197	57,197	**400,377**
Cumulative Reductions									
Energy	MWh	5,077	10,154	15,230	20,307	25,384	30,461	35,538	**35,538**
Demand	MW	0.4	0.9	1.3	1.7	2.2	2.6	3.0	**3.0**
Gas	CCF	57,197	114,393	171,590	228,787	285,983	343,180	400,377	**400,377**

Customer Incentives

Each program participant is provided an audit, energy education, and home weatherization services at no additional cost. In previous DSM-EE program filings, WeCare used a tiered approach (based on customer energy use) to determine the level of program services allowed for each home. Based on the tiered structure, implementation costs per home ranged from $350 to $2,100. The Companies propose revising this incentive structure to an average $1,500 in program services per single family household and $750 per multifamily unit.

WeCare participants will continue to receive a mix from among these energy-savings measures (as appropriate for each home), the companies plan to introduce or change measures deployed over the course of this filing as technology changes but within the overall proposed budget:

- Insulation
- Weather-stripping/caulking
- Water-saving devices
- Smart strips
- Refrigerator, window, and door replacements
- Water heater pipe and tank wrap
- HVAC system replacement/tune-up
- High-efficiency lighting (e.g., LEDs)
- Infiltration reduction
- Health, educational information on energy efficiency, safety, and repairs

The Companies will continue to pay up to $250 per home for health and safety measures (e.g., carbon monoxide detectors) and household repairs (if repairs are required to facilitate energy-saving measure installation). These measures and repairs will be accounted for within the overall average allowable measure cost per home.

Implementation Plan

The Companies will continue to administer the program and contract with a third-party vendor (and community action agencies where feasible) to provide implementation services such as recruiting and verifying the eligibility of potential participants, conducting total property energy assessments, installing free energy efficiency measures, ensuring production schedules are met, updating the program tracking database, managing installation contractor expectations and performance, and maintaining program expenditures within the annual budget. For multifamily participants, the vendor will provide property managers and owners a comprehensive assessment report identifying cost-effective energy efficiency upgrades in tenant units and common spaces.

The Companies will continue to collaborate with low-income advocates through their Customer Commitment Advisory Forum as well as the DSM Advisory Group. The forum provides low-income agencies with a process to meet regularly with the Companies to discuss low-income customer issues while the Advisory Group meets periodically to share information, opinions and insight as it relates to DSM-EE.

Annual Program Budget

The annual budget for WeCare is presented in Table L.

Table L. WeCare Annual Budget

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	195	201	207	213	219	226	233	**1,494**
Implementation	6,140	6,140	6,140	6,140	6,140	6,140	6,140	**42,980**
Incentives	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Miscellaneous	-	-	-	314	-	-	-	**314**
Total	**6,335**	**6,341**	**6,347**	**6,667**	**6,359**	**6,366**	**6,373**	**44,788**

Program Budgetary Assumptions

The WeCare budget is designed to accommodate deeper efficiency upgrades per residence and the addition of eligible master-metered multifamily buildings. The budget allocates funds equivalent to 1.0 full-time program manager, 0.25 full-time energy efficiency associate, and provides for implementation contractors to provide intake services, audits, education, installation of measures, and general program administration. The labor escalation rate is 3.0%, with a program evaluation expenditure occurring once over the seven-year program period (in 2022). WeCare represents approximately 16% of electric energy savings and 72% of CCF energy savings, representing over 46% of total DSM-EE expenditures.

2.2. Nonresidential Rebates Program

Program Overview

The Company is renaming the Commercial Conservation/Commercial Incentive Program to Nonresidential Rebates Program to reflect the work completed to include program offerings for industrial customers. Through the Nonresidential Rebates Program (previously marketed to customers as the Commercial Rebate Program and previously filed as the Commercial Conservation/Commercial Incentives Program), the Companies provide nonresidential customers with financial incentives to help replace aging and inefficient equipment. The Companies provide the following offerings as part of the Nonresidential Rebates Program:

- **Prescriptive incentives.** Customer incentives are available for energy audits[17] and high-efficiency equipment such as lighting, motors, pumps, variable frequency drives, and air conditioning retrofits installed in existing buildings.
- **Custom incentives.** Customers are eligible for custom incentives when they implement energy-efficient technologies not currently covered in the prescriptive component of the program. Custom projects are offered for retrofit applications in existing buildings and are subject to preapproval by the Companies.
- **New construction incentives.** The Companies offer performance-based incentives for constructing new, efficient nonresidential facilities that exceed current state building energy code requirements and bonus incentives for LEED certification.

The Companies propose to modify the Nonresidential Rebates Program in several ways:

- Expand eligibility to include industrial customers
- Remove prescriptive measures that are no longer cost-effective including geothermal heat pumps, and lower efficiency tier lighting and HVAC options
- Add new, cost-effective prescriptive measures including a wider variety of LED options
- Revise the prescriptive and custom incentive structure to align with achieved kWh reductions rather than kW reductions.
- Propose that measures and incentives be adjusted during the seven-year program plan as needed to reflect current cost-effectiveness based on avoided energy costs updated annually.

Rationale for Request

The 2017 Energy Efficiency Potential Study conducted for the Companies by Cadmus revealed some measures incented by the Nonresidential Rebates Program did not pass the cost-effectiveness screening and, therefore, do not offer any achievable potential beyond 2017. As a result, the

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[17] Customers must implement recommended energy-saving measures from the on-site energy audit to qualify for an incentive for the audit itself.

Companies propose removing geothermal heat pumps from the program measure offerings. Additionally, to align with the most recent federal codes and standards changes,[18] the Companies propose removing some of their lower efficiency tier lighting (e.g., select linear tube fluorescents) and HVAC systems from the program's offerings. These measures are being removed because the energy savings will not support the program cost to incent customers to implement the measure. The Companies will revise their measures list periodically to ensure cost-effectiveness and account for development of new or improved measures. Any such changes will be included in the Companies' annual DSM-EE program filings made each November.

The Companies' Proposed DSM-EE Program Plan revises the prescriptive and custom incentive structure. Historically, the Companies calculated prescriptive incentives based on avoided capacity costs of $100/kW-year. The Companies updated their methodology by aligning prescriptive incentive amounts with expected energy savings from the incented measure (in cents per kWh). The Companies also updated the custom incentive structure to rely on achieved energy savings rather than demand reductions (in cents per kWh rather than utilizing an avoided capacity cost equivalent). This change in custom incentives will not only better align with the prescriptive incentives, but it will also better align with the Companies' system needs. As noted above, the Companies will continue to monitor changes in the market and provide proposed updates to measures and incentives as needed in their annual DSM-EE program filings made each November.

According to the 2017 program review conducted by Cadmus (in conjunction with the 2017 Commercial and Residential Energy Efficiency Potential Study), successful DSM-EE portfolios adjust over time to accommodate changing markets and introductions of new technologies.[19] Utilities across the country are moving to adopt more specific delivery channels to address the unique challenges and circumstances of individual customer segments. The Companies plan to use a variety of methods to reach small business and manufacturing facilities. These methods may include, but not be limited to, direct install programs or partnerships with state and local agencies.

Program Audience

This program is available to all nonresidential customers.

The Companies conducted an industrial energy efficiency potential study. The change in this program is, in part, a result of that study. As used in this section, "nonresidential customers"

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[18] A full table and discussion of applicable code and standards can be found in Exhibit GSL-3 in the Companies' Residential and Commercial Demand-Side Management Potential Study 2019-2038, March 2017, Table 17. Federal Equipment Standards

[19] U.S. Environmental Protection Agency and U.S. Department of Energy. *National Action Plan for Energy Efficiency. Chapter 6: Energy Efficiency Program Best Practices*. 2007. Available online: http://www.epa.gov/cleanenergy/documents/suca/napee_chap6.pdf.

includes those industrial customers who do not use their statutory opt-out under the prescribed process defined in this filing.

Program Benefits

Customers benefit from energy savings that reduce their operating expenses and further reduce the Companies' generation requirements.

Participation Goals

Projected annual rebates awarded for the Nonresidential Rebates Program are presented in Table M.

Table M. Nonresidential Rebates Annual Goals

Rebates ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
LG&E	412	417	412	417	414	414	414	**2,900**
KU	412	417	412	417	414	414	414	**2,900**
Total	**824**	**834**	**824**	**834**	**828**	**828**	**828**	**5,800**

Energy and Demand Impacts

Projected annual and cumulative energy savings and demand reductions for the Nonresidential Rebates Program are presented in Table N.

Table N. Nonresidential Rebates Program Annual and Cumulative Energy and Demand Impacts

Usage Reductions	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Annual Reductions									
Energy	MWh	25,492	25,492	25,492	25,492	25,616	25,616	25,616	**178,814**
Demand	MW	5.2	5.2	5.2	5.2	5.3	5.3	5.3	**36.9**
Gas	CCF	22,408	22,408	22,408	22,408	22,408	22,408	22,408	**156,856**
Cumulative Reductions									
Energy	MWh	25,492	50,984	76,475	101,967	127,583	153,194	178,805	**178,805**
Demand	MW	5.2	10.5	15.7	21.0	26.3	31.6	36.9	**36.9**
Gas	CCF	22,408	44,816	67,224	89,632	112,040	134,403	156,766	**156,766**

Customer Incentives

Financial incentives will be available to nonresidential customers who install eligible energy-efficient equipment in new and existing buildings. The Companies propose the following incentives for the Nonresidential Rebates Program:

- **Prescriptive incentives** will continue to vary based on measure type and efficiency level. However, the Companies propose revising incentive amounts to align with expected per-measure energy savings rather than covering avoided cost of capacity.
- **Custom incentives** will be based upon achieved first-year kWh savings, rather than kW reduction.

- **New construction incentives** will continue to be awarded to customers for constructing nonresidential facilities that exceed the current state building code. Incentives will vary based on project size (i.e., square footage) and performance tier (ranging from 10% to 25% savings over code). Facilities that achieve LEED certification will continue to receive a bonus incentive, in addition to the performance-based incentives for constructing the project above code.
- **Small business** and manufacturing expanded direct install offerings may require a small co-pay from participating customers. The third-party vendor hired to implement the program will work with the Companies to design the most effective incentive structure, intended to offset the upfront cost of direct install measures (e.g., efficient lighting and hot water measures) through deep discounts.

Implementation Plan

The Companies will manage the program's operations and provide program oversight. The major operational responsibilities include promoting the program within the Companies' service territory, monitoring quality assurance, ensuring customer incentive and vendor payment, and overseeing the program database. The Companies provide program oversight through invoicing, monitoring customer satisfaction, retaining customer documentation on incented measure information, and facilitating an evaluation by a third-party contractor.

The Companies contract with a third-party vendor to process customer incentive payments. Additionally, the Companies may continue to contract with a third-party vendor to implement all aspects (i.e., recruitment, installation, and administration) of the expanded small business component of the program.

Annual Program Budget

The annual budget for the Nonresidential Rebates Program is presented in Table O.

Table O. Nonresidential Rebates Program Annual Budget

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	195	201	207	213	219	226	233	**1,494**
Implementation	1,816	1,821	1,491	1,496	1,496	1,496	1,496	**11,111**
Incentives	824	834	824	834	828	828	828	**5,800**
Miscellaneous	-	-	252	-	-	-	-	**252**
Total	**2,835**	**2,856**	**2,774**	**2,543**	**2,543**	**2,550**	**2,557**	**18,657**

Program Budgetary Assumptions

The Companies have allocated the equivalent to 1.0 full-time program manager and 0.25 energy efficiency associate to operate the Nonresidential Rebates Program. The budget for the expanded small business and manufacturing direct install offerings includes $1,000,000 per year to cover the

Exhibit GSL-1

cost of implementation services. The labor escalation rate is 3.0% and all other expenditures remain constant, except for the cost of program evaluation, which occurs once over the seven-year planning period (in 2021).

Incentives are based on the assumed kWh savings multiplied by the avoided cost of energy. This value is derived from the Companies' variable cost of generation. The Nonresidential Rebates Program represents approximately 81% of electric energy savings, 28% CCF savings, and 20% of demand savings, representing over 19% of total DSM-EE expenditures.

2.3. Advanced Metering Systems (AMS) Customer Service Offering

Program Overview

In Case No. 2014-00003, the Commission approved the AMS Customer Service Offering to allow the Companies to offer up to 10,000 advanced meters to those Rate RS or GS customers who elected to participate. As of November 30, 2017, more than 5,400 customers have chosen to participate and have AMS meters deployed to their residences or places of business. Participants' consumption is captured, communicated, and stored, allowing participants to monitor their hourly usage through an online portal (MyMeter) within two business days. The Companies provide annual reports to the Commission on the status of the program.

The Companies propose to continue this program to allow additional customers to participate subject to the existing 10,000 meter limit, to support and expand as necessary the existing AMS infrastructure, and to continue to permit participants to have the ability to view their hourly usage via the MyMeter online portal. The costs included in this filing are for the maintenance of network infrastructure, the meter data management system, and as well as the ongoing expenses of a web-portal to display consumption data to customers.

The success of this offering led the Companies to propose full deployment of AMS in their 2016 base-rate cases, which request the Companies withdrew in connection with settling the cases. The Companies presently anticipate again requesting full deployment of AMS. Any such request will include a proposal to terminate this offering and to include the existing AMS meters, infrastructure, and investments in non-DSM-EE rate base.

Rationale for Request

The Companies believe that it is important to continue to provide the ongoing maintenance and support to existing customers, as well as to provide the opportunity to participate to additional customers. A number of the customers that have participated have used MyMeter to review their usage data and have increased their energy-efficiency efforts as a result.[20]

Program Audience

Up to 5,000 LG&E and 5,000 KU RS and GS customers will receive an advanced meter on a voluntary basis.

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[20] Case Nos. 2016-00370 and 2016-00371, Application Exhibit JPM-1 at 87 (Ky. Pub. Serv. Comm'n Nov. 23, 2016).

Program Benefits

The Commission aptly described the benefits of the AMS Customer Service Offering in its order approving this offering in Case No. 2014-00003:

> Customers benefit from smart meters because they have a level of information at their disposal that allows them to control their energy use and, therefore, exercise more control over their utility bills. Utilities, on the other hand, benefit from reduced field costs, improved revenue capture, improved system response, and expanded customer services.[21]

Participation Goals

The Companies plan to continue the AMS Customer Service Offering allowing up to 10,000 advanced meters to those Rate RS or GS customers who elected to participate; 5,000 LG&E and 5,000 KU RS and GS customers. The Companies are not proposing to increase the number of participants under the DSM-EE Program given the Companies' current expectation to file for full deployment of AMS in January 2018.

Energy and Demand Impacts

The Companies do not assert any demand or energy savings to support this program; however, there is evidence that customers participating in the AMS Customer Service Offering do undertake energy-saving efforts and achieve energy savings as a result of participating in the offering.[22]

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[21] Case No. 2014-00003, Order at 25 (Nov. 14, 2014).

[22] Case No. 2014-00003, Advanced Metering Systems 2016 Annual Report at 8 (Jan. 31, 2017) ("The PRISM analysis indicated average household energy savings of approximately six percent."); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00371, LG&E Response to Second Requests for Information of Association of Community Ministries No. 24, Attachment at 3 (Feb. 20, 2017) ("Tetra Tech finds that LG&E and KU's estimate of 0.5 percent energy savings per residential advanced meter is reasonable, as it is near the midpoint of the range of values one would expect to see, which has low value of 0.18 percent and a high value of 0.92 percent.").

Customer Incentives

There are no financial incentives as part of this program. There is no cost to participate and the incentive is customer access to 15 minute interval data for analysis in making energy efficiency decisions.

Implementation Plan

The Companies will continue to educate customers and install advanced meters for customers who request them.

Annual Program Budget

The annual budget for the Advanced Metering Systems Customer Service Offering is presented in Table O.

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	291	300	309	318	328	338	348	**2,232**
Implementation	603	166	165	168	172	174	176	**1,624**
Incentives	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Miscellaneous	-	23	-	24	-	-	-	**47**
Total	**894**	**489**	**474**	**510**	**500**	**512**	**524**	**3,903**

Program Budgetary Assumptions

The Companies have allocated the equivalent of 1 full-time program manager and 1 AMS engineer to operate the offering. The budget for this offering requires no incentive. The labor escalation rate is 3.0%.

2.4. School Energy Management Program (SEMP)

Program Overview

Pursuant to the settlement approved by the Commission in the Companies' 2016 base-rate cases, the Companies are proposing to extend the SEMP approved originally in Case No. 2013-00067 through June 30, 2020. This program will continue to be managed by the Kentucky School Boards Association ("KSBA"). KSBA summits annual reports to the Companies and the Companies provide these to the Commission.

Rationale for Request

As part of the Final Order for Case Nos. 2016-00370 and 2016-00371, Article 5.2, the Companies were required to file an extension for the School Energy Managers Program (SEMP).

Program Audience

This program will be available to any schools within the Companies service territories as identified by KSBA.

Program Benefits

The extension of the SEMP will facilitate the continued hiring and retention of qualified, trained energy specialists by public, private, and independent school districts through June 30, 2020 to lead the continued expansion of energy efficiency improvements within each district. The primary goal of the SEMP is to support school districts in utilizing energy more wisely, with the objective that each school district will reduce energy consumption by an annual rate of 2.5 percent and achieve energy utilization indices ("EUI") of fifty or lower.

Participation Goals

The participation goals, provided by KSBA, are below:

Table Z. SEMP Program Participation Goals

Participants	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Annual Participation								
LG&E	169	169	N/A	N/A	N/A	N/A	N/A	**169**
KU	292	292	N/A	N/A	N/A	N/A	N/A	**292**
Total	**461**	**461**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**461**
Cumulative Participation								
LG&E	169	169	N/A	N/A	N/A	N/A	N/A	**169**
KU	292	292	N/A	N/A	N/A	N/A	N/A	**292**
Total	**461**	**461**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**461**

Energy and Demand Impacts

Energy and demand impacts for SEMP have been calculated assuming reductions for behavioral changes only. Therefore, its associated energy impacts are noncumulative and are for one year only. The energy and demand savings are in the table below:

Table AA. KSBA Program Annual and Cumulative Energy and Demand Impacts

Usage Reductions	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Annual Reductions								
Energy	MWh	7,227	7,227	N/A	N/A	N/A	N/A	N/A
Demand	MW	1.7	1.7	N/A	N/A	N/A	N/A	N/A
Cumulative Reductions								
Energy	MWh	7,227	7,227	N/A	N/A	N/A	N/A	N/A
Demand	MW	1.7	1.7	N/A	N/A	N/A	N/A	N/A

Customer Incentives

There are no direct financial incentives as part of this program. The financial incentives and disbursement of funds for projects is administered by KSBA.

Implementation Plan

KSBA, as the main administrator of the program, will be responsible for the implementation plan. The Companies will continue to require the KSBA to submit an annual report on costs and savings. The Companies will provide this report to the Commission within 30 days of receipt of the final report.

Annual Program Budget

The annual budget for the KSBA is presented in Table O.

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Implementation	725	725	N/A	N/A	N/A	N/A	N/A	**1,450**
Incentives	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Miscellaneous	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Total	**725**	**725**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**1,450**

The proposed initial payment to KSBA of $725,000 is to be paid on 7/1/2018, subject to Commission approval on or before 6/1/2018.

Program Budgetary Assumptions

The Companies have not allocated labor to assist in the operation of the Program. The budget for this offering is fixed, and after the Companies consulted with KSBA to determine the appropriate allocation between LG&E and KU, it is proposed that this allocation will be 50% LG&E and 50% KU, which allocation is subject to change as requested by KSBA.

3. Demand Conservation Programs

3.1. Residential and Small Nonresidential Demand Conservation Program

Program Overview

The Companies first offered the Residential and Small Nonresidential Demand Conservation Program (previously filed as the Residential Load Management/Demand Conservation Program) as a voluntary program in 2001. Through the program, the Companies provide opportunities for residential, multifamily, and small business customers to reduce electric primarily demand during peak times.[23] The Companies use one-way and two-way signals to communicate with switches installed on qualifying central air conditioning units and heat pumps, water heaters and pool pumps. The switches cycle the equipment off and on through a predetermined sequence. Since inception of the program participating customers have volunteered to allow the Companies to control over 230,000 devices equating to up to 100-150 MW of load on a hot summer day. This amount of controllable load is roughly equivalent to investing in a peaking combustion turbine.

In this DSM-EE Program Plan, the Companies are seeking to keep this program in a maintenance mode, allowing new participants to enroll in the program to the extent existing devices are available to deploy. The Companies do not propose to purchase or capitalize new devices for this program for the duration of the Proposed DSM-EE Program Plan.

Rationale for Request

The Residential and Small Nonresidential Demand Conservation Program is designed to reduce peak load. The cost associated with maintaining current participation levels in the program is similar to the cost of maintaining standard generation assets. In addition, the Companies' ability to continue to curtail load enables them to efficiently respond to emergency situations, such as the forced outage of a generating unit. The program provides two different options in responding to such situations.

First, the Companies can perform a SCRAM event. A SCRAM event causes all of the load control devices to operate at the same time for a single 10 minute period and then returns the controlled devices back to normal operation. SCRAM events also allow the Companies to obtain operational data to improve the program. The ability for the Companies to very quickly control a potentially significant amount of load can assist the Companies with managing the network and interconnects with other utilities. The Companies are requesting to have the ability to use a SCRAM event at any time of the year to achieve additional value from the installed infrastructure and to periodically test the amount of demand which can be achieved through the system. A SCRAM event will not be considered a Load Control Event for purposes of paying incentives under this program.

[23] As the Companies' Kentucky service territory is summer peaking, the program is primarily utilized during summer periods.

The second option is a Load Control Event. While similar to a SCRAM, it provides load reduction over a longer period of time by splitting the population of devices into three segments, where each segment is scheduled to be off for 10-15 minutes in each 30 minute increment for the duration of the load control event, which usually lasts up to four hours. Thus, for the 300-450 MW associated with the 230,000 devices a load control event may be expected to achieve about 100-150 MW of peak capacity reduction over a period of hours.

As discussed previously, the Companies have zero avoided capacity costs currently, but this could change in the future depending on various factors such as federal and state regulatory changes. Thus, a maintenance mode approach is requested for this portfolio period to avoid abandoning prior spending on the program or strand existing assets. Program to date spend for this program is approximately $114 million dollars since the start date in 2001.

Program Audience

The program is available to residential and small business customers with qualifying equipment (i.e., central air conditioning units, heat pumps). Residents of single-family or multifamily dwellings are eligible to participate. The Companies will discontinue water heater and pool pump switches. Customers currently with a switch will be allowed to continue to participate. A customer choosing to leave the program may ask the Companies to remove the switch. Any adjustments to the incentive the program offers to customers will be provided in the Companies' tariff sheets.

Program Benefits

The successful Residential and Small Nonresidential Demand Conservation Program will provide economic and environmental benefits by delaying the need to construct new generation assets.

Participation Goals

Projected annual participation goals for the Residential and Small Nonresidential Demand Conservation Program are presented in Table P. The Companies expect that the reduction in incentives discussed below will cause customer participation attrition.[24] Thus, the Companies have estimated the reduced participation from the previous 2014 filing (Case No. 2014-0003) during this DSM-EE Program Plan period.

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[24] Attrition is defined as the voluntary and involuntary loss of customers in the program through opt outs, move-outs, and inactive accounts.

Table P. Residential and Small Nonresidential Demand Conservation Program Participation Goals

Participants	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Annual Participation							
LG&E	115,735	109,874	104,363	99,102	94,091	89,280	84,769
KU	115,735	109,874	104,363	99,102	94,091	89,280	84,769
Total	**231,470**	**219,748**	**208,726**	**198,204**	**188,182**	**178,560**	**169,538**

Energy and Demand Impacts

The Residential and Small Nonresidential Demand Conservation Program reduces overall energy usage and peak demand during the summer months. The program relies on enabling technologies that cycle energy consuming devices on and off, based on a predetermined schedule that corresponds to the Companies traditional summer peak periods. Projected annual reductions for the Residential and Small Nonresidential Demand Conservation Program are presented in Table Q. The Companies have assumed attrition in demand reductions provided by the program over time due to switches ceasing to function or being removed from service without the Companies' knowledge, as well as to account for customers leaving the program due to reduced incentive levels.

Table Q. Residential and Small Nonresidential Demand Conservation Program Energy and Demand Impacts

Usage Reductions	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Annual Reductions								
Energy	MWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Demand	MW	162.2	154.0	146.3	138.9	131.8	125.1	118.7

Customer Incentives

The Companies will offer incentives as follows:

- **Switch Option:** For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season. If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit or heat pump enabled with a switch. A SCRAM event will not be considered a Load Control Event for purposes of paying incentives under this program.

- **Multifamily Option:** Previously, monthly bill credits for multifamily customers were split evenly between the property owner and the tenant. The Companies plan to discontinue splitting the incentives upon approval of the Proposed DSM-EE Program Plan and offer incentives solely to the account holder (i.e., either the tenant or the property owner). The incentive will match the same incentive level as described above under the switch option.

Any adjustments to incentives will be provided in the Companies' tariff sheets filed each November.

Implementation Plan

Upon request the Companies will enroll new customers, but only to the extent existing devices are available for deployment; the Companies will not purchase new load-control devices during the Proposed DSM-EE Program Plan. By the end of the Proposed DSM-EE Program Plan, the Companies expect to have removed approximately 62,000 devices from the Residential and Small Nonresidential Demand Conservation Program. This is a reduction of 27% due to not promoting the program and the subsequent number of customers electing to leave the program.

The Companies will discontinue the quality assurance and quality control policy requiring their third-party vendor to conduct annual on-site inspections of switch devices for a statistically significant sample of enrolled participants' homes. The analysis of SCRAM and load events makes this process no longer necessary and reduces maintenance expense.

Annual Program Budget

The annual budget for the Residential and Small Nonresidential Demand Conservation Program is presented in Table R.

Table R. Residential and Small Nonresidential Demand Conservation Program Annual Budget

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Administration	122	125	129	134	138	142	146	**936**
Implementation	3,233	2,033	2,033	2,033	2,033	2,033	2,033	**15,431**
Incentives	231	220	209	198	188	178	170	**1,394**
Miscellaneous	-	-	229	-	-	-	-	**229**
Total	**3,586**	**2,378**	**2,600**	**2,365**	**2,359**	**2,353**	**2,349**	**17,990**

Program Budgetary Assumptions

The Companies will continue to maintain the Residential and Small Nonresidential Demand Conservation Program with a reduced budget compared to previous program years. The labor escalation rate is 3.0%, with a program evaluation expenditure occurring once over the seven-year program period (in 2021). Other budget assumptions include:

- Reduced marketing investment and limited new installations (new switch expenditures)
- Cost equivalent of 1.0 full-time program manager and 0.25 energy efficiency associate

The Residential and Small Nonresidential Demand Conservation Program represents approximately 66% of demand savings and 18% of total DSM-EE expenditures.

3.2. Large Nonresidential Demand Conservation Program

Program Overview

The Company is renaming the Commercial Load Management/Demand Conservation Program to Large Nonresidential Demand Conservation Program to reflect the work completed to include program offerings for industrial customers. The Companies began offering the Large Nonresidential Demand Conservation Program as a voluntary program for large commercial customers in 2013. Through the program, the Companies provide load monitoring devices to help business owners reduce the demand for electricity during peak times, when energy consumption is at its highest.[25] This program provides a cost effective way to enhance the ability to quickly shed load for peaking events to offset the need for peaking combustion turbine use. The program has achieved 27.5 MW of potential capacity through customer participation.

Load monitoring devices provide real-time visibility into a customers' energy consumption, which a customer or the third-party implementation vendor can monitor through web-based software.

As the program matures, the Companies propose the following program adjustments to maintain current participation rates and refine participation opportunities:

- Expand eligibility to include industrial customers
- Revise incentive structure to allow participant to choose payment method (i.e., bill credit or incentive check)
- Reduce savings target to align with both the residential load control program and the Companies offering of curtailable service rider.

Rationale for Request

The Large Nonresidential Demand Conservation Program is designed to reduce peak load and thereby delay the need to invest in the construction of new generation assets. The cost associated with maintaining current participation levels in the Large Nonresidential Demand Conservation Program are similar to the cost of maintaining standard generation assets. Generally, the rationale provided above for the Residential and Small Nonresidential Demand Conservation Program again holds for this program as well.

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[25] As the Companies' Kentucky service territory is traditionally summer peaking, the program is utilized during summer periods. However, the Companies may choose to investigate opportunities to curtail winter load as demand increases during peak heating season.

Program Audience

The program is available to nonresidential customers with demand of at least 200 kW and minimum load reduction capability of at least 50kW.[26] Nonresidential customers participating in other demand curtailment tariffs, i.e., Curtailable Service Rider, are not eligible.

Program Benefits

In addition to the demand reduction benefits to the Companies, customers who participate in this program benefit from equipment installation and a web-based software application that allows them to monitor their day-to-day energy use and identify opportunities to use energy more efficiently.

Participation Goals

Table S shows the projected annual participation (number of devices) goals for the Large Nonresidential Demand Conservation Program. Because the program has reached stable funding and participation levels, the Companies do not anticipate significant increases in participation rates during this DSM-EE Program Plan.

Table S. Large Nonresidential Demand Conservation Participation Goals

Participants	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Annual Participation (number of devices)								
LG&E	120	120	120	120	120	120	120	**120**
KU	120	120	120	120	120	120	120	**120**
Total	**240**	**240**	**240**	**240**	**240**	**240**	**240**	**240**

Energy and Demand Impacts

The Large Nonresidential Demand Conservation Program is designed to reduce overall energy usage by targeting peak demand. Table T shows the projected annual reductions for the program.

Table T. Large Nonresidential Demand Conservation Energy and Demand Impacts

Usage Reductions	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Annual Reductions								
Energy	MWh	325	325	325	325	325	325	325
Demand	MW	20.3	20.3	20.3	20.3	20.3	20.3	20.3

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[26] Because of the minimum load reduction requirement, the Large Nonresidential Demand Conservation Program targets larger nonresidential customers. Smaller nonresidential customers are eligible to participate in load curtailment through the Residential and Small Nonresidential Demand Conservation Program.

Customer Incentives

In the 2014 filing (Case No. 2014-0003), the Companies received approval for increased autonomy to modify the incentive structure of the Large Nonresidential Demand Conservation Program. The Companies will continue to evaluate customer engagement and participation over time. Any adjustments to the incentive rate per kW reduction the program offers to customers will be provided in the Companies' tariff sheets filed each November. The Companies propose to offer customers the opportunity to choose a preferred payment method for these incentives, including the following options:

- A bill credit applied once the load control season is complete
- An incentive check paid once the load control season is complete

The incentive amount will be calculated based on the actual demand reductions achieved by the participant over the entire season's events. As with the Residential and Small Nonresidential Demand Conservation Program, for each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season.

Implementation Plan

The Companies propose to maintain static participation in the program by sustaining relationships with current participants.

Annual Program Budget

Table U presents the annual budget for the Large Nonresidential Demand Conservation Program.

Table U. Large Nonresidential Demand Conservation Annual Program Budget

Program Costs ($000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	**Total**
Administration	122	126	130	133	137	142	146	**936**
Implementation	740	640	640	640	640	640	640	**4,580**
Incentives	77	77	77	77	77	77	77	**539**
Miscellaneous	-	-	-	152	-	-	-	**152**
Total	**939**	**843**	**847**	**1,002**	**854**	**859**	**863**	**6,207**

Program Budgetary Assumptions

Based on several years of program operation experience (since 2013), the Companies have allocated an equivalent of 0.5 full-time program manager and 0.25 energy efficiency associate. The labor escalation rate is 3.0% and all other expenditures remain constant, except for the program evaluation expenditure that occurs once over the seven years (in 2022). The Large Nonresidential Demand Conservation Program represents approximately 1% of electric energy savings and 11% of demand savings, representing over 6% of total DSM-EE expenditures.

4. PortfolioPro Input Summary Reports

Table 4 - 1. Low Income Weatherization Program (WeCare)

Participation and Total Participant Costs by Year

	Annual Participants	Total Participant Costs
Year 1	4,000	$0
Year 2	4,000	$0
Year 3	4,000	$0
Year 4	4,000	$0
Year 5	4,000	$0
Year 6	4,000	$0
Year 7	4,000	$0
Total	**28,000**	**$0**

Table 4 - 2. Low Income Weatherization Program (WeCare)

Impacts and Savings by Year

	Annual Energy Savings (MWh)	Annual Demand Savings (MW)	Annual Natural Gas Savings (CCF)
Year 1	5,077	0.43	57,197
Year 2	5,077	0.43	57,197
Year 3	5,077	0.43	57,197
Year 4	5,077	0.43	57,197
Year 5	5,077	0.43	57,197
Year 6	5,077	0.43	57,197
Year 7	5,077	0.43	57,197
Total	**35,538**	**3.01**	**400,377**

Table 4 - 3. Low Income Weatherization Program (WeCare)

Utility Program Costs by Year

	Total Program Costs
Year 1	$6,334,923
Year 2	$6,340,771
Year 3	$6,346,794
Year 4	$6,667,451
Year 5	$6,359,387
Year 6	$6,365,969
Year 7	$6,372,748
Total	$44,788,043

Table 4 - 4. Nonresidential Rebates Program
Total Participant Costs and Incentives by Year

	Total Participant Costs	Total Incentives / Rebates
Year 1	$7,966,851	$824,145
Year 2	$7,966,851	$834,145
Year 3	$7,966,851	$824,145
Year 4	$7,966,851	$834,145
Year 5	$8,227,539	$827,885
Year 6	$8,227,539	$827,885
Year 7	$8,227,539	$827,885
Total	**$56,550,020**	**$5,800,233**

Table 4 - 5. Nonresidential Rebates Program Impacts and Savings by Year

	Annual Energy Savings (MWh)	Annual Demand Savings (MW)	Annual Natural Gas Savings (CCF)
Year 1	25,492	5.24	22,408
Year 2	25,492	5.24	22,408
Year 3	25,492	5.24	22,408
Year 4	25,492	5.24	22,408
Year 5	25,616	5.30	22,408
Year 6	25,616	5.30	22,408
Year 7	25,616	5.30	22,408
Total	**178,816**	**36.87**	**156,856**

Table 4 - 6. Nonresidential Rebates Program Utility Program Costs by Year

	Total Program Costs
Year 1	$2,834,973
Year 2	$2,855,848
Year 3	$2,773,812
Year 4	$2,543,075
Year 5	$2,543,145
Year 6	$2,549,726
Year 7	$2,556,506
Total	$18,657,085

Table 4 - 7. AMS Customer Service Offering Participation and Total Participant Costs by Year

	Annual Participants*	Total Participant Costs
Year 1	0	$0
Year 2	0	$0
Year 3	0	$0
Year 4	0	$0
Year 5	0	$0
Year 6	0	$0
Year 7	0	$0
Total	**0**	**$0**

**Note, no new participation for this program.*

Table 4 - 8. AMS Customer Service Offering

Impacts and Savings by Year

Values not applicable to Program

Table 4 - 9. AMS Customer Service Offering

Utility Program Costs by Year

	Total Program Costs
Year 1	$894,213
Year 2	$489,315
Year 3	$473,996
Year 4	$510,194
Year 5	$499,770
Year 6	$511,618
Year 7	$523,821
Total	$3,902,926

Table 4 - 10. School Energy Managers Program (SEMP)

Participation and Total Participant Costs by Year

	Annual Participants	Total Participant Costs
Year 1	461	$0
Year 2	461	$0
Year 3	0	$0
Year 4	0	$0
Year 5	0	$0
Year 6	0	$0
Year 7	0	$0
Total	**461**	**$0**

Table 4 - 11. School Energy Managers Program (SEMP)

Impacts and Savings by Year

	Annual Energy Savings (MWh)	Annual Demand Savings (MW)
Year 1	7,227	1.68
Year 2	7,227	1.68
Year 3	0	0.00
Year 4	0	0.00
Year 5	0	0.00
Year 6	0	0.00
Year 7	0	0.00
Total	**14,454**	**3.36**

Table 4 - 12. School Energy Managers Program (SEMP)

Utility Program Costs by Year

	Total Program Costs
Year 1	$725,000
Year 2	$725,000
Year 3	$0
Year 4	$0
Year 5	$0
Year 6	$0
Year 7	$0
Total	**$1,450,000**

Table 4 - 4. Residential and Small Nonresidential Demand Conservation Program

Participation and Total Participant Costs by Year

	Annual Participants	Total Participant Costs
Year 1	231,470	$0
Year 2	219,748	$0
Year 3	208,726	$0
Year 4	198,204	$0
Year 5	188,182	$0
Year 6	178,560	$0
Year 7	169,538	$0
Total	**169,538**	**$0**

Table 4 - 5. Residential and Small Nonresidential Demand Conservation Program Impacts and Savings by Year

	Annual Energy Savings (MWh)	Annual Demand Savings (MW)
Year 1	0	162.19
Year 2	0	154.00
Year 3	0	146.26
Year 4	0	138.87
Year 5	0	131.84
Year 6	0	125.08
Year 7	0	118.71
Total	**0**	**118.71**

Table 4 - 6. Residential and Small Nonresidential Demand Conservation Program Utility Program Costs by Year

	Total Program Costs
Year 1	$3,586,486
Year 2	$2,378,427
Year 3	$2,600,483
Year 4	$2,364,543
Year 5	$2,358,524
Year 6	$2,353,026
Year 7	$2,348,251
Total	**$17,989,739**

Table 4 - 7. Large Nonresidential Demand Conservation Program Participation and Total Participant Costs by Year

	Annual Participants	Total Participant Costs
Year 1	240	$57,750
Year 2	240	$57,750
Year 3	240	$57,750
Year 4	240	$57,750
Year 5	240	$57,750
Year 6	240	$57,750
Year 7	240	$57,750
Total	**240**	**$404,250**

Table 4 - 8. Large Nonresidential Demand Conservation Program Impacts and Savings by Year

	Annual Energy Savings (MWh)	Annual Demand Savings (MW)
Year 1	325	20.29
Year 2	325	20.29
Year 3	325	20.29
Year 4	325	20.29
Year 5	325	20.29
Year 6	325	20.29
Year 7	325	20.29
Total	**2,272**	**20.29**

Table 4 - 9. Large Nonresidential Demand Conservation Program

Utility Program Costs by Year

	Total Program Costs
Year 1	$939,116
Year 2	$842,779
Year 3	$846,553
Year 4	$1,002,860
Year 5	$854,442
Year 6	$858,566
Year 7	$862,813
Total	**$6,207,128**

Table 4 - 10. Program Development and Administration

Participation and Total Participant Costs by Year

Values not applicable to Program

Table 4 - 11. Program Development and Administration

Impacts and Savings by Year

Values not applicable to Program

Table 4 - 12. Program Development and Administration

Utility Program Costs by Year

	Total Program Costs
Year 1	$724,126
Year 2	$732,688
Year 3	$741,507
Year 4	$750,590
Year 5	$759,946
Year 6	$769,583
Year 7	$779,509
Total	**$5,257,949**

5. PortfolioPro Output Summary Reports

Table 5 - 1 Low Income Weatherization Program (WeCare)

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$37,535,914	$16,652,594	0.44
PAC	$37,535,914	$16,652,594	0.44
PCT	$0	$34,395,484	N/A
RIM	$85,951,154	$16,652,594	0.19

Table 5 - 13. Nonresidential Rebates Program

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$58,193,624	$66,540,244	1.14
PAC	$15,727,902	$66,540,244	4.23
PCT	$43,151,635	$92,459,943	2.14
RIM	$136,665,972	$66,540,244	0.49

Table 5 - 3. AMS Customer Service Offering

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$3,328,639	$0	0.00
PAC	$3,328,639	$0	0.00
PCT	$0	$0	N/A
RIM	$3,328,639	$0	0.00

Table 5 - 4. School Energy Managers Program (SEMP)

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$1,406,904	$427,677	0.30
PAC	$1,406,904	$427,677	0.30
PCT	$0	$808,997	N/A
RIM	$1,406,904	$427,677	0.19

Table 5 - 5. Residential and Small Nonresidential Demand Conservation Program

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$14,111,233	$0	0.00
PAC	$15,295,036	$0	0.00
PCT	$0	$1,087,758	N/A
RIM	$15,295,036	$0	0.00

Table 5 - 6. Large Nonresidential Demand Conservation Program

Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$5,100,182	$67,092	0.01
PAC	$5,213,146	$67,092	0.01
PCT	$309,266	$500,365	1.62
RIM	$5,310,016	$67,092	0.01

Table 5 – 7. Program Development and Administration Present Values (PVs) of Costs and Benefits per Test

Cost Test	Present Value of Costs	Present Value of Benefits	Benefits / Costs Ratio (Test Score)
TRC	$4,394,652	$0	0.00
PAC	$4,394,652	$0	0.00
PCT	$0	$0	N/A
RIM	$4,394,652	$0	0.00

6. Appendix A – DSM Advisory Group Meeting Materials

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Thursday, June 23, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Alex Petre	LG&E/KU	[redacted]	[redacted]
Kevin Craft	LGE/KU	[redacted]	[redacted]
MIKE MULHERN	JCPS	[redacted]	[redacted]
Rick Lovekamp	LG&E/KU	[redacted]	[redacted]
Larry Cook	OAG	[redacted]	[redacted]
mike Kurtz	KIUC	[redacted]	[redacted]
NAT ADAMS	North American Stainless	[redacted]	[redacted]
Kurt Boehm	KIUC	[redacted]	[redacted]
Cathy Hinko	MHC	[redacted]	[redacted]
Lisa Kilkelly	Legal Aid	[redacted]	[redacted]
David Huff	LG&E	[redacted]	[redacted]

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Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Thursday, June 23, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
John Hayden	LGE/KU	[redacted]	[redacted]
Greg Lawson	LGE/KU	[redacted]	[redacted]
LISA KEELS	LGE/KU	[redacted]	[redacted]
Tim Melton	LGE/KU	[redacted]	[redacted]
Molly Sutherland	Sutherland + Associates	[redacted]	[redacted]
Michelle King	APCD	[redacted]	[redacted]
Lee Colten	DEDI	[redacted]	[redacted]
Wallace McMullen	Sierra Club	[redacted]	[redacted]
Andrea Webster	Lou Metro Sustainabilit	[redacted]	[redacted]
Brent Fryrear	Partnership for a Green City	[redacted]	[redacted]

LG&E KU

PPL companies

Energy Efficiency Advisory Group – Stakeholder Meeting

June 23, 2016

Agenda

- Welcome / Intros

- Industrial Potential Study Results
  - *Achievable potential*
  - *Energy efficiency program examples*

- Industrial Exemption/DSM Opt-out
  - *State law KRS 278.285*

- Next Steps

Exhibit GSL-1
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PPL companies

PSC Order from DSM Application (CASE NO. 2014-000003)

5. Within three months of the issuance of this Order, the Companies shall commission an industrial potential or market-characterization study.

6. The Companies shall file with the Commission the industrial potential or market-characterization study within 30 days of the date it is completed and finalized.

Study was submitted to KY PSC on May 26, 2016.

Exhibit GSL-1
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Per ARTICLE III., Section 3.3 Industrial DSM-EE Matters - Final PSC Order from CASE NOs. 2014-00371 and 2014-00372

(A) The Utilities commit to instruct the vendor for their industrial-DSM-EE potential study to commence work on the study immediately, and will not seek DSM cost recovery of the study's cost. The Utilities further commit that the study will be completed by May 1, 2016, and filed with the Commission thirty days later in accordance with the Commission's final order in Case No. 2014-00003. Thereafter, Utilities commit that they will commence the DSM Advisory Group meeting process to discuss the results of the industrial study.

(B) The Utilities commit to address opt-out criteria for industrial customers, as well as the definition of "industrial," including whether the NAICS code should be used to define "industrial," in their first DSM-EE application following completion of their industrial-DSMEE-potential study.

Exhibit GSL-1
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LG&E KU
PPL companies

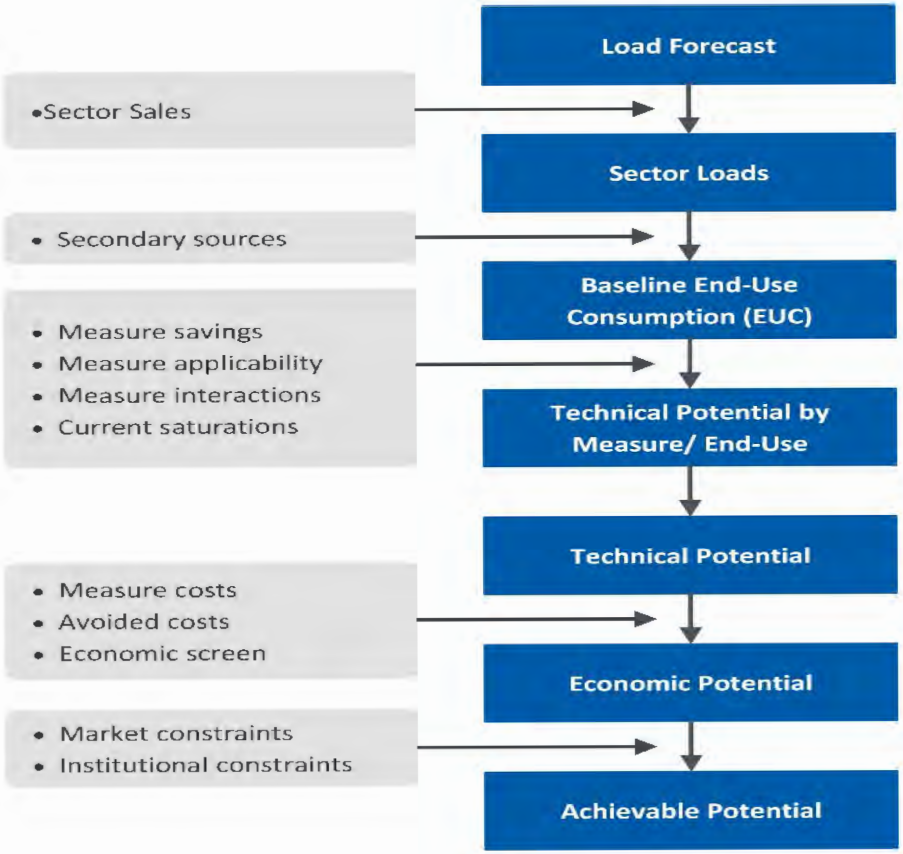
Types of Energy Efficiency Potential 2016-2035

Cadmus

EPA – National Action Plan for Energy Efficiency (2007)

LGE/KU

Potential Study Methodology



- Sector Sales
- Secondary sources
- Measure savings
- Measure applicability
- Measure interactions
- Current saturations
- Measure costs
- Avoided costs
- Economic screen
- Market constraints
- Institutional constraints

Load Forecast

Sector Loads

Baseline End-Use Consumption (EUC)

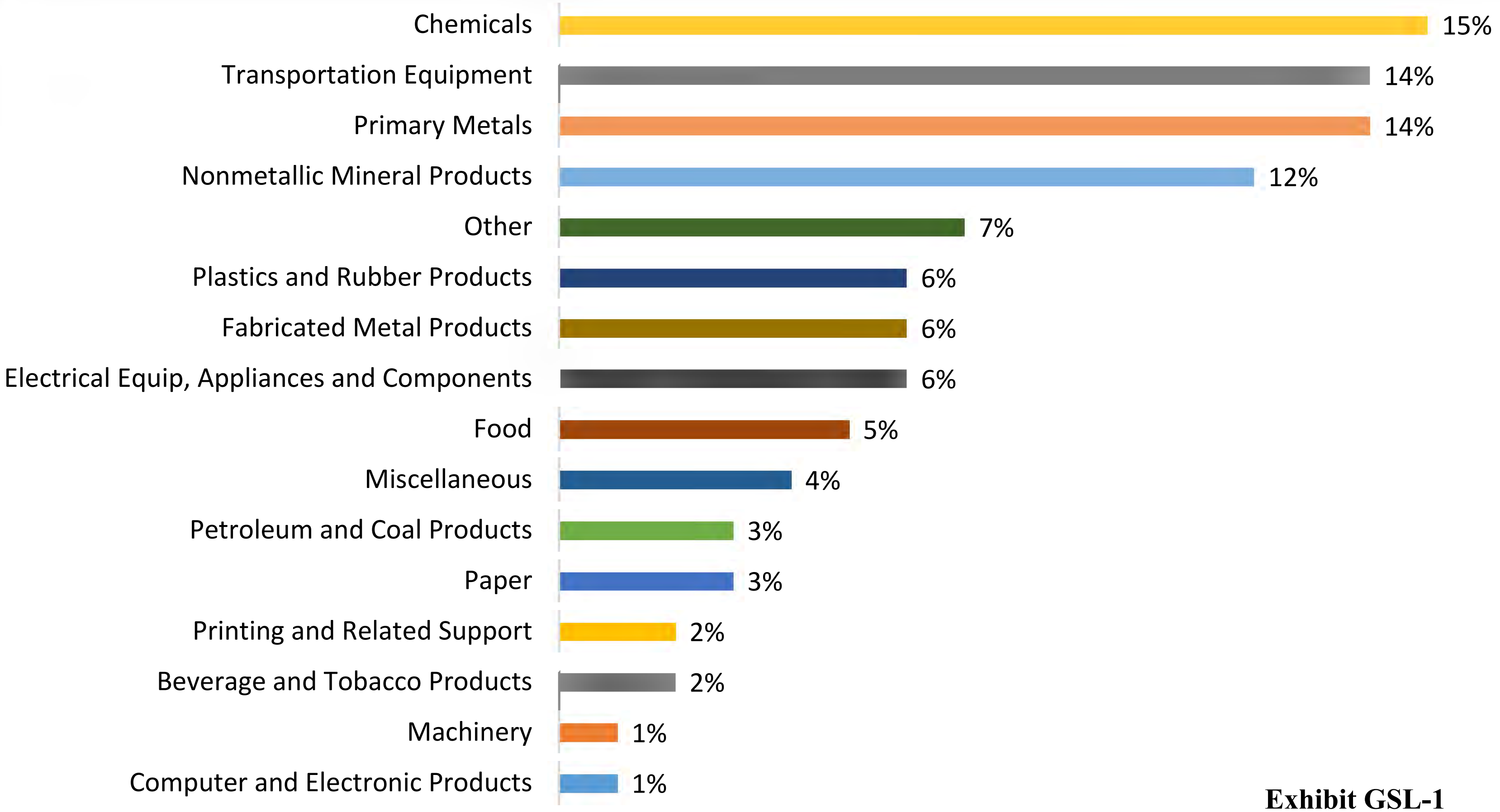
Technical Potential by Measure/ End-Use

Technical Potential

Economic Potential

Achievable Potential

Electric Baseline Consumption by Industry - 2035



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LG&E KU
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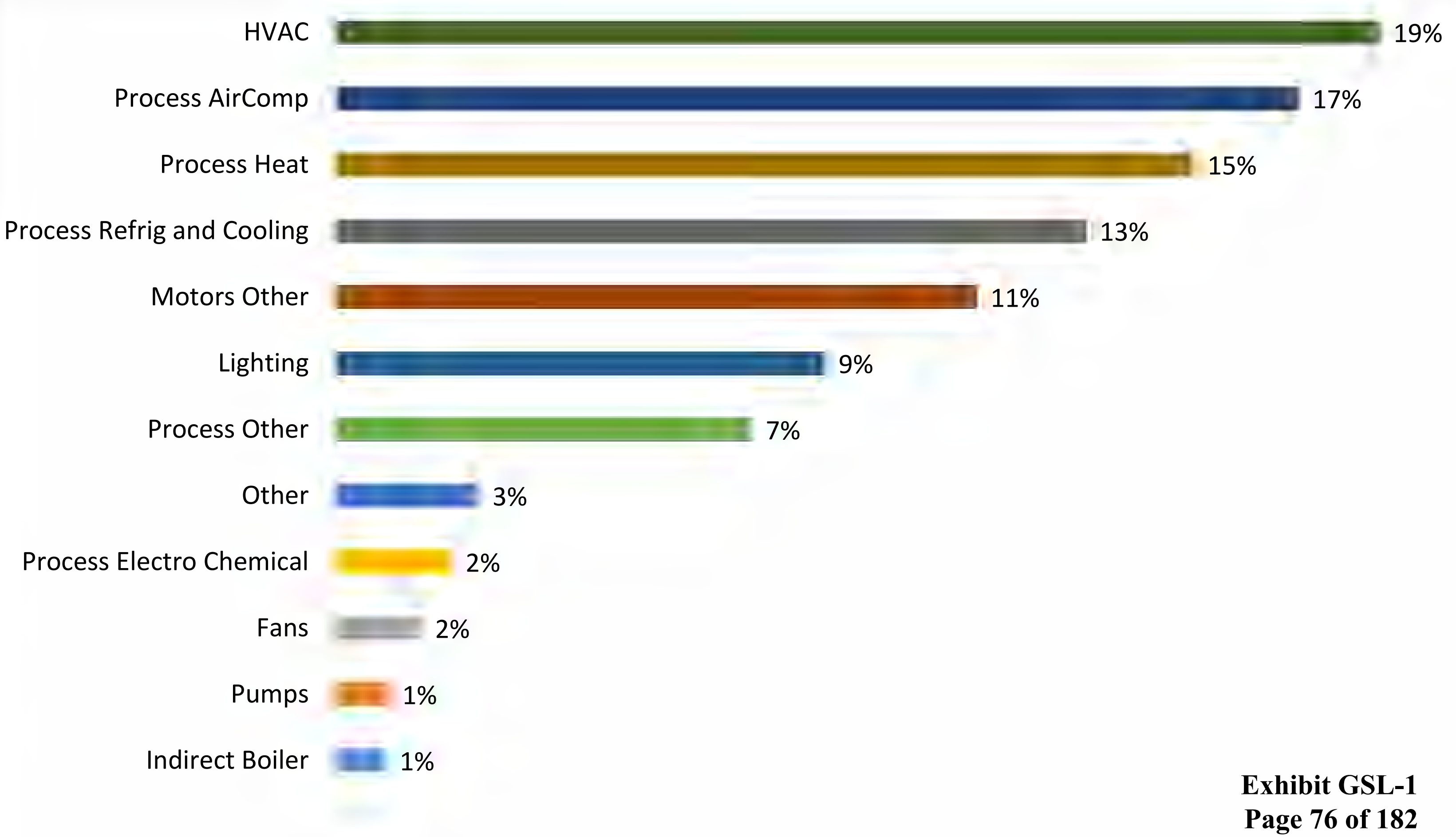
Electric Economic Potential by End Use – 20 yr. Cumulative



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PPL companies

Technical & Economic Energy Efficiency Potential

Energy

Utility	2035 Baseline Sales - MWh	20-Year Cumulative Potential - MWh		Percent of Baseline		Economic as a % of Technical
		Technical Potential	Economic Potential	Technical Potential	Economic Potential	
LGE	2,626,749	428,025	384,170	16.3%	14.6%	90%
KU	6,370,330	941,051	827,301	14.8%	13.0%	88%
Total	8,997,079	1,369,076	1,211,471	15.2%	13.5%	88%

Utility	20-Year Cumulative Potential - MW	
	Technical	Economic
LGE	53	48
KU	115	101
Total	168	149

Exhibit GSL-1
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Achievable Energy Efficiency Potential

Utility	20-Year Cumulative Achievable Potential - MWh		
	Low	Medium	High
MWh—Cumulative 20-year			
LGE	126,776	192,085	257,394
KU	273,009	413,651	554,292
Total	**399,785**	**605,736**	**811,686**
Percent of Baseline			
LGE	4.8%	7.3%	9.8%
KU	4.3%	6.5%	8.7%
Total	**4.4%**	**6.7%**	**9.0%**

Demand

Utility	20-Year Cumulative Achievable Potential - MW		
	Low	Medium	High
LGE	16	24	32
KU	33	51	68
Total	**49**	**74**	**100**

Exhibit GSL-1
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New Program Possibilities…

- Industrial Rebates

  Expanding to C&I

  — *Expands existing Commercial Rebates Program where Companies pay $100/kW for demand reductions that are result of prescriptive and custom measures*

- Industrial Energy Efficiency Consulting

  [redacted]

  — *New offering where Companies provide energy efficiency audit services for small to medium sized Industrial Customers*

- Industrial Automated Demand Response (ADR)

  Expanding to C&I

  — *Expands existing Large Commercial ADR Program where Companies pay annual incentives ($25/kW) for controllable demand reductions*

- Industrial Strategic Energy Management (SEM)

  New

  — *New offering where selected participants go on year-long in-depth EE awareness and facility education; No/low cost options are explored.*

LG&E KU
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Opt Out Current State Law: KRS 278.285

- (3) The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The **commission shall allow individual industrial customers** with **energy intensive processes** to **implement cost-effective energy efficiency measures** in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs.

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Next Steps

- DSM timeline
  - *Early 2018: estimated date for next DSM filing*
  - *Early 2017: decision on continued and new programs for 2019 forward*
  - *July 2016 – February 2017: series of Advisory Committee meetings to get firm understanding and consensus agreement of energy intensive definition and opt-out impacts*

- Input of meeting schedule and what gets accomplished

- Discussion items
  - *Energy intensive definition*
  - *Industrial programs*
  - *Costs and impacts*

Exhibit GSL-1
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PPL companies

Thank you

MEETING RECORD
Energy Efficiency Advisory Group Meeting

Date:	**June 23, 2016**
Location:	**Fairfield Inn & Suites** 1220 Kentucky Mills Drive Louisville, KY 40299
Participants:	**LG&E /KU:** Eight employees from various departments, including Energy Efficiency, Regulatory Affairs and Customer Service. **Stakeholders:** Representatives from twelve stakeholder groups.
Date Issued:	06/27/2016
Issued by:	John Hayden

The following meeting minutes have been prepared to summarize the conversations and issues discussed at the above referenced meeting.

[redacted]

Welcome / Introductions

David Huff welcomed the meeting participants. He reiterated the purpose for the meeting to the group as well as provided an introduction to Greg Lawson, the new Manager of LG&E/KU's Energy Efficiency Planning & Development Department. Lastly, he detailed the expiration of current DSM programming in December 2018 and the upcoming timeline of the next DSM Filing in 2018 to the Kentucky PSC for commencement of new DSM programming in January 2019.

Meeting Agenda

Greg Lawson introduced himself to the group and also thanked meeting participants for attending. All meeting participants then introduced themselves and indicated their company, agency, or organization of affiliation. Greg provided an overview of the meeting agenda:

- Welcome / Intros
- Industrial Potential Study Results
- Industrial Exemption / DSM Opt-Out
- Next Steps

Industrial Potential Study Results

Greg Lawson began by providing some background information on the regulatory orders that requested the Potential Study be commissioned. He mentioned to the group that a web link to the Study was distributed to attendees prior to the meeting. The study is also available online on the Kentucky PSC website. He then provided a description of the types of Energy Efficiency Potential, the methodology utilized by the vendor (The Cadmus Group, Inc.) who performed the study, as well as an overview of the Study's results.

- Discussion ensued regarding the results as well as the impact it may have on future programming.

- Questions were presented to the group about the results and the methodology used. A sample of some of the questions were:

    - Q) Where did the research data come from?
        - A) Secondary research came from national sources including the Manufacturing Energy Consumption Survey, the IAC facility audit database (which includes the Kentucky Industrial Assessment Center data), as well as Energy Information Administration Form 861. Primary research resulted from surveying the industrial customers in the service territories.
    - Q) How does current industrial consumption translate to potential?
        - A) Consumption by industry does not equally translate proportionally to end-use potential.
    - Q) How did the vendor determine cost-effectiveness?
        - A) Each measure was evaluated using a Total Resources Cost test based on the Company's forecast of energy and capacity costs
    - Q) Did the customer survey response portion of the study derive from a statistically significant sample size?
        - A) Yes, the surveyor reached out to all industrial customers (either via by phone, email/online, and by printed letters) and the responses received were statistically significant.

Industrial Exemption / DSM Opt-Out

Greg Lawson continued by describing the work that is currently being done by the Planning & Development department to identify program possibilities. It was mentioned that this work is still ongoing as the study did not analyze program potential.

- The group was asked to assist LG&E/KU in the current and future meetings in identifying what might be missing from the presented list as well identifying what programs may not be needed.
- The study described various types of utility programs in other states.
- In response to a participant's question about how the utility would determine what programs to offer, it was replied that in addition to the standard analysis, planning, and cost / benefit tests, the utility would also rely on these meetings to help to determine what to offer.
- The current state law (KRS 278.285) was provided for all to see the current language regarding industrial opt-out. Discussion revolved at how best to define and interpret the language in the law.

Next Steps

- Some of the topics suggested by the participants for the next meeting are listed below:
    - How do other states define the issues? Could MEEA provide some context to group and/or present?
    - What are the options for defining energy intensive?
    - What are the program funding impacts?

- David Huff asked the group for their preference on the timing of the next meeting. He indicated that LG&E/KU needed at least a month to continue their analysis. **A follow-up meeting was suggested for August 2016**. In the interim, it was mentioned that the DSM Advisory Group could reach out with any questions, comments, or issues regarding programming.

- Greg Lawson closed the meeting with thanking participants for their attendance, continued support, and the robust discussion of the issues.

LG&E KU
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Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet
Wednesday, August 24, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Greg Lawson	LG&E-KU	[redacted]	[redacted]
Sammy Stricker	LG+E and KU	[redacted]	[redacted]
Kelli Higdon	LG&E & KU	[redacted]	[redacted]
David Huff	LGE KU	[redacted]	[redacted]
[illegible]	LGE / KU	[redacted]	[redacted]
John Hayden	Lge / KU	[redacted]	[redacted]
Michelle King	APCD	[redacted]	[redacted]
Lisa Kilkelly	Legal Aid	[redacted]	[redacted]
Rick Lovekamp	LG&E/KU	[redacted]	[redacted]
Nat Adams	NAS / KIUC	[redacted]	[redacted]
Kurt Boehm	KIUC	[redacted]	[redacted]

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Wednesday, August 24, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
LISA P. KEELS	LKE	[redacted]	[redacted]
Rhonda Childers	Community Action Council	[redacted]	[redacted]
BARRY NAUM	WALMART	[redacted]	[redacted]
Nick Dreher	MEEA	[redacted]	[redacted]
Duncan Crosby	SKO for LGE-KU	[redacted]	[redacted]
RON WILLHITE	KSGA	[redacted]	[redacted]
Cheryl Bruner	LGE/KU	[redacted]	[redacted]
Cathy Hinko	Metropolitan Housing Coalition	[redacted]	[redacted]

Exhibit GSL-1

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Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Wednesday, August 24, 2016

Fairfield Inn & Suites

1220 Kentucky Mills Drive, Louisville, KY 40299

2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Wallace McMullen	Sierra Club	[redacted]	[redacted]

MEETING RECORD
Energy Efficiency Advisory Group Meeting

Date: **August 24, 2016**

Location: **Fairfield Inn & Suites**
1220 Kentucky Mills Drive
Louisville, KY 40299

Participants: **LG&E /KU:**
Ten employees from various departments, including Energy Efficiency, Regulatory Affairs, and Customer Service

Stakeholders:
Representatives from ten stakeholder groups.

Date Issued: 08/30/2016

Issued by: Kelli Higdon

The following meeting minutes have been prepared to summarize the conversations and issues discussed at the above referenced meeting.

[redacted]

Welcome / Introductions

Greg Lawson, the Manager of LG&E/KU's Energy Efficiency Planning & Development Department, welcomed the meeting participants. He reiterated the purpose for the meeting to the group. All meeting participants then introduced themselves and indicated their company, agency, or organization of affiliation.

Meeting Agenda

Greg Lawson thanked meeting participants for attending and provided an overview of the meeting agenda:

- Welcome / Intros
- Review of opt-out rules in other states - presentation from MEEA representative
- DSM Opt-Out in surrounding states not in MEEA
- Review of Kentucky state law and current tariff
- Energy intensive definition / Cost-effective energy efficiency measures
- Analysis of industrial exemption impact
- Next Steps

Industrial Exemption / DSM Opt-Out

Greg Lawson began by introducing Nick Dreher from MEEA, a nonprofit membership organization and advocate for energy efficiency. Nick presented slides for each of the states in their organization and details of how they defined an industrial customer and whether they had opt-out or self-direct policies. Greg Lawson then presented similar information for the surrounding states that are not in MEEA.

Next the Kentucky Revised Statute vs. current tariff language was discussed. Barry Naum, Walmart's attorney, noted that the statute does not specifically state NAICS codes in its definition of an industrial customer but the tariff language does. This led to further discussions on how an industrial customer should be defined.

Next, Greg Lawson stated that he would like for the focus of this meeting to be on the language "Energy Intensive", which could be based on the customer's prior 12 months "base" demand. A chart was presented that showed the impacts of different opt-out levels. It was noted that we currently have 100% opt-out for our industrial customers. Then it was asked why LG&E/KU were seeking to develop a program for industrial customers. The order from Case Nos. 2014-00371 and 2014-00372 states that we are to "commit to address opt-out criteria for industrial customers, as well as the definition of 'industrial', including whether the NAICS code should be used to define 'industrial'". David Huff stated that many industrial customers commented that they had people on staff to address their own energy efficiency projects / measures. David stated that we are required by the KPSC to report on the findings of the Potential Study before we can make a new DSM filing and we would like to file our new DSM filing no later than Feb 28, 2018.

Various stakeholders discussed their interpretation of the statute and how it relates to the existing tariff language.

Participants were directed to the Potential Study p.32 - Figure 12, showing the percentage of respondents with energy managers on site and also to p.49 - Figure 34, showing Electric Economic Potential by End Use.

David Huff said for the next meeting we would continue our analysis of the program and could back into the amount of program costs that would be spread across all industrial customers at each of these break-outs shown on slide 8 of Greg Lawson's presentation and look at the cost benefit ratios to report back to the group.

Next Steps

- Some of the topics suggested by the participants for the next meeting are listed below:
  - What is the definition of an industrial customer?
  - What is the definition of "energy intensive"? Is there a non-arbitrary threshold from which to base this on?
  - Discuss tariff language.

- Greg Lawson thanked the participants for their discussions at these meetings and reiterated that the meetings are open to all industrial customers if they want to participate. He then asked the group for their preference on the timing of the next meeting. He indicated that LG&E/KU needed at least a month to continue their analysis. **A follow-up meeting was suggested for late September or early October 2016**. In the interim, it was mentioned that the DSM Advisory Group could reach out with any questions, comments, or issues regarding programming.

- Rick Lovekamp stated that, as required, we provide the KPSC a monthly status update of any meetings that we have on this topic.

- Greg Lawson thanked the participants for their attendance and closed the meeting.

LG&E KU

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DSM Advisory Group Meeting

August 24, 2016

Agenda

- Welcome/Introductions
- Review of opt-out rules in other states
  - *Presentation from MEEA representative*
- Opt-out in surrounding states not in MEEA
- Review of Kentucky state law and current tariff
- DSM opt-out
  - *Energy intensive definition*
  - *Cost-effective energy efficiency measures*
- Analysis of industrial exemption impact
  - *Demand/Energy opt-out levels*
- Next steps

PPL companies

Case Study: Arkansas

- Request (via opt-out form) by customer to PSC by September 15th for following year and exempt for Supplier/Utility Program Planning Period; Allows Self-Direct

- Law based on Act 78 from 2015 and Act 253 from 2013

- Defining Industrial:
  - *NAICS sectors 31-33* and "…has a peak electrical demand of at least one (1) MW…" at single facility OR peak demand at multiple facilities that exceed 200 kW at each location with an aggregate of at least 1 MW*

    **Note: Does allow NAICS exemptions*

- Customer must also have not accepted money or measures related to DSM program for 5 years prior

- PSC can decrease the peak demand requirements

Exhibit GSL-1
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Case Study: Virginia

- Customers can opt-out if:
  - *Have average demand between 500 kW and 10 MW and*
  - *Customer must provide annual M&V report to PSC with past/planned EE investments*
    - Note: Customers over 10 MW are automatically exempt

- For Dominion: Opt-Out is due by 3/1 of current year to Provider and PSC
  - *Notification after 3/1 will apply to following year*

- Based on Virginia Code § 56-585

- Customer can opt back in at any time
  - *Min period is for 3 years*

- Self-Direct is not offered

Case Study: West Virginia

- Customers can opt-out if:
  - *Have demand greater than 1 MW and*
  - *Customer must provide documentation to PSC on savings to retain opt-out status*

  Note: Opt-out process can vary by provider

- Not a lot of specifics available for this state

- Self-Direct is not offered

Exhibit GSL-1

PPL companies

Kentucky DSM Opt-out language: key points

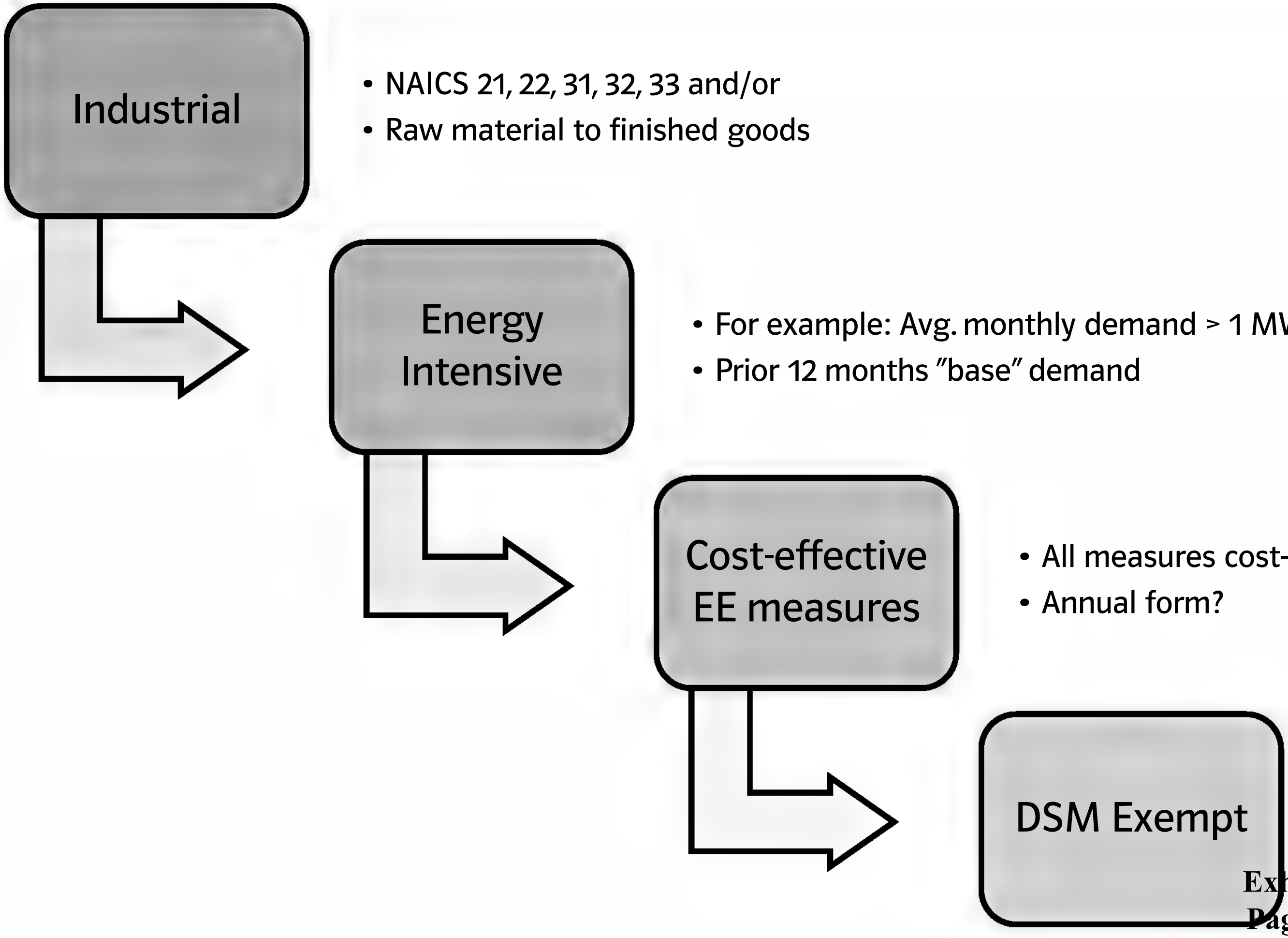
- Industrial customers: already defined in current tariff; potential for revised language

- Energy intensive processes: determined by level of demand in prior 12 month period

- Cost-effective energy efficiency measures: could be determined in annual form

- Not subsidized by other customer classes

Key Items to Consider in Tariff Language



Industrial

- NAICS 21, 22, 31, 32, 33 and/or
- Raw material to finished goods

Energy Intensive

- For example: Avg. monthly demand > 1 MW
- Prior 12 months "base" demand

Cost-effective EE measures

- All measures cost-effective?
- Annual form?

DSM Exempt

Exhibit GSL-1
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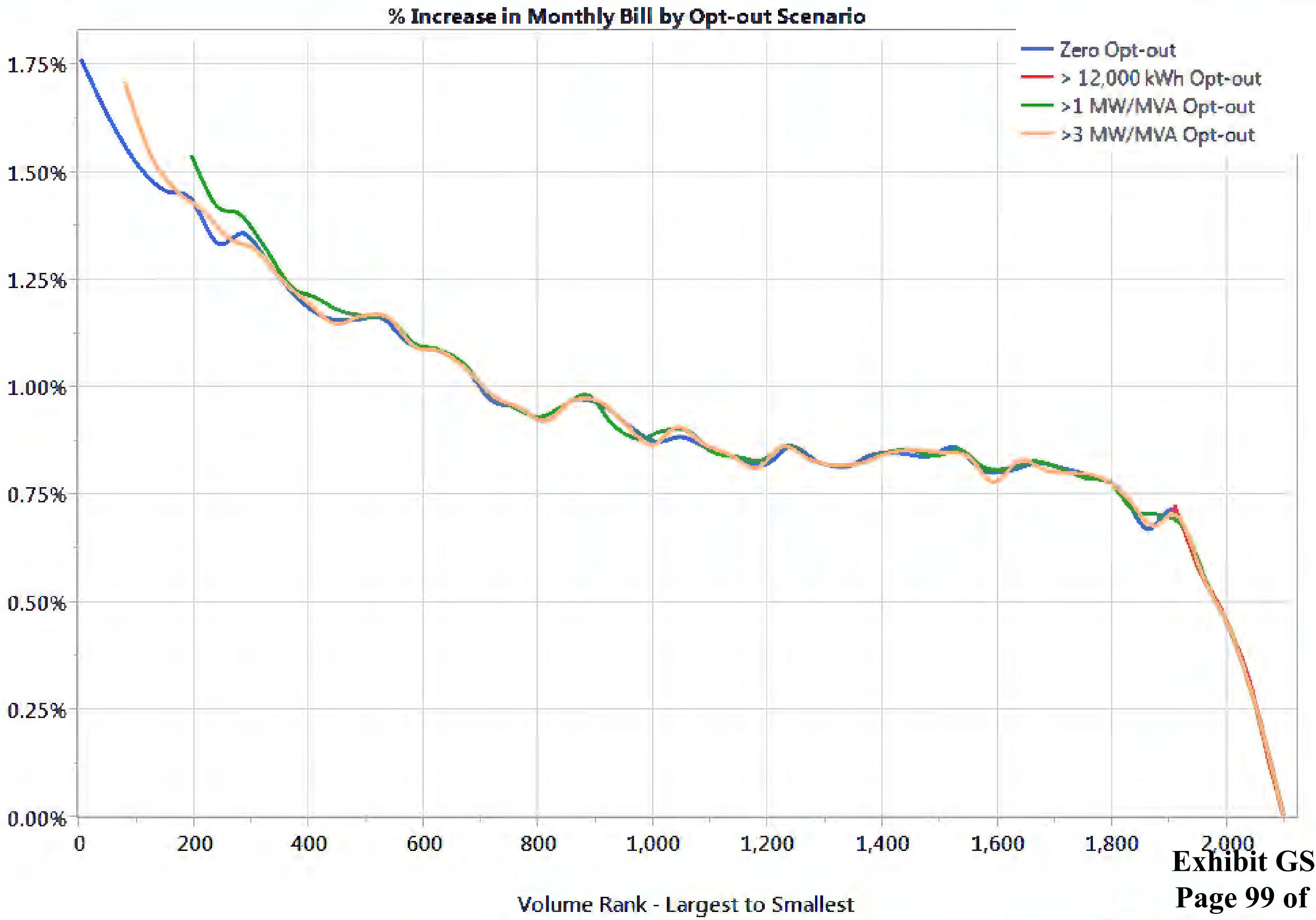
LG&E KU
PPL companies

Impacts of different opt-out levels

	Zero opt-out	> 12,000 kWh	> 1 MW/MVA	> 3 MW/MVA
Customers contributing	2,097 (100%)	191 (9%)	1,834 (87%)	1,993 (95%)
Customers opted out	0	1,906 (91%)	263 (13%)	104 (5%)
Contributing MWh	8,264,635	860 (0.01%)	1,216,026 (15%)	2,435,155 (29%)
Opted out MWh	0	8,263,775 (99.99%)	7,048,610 (85%)	5,829,480 (71%)
Avg. monthly bill impact (%)	0.96%	0.41%	0.89%	0.93%
Interquartile range (middle 50%)	0.8 – 1.2%	0.2 – 0.6%	0.8 – 1.0%	0.8 – 1.1%

Opt-out Scenarios – Billing Impact



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LG&E KU
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Next steps

- Next meeting – late September, October
- Finalize details around opt-out rules
- Review planning and timeline for next EE filing

Appendix

PPL companies

Opt Out Current Kentucky State Law: KRS 278.285

(3) The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual **industrial customers** with **energy intensive processes** to implement **cost-effective** energy efficiency measures in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are **not subsidized** by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs.

Current DSM Exemption Language

Same language for LG&E and KU
P.S.C. No. 17, Original Sheet No. 86, Section "AVAILABILITY OF SERVICE"

Industrial customers who elect not to participate in a demand-side management program hereunder shall not be assessed a charge pursuant to this mechanism. For purposes of rate application hereunder, non-residential customers will be considered "industrial" if they are primarily engaged in a process or processes that create or change raw or unfinished materials into another form or product, and/or in accordance with the North American Industry Classification System, Sections 21, 22, 31, 32, and 33. All other nonresidential customers will be defined as "commercial."

Exhibit GSL-1

PPL companies

Detailed comparison of surrounding states

	AR	IN	OH	MO	VA	WV
Peak / Energy Threshold	1 MW	1 MW	700,000 kWh	2.5 MW	500 kW	1 MW
Following Year Deadline to Opt-Out	Sep 15th	Nov 15th	Provide 12 month notice	Not specified	By Mar 1st for current year; if after 3/1, then for next year	Not specified
Opt-In Ability	✓	✓	✓	NA	✓	Not specified
Opt-In Period Min	Not Specified	3 Years	3 Years	NA	3 Years	Not specified
Opt-Out Administrator	PSC	Supplier / Provider	PSC & Supplier	PSC & Supplier	PSC & Supplier	PSC & Supplier
Self-Direct	✓	NA	✓	NA	NA	NA

Note: Opt-out not available in TN and IL.

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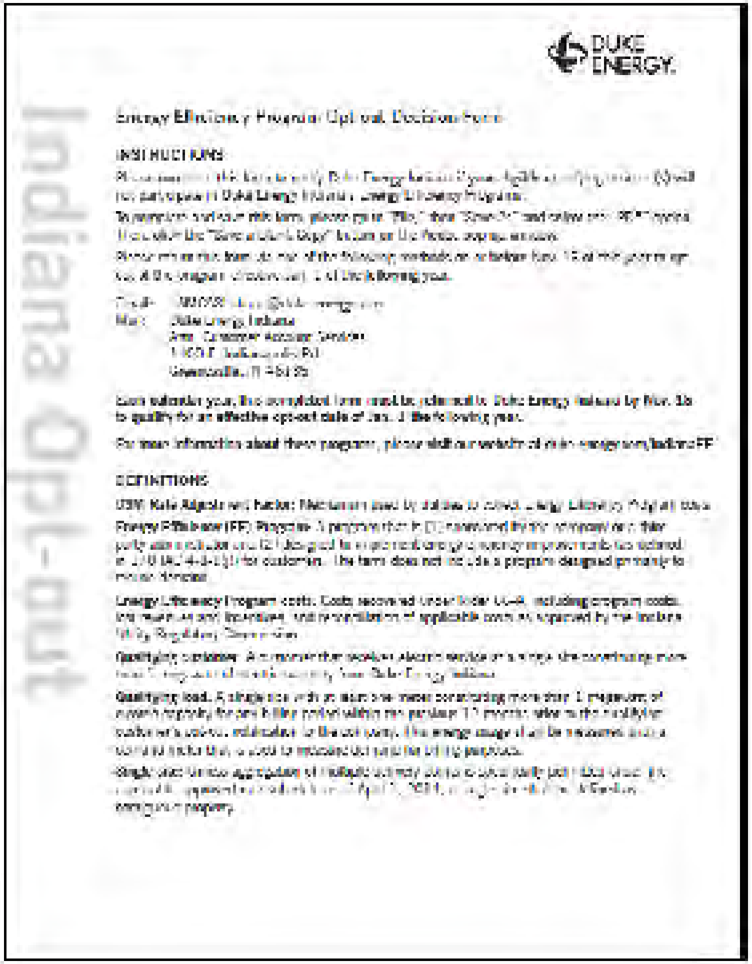
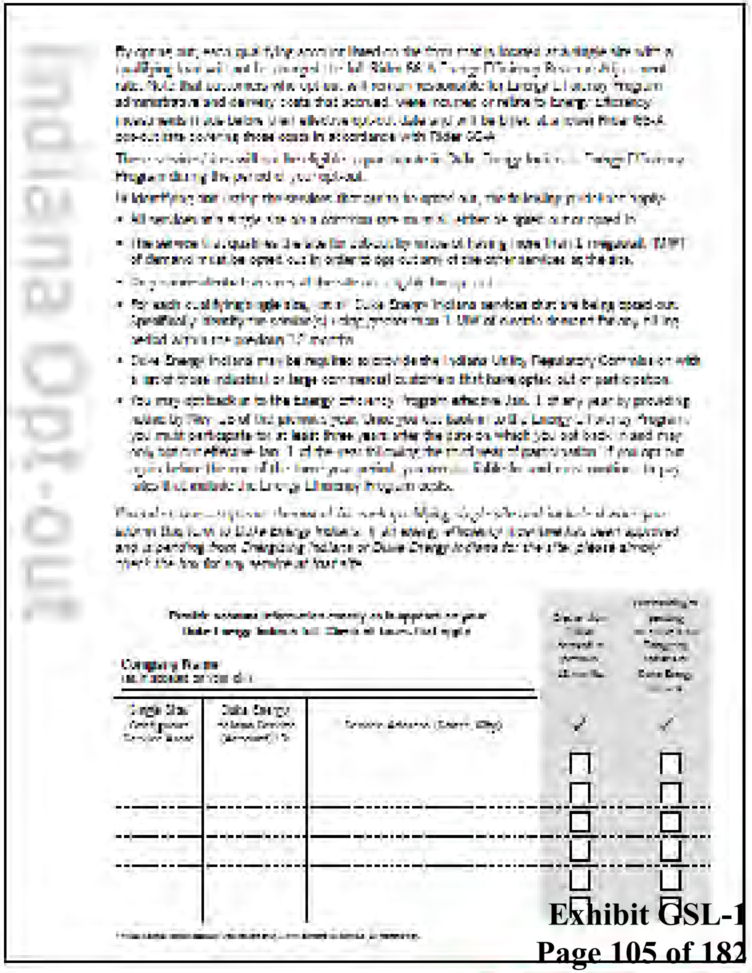
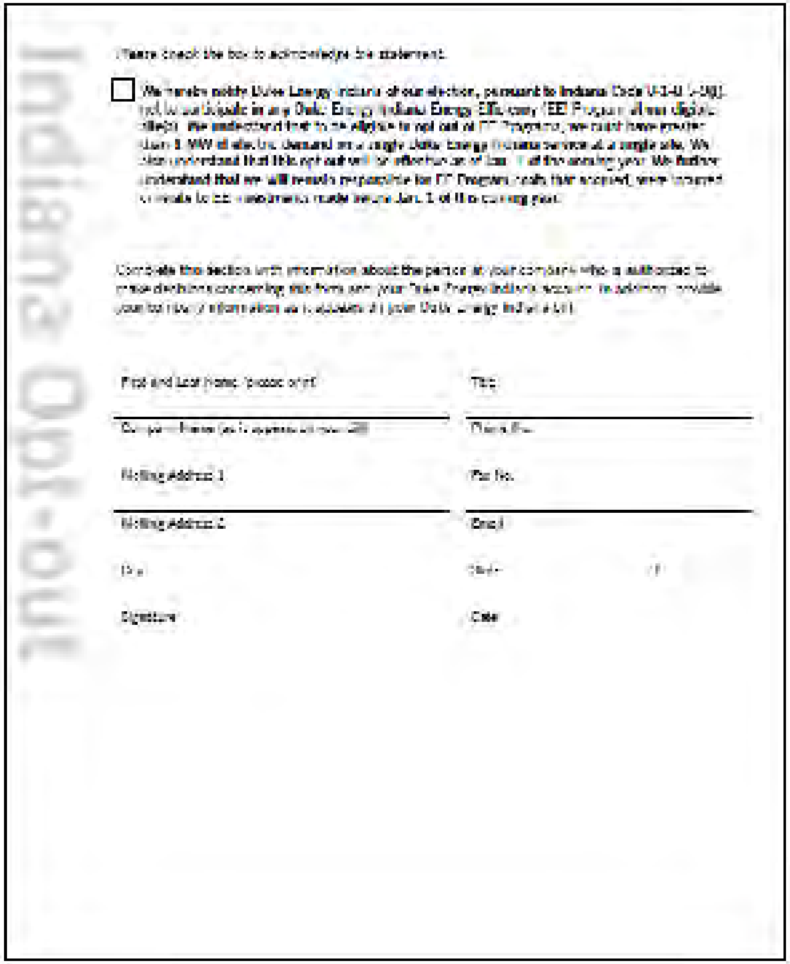
Indiana Opt-Out Form (pages 1 & 2 of 3)





Indiana Opt-Out Form (page 3 of 3)



Please check the box to acknowledge the statement.

☐

First and Last Name (please print)

Title

Phone No.

Mailing Address 1

Fax No.

Mailing Address 2

Email

Signature

Date

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet
Thursday, October 13, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
John Hayden	LGE/KU	[redacted]	[redacted]
David Huff	LGE KU	[redacted]	[redacted]
TOM FITZGERALD	KRC	[redacted]	[redacted]
Michelle King	Lou. Metro APCD	[redacted]	[redacted]
Samantha Stickler	LGE/KU	[redacted]	[redacted]
Kelli Higdon	LGE/KU	[redacted]	[redacted]
Sara Veeneman	LGE/KU	[redacted]	[redacted]
Lisa Kilkelly	Legal Aid	[redacted]	[redacted]
DONALD COLLIVER	UK/KIAC	[redacted]	[redacted]

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Thursday, October 13, 2016
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Greg Lawson	LG&E/KU	[redacted]	[redacted]
Lisa P. Keels	LGE/KU	[redacted]	[redacted]
Barry Naum	WALMART	[redacted]	[redacted]
Nick Dreher	MEEA	[redacted]	[redacted]
Leah Scull	MEEA	[redacted]	[redacted]
Ron Willhite	KSBA	[redacted]	[redacted]
Andrea Webster	LEA, Metro Office of Sustainability	[redacted]	[redacted]
Lee Colten	DEDI	[redacted]	[redacted]
Kurt Boehm	KIUC	[redacted]	[redacted]
NAT ADAMS	KIUC/N.A.S	[redacted]	[redacted]
Rick Lovekamp	LG&E/KU	[redacted]	[redacted]

DSM Advisory Group Meeting

October 13, 2016

LG&E KU
PPL companies

Agenda

- Welcome/Introductions
- Review of Kentucky state law regarding opt-out
- DSM Opt-out criteria proposal to meet KRS 278.285
  - “Industrial” definition
  - “energy intensive” definition
  - Implementing cost effective energy efficiency measures
- Next steps

Opt-out Current Kentucky State Law: KRS 278.285

- (3) The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual **industrial customers** with **energy intensive processes** to implement **cost-effective energy efficiency measures** in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs.

Emphasis added

Steps to DSM exemption: KRS 278.285

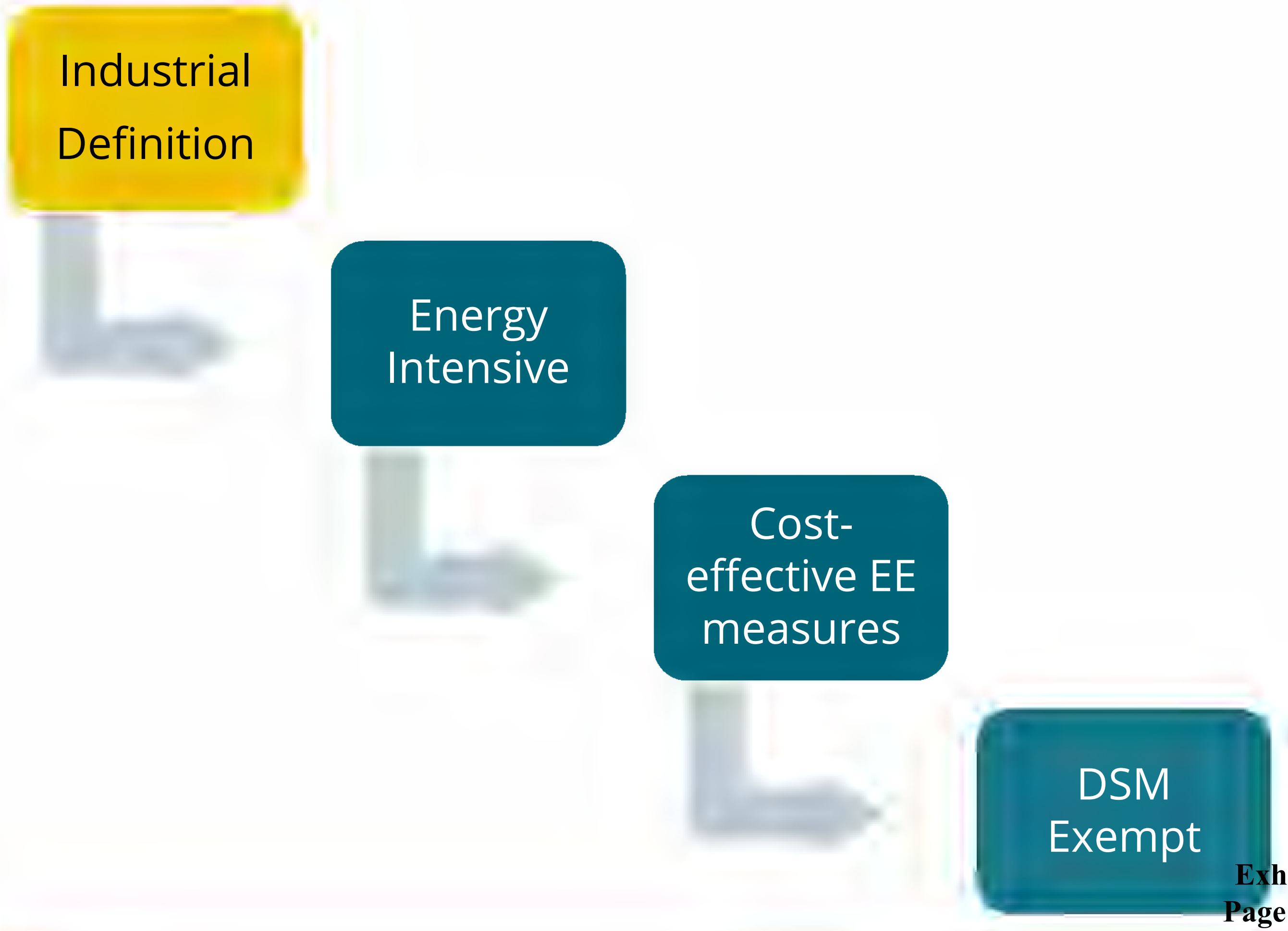
Industrial Definition

Energy Intensive

Cost-effective EE measures

DSM Exempt

Steps to DSM exemption: KRS 278.285



Industrial Definition

Energy Intensive

Cost-effective EE measures

DSM Exempt

Exhibit GSL-1
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Industrial definition for LG&E-KU Electric

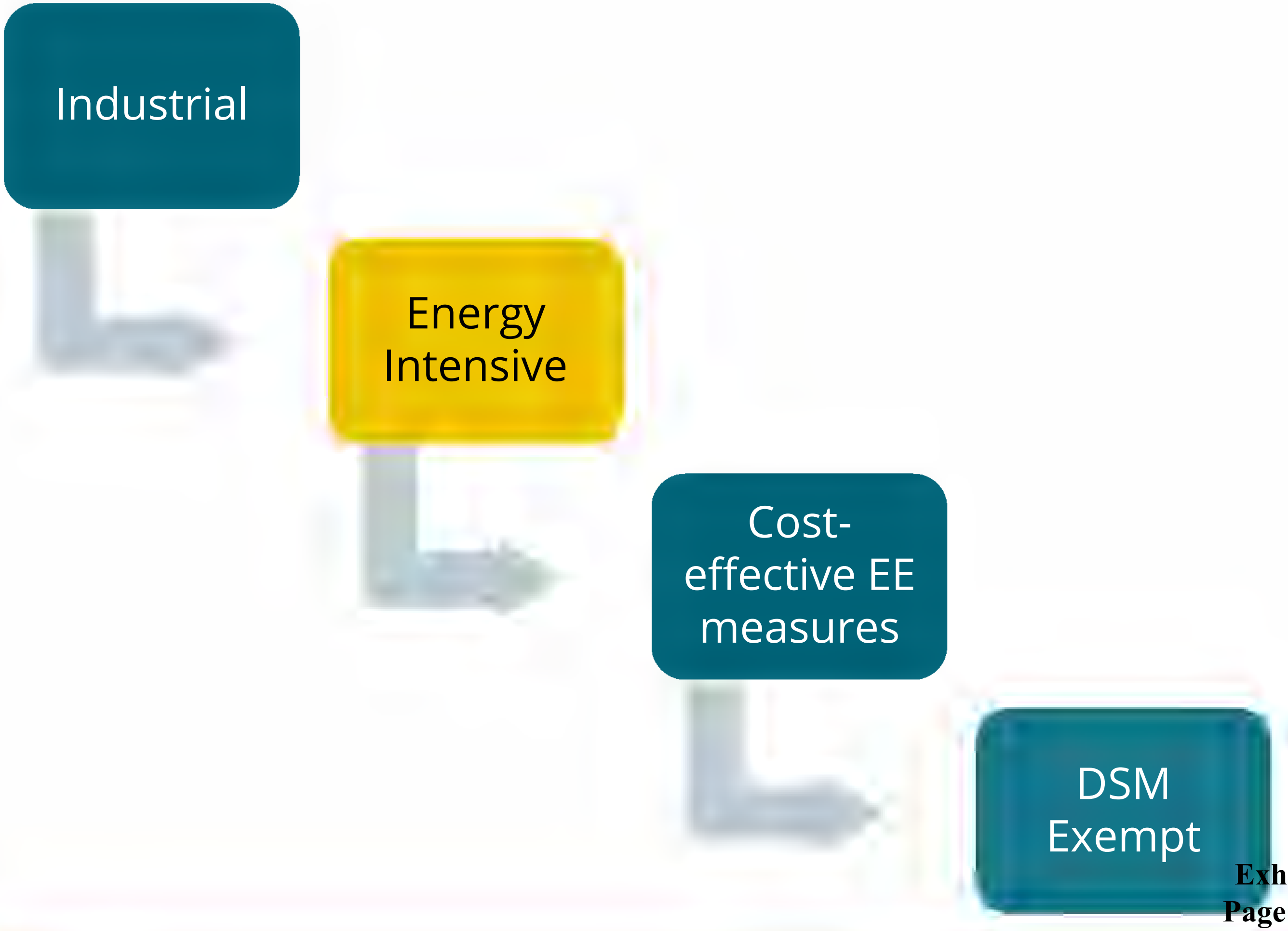
Current

- “[N]on-residential customers will be considered ‘industrial’ if they are primarily engaged in a process or processes that create or change raw or unfinished materials into another form or product, and/or in accordance with the North American Industry Classification System, Sections 21, 22, 31, 32, and 33.”

Proposed

- “[N]on-residential customers will be considered ‘industrial’ if they are engaged in activities primarily using electricity in a process or processes which either involve the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product.“

Steps to DSM exemption: KRS 278.285



Industrial

Energy Intensive

Cost-effective EE measures

DSM Exempt

Use rate level (tariff) to determine energy intensity

Advantages for customers and the company

- Simplifies process of determining “energy intensive”
  - — Rate determines intensity level
  - — Aligns with tariffs designed for large energy needs
  - — Eliminates subjectivity related to setting a MW limit
  - — Allows the customer to readily determine if they qualify for the “energy intensive” portion of the exemption under the statue – Tariff is stated on the customer’s bill
  - — Simplifies DSM Program management – improves program delivery for customers.

Tariffs for non-residential consumption

- Specific tariffs
  - GS: 12 month average monthly demand <50 kW (secondary)
  - PS: 12 month average monthly demand 50 – 250 kW (secondary) 0 – 250 kW (primary)
  - TOD Secondary: 12 month average monthly demand 250 kW – 5,000 kW
  - TOD Primary: 12 month average monthly minimum demand > 250 kVA
  - RTS: Transmission service, 12 month average monthly minimum demand > 250 kVA
  - FLS: fluctuating with monthly demand > 20 MVA

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Current characteristics of industrial customers by tariff

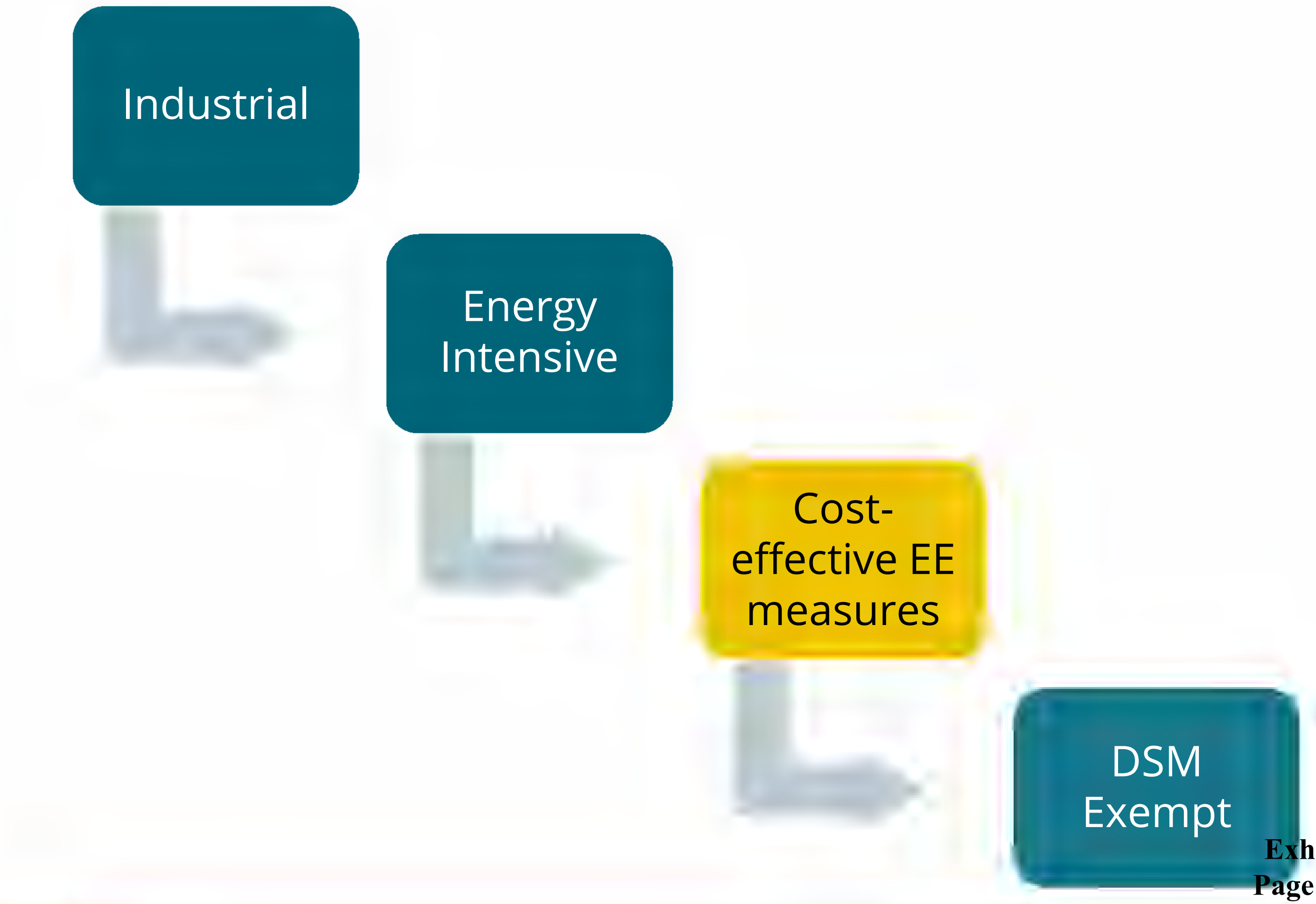
	Average of kW or kVA	Max of kW or kVA	Min of kW or kVA	Average of FC Annual kWh	Number of Contracts
GS	178	888	49	372,094	255
PS Sec	234	1,939	51	882,869	460
PS Pri	336	2,470	58	1,030,353	44
TODS	707	2,645	52	3,587,564	285
TODP	3,831	76,238	250	19,751,749	219
RTS & FLS	15,487	192,168	250	71,071,776	40

Current characteristics of industrial customers by tariff – energy intensive

	Average of kW or kVA	Max of kW or kVA	Min of kW or kVA	Average of FC Annual kWh	Number of Contracts
GS	178	888	49	372,094	255
PS Sec	234	1,939	51	882,869	460
PS Pri	336	2,470	58	1,030,353	44
TODS	707	2,645	52	3,587,564	285
TODP	3,831	76,238	250	19,751,749	219
RTS & FLS	15,487	192,168	250	71,071,776	40

Energy Intensive

Steps to DSM exemption: KRS 278.285



Industrial

Energy Intensive

Cost-effective EE measures

DSM Exempt

Implementing Cost Effective Energy Efficiency Measures

- Any industrial customer that wants to opt-out of DSM and meets both the industrial and energy intensive definitions would provide a letter to LG&E or KU on their company letter head or fill out a form online that would include the following:
  - Account number with meter or copy of the bill stating that the energy used through this meter is for the purposes of converting raw or unfinished materials into another form or product or extracting raw materials from the earth.
  - Positively state that they invested in energy efficiency measures with details about what was completed.

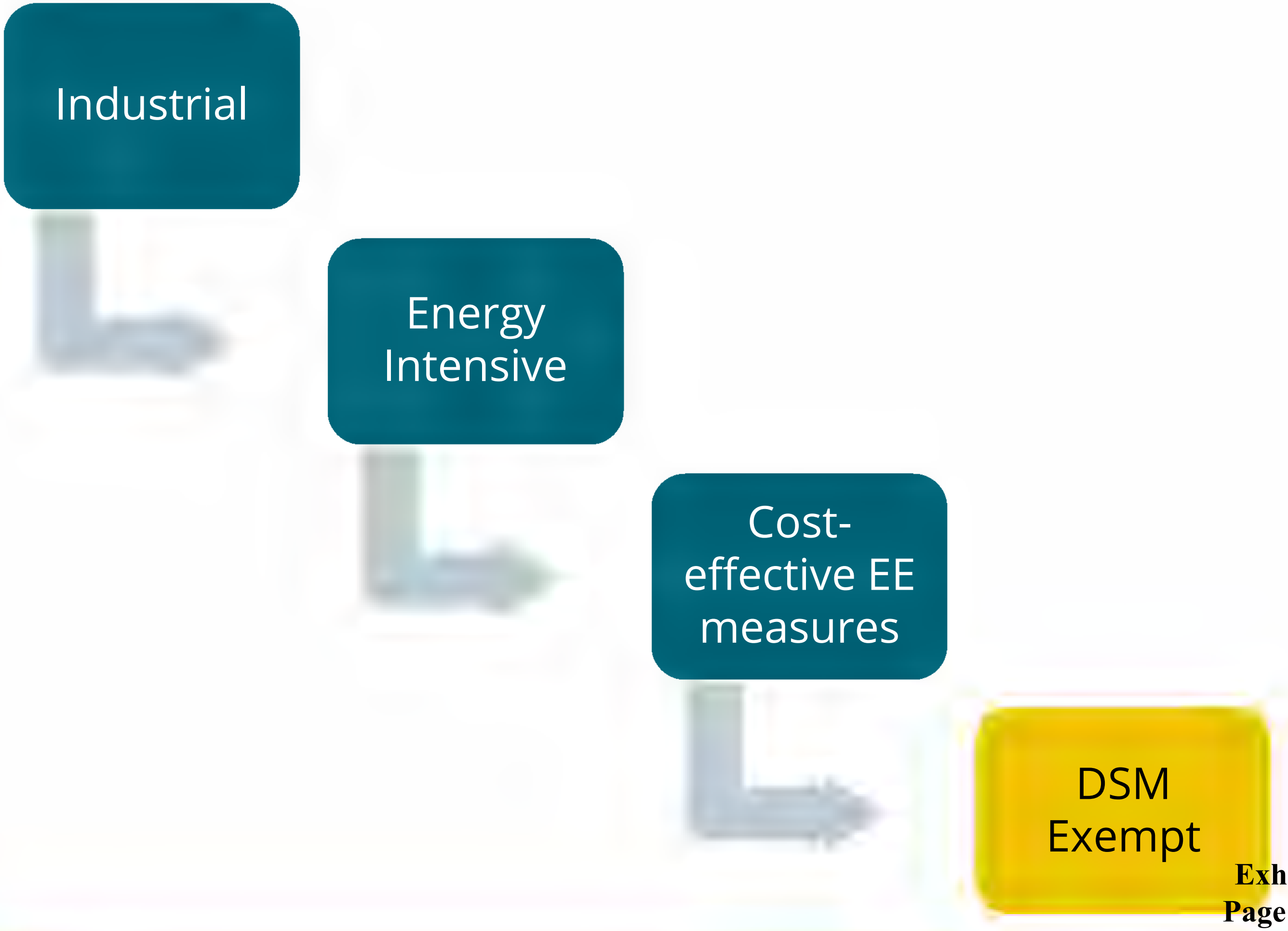
Implementing Cost Effective Energy Efficiency Measures

- Request that their meter or account be excluded from DSM charges

- With Company receipt of letter or form and validation of appropriate rate for “energy intensive”, an industrial customer would be excluded from DSM charges until the same industrial customer elects to participate at some point in the future.

- Any industrial customer who opts out of the DSM program and subsequently elects to participate in utility DSM programs, and thus pay DSM charges, will not be allowed to exercise an opt-out for a period of three years from the time they commence participation.

Steps to DSM exemption: KRS 278.285



Industrial

Energy Intensive

Cost-effective EE measures

DSM Exempt

Exhibit GSL-1
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In Summary

Advantages for customers and company

- Industrial definition clarifies the identification of an industrial customer.
- Tariff simplifies process of determining “energy intensive”
  - Rate determines intensity level
  - Aligns with tariffs designed for large energy needs
  - Eliminates subjectivity
- Determination of “implementing energy efficiency measures”
  - Letter or form stating customer meets the criteria and has installed cost-effective measures
- Residential and non-residential classification simplifies implementing DSM Programing

Next steps

- Next meeting – early 2017
- Review planning and timeline for next EE filing – target February 2018

Appendix

Exhibit GSL-1
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Current DSM Exemption Language

Same language for LG&E and KU

P.S.C. No. 17, Original Sheet No. 86, Section “AVAILABILITY OF SERVICE”

- Industrial customers who elect not to participate in a demand-side management program hereunder shall not be assessed a charge pursuant to this mechanism. For purposes of rate application hereunder, non-residential customers will be considered “industrial” if they are primarily engaged in a process or processes that create or change raw or unfinished materials into another form or product, and/or in accordance with the North American Industry Classification System, Sections 21, 22, 31, 32, and 33. All other nonresidential customers will be defined as “commercial.”

MEETING RECORD

Energy Efficiency Advisory Group Meeting

Date:	**October 13, 2016**
Location:	**Fairfield Inn & Suites** 1220 Kentucky Mills Drive Louisville, KY 40299
Participants:	**LG&E /KU:** Eight employees from various departments including Energy Efficiency and Regulatory Affairs **Stakeholders:** Representatives from eleven stakeholder groups
Date Issued:	10/19/16
Issued by:	Kelli Higdon

The following meeting minutes have been prepared to summarize the conversations and issues discussed at the above referenced meeting.

Welcome / Introductions

Greg Lawson, the Manager of LG&E/KU's Energy Efficiency Planning & Development Department, welcomed the meeting participants. He reiterated the purpose for the meeting to the group. All meeting participants then introduced themselves and indicated their company, agency, or organization of affiliation.

Meeting Agenda

Greg Lawson thanked meeting participants for attending and provided an overview of the meeting agenda:

- Welcome / Intros
- Review of Kentucky state law regarding opt-out
- Definition of Industrial
- Definition of Energy Intensive
- DSM Opt-out criteria proposal to meet KRS 278.285
- Next Steps

Industrial Exemption / DSM Opt-Out

Greg Lawson began by reviewing the current Kentucky State Law: KRS 278.285 which states the conditions in which DSM opt-out is allowed. Greg then went through both the current and the proposed definition of an "Industrial" customer. The proposed Industrial definition would remove the NAICS codes.

Next, the proposal of using the rate level (tariff) to determine the definition of "Energy intensive" was presented along with the benefits and simplification that it would bring to the process. Current characteristics of industrial customers were shown by tariff so that a line could be drawn from the groupings that were presented. This grouping clearly identified those customers who could be identified as “Energy Intensive” (those classified under the tariffs: TODP, RTS & FLS) from the others.

Then, the steps to achieve DSM exemption were presented. A customer must:

1. meet the definition of Industrial,
2. be energy intensive, and
3. finally, have implemented cost effective energy efficiency (“EE”) measures.

If a customer meets the criteria above, then the customer can send a letter to LG&E/KU stating that this customer, at this meter, meets all the criteria above. There was a discussion of how the implemented EE measures would be verified and that it is not the utility’s intention to audit the EE measures reported for each opt-out.

Next Steps

- Some of the topics suggested by the participants for the next meeting are listed below:
    - Share the results of the New Cadmus Potential Study for Residential and Commercial Programs
    - Share the potential programs that would be offered for all programs

- Greg Lawson thanked the participants for their discussions at these meetings. A follow-up meeting was suggested for early 2017. In the interim, it was mentioned that the DSM Advisory Group could reach out with any questions, comments, or issues regarding programming.

- Greg Lawson thanked the participants for their attendance and closed the meeting.

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet
Tuesday, September 26, 2017
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Kevin Craft	LG+E/KU Energy	[redacted]	[redacted]
Kelli Higdon	" "	[redacted]	[redacted]
Jeff Myers	" "	[redacted]	[redacted]
John Hayden	" "	[redacted]	[redacted]
Lauren Colberg	" "	[redacted]	[redacted]
Sarah Lynn Cunningham	Louisville CAN	[redacted]	[redacted]
Walter (Flip) Bell	Louisville CAN	[redacted]	[redacted]
Debbie Ferst	LG+E/KU	[redacted]	[redacted]
Wallace McMullen	Sierra Club	[redacted]	[redacted]

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Tuesday, September 26, 2017
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Lisa P. Kees	LGE KU	[redacted]	[redacted]
Lora Knight	HBAK	[redacted]	[redacted]
Lee Colten	KEDI	[redacted]	[redacted]
Joshua Bills	MACED	[redacted]	[redacted]
Maria Koetter	Lou Metro Gov	[redacted]	[redacted]
Lisa Kilkelly	ACM / Legal Aid	[redacted]	[redacted]
Rick Lovekamp	LG&E/KU	[redacted]	[redacted]
Ron Willhite	KSBA	[redacted]	[redacted]
Sam Judd	LGE/KU	[redacted]	[redacted]

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Tuesday, September 26, 2017
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
2:30pm – 4:30pm

Name	Organization	Phone	E-Mail
Tim Melton	LG&E & KU	[redacted]	[redacted]
Carrie Harris	Walmart/Sam's Club	[redacted]	[redacted]
Beth McFarland	LGE/KU	[redacted]	[redacted]
David Huff	LGE/KU	[redacted]	[redacted]
Carrie Ray	MACED	[redacted]	[redacted]
Brent Fryrear	Partnership for a Green City	[redacted]	[redacted]
Cathy Hinko	MHC	[redacted]	[redacted]

DSM Advisory Group Meeting

September 26, 2017

Agenda

- Welcome/Introductions
- Updates since last meeting/review of DSM program history
  - Energy savings
  - Demand savings
  - Annual spend
- Challenges for future programs
  - Rapid adoption of energy efficient technologies
    - Low to flat load growth
  - Low avoided costs for energy and capacity
  - Program cost-effectiveness
- Next steps
  - October meeting to review 2019-2023 EE/DSM Filing

Since last Advisory Meeting on October 13, 2016…

LG&E/KU has:

1. Reviewed existing program offerings, measures, model assumptions, and cost-effectiveness

2. Enlisted Cadmus to provide external expertise on portfolio offerings

3. Worked with Cadmus to complete an updated Residential & Commercial EE Potential Study

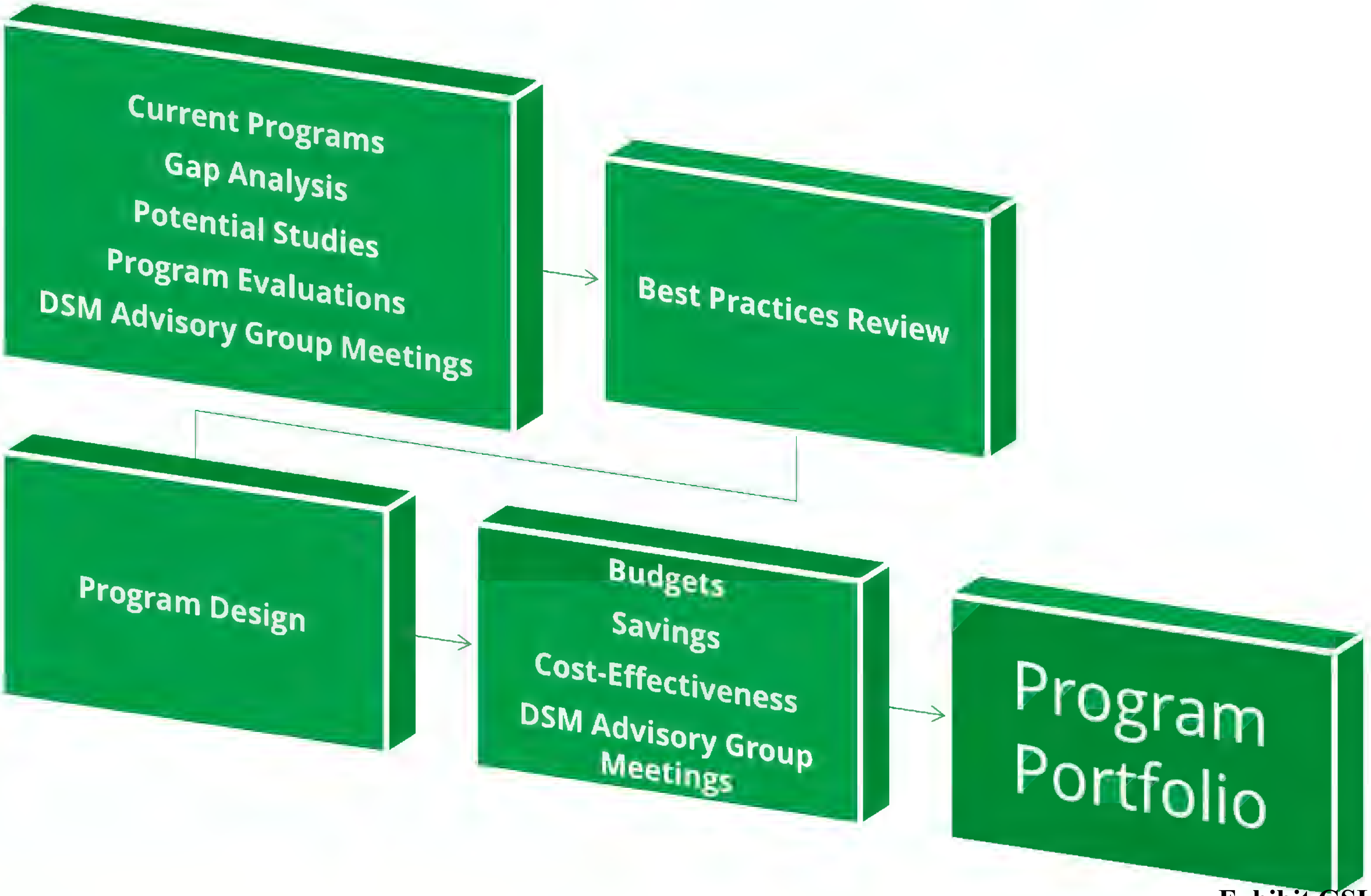
4. Incorporated findings from both completed EE Potential Studies (Industrial in 2016 & latest Residential / Commercial in 2017) into program planning for 2019+

Recent potential studies' results

Medium Scenario - 20-year Cumulative Achievable Potential	Residential	Commercial	Industrial
Study Period	*2019-2038*	*2019-2038*	*2016-2035*
Energy (% of baseline)			
LGE	5.5%	5.4%	7.3%
KU	5.5%	6.7%	6.5%
Total	5.5%	6.1%	6.7%
Demand (MWs)			
LGE	26	47	24
KU	48	65	51
Total	74	112	74

Exhibit GSL-1

The DSM Planning Process…



Current Programs
Gap Analysis
Potential Studies
Program Evaluations
DSM Advisory Group Meetings

Best Practices Review

Program Design

Budgets
Savings
Cost-Effectiveness
DSM Advisory Group Meetings

Program Portfolio

Upcoming DSM related filings

- 2018 Budget Filing
- KSBA Filing
- Current programs expire December 2018
- 2018 Balancing Adjustment

Current Energy Efficiency Portfolio

- Home Energy Rebates
- Home Energy Analysis
- Fridge & Freezer Recycling
- WeCare
- Smart Energy Profile
- Residential Demand Conservation
- Large Non-Residential Demand Conservation
- Non-Residential Rebates
- KSBA
- AMS Opt-in
- Customer Education and Public Information (CEPI)
- Program Development & Administration (PD&A)

Demand Reduction (MW)

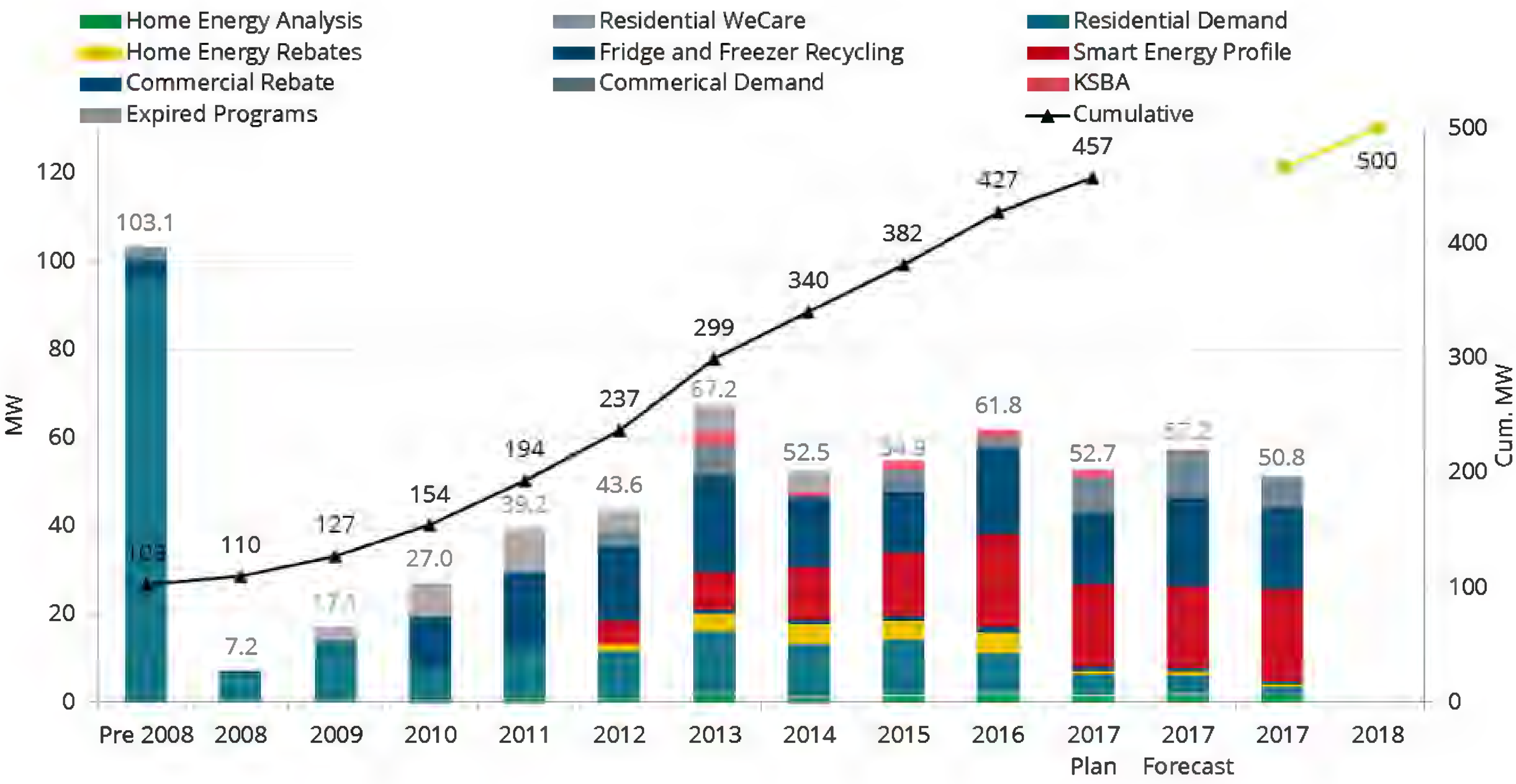


Exhibit GSL-1
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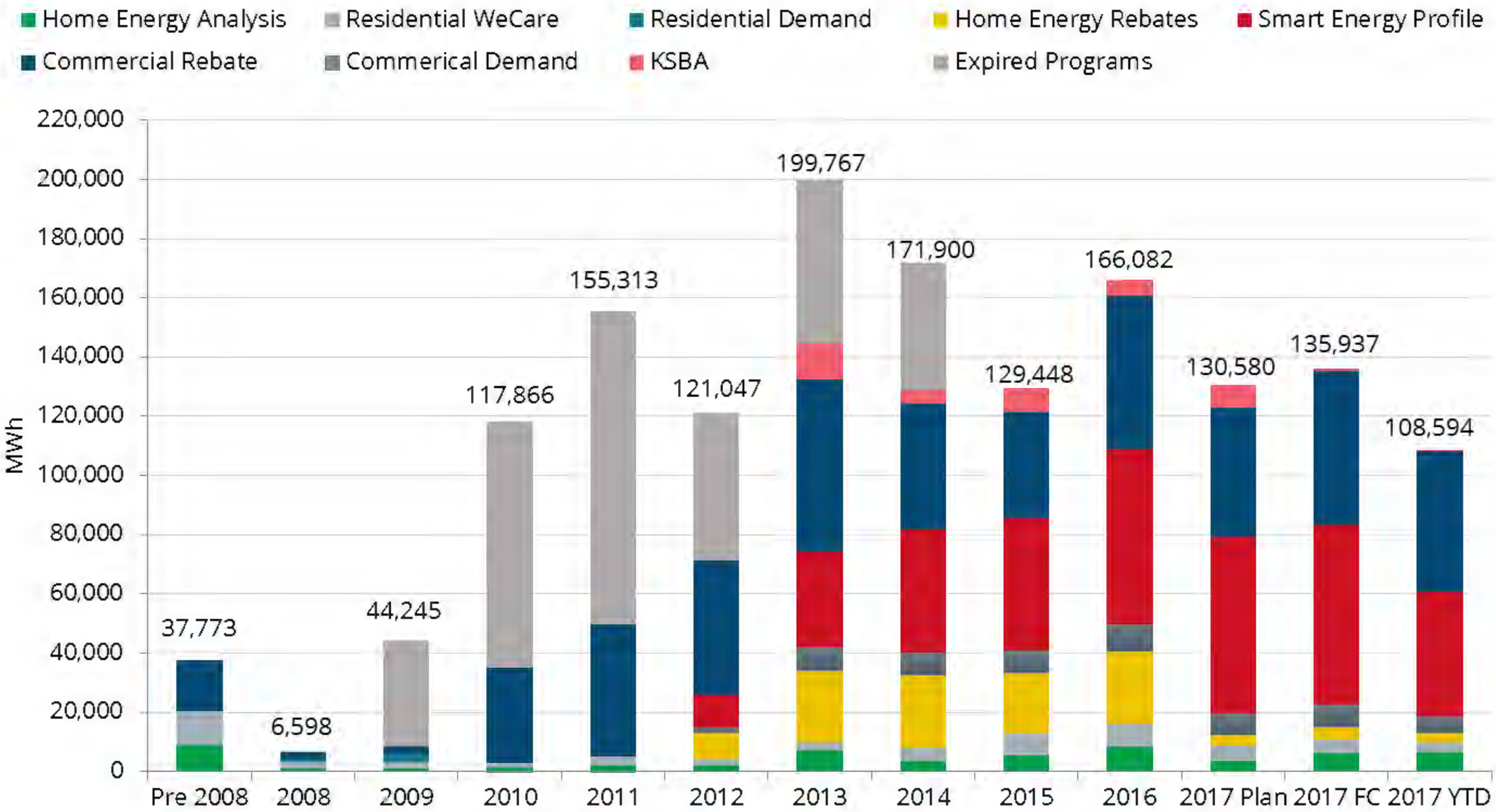
LG&E KU
PPL companies

Energy Savings (MWh)



Note: Energy Savings are the result of the company meeting Demand reductions through Energy Efficient programs.

Note: Energy Savings are based on the engineered deemed savings associated with each measure and equipment provided through the company's programs.

Note: Expired Programs include: Residential Lighting, Residential HVAC, New Homes, and Commercial HVAC.

Exhibit GSL-1
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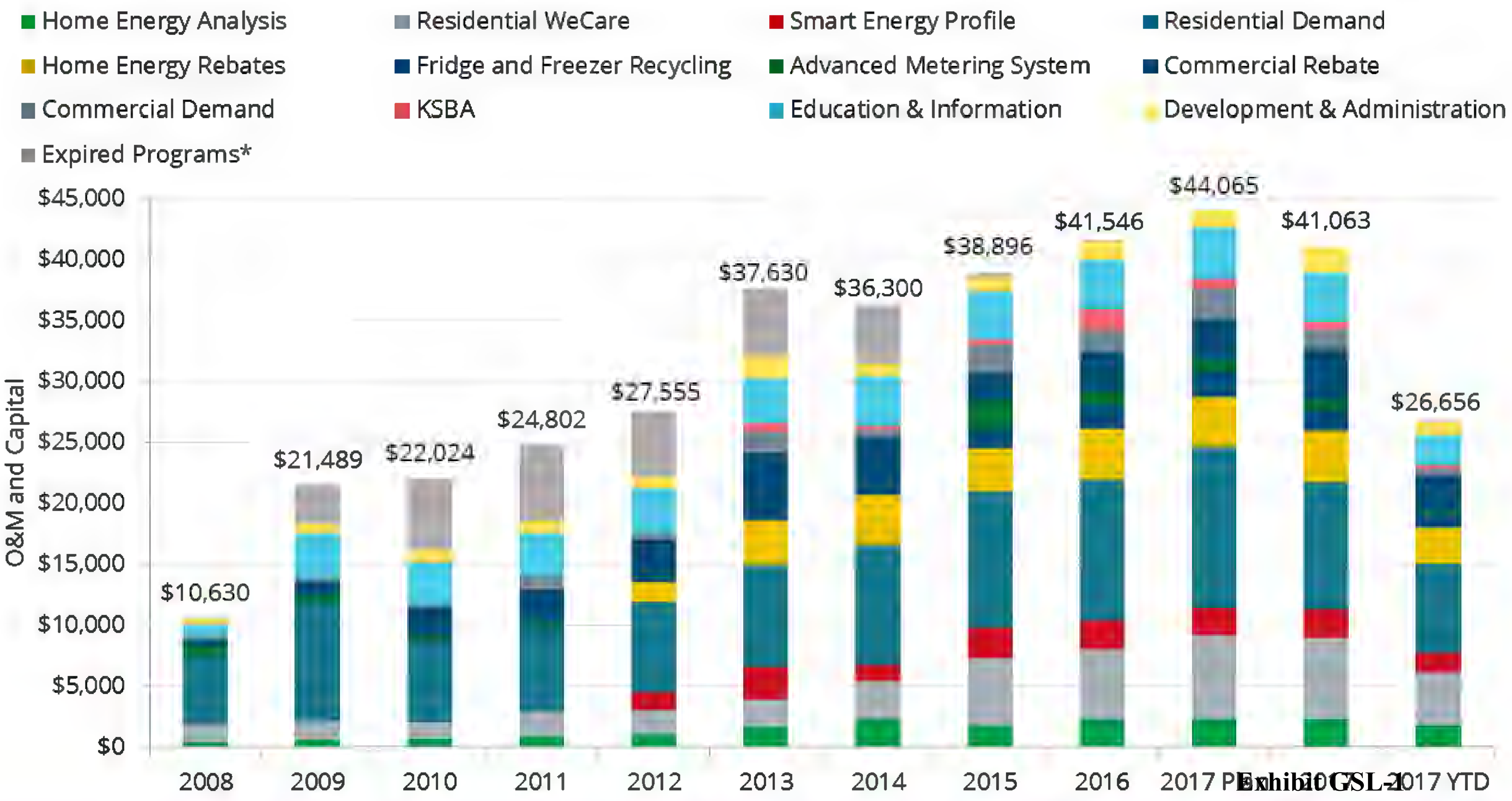
Financials ($000)



California Standards Tests: Costs & Benefits

Costs & Benefits	TRC	RIM	PCT	PAC
Avoided Energy (Fuel, O&M of generation, T&D systems)	Benefit	Benefit		Benefit
Avoided Capacity (Constructing power plants, T&D lines, pipelines)	Benefit	Benefit		Benefit
Other benefits (Fossil fuel savings, water savings, equipment O&M)	Benefit			
Externalities (Environmental benefits like emissions reductions)				
Participants' incremental cost (above baseline) of efficient equipment	Cost		Cost	
Program administration costs (Staff, marketing, EM&V, etc.)	Cost	Cost		Cost
Incentives (Rebates paid to customers)		Cost	Benefit	Cost
Lost utility revenue or Lower bills (Due to lower/less sales)		Cost	Benefit	

EE portfolio cost-effectiveness since 2015 is favorable to 2014 filing values

	1/2015 - 4/2017 Cost Effectiveness Ratios				2014 Filing Cost Effectiveness Ratios			
Program	**TRC**	**RIM**	**PCT**	**PAC**	**TRC**	**RIM**	**PCT**	**PAC**
Smart Energy Profile	4.23	1.38	NA	4.23	3.07	0.74	NA	3.07
ARP - Fridge-Freeze Recycle	3.68	0.60	NA	2.48	2.26	0.56	NA	1.86
WeCare	2.69	0.59	NA	2.69	2.57	0.60	NA	2.57
Home Energy Analysis	1.76	0.75	3.30	3.23	1.93	0.68	6.50	2.52
Home Energy Rebates	2.06	0.81	2.72	3.68	2.37	0.81	3.20	4.53
Residential Demand Conservation	2.14	1.41	NA	1.41	2.95	1.02	NA	1.47
Commercial Rebates	7.33	1.50	5.38	25.43	7.26	1.18	7.56	16.42
Commercial Demand Conservation	4.32	3.51	NA	3.51	2.27	0.86	NA	1.64
Overall Portfolio w/ PD&A, CEPI	3.32	1.09	5.93	4.01	3.07	0.86	8.66	3.13

Note: All values are California test ratios based on avoided costs of $100/kW-year and $0.043/kWh.

US electricity consumption has flattened over the last decade despite economic growth

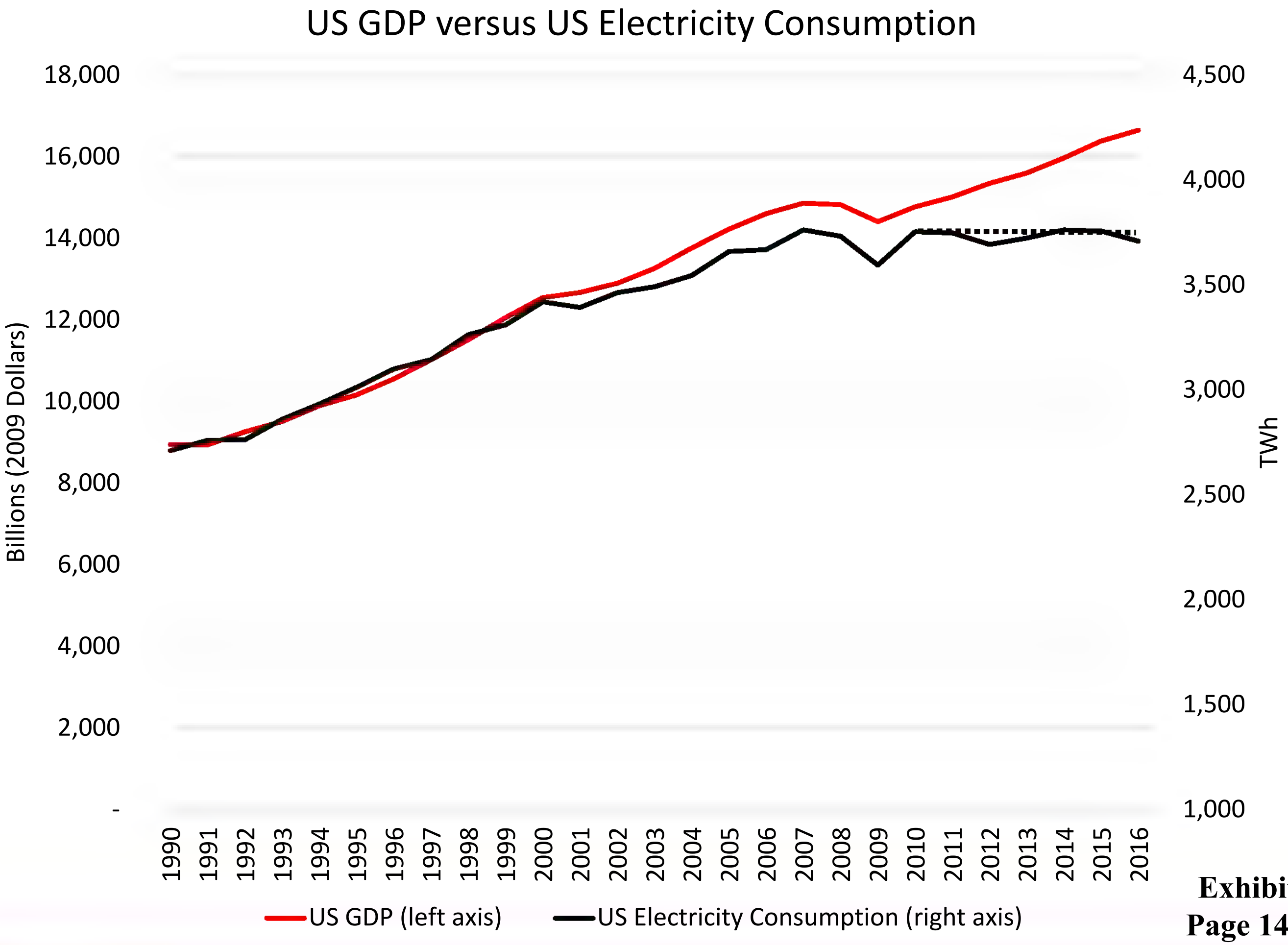


Exhibit GSL-1
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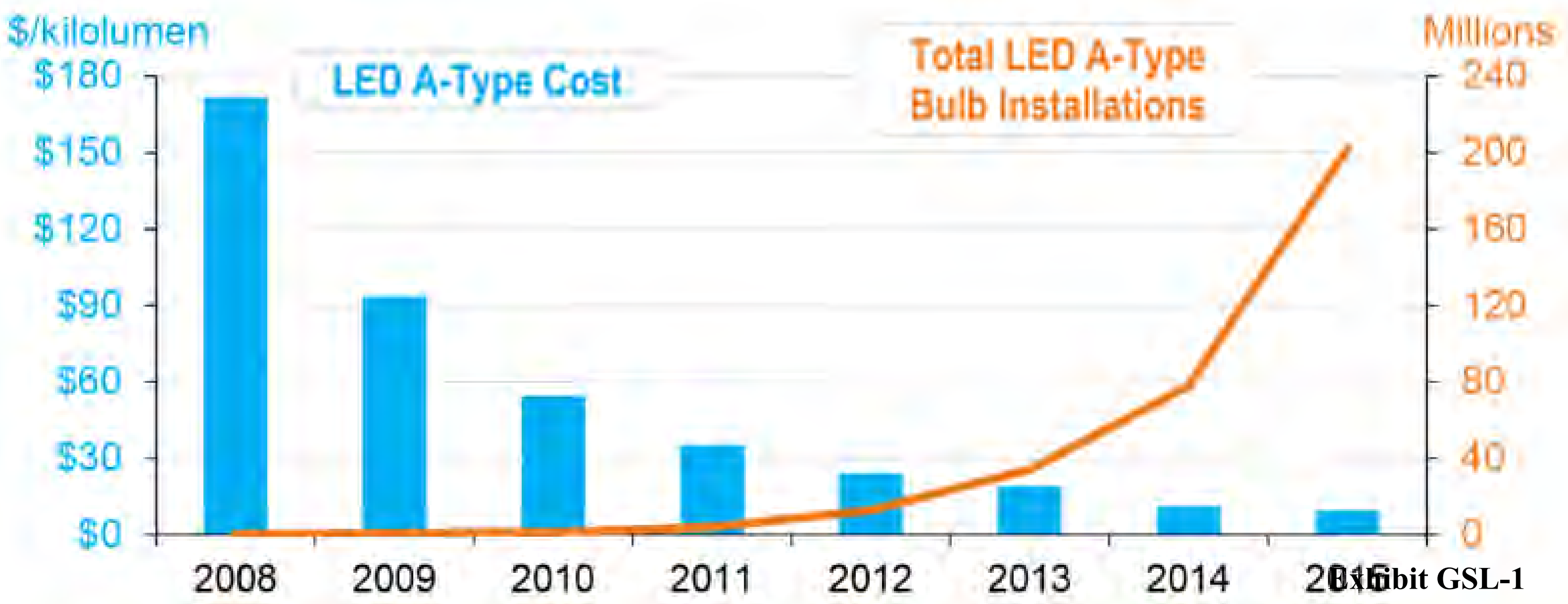
Flat sales trend impacted by end-use efficiency gains

- LED Lighting
  - Costs have fallen 97+% since 2008; efficiency expected to double by 2025.
  - Department of Energy forecasts 48% market share by 2020; 84% in 2030, up from 2% in 2013. This would reduce lighting consumption by 15% in 2020 and 40% in 2030.

LED Lighting: Global Cost and Installation Trends



Source: U.S. Department of Energy

Greater anticipated end-use efficiencies drive reductions in PIRA electricity sales forecast

- LED Lighting
  - Costs have fallen 90% since 2008; efficiency expected to double by 2025.
  - DOE forecasts 48% market share by 2020 and 84% in 2030, up from 2% in 2013. This would reduce lighting consumption by 15% in 2020 and 40% in 2030.
- Space Cooling
  - New standard for commercial rooftop air conditioners in 2018 expected to cut consumption by 30%.

In Summary

- Companies' programs have achieved excellent results over time
- Studies show declining energy efficiency potential and savings
- Avoided costs of energy and capacity are significantly lower since prior filing in 2014
- Low load growth and rapid adoption of efficient technology seen throughout the U.S.

Next steps

- Next meeting – October 26, 2017
- Review planning and timeline for next EE filing

Appendix

Exhibit GSL-1

California Standards Tests Definitions

- **The Total Resource Cost Test (TRC):** The Total Resource Cost Test measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. This test represents the combination of the effects of a program on both the customers participating and those not participating in a program. In a sense, it is the summation of the benefit and cost terms in the Participant and the Ratepayer Impact Measure tests, where the revenue (bill) change and the incentive terms intuitively cancel (except for the differences in net and gross savings).
- **The Ratepayer Impact Measurement Test (RIM):** The Ratepayer Impact Measure test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

California Standards Tests Definitions

- **The Participant Test (PCT):** The Participant Test is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.
- **The Program Administrator Cost Test (PAC):** The Program Administrator Cost Test measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are defined more narrowly.

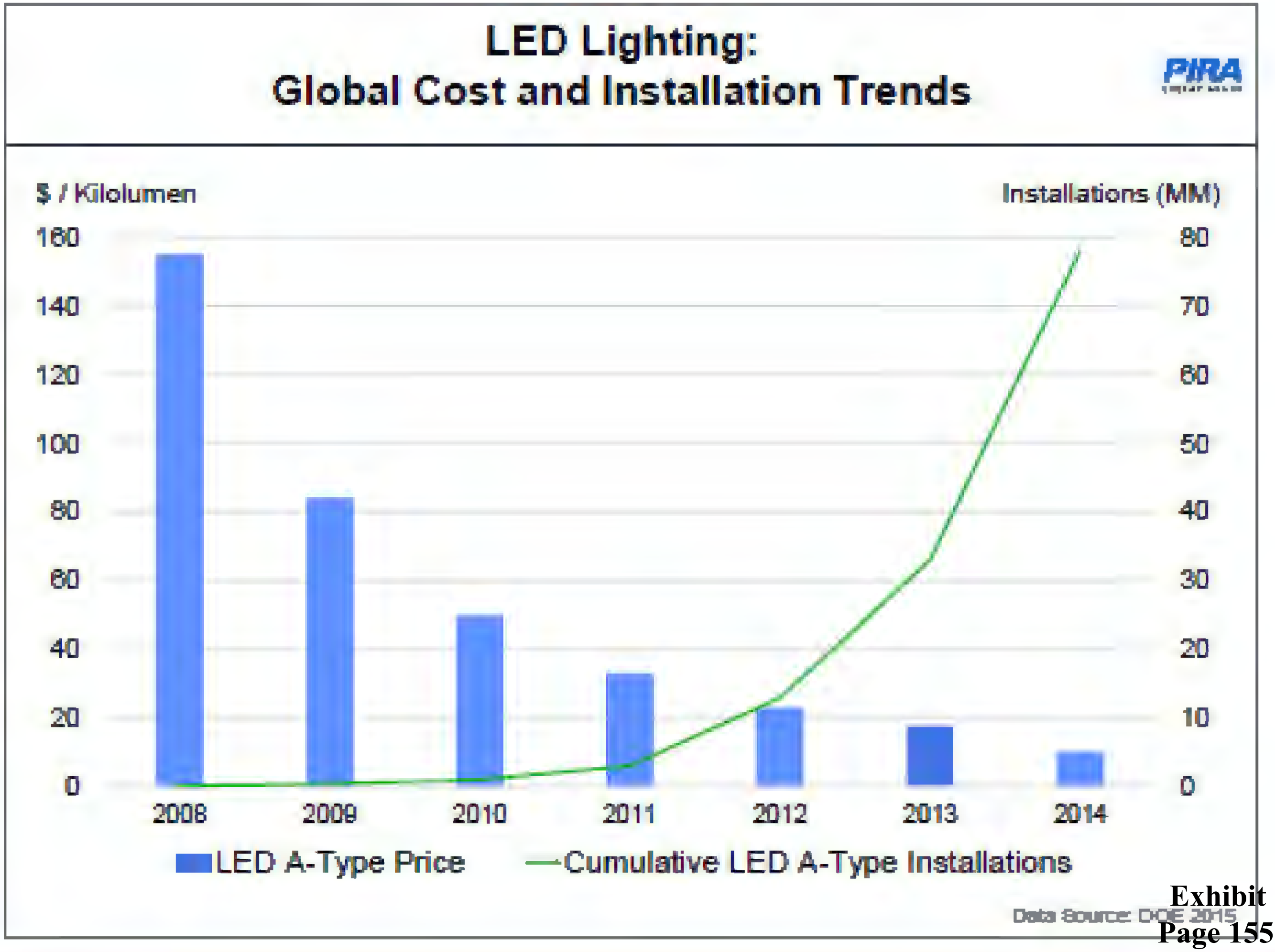
Structural headwinds may lead to declining US electricity growth

- Morgan Stanley forecasts US electricity consumption to decrease by ~0.3% annually over the next decade
  - Forecast risk skewed to the downside given the potential for efficiency breakthroughs and / or incremental government regulations
  - GDP, population, computing, and electric vehicles provide the most upside
- 0.3% CAGR 2015-2040 residential sales (EIA)
  - Reduced from 0.5% in previous AEO
- 0.54% CAGR in electricity sales through 2035 (PIRA)
  - Reduced from 0.83% in previous forecast

Recent saturation survey shows significant increase in LED adoption

In past 12 months…	2007	2010	2013	2014	2016	2017
Install CFL?	34%	72%	60%	56%	40%	34%
Average # installed	7	11	9	9	8	8
Install LED?	n/a	n/a	35%	37%	51%	61%
Average # installed			7	7	9	10

LED lighting saturation ramps up



LED Lighting:
Global Cost and Installation Trends

Data Source: DOE 2015

MEETING RECORD

Energy Efficiency Advisory Group Meeting

Date:	**September 26, 2017**
Location:	**Fairfield Inn & Suites** 1220 Kentucky Mills Drive Louisville, KY 40299
Participants:	**LG&E /KU:** Twelve employees from various departments including Energy Efficiency, Legal, Regulatory Affairs, and Customer Services **Stakeholders:** Thirteen representatives from eleven stakeholder groups
Date Issued:	9/27/2017
Issued by:	Kevin Craft

The following meeting minutes have been prepared to summarize the conversations and issues discussed at the above referenced meeting.

Welcome / Introductions

David Huff, LG&E/KU's Director of Energy Efficiency and Emerging Technologies, welcomed the meeting participants. He encouraged open dialogue and questions to be asked at any time throughout the meeting. All meeting participants then introduced themselves and indicated their company, agency, or organization of affiliation.

Meeting Agenda

Greg Lawson, LG&E/KU's Manager of Energy Efficiency Planning & Development, thanked meeting participants for attending and provided an overview of the meeting agenda:

- Welcome / Intros
- Updates since last meeting/review of DSM program history
- Challenges for future programs
- Next steps

DSM History and Potential Study Results

Greg Lawson began by noting the progress and work being done since the group's last meeting in October of 2016. These efforts included: (1) reviewing existing program offerings, measures, model assumptions, and cost-effectiveness, (2) collaborating with Cadmus to perform a Residential and Commercial EE market potential study, and (3) incorporating the findings from EE potential studies and program review into program planning for 2019 and beyond.

When discussing the achievable potential results from the Companies' most recent Residential and Commercial potential study, a participant asked if LG&E/KU ("Companies") feels the estimates for potential are too low.

A participant asked about the assumption within the potential study and where geographically the impacts are to be realized. The participant expressed concerns that people who cannot afford to adopt energy efficient technologies could be underserved and commented on equity of DSM benefits.

Participants requested to gain access to the Residential and Commercial potential study before the next meeting to better inform the discussion.

David Huff then described the differences between technical, economic, achievable, and program potential.

Greg Lawson explained the DSM planning process and the upcoming DSM-related filings to the Kentucky Public Service Commission. He then described the current portfolio of EE programs offered by the Companies and their track record of success with respect to energy and demand savings.

Cost-effectiveness Testing

Greg Lawson discussed the specific cost and benefit components of four California Standard Practice Manual cost-effectiveness tests and the differences between each test, specifically what components are considered costs and benefits for each test. Participants asked if externalities are included in any of the four tests mentioned, which they are not. Participants also asked about the origination of the California tests and whether or not they are tailored for LG&E and KU. Participants asked about the differences in values/ratios across the California tests and expressed a desire to become more educated on the issue.

David Huff commented on historical preferences associated with using the various California tests in evaluating DSM programming, and noted Kentucky has emphasized the Total Resource Cost (TRC) test. He also noted that the current Commission could focus on any of the California tests.

Participants asked if the recovery of lost revenue/bad debt is included as a benefit, specifically as it relates to the WeCare program.

The Environment of Avoided Costs

Greg Lawson then went through a series of slides providing a backdrop of the impacts that negligible load growth and the saturation of energy efficient technologies has and will continue to have on DSM program planning.

Participants asked if the Companies' avoided costs includes the cost to safely store and handle coal ash at its generating stations. The Companies' representatives indicated they believed it did but mentioned they would check with supply-side planning group and report back.

Participants asked if naturally-occurring energy efficiency adoption is included in the potential study's savings projections. The Companies' representatives responded that these projections are above and beyond natural-occurring EE that can be economically achieved through programs administered by the Companies. They noted that baseline efficiency standards have increased to the point where technical potential is already smaller than historically seen.

Participants asked if the Companies Integrated Resource Plan (IRP) also show flat load forecasts. The Companies' representatives noted that an IRP has not been filed since 2014 and that recent rate case rebuttal testimony stated that the Companies do not need new capacity for at least 30 years.

David Huff commented on how one main goal of energy efficiency is to offset the need for additional generating capacity, then noted the lack of need for additional generation in the long-term, based on current projections. He then remarked that the Companies' avoided capacity costs have fallen at least 80-90% since the last DSM filing, and that avoided energy costs have also fallen about 30% over the same period.

David Huff noted that the next Advisory Group meeting will continue on this path and provide a platform for discussing what the Companies feel they can offer cost-effectively.

Participants commented on the possibility of future/unforeseen impacts of things like grid electrification.

Participants stated their appreciation for the Companies bringing the group together and going through the information outside/prior to of the official proceedings.

Next Steps

- The Companies will check on sharing the most recent Cadmus Residential and Commercial Potential Study.

- The Companies will provide a response to what is included in the avoided cost of capacity and avoided cost of energy in the October DSM Advisory Group Meeting.

- Greg Lawson thanked the participants for their time and input. A follow-up meeting was suggested for October 26, 2017 and an invitation with time and location would be sent soon to all participants. In the interim, it was mentioned that the DSM Advisory Group could reach out to the Companies with any questions, comments, or issues regarding what was discussed.

- David Huff and Greg Lawson thanked the participants for their attendance and closed the meeting.

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet
Thursday, October 26, 2017
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
1:00pm – 4:00pm

Name	Organization	Phone	E-Mail
Malcolm Ratchford	Community Action Council	[redacted]	[redacted]
Tim Melton	LG+E / KU	[redacted]	[redacted]
Lisa Kilkelly	ACM	[redacted]	[redacted]
Walter Bell	Louisville Climate Action Network	[redacted]	[redacted]
Barry Zalph	Louisville Climate Action Network	[redacted]	[redacted]
Jon Nipple	Kentucky School Boards Assn.	[redacted]	[redacted]
Justin McNeil	KY Attorney General	[redacted]	[redacted]
Lee Colten	DEDI	[redacted]	[redacted]
Julia Friedman	MEEA	[redacted]	[redacted]
Carrie Ray	MACED	[redacted]	[redacted]
Sarah Lynn Cunningham	LCAN	[redacted]	[redacted]

LG&E KU
PPL companies

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet

Thursday, October 26, 2017
Fairfield Inn & Suites
1220 Kentucky Mills Drive, Louisville, KY 40299
1:00pm – 4:00pm

Name	Organization	Phone	E-Mail
John Hayden	Lge/KU	[redacted]	[redacted]
Kevin Craft	LGE/KU	[redacted]	[redacted]
Kelli Higdon	LGE/KU	[redacted]	[redacted]
Samantha Stucker	LGE/KU	[redacted]	[redacted]
Jeff Myers	LGE/KU	[redacted]	[redacted]
Duncan Crosby	SKO for LGE/KU	[redacted]	[redacted]
Don Harris	LGE/KU	[redacted]	[redacted]
Josef Bills	MACED	[redacted]	[redacted]
Wallace McMullen	Sierra Club	[redacted]	[redacted]
X Andrea Webber	Lou [illegible]	[redacted]	[redacted]

Energy Efficiency DSM Advisory Group Meeting – Sign in Sheet
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1:00pm – 4:00pm

	Name	Organization	Phone	E-Mail
x	Carrie Harris	Walmart	[redacted]	[redacted]
	Lauren Colberg	LGE + KU	[redacted]	[redacted]
x	Greg Lawson	LGE-KU	[redacted]	[redacted]
x	David Huff	LGE-KU	[redacted]	[redacted]
			[redacted]	[redacted]

DSM Advisory Group Meeting

October 26, 2017

Agenda

- Summary of September 26 meeting
- Tenets of DSM-EE filing
- Proposed plan programs
- Cost effectiveness
- Bill impacts
- Timeline

September 26 meeting summary

- Companies' programs achieved excellent results over time
- Studies show declining energy efficiency potential and savings
- Avoided costs of energy and capacity are significantly lower since prior filing in 2014
- Low load growth and rapid adoption of efficient technology seen throughout the U.S.

Tenets of Filing

- No need for capacity in next 30 years means \$0/kW-year avoided cost of capacity
- System lambda/marginal cost of generation has decreased by over 30% from 2014 to < \$0.03/kWh today
- Proposing reasonable demand side management programs consistent with KRS 278.285

Summary of proposed DSM-EE portfolio

Continuing programs in 2019

- WeCare
- Residential Demand Conservation (DLC)
- Large Nonresidential Demand Conservation
- Nonresidential Rebates
- School Energy Managers Program (SEMP)
- AMS Opt-in
- Program Development & Administration (PD&A)

Discontinued programs in 2019

- Home Energy Rebates (HER)
- Fridge & Freezer Recycling (FFR)
- Home Energy Analysis (HEA)
- Smart Energy Profile (SEP)
- Customer Education & Public Information (CEPI)

Industrial summary

- Industrial customers to be included in proposed DSM-EE Plan filing
- Certain industrial customers will be eligible to opt-out of program participation based on specific criteria
  - Meter defined on bill as an industrial customer
  - Billed on an energy intensive tariff
    - Retail Transmission Service (RTS)
    - Fluctuating Load Service (FLS)
    - Time-of-Day Primary (TODP)
  - Implemented cost-effective energy efficiency measures

Nonresidential Rebates

- Inclusion of industrial customers
  - Energy intensive customers expected to opt-out
- Incentives based on $0.03 per kWh saved (one year)
  - Previously $100 per kW saved
  - Aligns with avoided energy costs

WeCare

- Revised incentive structure

Tier	Annual Energy Consumption	Allowable Measure Cost: Current	Allowable Measure Cost: Proposed
A	Up to 11,499 kWh	$350	$1,500 average per single family dwelling $750 average per multifamily unit
B	11,500 to 16,000 kWh	$1,000	
C	Greater than 16,000 kWh	$2,100	

- Goal of 15% energy savings, realized at different costs based on home's specific needs
- Master-metered (commercial rates) multi-family buildings can qualify based on government subsidies
  - (e.g. Section 8, Low Income Housing Tax Credits Program, Affordable Housing Trust Fund, Home Investment Partnerships Program, etc.)
- 80/20% split target for single family/multi-family

Demand Conservation: Residential and Nonresidential

Programs continuing in maintenance mode

- No additional purchases of devices
- Redeploy any removed devices based up request
- Minimal promotion for program participation
- Reduced incentives for residential and nonresidential

Other programs included

- SEMP
  - Energy manager funding for FY 2019 and 2020 as stipulated in KPSC order in 2016 rate case
- AMS Opt-in
  - Continuation of current program

Proposed 2018 budget 30% lower

- Residential Audit: continue audits at $25/customer; no incentive for audits scheduled after Q1
- Demand Conservation
  - Residential incentive reduced from $5/month to $3/month
  - Large commercial incentive reduced from $25/kW to $15/kW
- Home Energy Rebates: no applications accepted after Q1
- Smart Energy Profile: sunset at the end of Q1
- Commercial Rebates: Incentive based on $0.03/kWh
- WeCare, FFR, CEPI, SEMP, AMS Opt-in, PD&A: no change

Portfolio of DSM-EE programs struggles with cost-effectiveness based on California Test ratios

Program*	TRC	PCT	RIM	PAC
Nonresidential Rebates	1.08	2.26	0.48	3.62
PD&A	0.00	0.00	0.00	0.00
Total Energy Efficiency and PD&A	**1.01**	**2.06**	**0.46**	**2.92**
Residential Demand Conservation	0.00	NA	0.00	0.00
Nonresidential Demand Conservation	0.01	1.61	0.01	0.01
WeCare	0.44	NA	0.19	0.44
KSBA/SEMP	0.30	NA	0.18	0.30
AMS Opt-in	0.00	NA	0.00	0.00
Total Portfolio	**0.59**	**3.10**	**0.31**	**0.84**

*California Test ratios (benefit/cost) use avoided costs of $0/kW-year and $0.03/kWh. Results are preliminary.

Billing impacts of reduced DSM

- Residential bills to decrease ~$15-$30 per year in 2018 compared to 2017
- Residential bills to decrease ~$30-$45 per year in 2019 compared to 2017

Timeline for upcoming filings

	2017				2018					2019
Filings	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May-Dec**	**Jan**
2018 Tariff Filing			File		Effect. 1/1					
2017 Balancing Adjustment Tariff Filing						File		Effect. 4/1		
2019 DSM-EE Plan Filing				File						Effect. 1/1
DSM Advisory Group Meetings	Cover history	DSM-EE Plan								

Appendix

Exhibit GSL-1

Opt-out Current Kentucky State Law: KRS 278.285

- (3) The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual **industrial customers** with **energy intensive processes** to implement **cost-effective energy efficiency measures** in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs.

Emphasis added

Tariffs for non-residential consumption

- Specific tariffs
  - GS: 12 month average monthly demand <50 kW (secondary)
  - PS: 12 month average monthly demand 50 – 250 kW (secondary) 0 – 250 kW (primary)
  - TOD Secondary: 12 month average monthly demand 250 kW – 5,000 kW
  - TOD Primary: 12 month average monthly minimum demand > 250 kVA
  - RTS: Transmission service, 12 month average monthly minimum demand > 250 kVA
  - FLS: fluctuating with monthly demand > 20 MVA

Implementing Cost Effective Energy Efficiency Measures

- Any industrial customer that wants to opt-out of DSM and meets both the industrial and energy intensive definitions would provide a letter to LG&E or KU on their company letter head or fill out a form online that would include the following:

  - Account number with meter or copy of the bill stating that the energy used through this meter is for the purposes of converting raw or unfinished materials into another form or product or extracting raw materials from the earth.

  - Positively state that they invested in energy efficiency measures with details about what was completed.

Implementing Cost Effective Energy Efficiency Measures

- Request that their meter or account be excluded from DSM charges

- With Company receipt of letter or form and validation of appropriate rate for “energy intensive”, an industrial customer would be excluded from DSM charges until the same industrial customer elects to participate at some point in the future.

MEETING RECORD

Energy Efficiency Advisory Group Meeting

Date: **October 26, 2017**

Location: **Fairfield Inn & Suites**
1220 Kentucky Mills Drive
Louisville, KY 40299

Participants: **LG&E /KU:**
Ten employees and one contractor from various departments including Energy Efficiency, Legal, Regulatory Affairs, and Customer Service

Stakeholders:
Fifteen representatives from twelve stakeholder groups

Date Issued: 10/31/2017

Issued by: John Hayden

The following meeting minutes have been prepared to summarize the conversations and issues discussed at the above referenced meeting.

Welcome / Introductions

Greg Lawson, the Manager of LG&E/KU's Energy Efficiency Planning & Development Department, opened the meeting a few minutes past 1:00 PM EDT and welcomed the meeting participants. All meeting participants then introduced themselves and indicated their company, agency, or organization of affiliation.

Meeting Agenda

Greg Lawson thanked meeting participants for attending and provided an overview of the meeting agenda:

- Summary of September 26 meeting
- Tenets of DSM-EE filing
- Proposed plan programs
- Cost effectiveness
- Bill impacts
- Timeline

Background

Greg Lawson began by providing a recap of the September meeting and the corresponding topics that were covered. Next, he reviewed the tenets of the upcoming filing that would be critical in its development, namely:

1. Proposal consistent with KRS 278.285
2. No need for capacity equates to avoided cost of capacity of $0/kW-year
3. Falling marginal cost of generation, where it is < $0.03/kWh today

Proposed Offerings and Cost Effectiveness

A summary of proposed Programs for 2019 forward was then provided along with those programs that would be discontinued. Discussion and questions followed regarding the continuing and discontinuing programs, what changes were being offered, as well as the results and rationale around the cost benefit tests. Additionally, a summary of each continuing program was provided that highlighted key changes as part of the 2019 plan. Lastly, as a result of this proposed portfolio, program year 2018 was noted to reflect a planned sunset of programs that would not continue into 2019.

Some of the items discussed centered on what specific measures are included in the Nonresidential Rebates program, who is eligible to participate in the AMS Opt-In program, obstacles to participation in the low-income community related to renters and multi-family residents, and was the impact of electric vehicles incorporated into the analysis.

A participant inquired about raising the minimum income requirements of the WeCare program (currently at the LIHEAP level) so that it matches that of the Weatherization Assistance Program (WAP) which is 200% below the poverty level.

- ➢ Companies have agreed to this recommendation so that more customers could be eligible to participate in the WeCare program.

Bill Impacts and Timeline

A bill impact estimate was then provided by Greg Lawson to reflect the resulting average expected DSM Rider bill savings by residential customers. Finally, a timeline was shown for illustrative purposes noting the upcoming DSM related program and tariff filings.
Additional questions and discussion topics carried over from the prior slides and were related to:

1. which programs included natural gas in the savings estimate
2. are transmission and distribution impacts considered in the cost effectiveness tests
3. what is the impact on nonresidential rebates program by moving away from demand based rebates and going to energy based rebates
4. has KSBA been included in prior DSM Filings
5. will Companies monitor and be able to adjust the proposed DSM Plan down the road if conditions arise
6. do Companies have ability to evaluate new technologies as they become more available
7. have the Companies considered EE related on-bill financing or utilizing a program similar to Energy Project Assessment District (EPAD)
8. did Companies evaluate various sensitivities and scenarios around programs to offer

Participants indicated their concern about how and when changes would be incorporated into the utility DSM programs as things changed in the future. They group indicated that it would prefer to have an annual meeting to review programs and market conditions. David Huff stated that he thought this was a good idea to continue the great work with the DSM Advisory Group.

Greg Lawson thanked the participants for their attendance and closed the meeting.

DSM Program Review

Exhibit GSL-2

Exhibit GSL-2

Louisville Gas & Electric / Kentucky Utilities Company DSM Program Review

March 2017

Louisville Gas and Electric Company / Kentucky Utilities Company
220 West Main Street
Louisville, KY 40202

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Exhibit GSL-2

CADMUS

Prepared by:
Amy Ellsworth
Jeana Swedenburg
Lakin Garth
Joan Wang

Cadmus: Energy Services Division

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Executive Summary

Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU)—collectively "the Company"—hired Cadmus to review its 2015–2018 Demand-Side Management and Energy Efficiency Program (DSM/EE) Plan. We performed our review in conjunction with the 2016 Energy Efficiency Potential Study (the potential study), also conducted by Cadmus, which provided data to help guide recommendations for programs that will be filed in early 2018.

Research Objectives

This report addresses the following research objectives:

- Gauge whether the Company's current energy efficiency programs incorporate all measures with cost-effective energy efficiency potential.
- Assess the technical and achievable potential captured by the Company's programs across all sectors.
- Identify ways to achieve savings and demand reductions in response to changing state and federal standards and evolving market conditions.
- Determine if the potential study's results warrant development of new programs.

Organization of this Report

In reviewing the Company's programs, Cadmus relied on the potential study's results to conduct the following research activities:

- Assess the company's existing programs
- Conduct a measure gap analysis
- Recommend existing program enhancements
- Identify potential new program concepts

This report's chapters document the results of each research activity, as appropriate:

1. **Research Approach** provides an overview of the research and analysis tasks Cadmus conducted to inform this report's recommendations.
2. **Measure Gap Analysis** compares measures currently included in the Company's residential and commercial energy efficiency programs to efficiency measures Cadmus assessed in the potential study.
3. **Portfolio Plan Considerations** includes a discussion of Cadmus' conclusions and recommendations associated with the Company's existing programs as well as new programs that the Company may consider as part of its next program cycle.

The report also includes an appendix that describes the measure-level gap analysis tool and results for residential and commercial programs (Appendix A. Measure Gap Analysis Results).

Exhibit GSL-2

Research Approach

Cadmus' program review involved the following:

- A detailed consideration of the Company's existing programs
- A gap analysis to identify potential new program measures and delivery options resulting from the potential study
- Secondary research on a select range of programmatic topics
- Development of recommendations for the portfolio moving forward

Assessment of Existing Programs

Cadmus carefully reviewed the Company's available program materials and performance information to understand delivery strategies and design parameters inherent in the existing programs, and to assess potential ways to increase their overall impacts. The assessment included reviewing the 2015–2018 DSM/EE Program Plan, the Company's website, and past evaluation reports and/or savings performance results (including Cadmus' 2013 Program Review report). Additionally, Cadmus held an in-depth discussion with Company program staff during the project kick-off meeting to fill gaps in program information and to enhance our understanding of each program's operations and performance characteristics.

Measure Gap Analysis

Cadmus performed an end-use and measure-level gap analysis, in which we compared measures currently offered in the Company's residential and commercial energy efficiency programs to efficiency measures we assessed in our potential study. The measure gap analysis sought to achieve three objectives:

1. Rank the 20-year technical and achievable potential of measures analyzed through the potential study to determine those offering the best opportunities for program deployment.
2. Identify cost-effective measures.
3. Identify gaps by comparing cost-effective measures offering notable potential to those offered by current programs.

Additionally, the gap analysis informed the portfolio plan considerations, which involved identifying potential modifications to the Company's portfolio that would enable the utility to efficiently capture cost-effective energy savings from measures identified as presenting significant potential, while avoiding allocation of resources to measures that did not prove cost-effective or represented low savings potential.

Ranking of 20-Year Potential of Measures

Cadmus ranked the 20-year technical and achievable potential for energy savings (MWh) and demand reduction (MW) as high, medium, or low. The analysis excluded measures without technical or achievable potential and that the Company did not offer. Table 1 displays savings and demand values used to determine these rankings.

Table 1. Criteria for Ranking the 20-Year Potential of Measures

Sector	Rank	Technical Potential Rank (Energy–MWh)	Achievable Potential Rank (Energy–MWh)	Technical Potential Rank (Demand–MW)	Achievable Potential Rank (Demand–MW)
Residential	Low	Below 25,000	Below 10,000	Below 1	Below 1
	Medium	25,000–100,000	10,000–50,000	1–10	1–10
	High	Above 100,000	Above 50,000	Above 10	Above 10
Commercial	Low	Below 10,000	Below 10,000	Below 1	Below 1
	Medium	10,000–50,000	10,000–20,000	1–10	1–10
	High	Above 50,000	Above 20,000	Above 10	Above 10

Identification of Cost-Effective Measures

For each measure in the potential study, Cadmus determined cost-effectiveness using the total resource cost (TRC) test ratio. We then calculated a savings-weighted benefit-cost ratio (BCR) for each potential study measure across the three housing segments for residential applications (e.g., single-family, multifamily, manufactured homes) and across 11 building types for commercial applications.

Identification and Mapping of Current Measures

Cadmus reviewed the list of rebated measures provided by the Company—along with our previous program evaluations for the Company, the Company's website, and the 2013 potential study report—to compile a complete list of measure offerings (by program) for the residential and commercial sectors. We then aligned the potential study result measures from currently offered program measures.

Notably, aligning energy efficiency program measures with those in a potential study cannot be considered an exact science. For example, a residential appliance rebate program may offer an incentive for ENERGY STAR® refrigerators. For a potential study, however, energy savings are modeled on a much more granular level, typically involving multiple tiers of ENERGY STAR refrigerators. In most cases, Cadmus' potential studies include a broad range of program-qualifying measures that do not directly correspond with individual program offerings.

This gap analysis does not account for the various programs that expired in 2014 and are not currently offered:

- The HVAC Diagnostic and Tune-Up Program for residential and commercial customers
- The Residential High Efficiency Lighting Program
- The Residential New Construction Program
- The Dealer Referral Network Program

Exhibit GSL-2

Analysis

Cadmus mapped the Company's currently offered measures to potential measures, then analyzed the results to determine the following:

- Currently offered measures with achievable potential, which the Company should continue to offer.
- Currently offered measures with little or no technical or achievable potential, which the Company could discontinue offering.
- Measures demonstrating high potential and cost-effectiveness, which the Company currently does not offer and could be added to program offerings.

Secondary Research

To provide context for Cadmus' existing and new program recommendations, we conducted a literature review, which compared program offerings with those of utilities in other jurisdictions. The study focused on the following sources:

- Previous program evaluations conducted by leading evaluation firms, including Cadmus
- Annual reports published by investor-owned utilities
- White papers published by American Council for an Energy-Efficient Economy (ACEEE)
- General program information published on the Internet

Exhibit GSL-2

Measure Gap Analysis

Appendix A. Measure Gap Analysis Results provides detailed measure gap analysis results, including spreadsheets for the residential and commercial sectors. This chapter provides Cadmus' interpretation of the gap analysis findings, including tables identifying technical and achievable potential by measure group for each measure currently offered by the Company. Cadmus aligned this information with the corresponding measure names and the following measure details, drawn from the potential study:

- Full and incremental measure costs
- Technical and achievable energy savings
- Technical and achievable demand reduction
- Technical and achievable potential ranks for energy savings and demand reduction
- BCRs

Residential Sector

Current Measures with Achievable Potential

Table 2 lists residential measures currently offered by the Company and that Cadmus determined are cost-effective with achievable potential. The table organizes these measures by measure group and lists them from their highest to lowest share of total residential achievable potential. Direct-install hot water measures (i.e., aerators and showerheads) account for 22% of the total residential achievable potential, while home energy reports account for 13% of the total residential achievable potential.

Table 2. Residential Measures with Achievable Potential

Measure Group	Measure Name from Potential Study	Total Achievable Potential (MWh)	Share of Total Achievable Energy Potential	
			Measure	Measure Group
Audits	Low-Flow Faucet Aerator—Bathroom	20,599	3%	22%
	Low-Flow Faucet Aerator—Kitchen	28,921	5%	
	Low-Flow Showerhead	89,167	14%	
	Low-Flow Showerhead—Federal Standard 1994	3,820	1%	
Home Energy	Home Energy Reports	84,421	13%	13%
Appliance Recycling	Refrigerator—Removal of Secondary	50,689	8%	8%
HVAC	Programmable Thermostat	30,873	5%	5%
Appliances	Clothes Washer (Front Loading)—ENERGY STAR	7,187	1%	2%
	Freezer—ENERGY STAR	6,453	1%	
Lighting	Lighting Specialty Lamp—High-Efficiency CFL	6,540	1%	1%

These residential measures account for 52% of total residential achievable potential. Measures not currently offered by the Company account for the remaining 48% of residential achievable potential.

Exhibit GSL-2

Current Measures Without Achievable Potential

The potential model revealed that several measures currently offered by the Company did not pass the cost-effectiveness screening. Hence they do not offer achievable potential. Given these program measures can be comprised of multiple efficiency levels in the potential model (e.g., CEE Tier 2, CEE Tier 3, ENERGY STAR), Cadmus grouped the total technical potential at the end-use level, as shown in Table 3.

Table 3. Residential Measures Without Achievable Potential

Measure Group	Existing Measures	Technical Potential*		Technical Potential Rank	
		MWh	MW	Energy	Demand
Appliances	ENERGY STAR Refrigerator	122,188	15	High	High
	ENERGY STAR Clothes Washer	60,578	4	Med	Med
	ENERGY STAR Dishwasher	5,467	<1	Low	Low
HVAC	Split System Air Conditioner	449,820	362	High	High
	Single Package Air-Source Heat Pump	181,175	146	High	High
Lighting	Lighting General Service Lamp - High-Efficiency CFL Bulbs	9,757	<1	Low	Low
Weatherization	Energy-Efficient Window	116,533	8	High	Med

*As these measures did not prove cost-effective, Cadmus could not calculate achievable potential; therefore, the table only shows technical potential.

Potential Study Measures with High/Medium Achievable Potential

Table 4 displays the complete list of potential study measures that Cadmus ranked as offering high or medium achievable potential for energy savings and demand reduction. The Company currently offers all of these measures, which encompasses 84% of total residential achievable potential.

Table 4. Potential Study Residential Measures with High/Medium Achievable Potential

Company Offers	Measure Group	Measure Name from Potential Study	Achievable Potential		Achievable Potential Rank	
			MWh	MW	Energy	Demand
Yes	Home Energy	Home Energy Reports	84,421	16	High	High
Yes	Programmable Thermostat	Programmable Thermostat	30,873	13	Med	High
Yes	High-Efficiency LED Bulbs*	Lighting Specialty Lamp—Premium Efficiency LED	40,796	2	Med	Med
Yes		Lighting General Service Lamp—Premium Efficiency LED	189,007	8	High	Med
Yes	ENERGY STAR Refrigerator	Refrigerator—Removal of Secondary	50,689	6	High	Med
Yes		Low-Flow Faucet Aerator—Bathroom	20,599	1	Med	Med

Exhibit GSL-2

Company Offers	Measure Group	Measure Name from Potential Study	Achievable Potential		Achievable Potential Rank	
			MWh	MW	Energy	Demand
Yes	On-Site Home Energy Analysis	Low-Flow Faucet Aerator—Kitchen	28,921	2	Med	Med
Yes		Low-Flow Showerhead	89,167	6	High	Med

* The Company offers LEDs as well as CFLs as direct install measures through its WeCare and Home Energy Analysis Programs.

Commercial Sector

Current Measures with Achievable Potential

Table 5 lists measures currently offered by the Company that Cadmus determined have achievable potential (and are cost-effective). The lighting measure group accounts for 62% of the total commercial achievable potential for measures currently offered by the Company. HVAC measures account for 11% of the total commercial achievable potential.

Table 5. Commercial Measures with Achievable Potential

Measure Group	Measure Name from Potential Study	Total Achievable Potential (MWh)	Share of Total Achievable Energy Potential	
			Measure	Measure Group
Lighting	Occupancy Sensor Control	212,020	34%	62%
	Daylighting Controls, Outdoors (Photocell)	51,631	8%	
	Lighting Interior - Screw Base LED - Above Standard	33,096	5%	
	Lighting Interior - Efficient Metal Halide - Above Standard	32,134	5%	
	Lighting Interior - TLED - Above Standard	30,614	5%	
	Lighting Package - Advanced Efficiency	16,031	3%	
	Solid State LED White Lighting	5,793	1%	
	Dimming-Stepped, Fluorescent Fixtures	4,742	1%	
HVAC	Motor - Pump & Fan System - Variable Speed Control	43,268	7%	11%
	Evaporative Cooler Replaces DX Package 240 to 760 kBtuh - Advanced Efficiency	14,151	2%	
	Evaporative Cooler Replaces DX Package 65 to 135 kBtuh - Advanced Efficiency	7,105	1%	
	Evaporative Cooler Replaces DX Package 135 to 240 kBtuh - Advanced Efficiency	2,876	0%	
	DX Package 240 to 760 kBtuh - Premium Efficiency	514	0%	
	PTAC (10,000 Btuh) - High Efficiency	281	0%	
	PTHP (10,000 Btuh) - High Efficiency	159	0%	
Motor/Pump/VFD	Motor - CEE Premium-Efficiency Plus	8,334	1%	1%

Exhibit GSL-2

The commercial measures listed in Table 5 account for 75% of the total commercial achievable potential. Measures not currently offered by the Company account for the remaining 25% of commercial achievable potential.

Current Measures Without Achievable Potential

The potential model revealed several measures currently offered by the Company that did not pass the cost-effectiveness screening test (i.e., TRC) and therefore do not have achievable potential. Given the large number of measure iterations across building types, construction vintages, and efficiency levels, Cadmus grouped the total technical potential at the measure group level for existing measure offerings, as shown in Table 6.

Table 6. Commercial Measures without Achievable Potential

Measure Group	Existing Measure Group	Technical Potential		Technical Potential Rank	
		MWh	MW	Energy	Demand
Chillers	Chiller, 150-300 tons	1,590	1	Low	Low
	Chiller, 0-149 tons	1,359	1	Low	Low
	Chiller, 300+ tons	1,090	1	Low	Low
HVAC	Other HVAC	13,709	3	Med	Med
	Rooftop/Unitary Air Conditioner	49,585	26	Med	High
	Rooftop/Unitary Heat Pump	32,269	17	Med	High
Lighting	Other Lighting	16,249	0	Med	Low
	T5 with Electric Ballast	35,367	6	Med	Med

Potential Study Measures with High/Medium Achievable Potential

Table 7 displays the complete list of the potential study's commercial measures that Cadmus ranked as having either high or medium achievable potential in both energy savings and demand reduction. Almost all measures shown in Table 7 also appear in Table 5, indicating that the Company already offers many of the potential study measures with the most achievable potential (high or medium rankings).

Table 7. Potential Study Commercial Measures with High/Medium Achievable Potential

Offered by the Company	Measure Group	Measure Name from Potential Study	Achievable Potential		Achievable Potential Rank	
			MWh	MW	Energy	Demand
Yes	Lighting	Occupancy Sensor Control	247,218	35	High	High
Yes	Lighting	Daylighting Controls, Outdoors (Photocell)	60,041	1	High	Low
Yes	HVAC	Motor—Pump and Fan System—Variable Speed Control	49,796	10	High	High
Yes	Lighting	Lighting Interior—Efficient Metal Halide—Above Standard	39,190	7	High	Med

Offered by the Company	Measure Group	Measure Name from Potential Study	Achievable Potential		Achievable Potential Rank	
			MWh	MW	Energy	Demand
Yes	Lighting	Lighting Interior—TLED—Above Standard	32,470	5	High	Med
Yes	Lighting	Lighting Interior—Screw-Base LED—Above Standard	27,897	4	High	Med
Yes	HVAC	DX Package 240-760 kBtuh—Premium Efficiency	22,259	12	High	High
No	None	Direct/Indirect Evaporative Cooling, Pre-Cooling	22,073	12	High	High
Yes	Lighting	Lighting Package—Advanced Efficiency	20,868	3	High	Med
No	None	Case Replacement Low Temperature	20,541	3	High	Med
No	None	Exit Sign—Photoluminescent	19,375	3	Med	Med
No	None	Anti-Sweat (Humidistat) Controls	15,348	2	Med	Med
Yes	HVAC	Evaporative Cooler Replaces DX Package 240-760 kBtuh—Advanced Efficiency	14,163	8	Med	Med
No	None	Recommissioning*	12,022	7	Med	Med

*Cadmus' modeling determined that this measure achieved the 1.0 BCR threshold for some applications (e.g., offices/retail) but fell below the cost-effective threshold in other applications.

As noted above, measures not currently offered by the Company represent roughly 25% of the total commercial achievable potential. These measures encompass an array of end uses, building types, and applications. Table 7 shows those ranked as offering medium or high achievable potential, represent 14% of the total commercial achievable potential. Table 16 in Appendix A shows low-ranked measures, representing the remaining 11% of total commercial achievable potential.

Exhibit GSL-2

Portfolio Plan Considerations

This section provides Cadmus' conclusions and recommendations for the Company's consideration when addressing its next program cycle. Cadmus bases these recommendations on findings from the measure gap analysis and on our extensive knowledge and understanding of the current, national DSM landscape, including trends in program design, changing state and federal standards, and evolving market conditions.

Table 8 details each program the Company currently offers as well as new programs concepts to consider, along with each program's performance status for 2016 (per our in-depth interviews with Company program staff).

Table 8. Summary of Portfolio Plan Considerations

Program	Status	Eligibility	Performance	Action
Residential Sector				
Advanced Metering Service	Existing	All residential	N/A	N/A*
Customer Education and Public Information	Existing	Schools: Kindergarten—8th grade	N/A	Continue program, consider adding energy efficiency kits to allow for claimed energy savings.
Fridge and Freezer Recycling	Existing	All residential electric	On track to meet goals in 2016	Continue program, remove freezer incentive.
Home Energy Analysis	Existing	Existing residential electric	On track to meet audit goals; low conversion rate	Continue program offering performance-based incentives, remove CFLs from direct-install measure offering.
Home Energy Rebates	Existing	All residential	On track to meet goals in 2016	Consider discontinuing program.
LED Lighting Distribution Program	New	All residential electric	N/A	Launch turnkey LED-focused, lighting giveaway or direct-install program.
Residential Demand Conservation	Existing	All residential electric	Projected to fall short of goals	Continue program.
Smart Energy Profile	Existing	All residential electric	Projected to fall short of goals	Continue program.
WeCare	Existing	Standard LIHEAP (150% FPL)	On track to meet goals in 2016	Continue program; remove CFLs from the direct-install program offering.
Commercial Sector				
Commercial Demand Conservation	Existing	All commercial with load $\geq$ 200 kW	Projected to fall short of goals	Continue program.
Commercial Energy Rebates	Existing	All commercial electric	On track to meet goals in 2016	Revise program offering based on potential study results.

Program	Status	Eligibility	Performance	Action
Small Business Lighting Program	New	Small commercial customers	N/A	Launch turnkey lighting-focused, direct-install program targeting hard-to-reach small business sector. Consider refrigeration measures as a co-pay measure option.

*At the Company's request, Cadmus did not include the Advanced Metering Service in the program review.

Residential Sector Considerations

The Company's residential portfolio offers the following:

- Energy audits with direct-installation measures (for single-family and multifamily homes)
- Appliance recycling
- Direct load control
- A comprehensive suite of prescriptive rebates
- Programs targeting energy-efficient behavior

Per recommendations from Cadmus' 2013 Program Review report, the Company's 2015–2018 DSM/EE Plan included program updates to better encompass the needs of single-family customers as well as the multifamily and low-income segments.

Conclusion: With minimal changes, the Company's appliance recycling program can continue to thrive despite a volatile market.

The Company's Fridge and Freezer Recycling program offers residential customers an incentive to have secondary, operational freezers and refrigerators picked up and recycled. The Company designed the program using many industry best practices, including the following:

- Partnering with Appliance Recycling Centers of America, an experienced appliance recycling vendor
- Working with retailers to promote the program
- Offering an incentive high enough to motivate customer participation ($50)

Utilities across the country must discontinue long-running ARP's due to decreasing cost-effectiveness as savings for recycled appliances decline (as appliance stock becomes more efficient) and avoided costs plummet. Additionally, the closing of a well-known appliance recycling vendor (JACO Environmental) in November 2015 disrupted the market for many program sponsors.

Despite these market issues, the potential study indicated high achievable potential for removing secondary refrigerators (50,689 MWh) within the Company's territory. Removing standalone freezers, however, can no longer be considered cost-effective (i.e., total weighted BCR of 0.89).

- **Recommendation:** In the next program cycle, continue offering a $50 incentive for refrigerator recycling.
- **Recommendation:** Discontinue the freezer recycling incentive, but continue offering freezer removal as a program benefit when paired with a qualifying refrigerator pickup. The program previously offered free removal services for window air conditioners and small "dorm-style" refrigerators at the time of qualifying appliance pickups, though the ARP did not provide incentives for these measures; consider applying the same limitations to freezers.

Conclusion: Bundled measure packages and performance-based incentives may allow the Company to capture savings from measures no longer deemed cost-effective.

The Home Energy Analysis program offers a subsidized home energy audit ($25) as well as performance-based incentives for electric customers who install energy efficiency retrofits in single-family and multifamily homes. The program uses the following incentive tiers:

Single-family incentive tiers:	Multifamily incentive tiers:
1. $300 for 16% energy reduction	1. $150 for 16% energy reduction
2. $500 for 20% energy reduction	2. $250 for 20% energy reduction
3. $1,000 for 30% energy reduction	3. $500 for 30% energy reduction

In its 2015–2018 DSM/EE Plan, the Company specified that customers receive the tier-one incentive ($300 for single-family, $150 for multifamily) upon completion of audit-recommended insulation and weatherization measures. The Company's website, however, does not list measure specification for incentive eligibility. The performance-based incentive structure allows flexibility in individual measures implemented by customers as long as the projects achieve energy reductions over the home's audited baseline.

Cadmus' potential model shows individual HVAC and weatherization measures (e.g., insulation, duct sealing, infiltration) no longer prove cost-effective. However, when bundled with direct installation measures that are cost effective, and offered through a performance based incentive, the Company may be able to realize cost-effective savings from the program. Additional modeling of measure packages combined with direct-install offerings can help determine whether measure combinations will achieve project-level or program-level cost-effectiveness.

- **Recommendation:** Conduct additional analysis of bundled-measure scenarios during the planning process to determine whether the Home Energy Analysis program can continue to generate cost effective savings for the Company. Based on these results, the Company should further consider offering performance-based incentives for customers who implement cost-effective energy efficiency projects.

Conclusion: Direct-install measures account for more than half of the Company's total residential achievable potential.

As discussed, the Home Energy Analysis program offers a subsidized home energy audit ($25) to single-family and multifamily homes. As part of the audit process, auditors provide direct-install measures (e.g., CFLs, LEDs, showerheads, faucet aerators, a smart power strip, hot water pipe wrap). The Company's WeCare program provides a similar direct-install offering to low-income customers. Cumulatively, these direct-install measures can account for 10% of overall energy savings for customers.

The potential model found direct-install hot water measures (i.e., aerators and showerheads) account for 25% of the total residential achievable potential, while LED lighting accounts for an additional 35%. Home energy audits (most notably these assessments' direct-install component) will continue to achieve significant savings for the Company's residential portfolio in the next program cycle.

- **Recommendation:** Consider updating the Home Energy Analysis and WeCare direct-install measure offerings, per the recommendations listed in Table 9. The Company should consider removing measures deemed not cost-effective (e.g., CFLs, smart power strips) and shifting the associated program dollars to higher-performing measures (e.g., such as general service and specialty LEDs and programmable thermostats).

Table 9. Direct-Install Offering Considerations

Measure	Measure Status	Cost-Effective?	Achievable Potential*		Share of Total Residential Achievable Potential	Recommended Action
			MWh	MW		
General Service CFL	Existing	No	N/A	N/A	N/A	Discontinue measure offering.
General Service LEDs	Existing	Yes	189,007	7.6	30%	Consider expanding measure offering to all participants.
Specialty LEDs	New	Yes	40,796	1.6	6%	Consider adding measure to offering.
Low-Flow Bathroom Faucet Aerator	Existing	Yes	20,599	1.4	3%	Continue offering.
Low-Flow Kitchen Faucet Aerator	Existing	Yes	28,921	2.0	5%	Continue offering.
Low-Flow Showerhead	Existing	Yes	89,167	6.0	14%	Continue offering.
Programmable Thermostats	New	Yes	30,873	13.1	5%	Consider adding measure to offering.
Smart Strip Plug Outlet	Existing	No	N/A	N/A	N/A	Discontinue measure from offering.
Water Heater Pipe Wrap	Existing	Yes	1,026	<1	<1%	Continue offering.

*Achievable potential cannot be calculated for measures that are not cost-effective.

- **Recommendation:** Ensure the Home Energy Analysis program's multifamily component capitalizes on the benefits of on-site audits (specifically, the low-cost direct-install measures).

Many program administrators and utilities (e.g., Focus on Energy and Consumers Energy) offer multifamily direct-install programs that work directly with property managers and owners (including local housing authorities specifically targeting low-income buildings), signing up their entire property for in-unit, direct-install assessments to be completed all at once. These projects can be completed quickly and cost-effectively to generate rapid savings for the residential portfolio. This approach also works well with manufactured home parks. To facilitate recruitment, the Company should waive the $25 audit fee for multifamily property (and manufactured home park) managers and owners who enroll their properties in the program.

Conclusion: The potential model's cost-effectiveness results hit the Home Energy Rebates program the hardest.

The potential model revealed that the Company currently offers several measures that did not pass the cost-effectiveness screening and, therefore, do not offer any achievable potential. Unfortunately, the Company's Home Energy Rebates program offers most of these measures (e.g., refrigerators, top-loading clothes washers, dishwashers, central air conditioners, air source heat pumps). By eliminating capacity benefits from the cost-effectiveness testing, all HVAC measures fell below the 1.0 TRC cost-effective threshold. The two-remaining cost-effective Home Energy Rebates program measures (i.e., front-loading closes washers and high-efficiency freezers) account for only 2% of the total residential achievable potential.

To determine whether new measures could be added to the Home Energy Rebates program offering, Cadmus reviewed all cost-effective retail products included in the gap analysis. The potential model identified several cost-effective consumer electronics (e.g., ENERGY STAR computers, multifunction devices, set top boxes, home audio systems) not already included in the Home Energy Rebates program offering. Customers, however, typically consider mail-in rebates for these products "not worth the hassle,"[1] so few utilities offer consumer electronics through mail-in rebate mechanisms.

Best practice program design for consumer electronics typically calls for a midstream incentive model, where sponsors provide incentives to retailers that stock and sell a higher percentage of energy-efficient products than they would have otherwise. While midstream programs can serve as effective incentive mechanisms for consumer electronics and retail products, they require an upfront administrative burden to establish an effective program infrastructure and to build retailer relationships. Additionally, consumer electronics identified in the potential model only account for 4% of the total residential achievable potential.

- **Recommendation:** Although the Home Energy Rebates program serves as a mainstay of the Company's portfolio (meeting or exceeding goals since its launch in 2012), consider discontinuing the program. As shown in Table 10, the potential study found nearly all of its measure offerings not cost-effective. Though ENERGY STAR freezers and front-loading clothes washers remain cost-effective, their subsequent energy savings may not be worth the cost to

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[1] http://aceee.org/files/proceedings/2016/data/papers/2_592.pdf

continue running the program for only two measures. The Company may also consider adding a midstream consumer electronics program to replace energy savings currently provided by the Home Energy Rebates program.

Table 10. Home Energy Rebates Program Offering Considerations

Measure	Measure Status	Cost-Effective?	Achievable Potential*		Recommended Action
			MWh	MW	
HVAC and Water Heating					
Air Source Heat Pumps	Existing	No	N/A	N/A	Discontinue incentives.
Central Air Conditioners	Existing	No	N/A	N/A	Discontinue incentives.
Heat Pump Water Heaters	Existing	No	N/A	N/A	Discontinue incentive.
Appliances					
ENERGY STAR Dishwashers	Existing	No	N/A	N/A	Discontinue incentive.
ENERGY STAR Refrigerators	Existing	No	N/A	N/A	Discontinue incentive.
ENERGY STAR Freezers	Existing	Yes	6,453	1	If continuing program, continue offering incentive.
ENERGY STAR Clothes Washers	Existing	Yes	7,187	1	If continuing program, modify incentive eligibility to include front-loading models only.
Building Envelope					
Window Film (or new windows with film applied)	Existing	No	N/A	N/A	Discontinue incentive.

*Achievable potential cannot be calculated for measures that are not cost-effective.

Conclusion: Behavioral savings offer significant potential for the Company's residential portfolio.

Periodically throughout the year, the Smart Energy Profile program uses the Opower® model to mail customized home energy reports to customers. The Company claims energy savings from customers who receive the reports and implement suggested energy savings tips (i.e., behavior changes). According to staff at the Company, approximately 50% of its residential customers currently receive the home energy reports (these customers are referred to as the treatment group). Per the potential study, home energy reports account for 13% of total residential achievable potential—the second-largest market share of achievable potential among residential measures (the first being direct-install hot water measures).

- **Recommendation:** Continue offering the Smart Energy Profile program, and monitor results during the next program cycle. To achieve accurate measurement and verification of behavioral program impacts, evaluators typically require 20% of the residential customer base serve as the

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program's control group (those who do not receive home energy reports). To maximize savings from the Smart Energy Profile program, consider expanding the treatment group to up to 80% of the residential customer base.

- **Recommendation:** Ensure the Smart Energy Profile program effectively incorporates and promotes the online portal/tools offered by Opower. These tools aim to further engage treatment customers in energy education and encourage greater behavior change (and savings).

Conclusion: In absence of a traditional lighting program, the Company leaves substantial electric savings on the table; LED lighting measures, however, offer savings potential for a limited-time.

As Cadmus recommended in the 2013 Program Review report, the Company discontinued its High Efficiency Lighting program in 2014.[2] Although the program experienced significant success, exceeding targets and producing substantial savings for the Company's portfolio between 2010 and 2013, CFLs' available cost-effective savings potential did not justify continuing the program as previously designed. The expiration, however, of the Company's only existing lighting program presents ample opportunities to capture residential lighting savings during the Company's next program cycle.

Despite CFLs' rapidly approaching obsolescence (specifically for general service bulbs), lighting programs still play an important role in utility energy efficiency portfolios nationwide. According to the Uniform Methods Project,[3] program administrators typically deliver residential lighting measures through four mechanisms:

1. **Upstream Buy-Down/Mark-Down:** Utilities most commonly seek residential lighting savings by offering "upstream" incentives to manufacturers (buy-down) or retailers (mark down) that reduce lighting measure costs for consumers at the point of sale. Although nearly all program administrators nationwide use this program model, successful delivery requires significant investments and lengthy ramp-up periods to allow program staff to recruit and build relationships with an array of participating manufacturers and/or retailers. Additionally, these programs require extensive retailer staff training to ensure effective program promotion, development of specialized marketing campaigns, and a rigorous evaluation approach.
2. **Coupons:** Some program administrators rely on instant (point-of-sale) or mail-in coupons as incentive mechanisms for residential lighting products. The Company originally launched its High Efficiency Lighting program in 2008 as a coupon-driven program with a direct-ship element; participation, however, remained low until the Company eliminated the coupon component in 2010.
3. **Direct-Install:** Many program administrators who offer residential audit programs include direct installation of energy-efficient lighting during audits as a program feature. The Company uses

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[2] The High Efficiency Lighting Program provided CFL bulbs to customers through a direct mail mechanism.

[3] http://www.nrel.gov/extranet/ump/pdfs/20140514_ump_res_lighting_draft.pdf

this approach for the Home Energy Analysis and WeCare programs, which currently incorporate direct installation of mixed CFLs and LEDs as part of the programs' audit processes.

4. **Giveaways:** Some program administrators provide energy-efficient light bulbs free of charge to residential customers, available through the mail, at customer service offices, or at events organized by community or religious organizations or by local government agencies. Targeting a wide variety of customer segments (e.g., rural customers, urban customers, elementary student households), bulbs can be mailed to customers upon request or be sent without prior customer notice. The Company's High Efficiency Lighting program successfully used the giveaway delivery mechanism from 2010 to 2013.

The Company appropriately retired the High Efficiency Lighting program in 2014, given the changing baseline for CFLs and the market uncertainty around LED technology costs and cost-effectiveness at that time. Since 2014, however, LED technologies have continued to improve while costs have declined significantly. The Company's portfolio could benefit from launching an innovative lighting program model (focused on LED lighting measures) during its next program cycle.

Though the potential study found significant achievable potential for general service (189,007 MWh) and specialty (40,796 MWh) LEDs, the Company must capture these savings quickly. In 2020 (and beyond), regulatory standards established by the Energy Independence and Security Act of 2007 (EISA) will change the effective baseline used to measure lighting savings. This will reduce available lighting savings by approximately 50% and affect lighting programs' overall cost-effectiveness. Therefore, an LED-focused lighting program that incorporates a high-impact delivery model and that can be deployed quickly would best serve the Company in capturing achievable savings in a short period of time.

- **Recommendation:** To maximize savings before federal standards increase, ensure all residential programs with direct-install elements (e.g., Home Energy Analysis, WeCare) only promote LED lighting in the next program cycle.
- **Recommendation:** Consider launching a quick-start LED distribution program to capture savings prior to the 2020 baseline increase. Direct-install and giveaway programs can be launched quickly and deliver savings results within a relatively short time frame. Table 11 lists turnkey programs with established and clear messages, offerings, and participation processes that can be easily understood, while requiring little administrative effort from the program sponsor. These programs can also serve a cross-promotional function: aiming to increase sales and awareness of ENERGY STAR-qualified lighting products, along with the Company's other program offerings that reduce energy consumption.

Table 11. Lighting Program Considerations

Program Name	Delivery Model	Program Overview	Example Program Sponsors
Bulb Exchange	Giveaway	Events at local retailers, multifamily properties, and/or community centers, encourage customers to switch out inefficient light bulbs with new energy-efficient bulbs.	Jacksonville Electric Authority

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Program Name	Delivery Model	Program Overview	Example Program Sponsors
Food Bank Lighting Distribution Program	Giveaway	Partner food banks distribute packages of bulbs to low-income community members they serve. Customers can enroll in the program sponsor's income-eligible energy efficiency program(s) when receiving the bulbs.	Ameren Missouri, Commonwealth Edison
Project Porchlight*	Direct-Install	Door-to-door installation of a single bulb in the porchlight fixtures of residential households. While on site, installation staff offer homeowners energy education and promote the program sponsor's other energy efficiency programs.	New Jersey Board of Public Utilities; Puget Sound Energy; Efficiency Vermont
School Kits	Giveaway	Partner elementary/middle schools distribute energy-saving kits to students participating in energy education. Kits typically include bulbs, aerators, and a showerhead, along with marketing materials designed to increase student households' awareness of energy-efficient lighting products and the program sponsor's other energy efficiency offerings. The kits could be paired with the Company's Children's Energy Education program (which does not claim energy savings), through which it has existing relationships with K-8 schools in the region.	Vectren Indiana, Xcel Energy, Dayton Power & Light

*For more information on Project Porchlight: https://vimeo.com/3268171

Commercial Sector Considerations

In the commercial sector, the Company offers prescriptive and custom energy efficiency opportunities as well as technical support for facility audits and incentives for demand reduction.

Conclusion: As currently designed, the Commercial Energy Rebates program captures most commercial achievable potential, but some current program measures are no longer cost-effective.

Per the potential model, measures incented by the Company's Commercial Energy Rebates program account for 75% of the portfolio's total commercial achievable potential. The program's lighting measures account for 60% of the total commercial achievable potential, while HVAC measures account for an additional 14%.[4] While most measures incented by the program remain cost-effective, some (e.g., chillers, rooftop and unitary air conditioners and heat pumps, T5 fixtures) do not, calling for updates to the program's measure offerings.

- **Recommendation:** Per the recommendations in Table 12, discontinue all Commercial Energy Rebates program incentives for measures no longer deemed cost-effective.

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[4] Program measures such as motors and chillers account for the remaining 1%.

Table 12. Commercial Energy Rebates Program Offering Considerations

Measure	Current Incentive	Cost-Effective?	Achievable Potential*		Recommended Action
			MWh	MW	
Chiller, 0–149 tons	$26/ton	No	N/A	N/A	Discontinue incentive
Chiller, 150–300 tons	$26/ton	No	N/A	N/A	Discontinue incentive
Chiller, 300+ tons	$26/ton	No	N/A	N/A	Discontinue incentive
Rooftop/Unitary Air Conditioner	$25–$30/ton	No	N/A	N/A	Discontinue incentive
Rooftop/Unitary Heat Pump	$25–$30/ton	No	N/A	N/A	Discontinue incentive
T5 with Electric Ballast	$3–$74/fixture	No	N/A	N/A	Discontinue incentive

*Achievable potential cannot be calculated for measures no longer cost-effective.

Conclusion: The Commercial Energy Rebates program could capture additional achievable savings potential with limited modifications.

Although, as discussed, the Commercial Energy Rebates program's design sought to capture savings from a diverse range of measures, the potential model identified two key measures with notable achievable potential: evaporative pre-coolers and recommissioning.

Evaporative Pre-Coolers

The potential study indicated evaporative pre-coolers accounted for 22,073 MWh of achievable potential, accounting for 3% of the Company's total commercial achievable potential. Evaporative pre-coolers can be installed on most cooling systems used in commercial, retail, education, health care, lodging, and some industrial sites.

Evaporative pre-cooling boosts the effectiveness of commercial air conditioners by reducing the air temperature surrounding a unit's outdoor section. For buildings with high outdoor air requirements (per American Society of Heating, Refrigerating, and Air-Conditioning Engineers [ASHRAE] standards), evaporative pre-cooling can significantly reduce building energy consumption.[5] Utilities such as Xcel Energy and Rocky Mountain Power offer incentives for evaporative pre-coolers as part of their commercial prescriptive rebate programs.

- **Recommendation:** Consider adding direct/indirect evaporative pre-coolers to the Commercial Energy Rebates program offering as a prescriptive measure. Table 13 provides examples of evaporative pre-cooler incentive levels offered by other program sponsors.

Table 13. Comparison of Direct/Indirect Evaporative Pre-Cooler Incentives

Program Sponsor	State	Incentive
Black Hills Energy	CO	$15/ton
Fort Collins Utilities	CO	$100/ton
Pacific Power	CA, WA	$75/ton of attached cooling capacity

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[5] http://aceee.org/files/proceedings/1998/data/papers/0312.PDF

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Program Sponsor	State	Incentive
Rocky Mountain Power	UT, ID, WY	$75/ton of attached cooling capacity
Xcel Energy	CO	$100/ton

Recommissioning

While commissioning ensures specific building systems perform optimally and interactively, per the design intent and the customer's operational needs, recommissioning ensures a previously commissioned building continues to run at optimal performance levels. Additionally, retro-commissioning tunes up an existing building that was never formally commissioned, identifying less-than-optimal performance in the facility's equipment and process systems. Though the potential model determined that recommissioning can be cost-effective in some applications (e.g., offices/retail), it fell below the cost-effective threshold (BCR ≥1.0) in other applications. Continuing to classify recommissioning as a custom measure rather than as a prescriptive measure would allow the Company to verify a proposed projects' cost-effectiveness before approving eligibility for program incentives.

- **Recommendation:** Consider promoting recommissioning/retro-commissioning as a Commercial Energy Rebates custom measure offering. Tailor recommissioning marketing messages to target customer segments more likely to result in cost-effective projects (i.e., office and retail).

Conclusion: Direct-install programs introduce LED lighting technologies to hard-to-reach markets, such as small businesses.

Successful DSM portfolios provide programs that change over time to accommodate markets and introductions of new technologies.[6] The Commercial Energy Rebates program's design serves a traditional objective: offer incentives for a wide array of high-efficiency measures to a diverse set of commercial customers. In recent years, however, utilities have been moving to adopt more specific delivery channels to address the unique challenges and circumstances of individual customer segments. Increasingly, program administrators offer direct-install programs with generous incentives to reach small businesses—typically considered a hard-to-reach market in the commercial sector.

Small business direct-install programs offer a turnkey delivery approach, with minimal administrative requirements, and a proven, successful track record. These programs are designed to overcome traditional small commercial participation barriers (e.g., lack of time and capital resources, split incentive barrier). Additionally, many program administrators across the country leverage small business programs to serve a cross-promotional benefit for other commercial programs.

As discussed, LED lighting accounts for 60% of the total commercial achievable potential. Photoluminescent exit signs also showed significant potential (17,489 MWh), representing an additional 3% of total commercial achievable potential. A lighting-focused, direct-install program, specifically

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[6] U.S. Environmental Protection Agency and U.S. Department of Energy. *National Action Plan for Energy Efficiency. Chapter 6: Energy Efficiency Program Best Practices*. 2007. Available online: http://www.epa.gov/cleanenergy/documents/suca/napee_chap6.pdf.

targeting small businesses, could capture significant savings and lead to program uplift among a population that otherwise may not have the resources (e.g., capital budget, staffing, energy efficiency knowledge) to implement energy-saving projects.

- **Recommendation:** Consider launching a lighting-focused, small business direct-install program. Table 14 presents a summary small business program designs offered by other program administrators.

Table 14. Comparison of Small Business Direct-install Programs

Program Sponsor	State	Eligibility Criteria	Offering	Customer Cost
Black Hills Energy	CO	Average electric demand of ≤350 kW per year	Up to 70% of installation and equipment costs for projects such as high-efficiency lighting upgrades and commercial refrigeration measures.	30% of project cost
ConEdison	NY	Average peak monthly electric demand of ≤100 kW	Up to 70% of installation and equipment costs for projects such as high-efficiency lighting upgrades and commercial refrigeration measures.	30% of project cost
Focus on Energy	WI	Monthly peak demand of <100kW	Free walkthrough lighting assessment and technical assistance. Customers choose to implement one of three co-funded lighting packages, based on assessment results.	$75-$295
Puget Sound Energy	WA	<10,000 square feet	Free walkthrough assessment and no-cost installation of LED lighting and water-saving measures.	$0
Vectren	IN	Monthly electric demand of ≤400 kW	Free walkthrough assessment and direct installation of measures (e.g., LEDs, aerators). Significant discounts on additional measures (e.g., T8s, LED exit signs, occupancy sensors, refrigerated display case lighting).	25%–50% of project cost (depending on business size)
Xcel Energy	CO	Annual peak demand of ≤100 kW	Free direct-installation service for LEDs and aerators in restroom and kitchen sinks.	$0

In addition to lighting, some program sponsors also use small business programs to encourage certain customers (e.g., small grocery and convenience stores) to install cost-effective high efficiency refrigeration measures. While refrigeration measures typically require a co-pay from the participant, the turnkey, direct-install program model serves as an effective entryway for small business customers to implement refrigeration projects. The potential model shows case replacement and anti-sweat controls account for 5% of total commercial achievable potential.

- **Recommendation:** If the Company decides to offer a small business lighting program during the next program cycle, consider offering refrigeration measures as a direct install co-pay measure in commercial facilities where refrigeration opportunities are available. Refrigeration measures could also be added to the Commercial Energy Rebates program as a

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cost-effective, prescriptive rebate offering and cross-promoted through the small business lighting program.

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Appendix A. Measure Gap Analysis Results

Table 15. Residential Measure Gap Analysis

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
None	None	Computer - ENERGY STAR	$0	$0	6,295	1	3,082	0	Low	Low	Low	Low	1034.74
		Cooking Oven - High Efficiency	$628	$591	8,649	1	0	0	Low	-	Low	-	0.27
		Air-to-Air Heat Exchanger	$1,580	$0	36,165	21	0	0	Med	-	High	-	0.19
Weatherization	Attic and Wall Insulation	Ceiling Insulation (KY) - Above Code	$1,712	$0	63,064	17	0	0	Med	-	High	-	0.21
		Ceiling Insulation (KY) - Code	$1,423	$0	84,999	26	0	0	Med	-	High	-	0.23
HVAC	Split System Air Conditioner > SEER 14.5	Central Air Conditioner - ENERGY STAR	$1,596	$155	0	0	0	0	-	-	-	-	-
		Central Air Conditioner - ENERGY STAR 2016 Most Efficient	$2,060	$619	0	0	0	0	-	-	-	-	-
		Central Air Conditioner - Enhanced	$2,370	$1,441	449,820	362	0	0	High	-	High	-	0.25
None	None	Central Cooling - Evaporative Cooler	$748	$1,441	3,999	3	2,220	2	Low	Low	Med	Med	999.00
		Construction - ICF/SIP	$10,015	$6,433	4,654	3	0	0	Low	-	Med	-	0.09
		Cool Roof	$2,172	$2,046	14,823	12	0	0	Low	-	High	-	0.12
		Door (KY) - Above Code	$794	$487	26,015	8	0	0	Med	-	Med	-	0.20
Weatherization	Air and Duct Sealing and Insulation	Duct Sealing and Insulation - Code	$1,162	$0	82,994	47	0	0	Med	-	High	-	0.41
Home Energy	Home Energy	Home Energy Reports	$10	$0	130,825	25	84,421	16	High	High	High	High	1.85
None	None	Infiltration Control - Reduction of Existing Conditions	$320	$0	22,061	10	0	0	Low	-	High	-	0.11
HVAC	Programmable Thermostat	Programmable Thermostat	$108	$75	22,704	11	30,873	13	Low	Med	High	High	1.92
None	None	Quality Installation - Central Air Conditioner	$512	$0	91,243	73	0	0	Med	-	High	-	0.24
		Tune-up - Central Air Conditioner	$100	$0	78,433	63	0	0	Med	-	High	-	0.42
Weatherization		Wall Insulation (KY) - Above Code	$2,276	$1,816	11,683	3	0	0	Low	-	Med	-	0.54

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
	Attic and Wall Insulation	Wall Insulation (KY) - Maximum Feasible	$1,882	$0	313,985	87	0	0	High	-	High	-	0.60
None	None	Wi-Fi Thermostat	$280	$88	103,071	55	0	0	High	-	High	-	0.62
Weatherization	Energy-Efficient Window (Replacement)	Window (KY) - Tier 1 Above Code	$34	$8	0	0	0	0	-	-	-	-	-
		Window (KY) - Tier 2 Above Code	$13,603	$0	272,680	90	0	0	High	-	High	-	0.03
	Window Film Solar Heat Gain Coefficient < 0.45	Window Film	$1,159	$0	39,952	32	0	0	Med	-	High	-	0.04
None	None	Ductless Air Conditioner (DAC)	$1,303	$233	13,648	11	0	0	Low	-	High	-	0.04
HVAC	Energy-Efficient Air Conditioner (Replacement)	Room AC - ENERGY STAR	$292	$233	2,216	2	0	0	Low	-	Med	-	0.10
None	None	Office Copier - ENERGY STAR	$0	$0	3,809	0	1,864	0	Low	Low	Low	Low	1910.47
		DVD Player - ENERGY STAR	$0	$0	361	0	177	0	Low	Low	Low	Low	83.39
		Dehumidifier - High Efficiency	$45	$0	261	0	0	0	Low	-	Low	-	0.38
		Dryer - ENERGY STAR	$40	$0	0	0	0	0	-	-	-	-	-
Appliances	ENERGY STAR Freezer	Freezer - ENERGY STAR	$7	$0	4,920	1	6,453	1	Low	Low	Low	Low	1.18
Appliance Recycling	ENERGY STAR Freezer	Freezer - Removal of Stand-Alone	$76	$0	83,746	12	0	0	Med	-	High	-	0.95
None	None	Floor Insulation (KY) - Above Code	$1,014	$0	91,698	38	0	0	Med	-	High	-	0.70
		Infiltration Control - Reduction of New Thermal Shell	$828	$0	6,172	3	0	0	Low	-	Med	-	0.13
		Insulation - Basement Wall - Above Code	$221	$0	1,646	0	0	0	Low	-	Low	-	0.72
		Insulation - Basement Wall - Code	$132	$0	841	0	740	0	Low	Low	Low	-	0.99
		Slab Insulation - Above Code	$1,921	$1,446	4,046	1	0	0	Low	-	Low	-	0.56
		Tune-up - Furnace (Electric)	$100	$0	25,376	0	0	0	Med	-	Low	-	0.49

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
HVAC	Single Package Air-Source Heat Pump > SEER 14	Heat Pump - Air Source CEE Tier 2	$2,700	$681	0	0	0	0	-	-	-	-	-
		Heat Pump - Air Source ENERGY STAR	$2,190	$170	0	0	0	0	-	-	-	-	-
		Heat Pump - Air Source ENERGY STAR 2016 Most Efficient	$3,381	$1,361	0	0	0	0	-	-	-	-	-
		Heat Pump - Air Source Enhanced	$4,062	$2,020	181,175	146	0	0	High	-	High	-	0.30
None	None	Heat Pump - Ground Source ENERGY STAR	$4,573	$2,020	54,070	44	0	0	Med	-	High	-	0.47
		Heat Pump - Ground Source ENERGY STAR 2016 Most Efficient	$6,240	$2,020	69,145	56	0	0	Med	-	High	-	0.36
		Quality Installation - Heat Pump	$512	$0	73,277	59	0	0	Med	-	High	-	0.79
		Tune-up - Heat Pump	$100	$0	36,215	29	12,147	10	Med	Med	High	Med	0.90
		Ductless Heat Pump (DHP)	$2,565	$599	5,135	0	0	0	Low	-	Low	-	0.75
		Ductless Heat Pump (DHP) - ENERGY STAR 2016 Most Efficient	$2,612	$599	5,848	0	0	0	Low	-	Low	-	0.77
		Home Audio System - ENERGY STAR	$1	$0	3,361	0	1,644	0	Low	Low	Low	Low	3.06
Lighting	High-Efficiency CFL Bulbs	Lighting Specialty Lamp - High Efficiency CFL	$3	$1	9,757	0	6,540	0	Low	Low	Low	Low	118.00
None	None	Lighting Specialty Lamp - Premium Efficiency LED	$6	$1	76,168	3	40,796	2	Med	Med	Med	Med	4.25
		Occupancy Sensor - Interior Lighting	$38	$0	9,336	0	0	0	Low	-	Low	-	0.05
		Photocell Daylighting Control - Interior/Exterior Lighting	$31	$0	8,963	0	0	0	Low	-	Low	-	0.08
		Time Clock - Exterior Lighting	$58	$0	8,314	0	0	0	Low	-	Low	-	0.05
Lighting	High-Efficiency CFL Bulbs	Lighting General Service Lamp - High Efficiency CFL	$3	$1	0	0	0	0	-	-	-	-	-
None	None	Lighting General Service Lamp - Premium Efficiency LED	$7	$3	168,613	7	189,007	8	High	High	Med	Med	999.00

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		Monitor - ENERGY STAR 2016 Most Efficient	$322	$231	28,813	3	0	0	Med	-	Med	-	0.04
		Office Multifunction Device - ENERGY STAR	$1	$0	37,350	4	18,253	2	Med	Med	Med	Med	31.60
		Smart Strip Plug Outlet	$54	$15	20,429	2	0	0	Low	-	Med	-	0.24
Appliances	ENERGY STAR Refrigerator ≥ 7.75 cubic feet	Refrigerator - CEE Tier 2	$699	$99	0	0	0	0	-	-	-	-	-
		Refrigerator - CEE Tier 3	$755	$600	122,188	15	0	0	High	-	High	-	0.19
		Refrigerator - ENERGY STAR	$657	$57	0	0	0	0	-	-	-	-	-
		Refrigerator - ENERGY STAR 2016 Most Efficient	$752	$152	0	0	0	0	-	-	-	-	-
Appliance Recycling	ENERGY STAR Refrigerator	Refrigerator - Removal of Secondary	$40	$0	77,953	9	50,689	6	Med	High	Med	Med	1.12
None	None	Set Top Box - ENERGY STAR	$7	$0	9,592	1	4,728	1	Low	Low	Med	Low	2.38
		TV - ENERGY STAR	$0	$0	0	0	213	0	-	Low	-	Low	-
		TV - ENERGY STAR 2016 Most Efficient	$43	$0	50,690	6	0	0	Med	-	Med	-	0.15
		Motor - ECM	$501	$423	26	0	0	0	Low	-	Low	-	0.00
		CO2 Heat Pump Water Heater	$6,792	$885	108,426	7	0	0	High	-	Med	-	0.05
Appliances	ENERGY STAR Clothes Washer	Clothes Washer (Front Loading) - CEE Tier 2	$1,013	$47	0	0	0	0	-	-	-	-	-
		Clothes Washer (Front Loading) - CEE Tier 3	$706	$668	24,148	2	0	0	Low	-	Med	-	0.91
		Clothes Washer (Front Loading) - ENERGY STAR	$994	$28	0	0	7,187	0	-	Low	-	Low	-
		Clothes Washer (Front Loading) - ENERGY STAR 2016 Most Efficient	$1,016	$50	0	0	0	0	-	-	-	-	-
		Clothes Washer (Top Loading) - CEE Tier 2	$949	$284	0	0	0	0	-	-	-	-	-

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		Clothes Washer (Top Loading) - CEE Tier 3	$984	$319	4,116	0	0	0	Low	-	Low	-	0.46
		Clothes Washer (Top Loading) - ENERGY STAR	$816	$151	0	0	0	0	-	-	-	-	-
		Clothes Washer (Top Loading) - ENERGY STAR 2016 Most Efficient	$289	$202	32,314	2	0	0	Med	-	Med	-	0.57
	ENERGY STAR Dishwasher	Dishwasher - ENERGY STAR	$289	$10	0	0	0	0	-	-	-	-	-
		Dishwasher - ENERGY STAR 2016 Most Efficient	$797	$261	5,467	0	0	0	Low	-	Low	-	0.03
None	None	Drain Water Heat Recovery	$936	$0	9,254	1	0	0	Low	-	Low	-	0.20
		Faucet Aerator Low Flow - Bathroom	$6	$6	22,543	2	20,599	1	Low	Med	Med	Med	118.02
		Faucet Aerator Low Flow - Kitchen	$6	$6	32,220	2	28,921	2	Med	Med	Med	Med	167.40
Water Heaters	ENERGY STAR Heat Pump Water Heater	Heat Pump Water Heater - ENERGY STAR	$1,175	$358	56,691	4	0	0	Med	-	Med	-	0.37
Audits	On-Site Home Energy Analysis (Tier 1)	Low-Flow Showerhead	$68	$44	108,039	7	89,167	6	High	High	Med	Med	5.87
None	None	Low-Flow Showerhead - Federal Standard 1994	$44	$0	5,272	0	3,820	0	Low	Low	Low	Low	1.60
		Pipe Insulation - Water Heater	$10	$0	1,490	0	1,026	0	Low	Low	Low	Low	1.18
		Solar Water Heater - ENERGY STAR	$6,416	$618	43,539	3	0	0	Med	-	Med	-	0.04
Water Heaters	ENERGY STAR Heat Pump Water Heater	Heat Pump Water Heater - Enhanced Efficiency	$1,263	$334	59,841	4	0	0	Med	-	Med	-	0.36
None	None	Pool Pump - 2 Speed	$235	$235	0	0	29,800	3	-	Med	-	Med	-
		Pool Pump - VSD	$549	$0	101,716	10	0	0	High	-	High	-	0.72
		Pool Pump Timer	$82	$0	1,183	0	1,054	0	Low	Low	Low	Low	3.43

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Table 16. Commercial Measure Gap Analysis

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
None	None	Active Chilled Beam Cooling with DOAS	$166,508	-$8,764	135	0	18	0	Low	Low	Low	Low	187.91
HVAC	Rooftop/Unitary Heat Pump	Air Source Heat Pump > 240 kBtuh - Federal Standard 2018	$3	$3	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump > 240 kBtuh - Federal Standard 2023	$5	$5	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump > 240 kBtuh - Premium Efficiency	$11	$11	12,321	7	0	0	Med	-	Med	-	0.07
		Air Source Heat Pump 135 to 240 kBtuh - Federal Standard 2018	$4	$4	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump 135 to 240 kBtuh - Federal Standard 2023	$6	$6	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump 135 to 240 kBtuh - Premium Efficiency	$12	$12	2,832	2	0	0	Low	-	Med	-	0.03
		Air Source Heat Pump 65 to 135 kBtuh - Federal Standard 2018	$5	$5	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump 65 to 135 kBtuh - Federal Standard 2023	$7	$7	0	0	0	0	-	-	-	-	-
		Air Source Heat Pump 65 to 135 kBtuh - Premium Efficiency	$12	$12	13,090	7	0	0	Med	-	Med	-	0.02
None	None	Anti-Sweat (Humidistat) Controls	$42	$42	17,915	3	13,276	2	Med	Med	Med	Med	1.11
		Automated Exhaust VFD Control - Parking Garage CO sensor	$853	$853	3,065	1	980	0	Low	Low	Low	Low	0.89
		Automated Ventilation VFD Control (Occupancy Sensors / CO2 Sensors)	$18,912	$18,912	13,605	7	0	0	Med	-	Med	-	0.51
		Bi-Level Control, Stairwell Lighting	$120	$120	2,600	0	0	0	Low	-	Low	-	0.24
		Building Strategy Optimization	$44	$44	3,221	1	0	0	Low	-	Med	-	0.75
		Case Replacement Low Temp	$55	$55	25,187	3	18,638	2	Med	Med	Med	Med	4.76

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CADMUS

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		Case Replacement Med Temp	$106	$106	2,148	0	0	0	Low	-	Low	-	0.21
Chillers	Other Chiller	Chilled Water / Condenser Water Settings-Optimization	$12,886	$12,886	15	0	0	0	Low	-	Low	-	0.02
		Chilled Water Piping Loop with VSD Control	$59,494	$59,494	1,114	1	0	0	Low	-	Low	-	0.04
	Chilled Water Reset	Chilled Water Reset	$51,543	$51,543	745	0	0	0	Low	-	Low	-	0.02
	Other Chiller	Chilled Water Side Economizer	$394,071	$394,071	261	0	0	0	Low	-	Low	-	0.00
		Chiller - Pipe Insulation - Above Code	$20	$6	365	0	0	0	Low	-	Low	-	0.15
		Chiller - Pipe Insulation - Code	$14	$14	659	0	0	0	Low	-	Low	-	0.16
	Chiller, 0-150 tons	Chillers < 150 tons (screw) - Advanced Efficiency	$4	$4	1,359	1	0	0	Low	-	Low	-	0.10
		Chillers < 150 tons (screw) - High Efficiency	$3	$3	0	0	0	0	-	-	-	-	-
		Chillers < 150 tons (screw) - Premium Efficiency	$3	$3	0	0	0	0	-	-	-	-	-
	Chiller, 300+ tons	Chillers > 300 tons (centrifugal) - High Efficiency	$2	$2	0	0	0	0	-	-	-	-	-
		Chillers > 300 tons (centrifugal) - Premium Efficiency	$2	$2	0	0	0	0	-	-	-	-	-
		Chillers > 300 tons (centrifugal) with VSD - Advanced Efficiency	$2	$2	1,090	1	0	0	Low	-	Low	-	0.45
	Chiller, 150-300 tons	Chillers 150-300 tons (screw) - Advanced Efficiency	$3	$3	1,590	1	0	0	Low	-	Low	-	0.47
		Chillers 150-300 tons (screw) - High Efficiency	$2	$2	0	0	0	0	-	-	-	-	-
		Chillers 150-300 tons (screw) - Premium Efficiency	$2	$2	0	0	0	0	-	-	-	-	-

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
None	None	Clothes Washer (Front Loading) - CEE Tier 3	$1,022	$56	12	0	0	0	Low	-	Low	-	0.91
		Clothes Washer (Front Loading) - ENERGY STAR	$994	$28	0	0	7	0	-	Low	-	Low	-
		Clothes Washer (Top Loading) - ENERGY STAR	$816	$151	0	0	0	0	-	-	-	-	-
		Clothes Washer (Top Loading) - ENERGY STAR 2016 Most Efficient	$952	$287	21	0	0	0	Low	-	Low	-	0.51
		Clothes Washer Commercial	$200	$200	142	0	0	0	Low	-	Low	-	0.23
		Combination Oven	$789	$789	1,659	0	1,075	0	Low	Low	Low	Low	1.82
		Commercial Refrigerator - Semivertical - No Doors - Med Temp	$141	$141	29,976	4	0	0	Med	-	Med	-	0.23
		Commercial Refrigerator - Vertical - No Doors - Med Temp	$191	$191	40,698	5	0	0	Med	-	Med	-	0.23
		Commissioning	$2,366	$2,366	218	0	0	0	Low	-	Low	-	0.36
		Computer - ENERGY STAR	$0	$0	1,334	0	0	0	Low	-	Low	-	0.00
		Continuous Commissioning	$8,764	$8,764	6,343	3	0	0	Low	-	Med	-	0.16
		Convection Oven	$860	$860	536	0	0	0	Low	-	Low	-	0.41
		Convert Constant Volume Air System to VAV	$275,841	$275,841	30,180	9	0	0	Med	-	Med	-	0.10
		Cooking Hood Controls	$6,250	$6,250	1,809	0	0	0	Low	-	Low	-	0.10
		Cool Roofs	$26,729	$5,959	41,268	21	0	0	Med	-	High	-	0.38
		Cooling Tower-Two-Speed Fan Motor	$58	$2	64	0	0	0	Low	-	Low	-	0.17
		Cooling Tower-VSD Fan Control	$18,823	$3,161	1,248	1	0	0	Low	-	Low	-	0.55
		Copiers - ENERGY STAR	$0	$0	458	0	0	0	Low	-	Low	-	0.00
		Cycling Dryers	$461	$461	1	0	1	0	Low	Low	Low	Low	2.21

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CADMUS

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
Lighting	Other Lighting	Daylighting Controls, Outdoors (Photocell)	$664	$664	70,168	1	51,631	1	High	High	Low	Low	2.85
None	None	Demand Control Defrost - Hot Gas	$1,100	$1,100	6,881	1	0	0	Low	-	Low	-	0.14
		Demand Controlled Circulating Systems	$1,400	$1,400	1,451	0	0	0	Low	-	Low	-	0.16
Lighting	Other Lighting	Dimming-Continuous, Fluorescent Fixtures	$75,650	$75,650	0	0	0	0	-	-	-	-	-
		Dimming-Stepped, Fluorescent Fixtures	$56,737	$56,737	44,506	8	4,742	1	Med	Low	Med	Low	0.60
None	None	Direct / Indirect Evaporative Cooling, Pre-Cooling	$7,111	$7,111	28,229	15	21,829	12	Med	High	High	High	1.52
		Direct Digital Control System-Installation	$23,641	$23,641	26,722	13	0	0	Med	-	High	-	0.29
		Direct Digital Control System-Optimization	$36,879	$13,239	8,879	4	2,981	2	Low	Low	Med	Med	0.87
		Dishwasher - ENERGY STAR 2016 Most Efficient (Residential Sized)	$850	$571	281	0	0	0	Low	-	Low	-	0.03
		Dishwashing - Commercial - Low Temp	$36	$36	3,434	1	5,630	1	Low	Low	Low	Low	92.66
		Display Case Electronically Commutated Motor - Low Temp	$200	$200	8,747	1	0	0	Low	-	Med	-	0.45
		Display Case Electronically Commutated Motor - Medium Temp	$200	$200	8,933	1	0	0	Low	-	Med	-	0.37
		Display Case LEDs (Closed Cases)	$22	$22	8,650	1	0	0	Low	-	Med	-	0.55
		Display Case LEDs (Open Cases)	$45	$45	5,982	1	0	0	Low	-	Low	-	0.22
		Display Case Motion Sensors	$3	$3	1,694	0	0	0	Low	-	Low	-	0.67
		Domestic Hot Water Pipe Insulation - Code	$3	$3	191	0	280	0	Low	Low	Low	Low	11.99

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		Drainwater Heat Recovery Water Heater	$1,555	$1,555	420	0	62	0	Low	Low	Low	Low	0.46
		Duct Repair and Sealing	$2,103	$2,103	4,120	2	0	0	Low	-	Med	-	0.28
HVAC	Other HVAC	Ductless Air Conditioner (DAC)	$1,140	$936	17	0	0	0	Low	-	Low	-	0.03
		Ductless Heat Pump (DHP)	$2,565	$1,965	0	0	0	0	-	-	-	-	-
		Ductless Heat Pump (DHP) - ENERGY STAR 2016 Most Efficient	$2,612	$2,012	121	0	0	0	Low	-	Low	-	0.27
	Rooftop/Unitary Air Conditioner	DX Package 135 to 240 kBtuh - Federal Standard 2018	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 135 to 240 kBtuh - Federal Standard 2023	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 135 to 240 kBtuh - Premium Efficiency	$4	$4	10,325	6	0	0	Med	-	Med	-	0.14
		DX Package 240 to 760 kBtuh - Federal Standard 2018	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 240 to 760 kBtuh - Federal Standard 2023	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 240 to 760 kBtuh - Premium Efficiency	$3	$3	52,970	29	514	0	High	Low	High	Low	0.67
		DX Package 65 to 135 kBtuh - Federal Standard 2018	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 65 to 135 kBtuh - Federal Standard 2023	$3	$3	0	0	0	0	-	-	-	-	-
		DX Package 65 to 135 kBtuh - Premium Efficiency	$4	$4	26,460	13	0	0	Med	-	High	-	0.12
		DX Package-Air Side Economizer	$40,347	$40,347	2,273	1	0	0	Low	-	Med	-	0.17
None	None	ENERGY STAR - Scanners	$0	$0	240	0	0	0	Low	-	Low	-	0.00
		ENERGY STAR - Water Cooler	$191	$1	5,550	1	4,109	1	Low	Low	Low	Low	22.38
		Engineered Nozzles	$15	$15	0	0	0	0	Low	Low	Low	Low	15.87

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
HVAC	Other HVAC	Evaporative Cooler Replaces DX Package 135 to 240 kBtuh - Advanced Efficiency	$2	$2	3,387	2	2,876	2	Low	Low	Med	Med	999.00
		Evaporative Cooler Replaces DX Package 240 to 760 kBtuh - Advanced Efficiency	$2	$2	16,545	9	14,151	8	Med	Med	Med	Med	999.00
		Evaporative Cooler Replaces DX Package 65 to 135 kBtuh - Advanced Efficiency	$2	$2	8,619	4	7,105	4	Low	Low	Med	Med	999.00
None	None	Evaporator Fan Controller - Low Temp	$147	$147	1,371	0	0	0	Low	-	Low	-	0.36
		Evaporator Fan Controller - Medium Temp	$224	$224	2,138	0	0	0	Low	-	Low	-	0.30
HVAC	Other HVAC	Exhaust Air to Ventilation Air Heat Recovery	$17,118	$17,118	3,551	1	0	0	Low	-	Med	-	0.04
None	None	Exhaust Hood Makeup Air	$24	$24	3,210	1	1,621	1	Low	Low	Med	Low	7.84
		Exit Sign - LED	$49	$49	12,272	2	0	0	Med	-	Med	-	0.56
		Exit Sign - Photoluminescent or Tritium	$42	-$7	23,480	4	17,489	3	Med	Med	Med	Med	999.00
		Fax - ENERGY STAR	$0	$0	31	0	0	0	Low	-	Low	-	0.00
		Floating Condenser Head Pressure Controls	$0.48	$0.479	8,984	1	437	0	Low	Low	Med	Low	0.84
		Freezer (Residential) - ENERGY STAR	$0	$0	269	0	0	0	Low	-	Low	-	0.00
		Fryers	$688	$688	449	0	0	0	Low	-	Low	-	0.40
		Glass Door ENERGY STAR Refrigerators/Freezers	$174	$174	2,852	0	2,113	0	Low	Low	Low	Low	1.18
		Green Roof	$306,725	$131,454	4,141	2	0	0	Low	-	Med	-	0.00
		Griddle	$0.01	$0.010	476	0	395	0	Low	Low	Low	Low	43160.63

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Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
HVAC	Ground Source Heat Pump	Ground Source Heat Pump Replacing Air Source Heat Pump > 240 kBtuh - Advanced Efficiency	$23	$23	633	0	0	0	Low	-	Low	-	0.04
		Ground Source Heat Pump Replacing Air Source Heat Pump 135 to 240 kBtuh - Advanced Efficiency	$23	$23	122	0	0	0	Low	-	Low	-	0.02
		Ground Source Heat Pump Replacing Air Source Heat Pump 65 to 135 kBtuh - Advanced Efficiency	$27	$27	492	0	0	0	Low	-	Low	-	0.01
None	None	Hot Food Holding Cabinet	$517	$517	977	0	0	0	Low	-	Low	-	0.76
		Hotel Key Card Room Energy Control System	$13,072	$13,072	18,876	7	0	0	Med	-	Med	-	0.16
		Ice Maker - ENERGY STAR	$0	$0	9,133	1	0	0	Low	-	Med	-	0.00
		Infiltration Reduction	$267	$267	3,529	1	1,724	1	Low	Low	Med	Low	3.90
		Insulation - Ceiling - Above Code	$9,202	$3,243	641	0	0	0	Low	-	Low	-	0.09
		Insulation - Ceiling - Code	$5,959	$5,959	8,987	2	0	0	Low	-	Med	-	0.22
		Insulation - Duct - Above Code	$571	$60	3,307	2	2,114	1	Low	Low	Med	Med	5.19
		Insulation - Duct - Code	$511	$511	6,339	3	3,422	2	Low	Low	Med	Med	4.70
		Insulation - Floor (non-slab) - Above Code	$10,779	$2,541	791	0	0	0	Low	-	Low	-	0.09
		Insulation - Floor (non-slab) - Code	$8,238	$8,238	5,140	1	0	0	Low	-	Low	-	0.24
		Insulation - Wall - Above Code	$8,065	$1,142	1,063	0	0	0	Low	-	Low	-	0.18
		Insulation - Wall - Code	$6,923	$6,923	1,993	0	0	0	Low	-	Low	-	0.24
Lighting	LED Lights	LED Exterior Wall Pack	$286	$286	260,820	3	0	0	High	-	Med	-	0.53
	Metal Halide	Lighting Interior - Efficient Metal Halide - Above Standard	$1	$1	0	0	32,134	6	-	High	-	Med	-

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
	HP T8	Lighting Interior - Fluorescent - 2018 Federal Standard	$2	$2	0	0	0	0	-	-	-	-	-
	T5 with Electronic Ballast	Lighting Interior - Fluorescent T5 - Above Standard	$3	$3	0	0	0	0	-	-	-	-	-
	T8	Lighting Interior - Fluorescent T8 - Above Standard	$2	$2	0	0	0	0	-	-	-	-	-
	HP T8	Lighting Interior - Fluorescent T8 High Performance - Above Standard	$2	$2	0	0	0	0	-	-	-	-	-
	RW T8	Lighting Interior - Fluorescent T8 Reduced Wattage - Above Standard	$3	$3	0	0	0	0	-	-	-	-	-
	T5 with Electronic Ballast	Lighting Interior - High Bay Fluorescent High Output - Above Standard	$1	$1	35,367	6	0	0	Med	-	Med	-	0.38
	LED Lights	Lighting Interior - High Bay LED - Above Standard	$1	$1	109,118	19	0	0	High	-	High	-	0.37
	CFL	Lighting Interior - Screw Base CFL - Above Standard	$0.02	$0.018	0	0	0	0	-	-	-	-	-
		Lighting Interior - Screw Base Incandescent - Backstop EISA 2020 Standard	$0.01	$0.015	0	0	0	0	-	-	-	-	-
	LED Lights	Lighting Interior - Screw Base LED - Above Standard	$0.06	$0.059	43,728	7	33,096	5	Med	High	Med	Med	999.00
		Lighting Interior - TLED - Above Standard	$2	$2	900,442	152	30,614	4	High	High	High	Med	0.56
	Other Lighting	Lighting Package - Advanced Efficiency	$0.40	$0.399	37,646	6	16,031	2	Med	Med	Med	Med	2.28
		Lighting Package - High Efficiency	$0.25	$0.251	0	0	0	0	-	-	-	-	-

Exhibit GSL-2

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		Lighting Package - Premium Efficiency	$0.32	$0.319	0	0	0	0	-	-	-	-	-
None	None	Low-Flow Faucet Aerators	$2	$0.100	883	0	1,401	0	Low	Low	Low	Low	493.08
		Low-Flow Pre-Rinse Spray Valves	$54	$5	248	0	417	0	Low	Low	Low	Low	6.86
		Low-Flow Showerheads	$45	$13	191	0	19	0	Low	Low	Low	Low	0.42
		Mist Eliminators	$3,397	$3,397	1	0	0	0	Low	-	Low	-	0.20
		Monitor - ENERGY STAR 2016 Most Efficient	$0.16	$0.157	8,637	1	0	0	Low	-	Med	-	0.03
Motor/Pump/VFD	Motors	Motor - CEE Premium-Efficiency Plus	$2	$2	13,618	3	8,334	2	Med	Low	Med	Med	60.84
HVAC	Other HVAC	Motor - Pump & Fan System - Variable Speed Control	$492	$492	76,486	16	43,268	9	High	High	High	Med	3.59
		Motor - VAV Box High Efficiency (ECM)	$21,303	$21,303	10,020	2	0	0	Med	-	Med	-	0.11
None	None	Motor Rewind	$5	$5	42	0	0	0	Low	-	Low	-	0.49
		Natural Ventilation	$8,764	$8,764	45	0	0	0	Low	-	Low	-	0.09
		Network PC Power Management	$15	$15	17,813	2	9,840	1	Med	Low	Med	Med	1.37
		Night Covers for Display Cases	$38	$38	96,068	12	0	0	High	-	High	-	0.56
		No Air Loss Drain	$448	$448	1	0	1	0	Low	Low	Low	Low	2.17
Lighting	Other Lighting	Occupancy Sensor Control	$0.0002	$0.0002	208,288	27	212,020	30	High	High	High	High	2773471.36
None	None	Optimized Variable Volume Lab Hood Design	$3,560	$3,560	8,704	2	0	0	Low	-	Med	-	0.51
Lighting	Other Lighting	Parking - Covered Lighting	$0.07	$0.068	13,121	0	0	0	Med	-	Low	-	0.26
		Parking - Surface Lighting	$0.03	$0.026	3,128	0	0	0	Low	-	Low	-	0.61
None	None	Pool Pump - Two Speed	$0.08	$0.079	3,328	0	1,515	0	Low	Low	Low	Low	4.47
		Pool Pump - VSD	$0.12	$0.119	10,099	1	4,596	1	Med	Low	Med	Low	3.81
		Pool Pump Timers	$150	$150	3,810	1	2,777	0	Low	Low	Low	Low	10.28
		Printers - ENERGY STAR	$0	$0	215	0	0	0	Low	-	Low	-	0.00

Exhibit GSL-2

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
HVAC	PTAC	PTAC (10,000 Btuh) - High Efficiency	$6	$6	11,470	5	281	0	Med	Low	Med	Low	0.80
		PTHP (10,000 Btuh) - High Efficiency	$7	$7	8,251	4	159	0	Low	Low	Med	Low	0.73
None	None	Re-Commissioning	$2,366	$2,366	67,838	32	0	0	High	-	High	-	0.46
		Refrigeration Commissioning or Re-commissioning	$96	$96	72,499	10	4,297	1	High	Low	High	Low	1.12
		Refrigerator (Residential) - ENERGY STAR 2016 Most Efficient	$0.01	$0.012	7,477	1	876	0	Low	Low	Med	Low	0.73
		Residential Freezer Recycling	$124	$124	445	0	407	0	Low	Low	Low	Low	2.58
		Residential Refrigerator Recycling	$124	$124	3,463	1	3,197	1	Low	Low	Low	Low	3.23
AC Units	Residential	Room AC - ENERGY STAR	$1	$1	297	0	0	0	Low	-	Low	-	0.01
None	None	Server - ENERGY STAR	$1	$1	3,254	0	0	0	Low	-	Low	-	0.02
		Server Virtualization	$2,000	$2,000	978	0	0	0	Low	-	Low	-	0.86
		Smart Strip Plug Outlet	$32	$17	8,780	1	0	0	Low	-	Med	-	0.09
		Solid Door ENERGY STAR Refrigerators/Freezers	$174	$174	4,691	1	0	0	Low	-	Low	-	0.97
Lighting	Other Lighting	Solid State LED White Lighting	$37	$37	7,822	0	5,793	0	Low	Low	Low	Low	1.09
None	None	Steam Cooker	$630	$630	3,712	1	3,077	1	Low	Low	Low	Low	3.58
		Strip Curtains for Walk-Ins	$508	$508	1,089	0	0	0	Low	-	Low	-	0.03
		Time Clock	$103	$103	6,841	1	6,874	1	Low	Low	Low	Med	10.34
Chillers	Other Chiller	Tune-up - Chiller Maintenance	$12,104	$12,104	410	0	0	0	Low	-	Low	-	0.17
HVAC	Rooftop/Unitary AC	Tune-up - DX Maintenance	$90,780	$90,780	10,526	6	0	0	Med	-	Med	-	0.10
	Rooftop/Unitary HP	Tune-up - Heat Pump Maintenance	$9,263	$9,263	4,026	2	0	0	Low	-	Med	-	0.13
None	None	Ultrasonic Faucet Control	$185	$185	606	0	0	0	Low	-	Low	-	0.37
		Vending Machines - Federal Standard 2020	$0	$0	1,748	0	0	0	Low	-	Low	-	0.00

Exhibit GSL-2

Measure Group	Measures	Measure Name from Potential Study	Full Measure Cost	Incremental Cost	Technical Potential		Achievable Potential		Potential Rank				Technical Weighted BCR
					MWh	MW	MWh	MW	Technical (Energy)	Achievable (Energy)	Technical (Demand)	Achievable (Demand)	
		VFD Air Compressor Upgrade	$10,338	$10,338	1	0	0	0	Low	-	Low	-	0.17
		Walk-In Electronically Commutated Motor	$180	$180	14,826	2	10,969	1	Med	Med	Med	Med	1.09
		Water Cooled Refrigeration with Heat Recovery	$151	$151	503	0	312	0	Low	Low	Low	Low	0.70
		Water Heater GT 55 Gal - CO2 Heat Pump	$0	$0	6,917	1	0	0	Low	-	Med	-	0.00
		Water Heater LE 55 Gal - CO2 Heat Pump	$0	$0	35,533	6	0	0	Med	-	Med	-	0.00
		Water Heater LE 55 Gal - Heat Pump - Enhanced Efficiency	$0	$0	15,900	3	0	0	Med	-	Med	-	0.00
		Window Film	$6	$6	5,349	3	0	0	Low	-	Med	-	0.40
		Windows - Above Code	$18,752	$878	18,860	9	7,988	4	Med	Low	Med	Med	1.16
		Windows - Code	$17,874	$17,874	3,312	2	0	0	Low	-	Med	-	0.07

EE Residential and Commercial Potential Study

Exhibit GSL-3

Exhibit GSL-3

Demand-Side Management Potential Study 2019-2038

March 2017

Louisville Gas and Electric Company and Kentucky Utilities Company
220 West Main Street
Louisville, Kentucky 40202

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Exhibit GSL-3

CADMUS

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Exhibit GSL-3

List of Acronyms

ACS: American Community Survey

B/C: Benefit-to-cost

CBECS: Commercial Building Energy Consumption Survey (Energy Information Agency)

CIS: Customer information system

EIA: Energy Information Agency

EUC: End-use consumption

EUL: Effective useful life

EUI: End-use intensities

GWh: Gigawatt hours

MECS: Manufacturing Energy Consumption Survey (Energy Information Agency)

MW: Megawatt

MWh: Megawatt hour

NAICS: North American Industrial Classification System

KU: Kentucky Utilities Company

LG&E: Louisville Gas and Electric Company

kWh: Kilowatt hour

RASS: Residential Appliance Saturation Survey

RECS: Residential Energy Consumption Survey (Energy Information Agency)

SIC: Standard industrial classification

TRC: Total resource cost test

UEC: Unit energy consumption, also referred to as end-use consumption

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Executive Summary

Overview

Cadmus conducted an independent study of the long-run technical, economic, and achievable potential of electric and natural gas energy efficiency for the residential and commercial sectors in the service territories of Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU), hereafter referred to as the Company, from 2019 to 2038. The Company commissioned this study to inform the development of the 2019 and forward energy efficiency program portfolio and its next integrated resource plan. Although Cadmus focused this study primarily on electric efficiency, we also conducted a preliminary study of natural gas efficiency potential as an update to the analysis we performed for the Company's 2013 energy efficiency potential study.

Cadmus relied on secondary and primary data to conduct the analysis, which comprised the Company's most recent official load forecasts, long-term avoided costs (including annual energy and capacity values), system loss factors, and discount rate. Because the Company had already vetted these data, we did not validate them and used the data as provided. For critical technical and market information specific to the Company's service territory, we used phone surveys of LG&E and KU residential and commercial customers, along with the on-site audits of commercial customers conducted for the 2013 LG&E and KU potential study. We updated the market data collected for the 2013 potential study to account for the following information:

- The Company's demand-side management (DSM) program accomplishments from 2013 through 2016
- The impact of recently adopted building energy codes and federal equipment standards
- The natural adoption of efficient technology since 2013
- New energy efficiency measures, changes in measure costs, and up-to-date estimates of measure savings

Cadmus supplemented primary data with information from secondary sources.[1] Together, these data provided the foundation for estimating technical, economic, and achievable potential, defined as follows:

- ***Technical potential*** represents all technically feasible, energy efficiency measures being implemented, regardless of their costs or market barriers.
- ***Economic potential*** represents a subset of technical potential, consisting only of measures meeting cost-effectiveness criteria based on the Company's avoided supply costs for delivering

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[1] Note that secondary sources are different from secondary data. Secondary sources provide information that was not directly gathered or compiled by Cadmus, but which we consider accurate. Examples of secondary sources are the U.S. Census Bureau and U.S. Energy Information Administration websites, where we obtained supplemental technical and market data.

electricity and natural gas and for avoided line losses. Cadmus determined the economic potential using a total resource cost (TRC) test, in which we compared the net benefits of energy efficiency measures with their costs.[2]

- ***Achievable potential*** represents the portion of economic potential assumed to be reasonably achievable in the course of the planning horizon, given budgetary constraints and market barriers that may impede customers' participation in utility programs. In this study, Cadmus examined survey results to assess consumers' willingness to adopt energy efficiency measures at three levels, depending on the fraction of the measure's incremental cost (0%, 50%, and 75%) covered by the Company's incentives.

To estimate technical potential, Cadmus used the industry-standard, bottom-up approach. This approach is consistent with energy efficiency studies by Cadmus and other consultants in various jurisdictions throughout the United States. We began with a comprehensive review of electric and natural gas energy efficiency measures applicable to each of the Company's sector and market segments. Using technical measure data and market characteristics, we determined the likely long-term saturations of each measure in specific sectors and market segments. This assessment resulted in a technical potential supply curve at the measure level, which we then screened for cost-effectiveness to determine the economic potential. With this study, we also established the achievable levels of energy efficiency potential by assessing customers' willingness to pay for energy efficiency measures, also derived from survey results.

This study does not include consideration of program potential, which is the portion of achievable potential that the Company may realize through DSM programs, and which accounts for the Company's spending on energy efficiency programs and for any program implementation barriers. Program potential also can provide the basis for the Company's DSM savings goals. Although estimates of achievable potential can inform the development of Company DSM programs, estimates of potential program savings must be produced outside the scope of this study.

Summary of Results

For this study, Cadmus quantified the amount of energy and demand the Company can save in its service territory from 2019 to 2038. The Company can achieve these savings by adopting proven, commercially available energy-efficient technologies while also accounting for the following factors:

- Changes in codes and standards (taking effect from 2019 to 2038)
- Technical feasibility and limitations (technical potential)

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[2] For a description of the method for calculating TRC, see: California Public Utilities Commission. *California Standard Practice Manual: Economic Analysis of Demand-Side Management Programs*. October 2001. Available online: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf

- Cost-effectiveness (economic potential), using the TRC benefit/cost test
- Consumers' willingness to adopt energy efficiency measures (achievable potential)

Electric Energy Efficiency Potential

Summary of Key Findings

Cadmus identified the following key findings from our analysis of electric energy efficiency potential:

- ***New technologies contributed to higher technical and economic potential.*** Technical potential increased significantly because of new high-efficiency technologies for lighting, HVAC, dryers, and water heaters; however, most of these technologies are not cost-effective. LED lighting in the residential sector is now cost-effective and has significant savings potential. It is the highest-saving residential measure and accounts for nearly one-third of all achievable potential in the sector. Some measures that were considered in this study, but not in the 2013 assessment, which have high economic potential are energy feedback (i.e., home energy reports), 1.5 gallons per minute (gpm) showerheads, and LED linear fluorescent lighting (TLED) in the commercial sector.
- ***Naturally occurring conservation and DSM program accomplishments reduced economic potential.*** The Company's existing DSM programs, combined with the natural adoption of efficiency measures, has led to an increase in the saturation of cost-effective DSM measures over the last three years. This led to decreased estimates of technical, economic, and achievable energy efficiency potential. New federal equipment standards for water heaters, lighting, HVAC, and various appliances further reduced energy efficiency potential.
- ***Lower avoided costs reduced economic potential.*** Declines in the Company's avoided energy and capacity costs reduced the overall benefit for energy efficiency. This, in turn, decreased estimates of economic potential.

Detailed Results

The study results indicate a cumulative 7,072 gigawatt hours (GWh) of technically feasible, electric energy efficiency potential by 2038, the end of the 20-year study horizon, with approximately 1,988 GWh (28%) of these savings proving cost-effective (Table 1). The estimated amount of economic potential is equivalent to 9% of the Company's 2038 sales forecast.

Calculating economic potential is the first step in determining the amount of energy efficiency potential the Company should expect from its programmatic efforts. However, it does not represent the total amount the Company can expect to achieve because of well-documented market barriers, which is detailed in the Achievable Potential section.

Table 1. Technical and Economic Electric Energy Efficiency Potential – Energy (GWh)

Sector	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Residential	11,453	4,143	1,093	36%	10%	26%
Commercial	10,200	2,930	895	29%	9%	31%
Total	**21,652**	**7,072**	**1,988**	**33%**	**9%**	**28%**

Table 2 shows the technical and economic peak demand reduction potential. The 20-year cumulative technical potential is 2,069 MW and the 20-year cumulative economic potential is 303 MW, which is equivalent to 35% and 5% of baseline peak demand, respectively.

Table 2. Technical and Economic Electric Energy Efficiency Potential – Demand (MW)

Sector	Baseline Peak	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Residential	3,843	1,495	138	39%	4%	9%
Commercial	2,069	574	166	28%	8%	29%
Total	**5,912**	**2,069**	**303**	**35%**	**5%**	**15%**

Cadmus used the same approach to estimate achievable potential in this study as we used in the 2013 assessment. Because of uncertainties inherent in future markets for energy efficiency products and services (described in the Achievable Potential section), we did not attempt to develop a point estimate of achievable potential in this study. Rather, we developed a *range* of estimates, based on the fraction of economic potential we expect to be achievable, given customers' willingness to adopt energy efficiency measures.

We used primary data collected for the 2013 potential study, in which we had asked customers about their willingness to invest in energy efficiency if the Company subsidized the investment by paying 0%, 50%, or 75% of the energy efficiency measure's incremental cost. (Note that none of these incentive levels were related to the Company's avoided cost of energy or capacity.) We had designed the 2013 survey to learn which incentive levels would motivate customers to install energy efficiency measures.

Table 3 and Table 4 show the low, medium, and high levels of cumulative, electric energy efficiency potential the Company can expect to be achievable over the course of this study's 20-year horizon, for energy and demand, respectively.

Table 3. Achievable Electric Energy Efficiency Potential – Energy (GWh)

Sector	Baseline Sales	Cumulative 2038			Percentage of Baseline		
		Low	Medium	High	Low	Medium	High
Residential	11,453	477	635	710	4%	6%	6%
Commercial	10,200	387	620	689	4%	6%	7%
Total	**21,652**	**864**	**1,255**	**1,400**	**4.0%**	**5.8%**	**6.5%**

Exhibit GSL-3

Table 4. Achievable Electric Energy Efficiency Potential – Demand (MW)

Sector	Baseline Sales	Cumulative 2038			Percentage of Baseline		
		Low	Medium	High	Low	Medium	High
Residential	3,843	51	74	83	1%	2%	2%
Commercial	2,069	69	112	125	3%	5%	6%
Total	**5,912**	**120**	**186**	**207**	**2.0%**	**3.1%**	**3.5%**

Results indicate a range of 864 GWh to 1,400 GWh of achievable electricity savings for energy, representing 4.0% and 6.5% of retail sales in 2038, respectively. These estimated savings have a medium value of 1,255 GWh, which represents 5.8% of the baseline sales. The achievable demand reduction indicates a range of 120 MW to 207 MW, representing 2.0% and 3.5% of baseline summer peak demand.

Figure 1 shows incremental achievable potential for the medium scenario in each year of the study horizon if the Company were to acquire discretionary (retrofit) savings evenly over the first 10 years of the study horizon. After 2028, incremental savings comes from lost opportunity (equipment replacement and new construction) measures.

Figure 1. Incremental Achievable Potential for Medium Achievable Scenario – 10-Year Retrofit Ramp

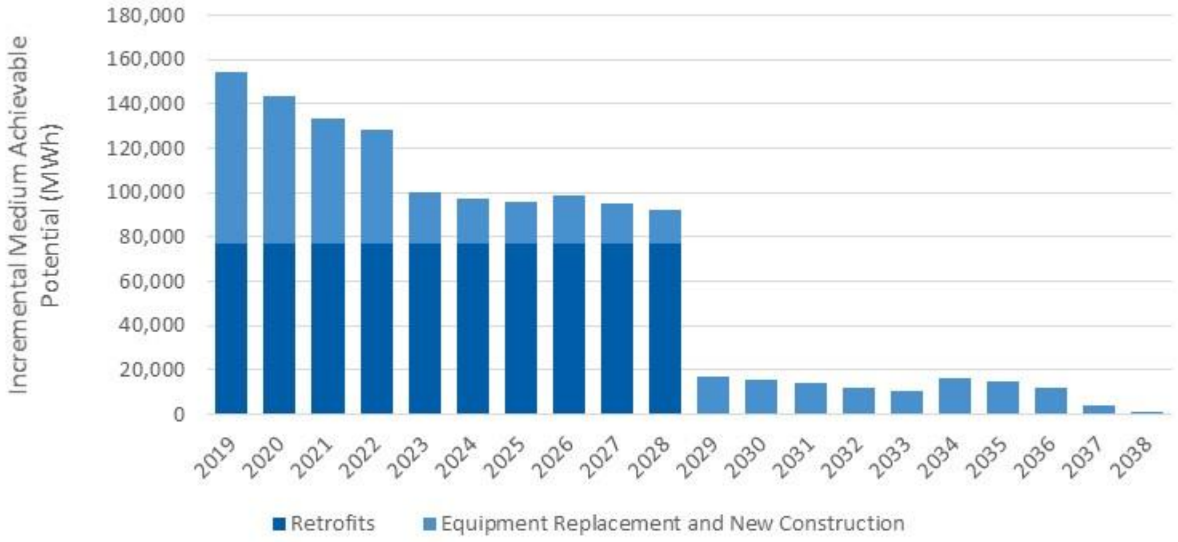
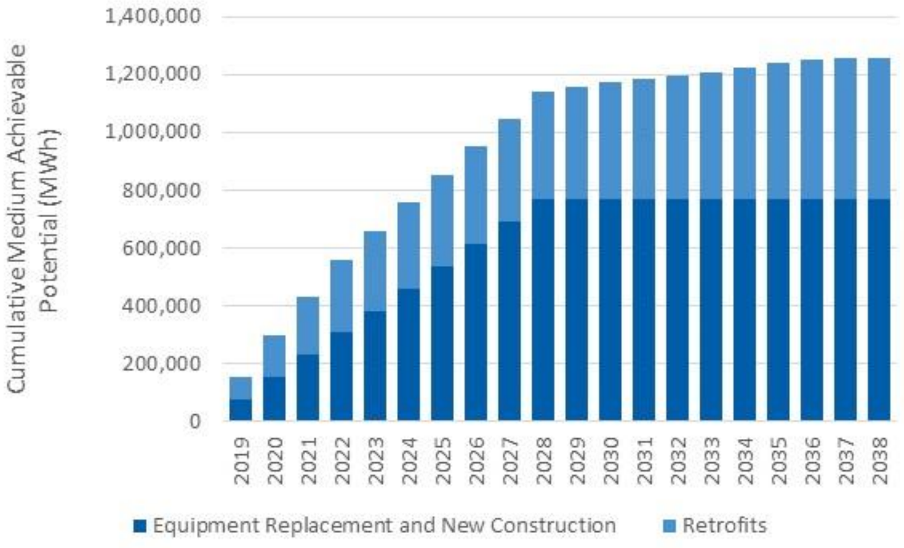


Figure 2 shows cumulative achievable potential for the medium scenario.

Figure 2. Cumulative Achievable Potential for Medium Achievable Scenario



Top-Saving Measures

Table 5 and Table 6 show the residential and commercial measures with the highest achievable potential, respectively. All measures passed the TRC benefit/cost test, and many are already provided through the Company's existing energy efficiency programs. In the residential sector, LED lighting for medium screw-base sockets accounts for 33% of the sector's achievable potential. Overall, standard and specialty LED bulbs account for 39% of the residential sector's achievable potential, which equals nearly 210,000 MWh of cumulative energy savings by 2038. Low-flow showerheads (those rated at 1.5 gpm) also have high achievable potential at a relatively low cost by offering significant efficiency gains over 2.2 gpm units that merely comply with federal standards.

Table 5. Top Residential Measures

Measure Name	Cumulative 2038 Achievable Potential (Medium) - MWh	Percentage of Total Achievable Potential
Lighting General Service Lamp - Premium Efficiency LED	176,728	33%
Low-Flow Showerhead	72,548	13%
Home Energy Reports	67,537	12%
Refrigerator - Removal of Secondary	40,551	7%
Lighting Specialty Lamp - Premium Efficiency LED	33,273	6%
Pool Pump - Two-Speed	27,448	5%
Programmable Thermostat	24,698	5%
Low-Flow Faucet Aerator - Kitchen	23,510	4%
Low-Flow Faucet Aerator - Bathroom	16,746	3%
Office Multifunction Device - ENERGY STAR®	16,585	3%

Occupancy sensor controls for lighting are the highest-saving cost-effective measure in the commercial sector. Although Cadmus considered this measure in our 2013 assessment of energy efficiency potential, recent program evaluations have identified savings that are much higher than previously assumed. For example, a Lawrence Berkley National Laboratory (LBNL) meta-study of occupancy sensor evaluations[3] found higher savings than assumed in Cadmus 2013 study. These studies included in the LBNL report identified occupancy sensor savings equivalent to nearly 20% of lighting usage for many applications (such as linear fluorescent, screw base, and high bay).

Table 6. Top Commercial Measures

Measure Name	Cumulative 2038 Achievable (Medium) - MWh	Percentage of Total Achievable Potential
Occupancy Sensor Control	171,640	33%
Daylighting Controls, Outdoors (Photocell)	41,882	8%
Motor - Pump and Fan System - Variable Speed Control	34,937	7%
Lighting Interior - Screw-Base LED - Above Standard	30,013	6%
Lighting Interior - Efficient Metal Halide - Above Standard	29,432	6%
Lighting Interior - TLED - Above Standard	27,666	5%
Direct/Indirect Evaporative Cooling, Pre-Cooling	17,629	3%
Lighting Package - Advanced Efficiency	15,536	3%
Case Replacement Low Temperature	14,911	3%
Exit Sign - Photoluminescent or Tritium	14,148	3%

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[3] Lawrence Berkeley National Laboratory (Page, Erik). "A Meta-Analysis of Energy Savings from Lighting Controls in Commercial Buildings." September 2011. Available online: https://eetd.lbl.gov/sites/all/files/a_meta-analysis_of_energy_savings_from_lighting_controls_in_commercial_buildings_lbnl-5095e.pdf

Considerations and Limitations for Program Design

While this study provides insight into which measures the Company could offer in future programs, it is only meant to inform, not set, program targets. While this study identifies the level of cost-effective energy efficiency that the Company's customers could adopt over the next 20 years, it does not identify how much of that savings should be captured through programs—it does not estimate program potential. The Company has used the results of this potential study to guide the development of its energy efficiency program plans. However, program plans may differ from the results presented in this study for the following reasons:

- **Potential study estimates account for interactions between cost-effective measures**. When two interactive measures are installed (such as ceiling insulation and windows), the combined interactive savings are lower than the sum of the stand-alone savings for the two measures. This effect is sometimes referred to as "measure stacking." These interactive effects can produce lower estimates than planned savings because program plans may not include all of the measures considered within the potential study.
- **The potential study produced estimates of cumulative energy efficiency savings, while program planning produces incremental savings.** While for many measures, cumulative and incremental savings are the same, for measures with short lifetimes, cumulative savings can be much lower than the sum of incremental savings. A home energy reports measure may save 50,000 MWh per year, though the cumulative savings over 20 years is still only 50,000 MWh because customers must be re-enrolled each year.
- **The potential study uses broad assumptions about the adoption of energy efficiency measures with different incentive levels:** The different estimates of achievable potential are meant to be directional; i.e. given a certain increase/decrease in incentives, we would expect to see a corresponding increase/decrease in savings. This approach provides a realistic range of estimates, given a range of incentive levels. However, program design requires a more detailed look at historic participation and incentive levels on a measure-by-measure basis. The potential study can then be used to inform planning for measures the Company has not historically offered.
- **The potential study only considers cost-effective energy efficiency measures.** It does not consider the possible bundling of cost-effective and non-cost-effective measures. Some programs, however, can be designed so measures that are not cost-effective on their own can be delivered in cost-effective bundles.
- **The potential study does not consider program implementation barriers:** While it does account for customers' willingness-to-adopt efficiency measures, it does not examine whether these measures can be delivered through programs. Many programs require robust trade ally networks, or must overcome barriers such as split incentives, to succeed. This study does not account for such barriers.

Comparison to 2013 Potential Study

Technical Potential

Cadmus identified higher technical potential in this study than we found in our 2013 assessment. Overall, technical potential accounts for approximately 33% of baseline sales in this 2016 study, compared to 22% of baseline sales in the 2013 study (see Table 7).[4]

Table 7. Technical Potential Comparison

Sector	Technical Potential – 20-Year (GWh)		Technical Potential – Percentage of Baseline	
	2016 Study	2013 Study	2016 Study	2013 Study
Residential	4,143	3,689	36%	26%
Commercial	2,930	1,702	29%	17%
Total	**7,072**	**5,391**	**33%**	**22%**

New technologies contributed to a significant increase in technical potential in both sectors. To begin this project, Cadmus thoroughly reviewed the energy efficiency measures included in our 2013 assessment. We removed measures that have become a part of Kentucky's building energy code or federal equipment standards and added measures that have become commercially viable within the last three years.

In the residential sector, examples of new technologies with high technical potential include enhanced efficiency central cooling and heat pumps (SEER 22+), heat pump dryers, and advanced weatherization. These, and other new technologies, could produce technically feasible savings equivalent to 12% of residential baseline sales. The introduction of these new technologies effectively increased residential technical potential by nearly 50%.

However, other factors contributed to a decrease in technical potential. Program accomplishments, the natural adoption of efficient equipment, and federal equipment standards increasing between 2013 and 2016 contributed to a reduction in residential sector technical potential. These factors increased the baseline saturation of efficient technology, which in turn reduced the technical potential for many measures. Combined, these three factors produced savings equivalent to approximately 2% of residential baseline sales.

Figure 3 shows how new technologies and the adoption of efficient technology (either through programs or outside programs) contributed to a net increase of technical potential equivalent to 10% of baseline residential sales.

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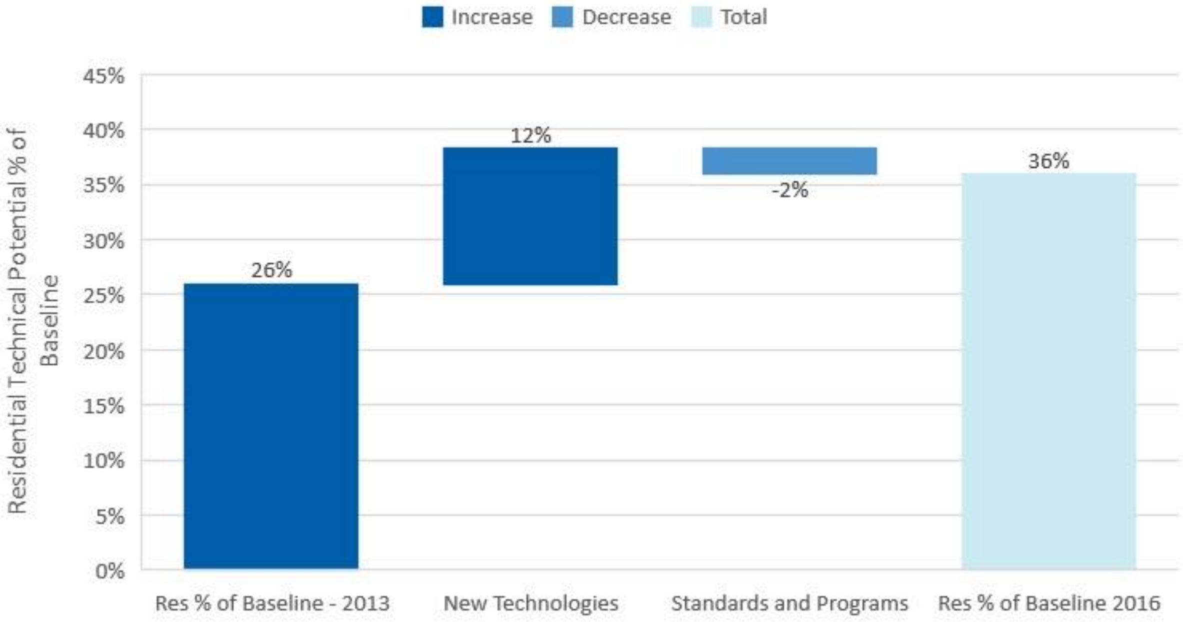
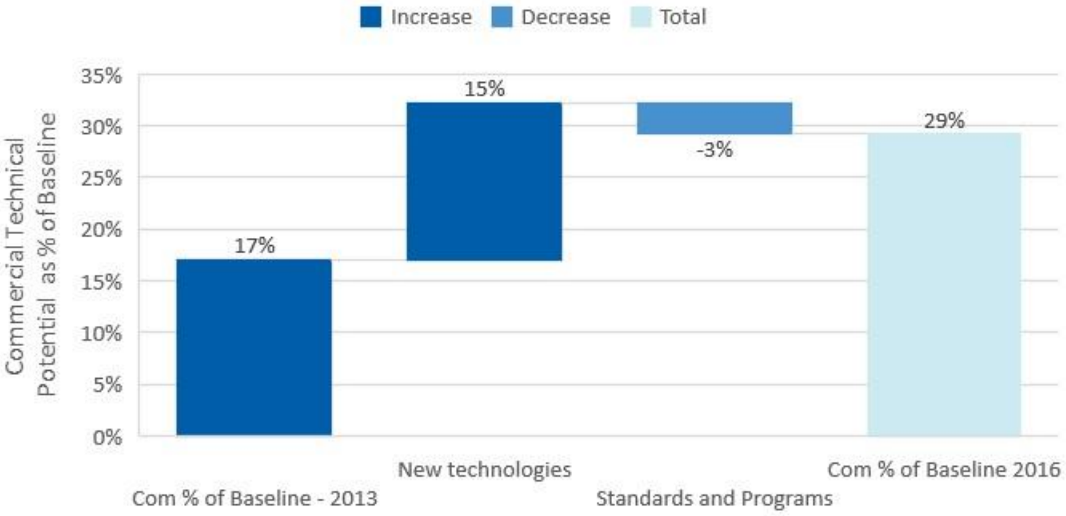
[4] Cadmus compared savings relative to baseline sales (as a percentage) from each study, as opposed to relative to absolute savings, because we relied on different baseline forecasts for the two studies. By comparing relative savings, not absolute savings, we avoid misidentifying differences due to changes in the reference case.

Figure 3. Residential Technical Potential – Changes from 2013 Study



New technologies and the adoption of efficient technologies contributed to a similar net increase in commercial sector technical potential. New lighting technologies, such as LED replacements for linear fluorescents and high-bay fixtures, contributed to a large increase in commercial technical potential. Specifically, linear TLED lighting, super-efficient cooling, and higher evaluated savings for occupancy sensors contributed to an increase in commercial technical potential equivalent to 15% of the sector's baseline sales. At the same time, increasing standards, the natural adoption of efficient technologies, and the Company's program accomplishment contributed to a reduction in technical potential equivalent to 3% of commercial baseline sales. Overall, commercial sector technical potential increased from 17% to 29% (as shown in Figure 4).

Figure 4. Commercial Technical Potential – Changes from 2013 Study



Economic Potential

Compared to the 2013 study, for this 2016 study Cadmus identified lower economic potential in the residential sector and higher economic potential in the commercial sector, although the overall economic potential in the two studies is similar. Lower avoided costs (both energy and capacity) decreased estimates of economic potential, while new commercially available cost-effective measures increased the economic potential back to a level similar to the 2013 study. Levelized avoided energy costs are nearly 20% lower compared to the 2013 study, and avoided capacity costs are $0 per kW compared to $100 per kW in the 2013 study (see Table 8).

Table 8. Avoided Cost Comparison

Component	2013 Study	2016 Study
Energy (20-year levelized)	Between $0.037/kWh and $0.046/kWh	Between $0.030/kWh and $0.037/kWh
Capacity	$100/kW per year	$0/kW per year

Table 9 shows a comparison of the economic potential from the 2013 and 2016 studies. Residential sector economic potential decreased from 12% of baseline sales to 10% because of naturally occurring conservation, program activity, and lower avoided costs. Commercial sector economic potential increased from 8% of baseline sales in the 2013 study to 9% in the 2016 study, mostly because of new commercially available cost-effective measures; lower avoided costs had less of an impact on the commercial sector than on the residential sector.

Table 9. Economic Potential Comparison

Sector	Economic Potential – 20-Year (GWh)		Economic Potential – Percentage of Baseline	
	2016 Study	2013 Study	2016 Study	2013 Study
Residential	1,093	1,716	10%	12%
Commercial	895	811	9%	8%
Total	**1,988**	**2,527**	**9%**	**10%**

Figure 5 shows the factors that contributed to the net decrease in residential economic potential. First, new cost-effective measures in the 2016 study, such as home energy reports and 1.5 gpm showerheads, contributed to an increase in economic potential equivalent to 1% of baseline sales. LED lighting for medium screw-base bulbs, which was not cost-effective in the 2013 assessment, is cost-effective in the 2016 study, and contributed to an increase in economic potential equivalent to 3% of baseline sales. Naturally occurring savings and program accomplishments produced a decrease in economic potential equivalent to 2% of baseline sales, and the Company's lower avoided energy and capacity costs reduced economic potential by an amount equivalent to 4% of baseline sales. After accounting for each of these factors, overall residential economic potential decreased from approximately 12% of baseline sales to 10%.

Figure 5. Residential Economic Potential – Changes from the 2013 Study

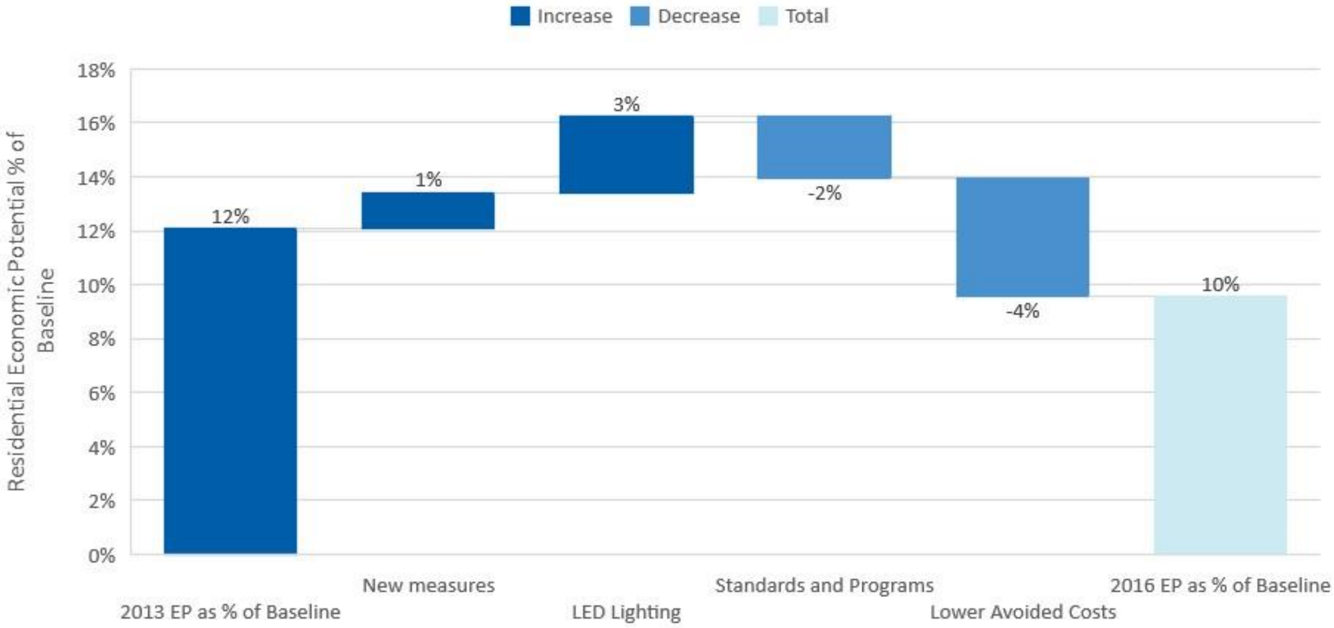
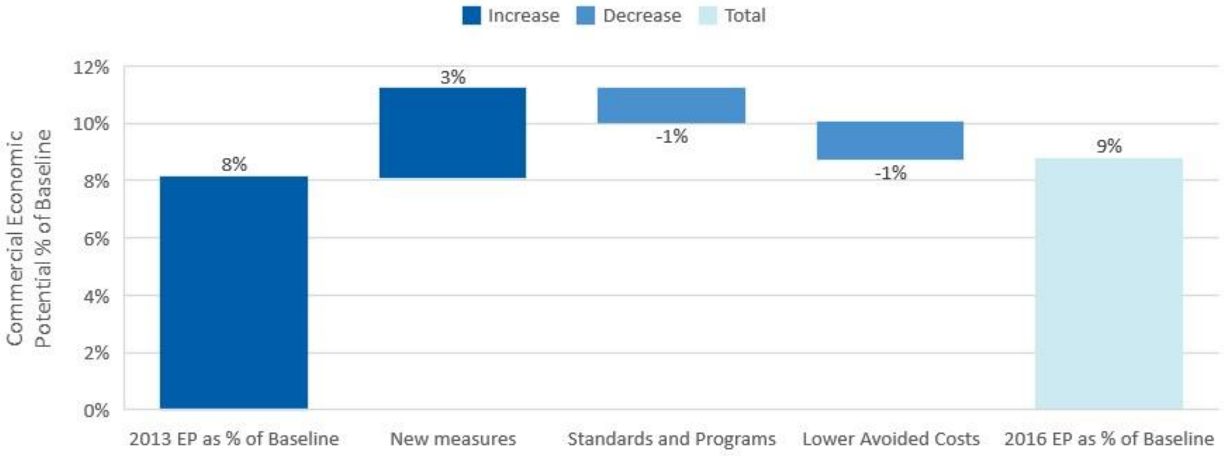


Figure 6 shows the factors that contributed to an increase in commercial sector economic potential, from being equivalent to 8% of baseline sales in the 2013 study to 9% of baseline sales in the 2016 study. New measures and new data on the savings for old measures contributed to an increase in economic potential equivalent to 3% of baseline sales. Increased standards and program accomplishments contributed to a decrease in economic potential equivalent to 1% of baseline sales, and lower avoided costs also contributed to a decrease equivalent to 1% of baseline sales.

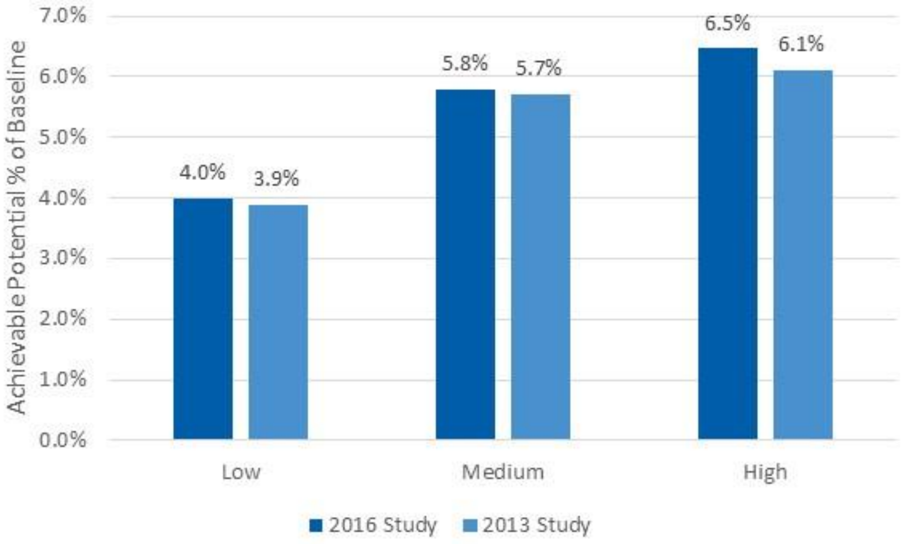
Figure 6. Commercial Economic Potential – Changes from 2013 Study



Achievable Potential

Estimates of achievable potential in this 2016 study are slightly higher than estimates from the 2013 study (shown in Figure 7). The 2013 study produced a range of achievable estimates that were equivalent to between 3.9% and 6.1% of baseline sales, while this study produced a range equivalent to between 4.0% and 6.5% of baseline sales.

Figure 7. Electric Achievable Potential – Comparison to the 2013 Study



Natural Gas Energy Efficiency Potential

2016 study results indicate that 11.7 million MCF of natural gas energy efficiency potential are technically feasible by 2038. Using avoided natural gas commodity costs to screen measures for cost-effectiveness, nearly one-third of this potential (or approximately 4 million MCF) will be economic. This level of cost-effective potential represents 15% of the Company's projected sales in 2038.

Table 10. Technical and Economic Natural Gas Energy Efficiency Potential (Cumulative 2038) by Sector (MCF)

Sector	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Residential	17,872,105	8,794,324	3,082,896	49%	17%	35%
Commercial	8,775,436	2,974,937	937,691	34%	11%	32%
Total	26,647,541	11,769,261	4,020,586	44%	15%	34%

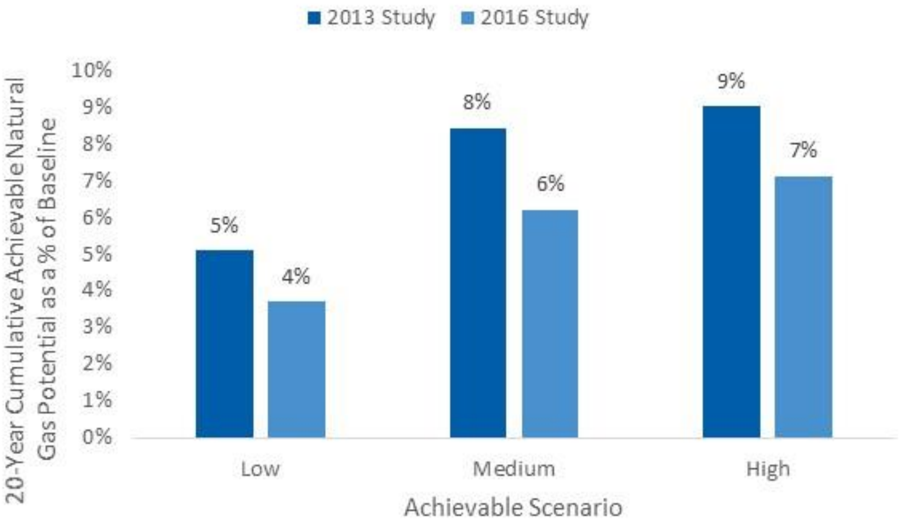
The study results suggest that between 0.98 million to 1.8 million MCF of natural gas savings are achievable over the 20-year planning period. These results indicate that the Company can expect a medium level (1.6 million MCF) of achievable potential, representing 6.2% of the Company's baseline sales forecast (as shown in Table 11).

Table 11. Achievable Natural Gas Energy Efficiency Potential (Cumulative 2038) by Sector (MCF)

Sector	Baseline Sales	Cumulative 2038			Percentage of Baseline		
		Low	Medium	High	Low	Medium	High
Residential	17,872,105	738,633	1,189,821	1,364,631	4.1%	6.7%	7.6%
Commercial	8,775,436	249,711	456,015	515,945	2.8%	5.2%	5.9%
Total	**26,647,541**	**988,344**	**1,645,836**	**1,880,577**	**3.7%**	**6.2%**	**7.1%**

Compared to the 2013 potential study, this study identified lower achievable natural gas potential in each scenario. The 2013 potential study produced a range of achievable natural gas potential equivalent to between 5% and 9% of baseline sales, while this study identified a range of 4% to 7% (Figure 8). Lower natural gas commodity prices, higher saturations of efficient natural gas technologies, and federal furnace and boiler standards all contributed to the drop in achievable natural gas potential.

Figure 8. Natural Gas Achievable Potential – Comparison to the 2013 Potential Study



Demand Response Potential

Cadmus considered five different demand response (DR) programs each for LG&E's and KU's service territories. For this assessment, Cadmus used three demand response options—direct load control (DLC), pricing, and load curtailment—across five programs:

- DLC: Residential and Commercial Demand Conservation Program
- DLC: Residential Wi-Fi Thermostat Option for Demand Conservation
- Pricing: Residential Time-of-Use (TOU)
- Pricing: Residential Critical Peak Pricing (CPP)
- Commercial Load Curtailment

The Company offers DLC, a Wi-Fi thermostat pilot, and curtailment through DSM programs. They also offer TOU rates outside of the DSM programs, but do not offer a residential CPP program. Cadmus modeled low and high participation scenarios for each DR program (except for critical peak pricing), and we report both summer and winter peak savings for each scenario (Table 12). The low scenarios are based on LG&E's and KU's existing programs. To determine the high scenarios, Cadmus considered program changes consistent with benchmarking similar programs at other utilities.

Exhibit GSL-3

Table 12. Demand Reduction Analysis Scenarios

Program	Summer Peak		Winter Peak	
	Low	High	Low	High
Residential DLC	✓	✓	✓	✓
Commercial DLC	✓	✓	✓	✓
Wi-Fi Thermostat*	✓	✓	✓	✓
Time of Use	✓	✓	✓	✓
Curtailment	✓	✓	✓	✓
Critical Peak Pricing	✓		✓	

* Cadmus included the winter Wi-Fi smart thermostat participants in the winter residential DLC program, since device impacts were identical.

Cadmus employed a top-down approach to determining the achievable load reduction potential, in which we disaggregated system loads by sector, segment, and applicable end uses, then applied technical potential, program participation, and event participation.[5] Table 13 shows that the summer achievable load reduction for KU totals 70 MW in the low scenario and 176 MW in the high scenario (2% and 5% of summer peak, respectively). The winter achievable load reduction for KU totals 105 MW in the low scenario and 151 MW in the high scenario (6% and 9% of winter peak, respectively).

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[5] Cadmus used the top-down approach for TOU, CPP, and curtailment, but estimated DLC programs using device-level impacts at the device level.

Table 13. KU Demand Reduction Potential Results

Program	Utility	Peak Season	Achievable Load Reduction in 2038*		Peak Reduction**		Levelized Cost per Year ($/kW-year)***	
			Low	High	Low	High	Low	High
Residential DLC	KU	Summer	32	96	1.0%	2.9%	$232	$75
Commercial DLC	KU	Summer	0	3	0.0%	0.1%	$278	$86
Wi-Fi Thermostat	KU	Summer	2	4	0.1%	0.1%	$79	$48
TOU	KU	Summer	9	33	0.3%	1.0%	$155	$88
Curtailment	KU	Summer	27	40	0.8%	1.2%	$55	$80
CPP	KU	Summer	27	N/A	0.8%	N/A	$98	N/A
Total+	**KU**	**Summer**	**70**	**176**	**2%**	**5%**		
DLC	KU	Winter	84	114	5.8%	7.9%	$87	$63
TOU	KU	Winter	3	10	0.1%	0.3%	$549	$314
Curtailment	KU	Winter	18	27	0.5%	0.8%	$69	$92
CPP	KU	Winter	8	N/A	0.6%	N/A	$206	N/A
Total+	**KU**	**Winter**	**105**	**151**	**6%**	**9%**		

* These values are at generation and include line losses.

** This represents achievable load reduction divided by the market basis (peak load) for residential and commercial loads during the top 40 hours (10 four-hour events).

*** Cadmus discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% rate of inflation.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

\+ Totals exclude CPP as it is an alternative to the TOU program, and the savings are not additive.

Table 14 shows that the summer achievable load reduction for LG&E totals 70 MW in the low scenario and 176 MW in the high scenario (2% and 6% of summer peak, respectively). The winter achievable load reduction for LG&E totals 108 MW in the low scenario and 147 MW in the high scenario (8% and 11% of winter peak, respectively).

Table 14. LG&E Demand Reduction Potential Results

Program	Utility	Peak Season	Achievable Load Reduction in 2038*		Peak Reduction**		Levelized Cost per Year ($/kW)***	
			Low	High	Low	High	Low	High
Residential DLC	LG&E	Summer	33	105	1.3%	4.2%	$223	$76
Commercial DLC	LG&E	Summer	0	0	0.0%	0.0%	$304	$140
Wi-Fi Thermostat	LG&E	Summer	2	4	0.1%	0.1%	$59	$44
TOU	LG&E	Summer	7	26	0.2%	0.8%	$200	$113
Curtailment	LG&E	Summer	28	41	0.8%	1.3%	$52	$77
CPP	LG&E	Summer	21	N/A	0.8%	N/A	$114	N/A
Total+	**LG&E**	**Summer**	**70**	**176**	**2%**	**6%**		
DLC	LG&E	Winter	78	106	7.1%	9.6%	$129	$94
TOU	LG&E	Winter	2	7	0.1%	0.2%	$766	$432
Curtailment	LG&E	Winter	22	34	0.7%	1.0%	$58	$82
CPP	LG&E	Winter	5	N/A	0.5%	N/A	$283	N/A
Total+	**LG&E**	**Winter**	**103**	**147**	**8%**	**11%**		

* These values are at generation and include line losses.

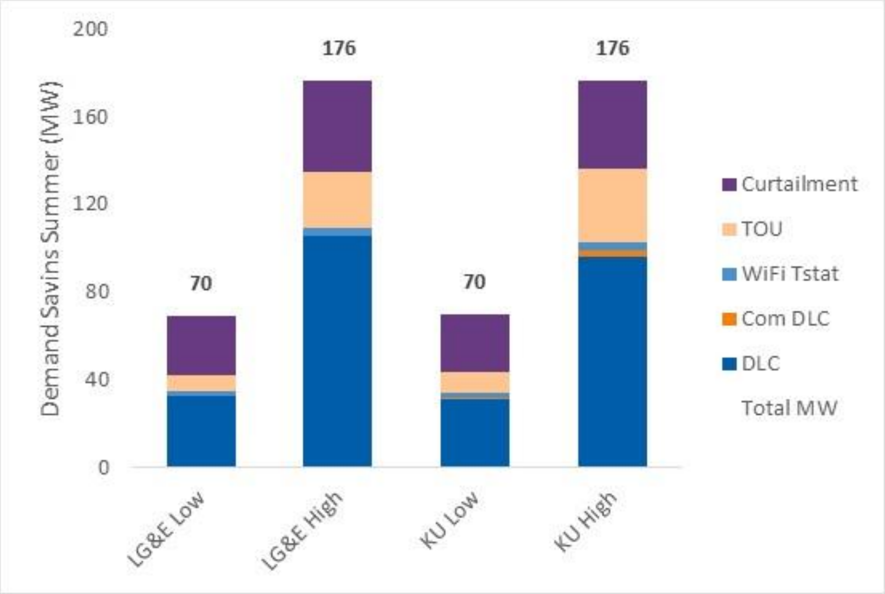
** This represents achievable load reduction divided by the market basis (peak load) for residential and commercial loads during the top 40 hours (10 four-hour events).

*** Cadmus discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% rate of inflation.

+ Totals exclude CPP as it is an alternative to the TOU program, and the savings are not additive.

The low scenarios are based on LG&E's and KU's existing programs. To determine the high scenarios, Cadmus considered program changes consistent with benchmarking similar programs at other utilities. As shown in Figure 9, the results indicate that each utility can achieve summer demand reductions equivalent to 176 MW under the high scenario, which results in a 6% summer peak load reduction for LG&E and a 5% summer peak load reduction for KU.

Figure 9. Demand Reduction Portfolio Results for Summer Peak



The low scenario aligns with LG&E- and KU-specific program data provided by the Company, impact and process evaluations, and DSM plan filings with the Public Service Commission.[6] For the high scenario program assumptions, Cadmus adjusted the low scenario to align with benchmarking for similar programs. The reduced percentage of system peak more than doubled under the KU high scenario (from 2% to 5%) and tripled under the LG&E high scenario (from 2% to 6%). Given the additional potential offered by the high scenario, Cadmus presents the following recommendations for the Company's existing demand reduction programs:

- ***Consider modifying the residential DLC program to Wi-Fi or advanced metering infrastructure (AMI) controlled thermostats.*** This shift would allow for increasing the control strategy from approximately 33% to between 40% and 50%, a typical percentage for cooling programs. Two-way communications can be used to identify nonresponsive devices (NRD), thus improving event participation beyond the existing 70%.
- ***Consider expanding the residential TOU program beyond the pilot size.*** Cadmus could not obtain the evaluated participation or results for the TOU program, and in 2018, AMI deployment plans are limited to 5,000 units for each territory. In our analysis, Cadmus assumed full AMI deployment by 2022 for both the high and low scenarios.
- ***Consider implementing a residential winter DLC pilot program***. This analysis indicated that there is significant potential for winter peak reduction in the low scenario, with a winter peak

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[6] Program-related data include program participation, event participation, device impacts, and program-related costs.

reduction of 6% for KU and 8% for LG&E. The Company could target Wi-Fi thermostat participants for the pilot, providing a more accurate estimate of demand impacts.

Organization of Report

This document presents methodologies and findings and includes the following four sections:

1. General Approach and Methodology, which provides an overview of the methodology Cadmus used to estimate technical, economic, and achievable potential.
2. Technical and Economic Potential, which presents the technical and economic potential available from energy efficiency resources.
3. Achievable Potential, which describes the basis for and results of estimating realistically achievable energy efficiency potential.
4. Demand Response, which summarizes the peak demand reduction potential from demand response strategies.

Exhibit GSL-3

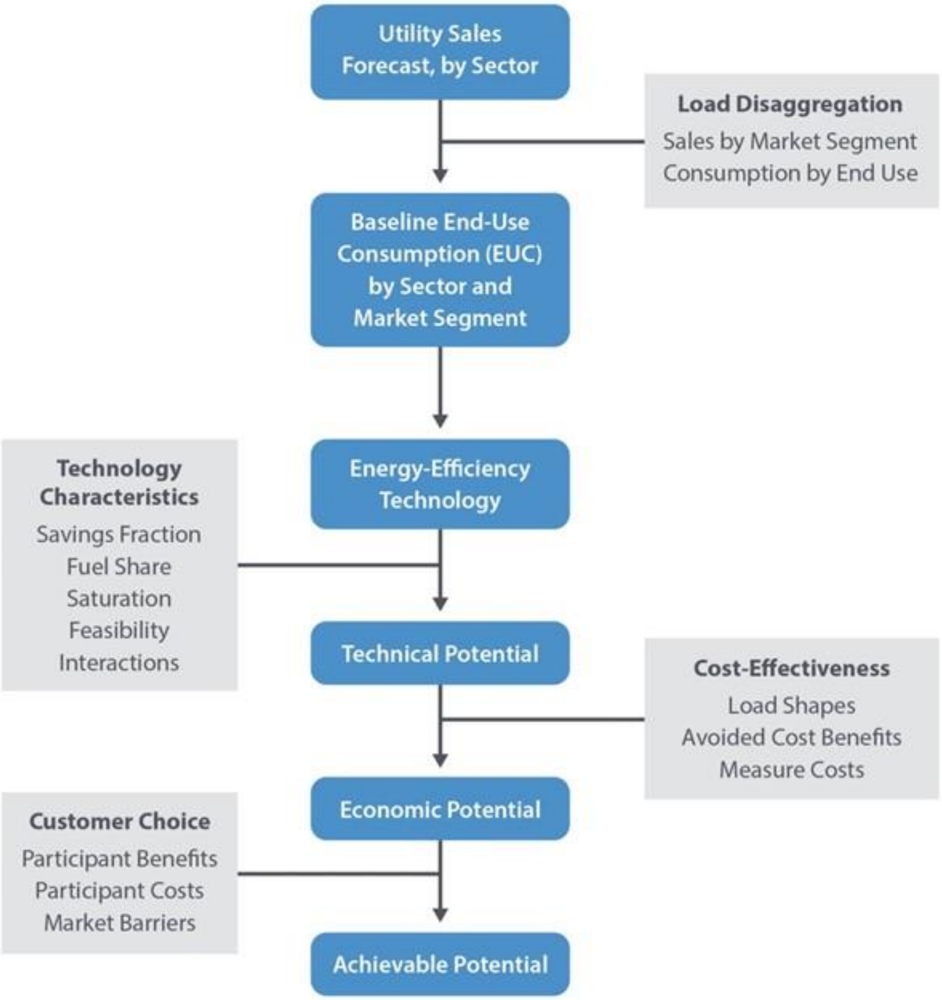
General Approach and Methodology

For this assessment, Cadmus relied on industry best practices, analytic rigor, and flexible and transparent tools to accurately estimate the potential for energy and capacity savings in the Company's service territory between 2019 and 2038. This section describes each step of our assessment process and summarizes the results.

General Approach

To estimate the technical, economic, and achievable energy efficiency potential, Cadmus drew upon standard industry practices. Figure 10 presents our general methodology and illustrates how we combined baseline and efficiency data to estimate savings for each type of potential.

Figure 10. General Methodology for Assessing Energy Efficiency Potentials



Cadmus calculated three types of potential: technical, economic, and achievable.

- ***Technical potential*** represents all technically feasible DSM measures being implemented, regardless of their costs or market barriers. For energy efficiency resources, there are three distinct classes of technical potential: retrofit opportunities in existing buildings, equipment replacements in existing buildings, and new construction. The first class, existing in current building stock, can be acquired at any point in the planning horizon, while end-use equipment turnover rates and new construction rates dictate the timing of the other two classes.
- ***Economic potential*** represents a subset of technical potential, consisting only of measures meeting the cost-effectiveness criteria based on the Company's avoided energy and capacity costs. For each energy efficiency measure, Cadmus structured the benefit/cost test as the ratio of the net present values (NPVs) of the measure's benefits and costs, and only deemed measures with a benefit/cost ratio of 1.0 or greater as cost-effective.
- ***Achievable potential*** represents the portion of economic potential that might be assumed as reasonably achievable in the course of the planning horizon, given market barriers that might impede customer participation in utility programs. Achievable potential can vary greatly based on program incentive structures, marketing efforts, energy costs, customer socio-economic characteristics, and other factors. In this study, Cadmus examined survey results to assess customers' willingness to adopt energy efficiency measures at three levels, based on the fraction of the measure's incremental cost covered by theoretical incentive levels: 0%, 50%, and 75%.

Although this study is meant to inform program design, we did not set program targets. Specifically, Cadmus did not estimate the fourth type of energy efficiency potential—program potential. Program potential reflects energy savings that a utility expects to achieve given certain spending levels and program design objectives. It requires a more detailed assessment of rebate levels, expenditures on marketing and administration, and the possible mixture of measures the Company can offer in its portfolio. Although study results are an excellent reference point for program development, they are based on some broad assumptions that may not apply to the Company's specific programs.

For example, estimates of achievable potential include all cost-effective energy efficiency measures and no measures that fail the TRC benefit/cost test. The Company may include measures that are not cost-effective in a portfolio as along as the portfolio-level TRC benefit/cost ratio exceeds 1.0. Because of this, the results from this study are a directional indicator of the energy efficiency potential available for the Company, and they identify areas and provide indicators of which energy efficiency measures have the most remaining energy efficiency potential savings, as well as areas that have limited remaining potential based on the current commercial available energy efficiency technologies.

Overview

To estimate energy efficiency potential, Cadmus conducted a sequential analysis of various energy efficiency measures in terms of technical feasibility (technical potential), cost-effectiveness (economic potential), and expected market acceptance, considering normal barriers that may impede measure implementation (achievable potential). The steps for this assessment were as follows:

1. ***Developing baseline forecast:*** Cadmus determined 20-year future energy consumption by fuel, sector, market segment, and end use. We calibrated the base year, 2016, to the Company's sector load forecasts. As previously described, baseline forecasts shown in this report include estimates of naturally occurring potential.
2. ***Estimating technical potential:*** Next, we estimated technical potential based on alternative forecasts that reflect technical impacts of specific energy efficiency measures.
3. ***Estimating economic potential:*** Then Cadmus estimated economic potential based on forecasts that reflect the technical impacts of cost-effective energy efficiency measures.
4. ***Estimating achievable potential:*** Last, we determined achievable potential, which we calculated by applying ramp rates and an achievability percentage to cost-effective measures (as detailed later in this section).

Developing Baseline Forecast

Collecting Baseline Data

Creating a baseline forecast required multiple data inputs to accurately characterize energy consumption in the Company's service area. These key inputs included:

- Sales and customer forecasts
- Major customer segments (e.g., residential dwelling types or commercial business types)
- End-use saturations
- Equipment saturations
- Fuel shares
- Efficiency shares (the percentage of equipment below, at, and above code)
- Annual end-use consumption estimates, by efficiency level

Data specific to the Company's service territory not only provided the basis for baseline calibration, but supported the estimation of technical potential. The Company also provided data on actual and forecasted sales and customers by sector. Table 15 identifies sources for key data.

Table 15. Baseline Forecast Data Sources

Input	Residential	Commercial
Customer and Load Forecasts	LG&E and KU actual	LG&E and KU actual
Percentage Sales or Customers by Building Type	LG&E and KU customer database, U.S. Census data	LG&E and KU customer database
End-Use Energy Consumption	Energy Information Administration (EIA's) 2012 Residential Energy Consumption Survey (RECS),* ENERGY STAR,** engineering calculations, building simulations	EIA's 2013 Commercial Buildings Energy Consumption Survey (CBECS),*** ENERGY STAR, engineering calculations, building simulations
Saturations and Fuel Shares	LG&E and KU saturation surveys, Cadmus' 2013 study, EIA's RECS, LG&E and KU energy efficiency program evaluations	LG&E and KU saturation surveys, Cadmus' 2013 study, EIA's CBECS, LG&E and KU energy efficiency program evaluations
Efficiency Shares	LG&E and KU saturation surveys, Cadmus' 2013 study, EIA's RECS, ENERGY STAR unit shipment reports[7]	LG&E and KU saturation surveys, Cadmus' 2013 study, EIA's CBECS, ENERGY STAR reports
Energy Efficiency Measures	Cadmus' 2013 study, LG&E and KU existing prescriptive programs and program evaluation data, regional technical reference manuals (TRMs),Cadmus' energy efficiency measure database, ENERGY STAR	Cadmus' 2013 study, LG&E and KU existing prescriptive programs and program evaluation data, regional TRMs, Cadmus' measure list, ENERGY STAR

* Energy Information Administration. "Residential Energy Consumption Survey." Available online: https://www.eia.gov/consumption/residential/

** ENERGY STAR Cost Savings Calculators. Available online: http://energy.gov/eere/femp/energy-and-cost-savings-calculators-energy-efficient-products

*** Energy Information Administration. "Commercial Buildings Energy Consumption Survey." Available online: https://www.eia.gov/consumption/commercial/

+ Regional TRMs may include sources such as the California Energy Commission Database for Energy Efficient Resources (http://www.deeresources.com/), Pennsylvania TRM (http://www.puc.state.pa.us/filing_resources/issues_laws_regulations/act_129_information/technical_reference_manual.aspx), or the Northeast TRM (http://www.neep.org/mid-atlantic-technical-reference-manual-v6)

Baseline Forecast of Sales and Customers

Cadmus ensured that the baseline end-use forecast was aligned with the Company's official forecasts. To accomplish this, we relied on the Company's residential and commercial customer forecasts to determine the number of homes and the amount of commercial floor space in each year of the study horizon. We also calibrated the final baseline energy forecasts to the Company's by adjusting the number of users per household in the residential sector and the use per square feet in the commercial

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[7] EPA ENERGY STAR Unit Shipment Data. https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data

sector. Also, we ensured that the rate classes included in each sector reflected the customers who pay into the Company's DSM programs, and therefore are eligible to participate. The Company provided data to allocate rate class level forecasts to nine different sectors. We excluded five of these sectors from this study—industrial, mine power, municipal pumping, street lighting, and wholesale municipal. The study's commercial sector includes large commercial, small commercial, and public authority customers. Table 16 shows the mapping of the Company's sector categories to the sectors used in this study.

Table 16. Sector Mapping

Company Sector Categories	2016 Study Sector
Industrial	-
Large Commercial	Commercial
Mine Power	-
Municipal Pumping	-
Public Authorities *	Commercial
Residential	Residential
Small Commercial	Commercial
Street Lights	-
Wholesale Municipal	-

* This sector excludes the Fort Knox and Louisville Water customers.

One key distinction between this study and the 2013 study is that the previous study did not include public authority customers, who account for the significant absolute increase in baseline sales and potential in the commercial sector. However, the inclusion of public authority customers did not increase the potential when expressed as a fraction of baseline sales.

End-Use Energy Consumption

The per-unit end-use energy consumption, sometimes referred to as unit energy consumption for a residential forecast and energy-use intensity for a commercial forecast, is a crucial input for end-use forecasts. Industry studies have derived this consumption using a variety of methods, including statistical methods (such as conditional demand modeling), physics-based building simulation models (such as the U.S. Department of Energy's EnergyPlus model), and simple algorithms (such as ENERGY STAR calculators). Specific sources for this study include:

- ***EIA 2012 RECS and 2013 CBECS:*** EIA's RECS and CBECS are national surveys of collected information about building characteristics and end-use saturations. In addition, EIA uses utility bills and end-use data to develop conditional demand models that produce estimates of end-use consumption for different climate zones. EIA's RECS and CBECS are generally reliable sources for end-use consumption because estimates are derived using robust statistical methods and actual use data.

- ***U.S. Environmental Protection Agency's (EPA) ENERGY STAR Calculators:*** EPA produces calculators that use simple engineering algorithms to estimate energy consumption for common non-weather-sensitive end uses such as refrigerators, clothes washers, and various home electronics. Because energy consumption for these end uses changes very little with climate, Cadmus only needed to make a few adjustments (if any) to these algorithms for this study.
- ***Engineering calculations:*** Cadmus produced additional use algorithms for non-weather-sensitive end uses without an ENERGY STAR calculator. We derived these algorithms from various regional TRMs, such as the Pennsylvania TRM, the Northeastern TRM, California's Database of Energy Efficiency Resources (DEER), or the Northwest Regional Technical Forum (RTF) workbooks.
- ***Cadmus building simulations, adjusted for Kentucky's climate:*** Cadmus maintains a library of end-use consumption estimates derived from various building simulation tools including eQUEST, EnergyPlus, REM/Rate, and the Simplified Energy Enthalpy Model. For weather-sensitive measures, we adjusted estimates to reflect Kentucky's climate.

Although the Company produces residential end-use forecasts, Cadmus relied on the sources listed above because the potential study requires higher resolution estimates. That is, while the Company's load forecast may provide use for a broad end use (such as a central air conditioner), the potential study requires details of the use for specific pieces of equipment (such as air conditioners of different efficiencies). Our calibration process aligned aggregated end-use consumption in Cadmus' models with end-use estimates in the Company's models.

Saturations and Fuel Shares

To produce a bottom-up end-use forecast, Cadmus first determined how many units of each end use are in a typical home. End-use saturations represent the average number of units in a home and fuel shares represent the proportion of those units that either use electricity versus natural gas. For instance, on average, a typical home has 0.9 clothes dryers (the saturation), and 85% of these units are electric (the fuel share).[8]

Cadmus relied on the following sources to estimate saturations and fuel shares:

- ***LG&E's and KU's most recent saturation surveys:*** LG&E and KU complete frequent residential end use surveys to inform load forecasts. Cadmus analyzed the Company's most recent surveys to produce fuel shares and saturations.
- ***Data from Cadmus' 2013 phone surveys and site visits at residences and businesses:*** For the 2013 study, Cadmus completed phone surveys with residential and commercial customers, as well as site assessments for commercial customers. We used these surveys to supplement

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[8] Saturations are less than 1.0 when some homes do not have the end use.

LG&E's and KU's existing saturation surveys with data that are difficult to collect over the phone (such as the cooling system type and size in commercial buildings).

- ***EIA's RECS/CBECS****:* The EIA RECS and CBECS include nearly comprehensive end-use data for residential and commercial buildings. While Cadmus prefers to use LG&E and KU-specific saturation surveys, EIA's RECS and CBECS can provide reliable regional estimates for end uses that cannot be characterized by the Company's saturation surveys.

Although many of these sources are roughly three years old, we did not need to adjust the saturations and fuel shares. While changes in end-use efficiency can occur over a short period of time (discussed in the next section), saturations and fuel shares stay relatively constant. Cadmus has reviewed multiple iterations of EIA's RECS and CBECS surveys, and found that saturations and fuel shares for the core end uses (such as for heating, cooling, water heating, various appliances, and plug load end uses) change little.

Efficiency Shares

Efficiency shares equal the current saturation of a specific type of equipment (of varying efficiency). Within an end use, these shares sum to 100%. For instance, the efficiency shares for a central air conditioning end use may be 50% SEER 13, 25% SEER 15, and 25% SEER 16. Sources for efficiency shares included:

- ***LG&E's and KU's most recent saturation surveys:*** Phone and mail surveys, such as LG&E's and KU's saturation survey, collect equipment age data that Cadmus used as a proxy for efficiency shares. Knowing the age of a unit of equipment, we were able to determine its minimum efficiency based on the federal government adopted equipment standards at that time.
- ***Data from Cadmus' 2013 phone surveys and site visits for residences and businesses:*** For our 2013 commercial site assessments, Cadmus collected efficiency information for major end uses (such as lighting, cooling, and water heating). In addition, in both our phone surveys and site assessments, we collected equipment age data, which we then used as a proxy for efficiency.
- ***EIA's RECS/CBECS:*** When Cadmus could not estimate efficiency shares using the two survey sources listed above, we filled in these gaps using EIA data.
- ***ENERGY STAR Unit Shipment Reports:*** The EPA has reported unit shipment data for all ENERGY STAR-rated equipment since 2003. These reports allowed Cadmus to estimate the current saturation of ENERGY STAR-rated equipment; these end uses include various appliances (such as refrigerators, freezers, and clothes washers) and home electronics (such as televisions, set top boxes, computers, and monitors).

Cadmus adjusted efficiency shares calculated from these sources to account for LG&E's and KU's energy efficiency program accomplishments, recent equipment standards, and the natural adoption of equipment more efficient than federal standards. Unlike saturations and fuel shares, efficiency shares can change significantly over a short period of time. For instance, the saturation of high-efficiency lighting (CFLs and LEDs) has increased significantly in many regions over the last three years, driven by low measure lives, declining equipment costs, and increasing federal standards. To account for these changes, Cadmus simulated the natural turnover of equipment for each end use over the last three years and estimated the new distribution of equipment after the installation of standard and above-standard units.

Preparing the Baseline Forecast

We derived the baseline forecast for each customer sector from the baseline data (described above) to obtain estimates of average consumption by market segment, construction vintage, and end use; then we summed this data to the sector level. Next, we calibrated the end-use and customer sector forecasts to the Company's official forecast to evaluate the accuracy of Cadmus' forecast and to ensure its consistency with the Company forecast. This approach offered the following key advantages:

- Cadmus derived savings estimates using a baseline calibrated to official sales forecasts, which required care to ensure that the underlying inputs and assumptions were reasonable and consistent with other known customer characteristics.
- We incorporated the effects of equipment standards and naturally occurring efficiency improvements resulting from usage reductions upon the retirements of lower-efficiency equipment and their replacement with higher-efficiency units. Ensuring that the baseline forecast accounted for these effects prevented potential estimates from being inflated by naturally occurring efficiency, thus double-counting the potential.
- We used the same assumptions underlying the baseline forecasts to develop the energy efficiency measure inputs, as well as estimates of technical potential, ensuring consistency.

Incorporating Impending Codes and Standards

The importance of accurately accounting for changes in codes and standards over the planning horizon cannot be overstated. Not only do these changes affect customers' energy consumption patterns and behaviors, but they determine which energy efficiency measures continue to produce savings over minimum requirements. In this study, Cadmus captured current efficiency requirements as well as those enacted, but not yet in effect.

For our analysis, Cadmus did not attempt to predict how energy codes and standards might change in the future; rather, we only factored in the enacted legislation, notably, the provisions of the 2007 Energy Independence and Security Act (EISA), known to take effect over the course of this analysis.

EISA includes a backstop provision, requiring still higher-efficiency technologies beginning in 2020. Capturing the effects of this legislation proved especially important, as residential lighting has had a large role in the Company's energy efficiency programs over the past several years.

Moreover, Cadmus explicitly accounted for several other pending federal codes and standards. For the residential sector, these include appliances, HVAC, and water heating standards. For the commercial sector, these include appliances, motors, water heating, HVAC, and lighting standards. Table 17 provides a comprehensive list of the standards we considered in this study.

Table 17. Federal Equipment Standards

Equipment Type	Existing (Baseline) Standard	New Standard	Date Effective*
Appliances			
Clothes washer (top loading)	Federal standard 2007	Federal standard 2015	March 7, 2015
Clothes washer (front loading)	Federal standard 2007	Federal standard 2018	January 1, 2018
Commercial refrigeration equipment (semi-vertical and vertical cases)	Federal standard 2012	Federal standard 2017	March 27, 2017
Dishwasher	Federal standard 2010	Federal standard 2013	May 30, 2013
Dryer	Federal standard 2011	Federal standard 2015	January 1, 2015
Freezer	Federal standard 2001	Federal standard 2014	September 15, 2014
Refrigerator	Federal standard 2001	Federal standard 2014	September 15, 2014
HVAC			
Central air conditioner	Federal standard 2006	Federal standard 2015 (no change for northern region)	July 1, 2016
Heat pump (air source)	Federal standard 2006	Federal standard 2015	January 1, 2015
Residential furnace fans	Existing conditions (no federal standard)	Federal standard 2019	July 3, 2019
Room air conditioners	Federal standard 2000	Federal standard 2014	June 1, 2014
Lighting			
Lighting general service lamp (EISA)	Existing conditions (no federal standard before EISA)	Federal standard 2014 (phased in over three years)	January 1, 2014
Lighting general service lamp (EISA backstop provision)	Existing conditions (no federal standard before EISA)	Federal standard 2020	January 1, 2020
Fluorescent linear lamps	Federal standard 2012	Federal standard 2018	January 26, 2018
Metal halide lamp fixtures	Federal standard 2009	Federal standard 2017	February 10, 2017
Motors			
Small electric motors	Federal standard 1987	Federal standard 2015	March 9, 2015
Water Heaters			
Water heater > 55 gallons	Federal standard 2004	Federal standard 2015	April 16, 2015
Water heater ≤ 55 gallons	Federal Standard 2004	Federal Standard 2015	April 16, 2015

* For the potential assessments, Cadmus assumed that standards taking effect mid-year will begin on January 1 of the following year.

To ensure accurate assessment of the remaining potential, Cadmus accounted for the effects of future standards. Drawing on a strict interpretation of the legislation, Cadmus assumed that affected equipment would be replaced with more efficient alternatives that meet the minimum federal standards (in other words, we assumed complete compliance with the standards).

Accounting for Naturally Occurring Efficiency

Cadmus' baseline forecast included naturally occurring efficiency—that is, reductions in energy use likely to occur from normal market forces (such as technological changes, energy price changes, market transformation efforts, and higher energy codes and standards). We accounted for naturally occurring efficiency in four ways:

1. For the potential associated with certain energy efficiency measures, we assumed a natural adoption rate, net of current saturation. For example, to determine total potential savings associated with ENERGY STAR appliances, we accounted for current adoption trends.
2. Cadmus accounted for gradual efficiency increases due to retiring older equipment in existing buildings, followed by replacement with units meeting or exceeding minimum standards at the time of replacement.
3. We accounted for pending improvements to equipment efficiency standards taking effect during the planning horizon (as discussed). We did not, however, forecast changes to standards not yet adopted.
4. Our estimates of energy consumption in new construction reflect the 2012 International Energy Conservation Code (IECC).[9] For this study, we assumed that all energy efficiency measures would meet or exceed the 2012 IECC, and, where applicable, we calculated energy savings using 2012 IECC as a baseline. For example, current building code requires R-38 ceiling insulation, so we calculated energy savings for all ceiling insulation measures in new construction with R-38 as the baseline. Consequently, we did not attribute savings to ceiling insulation levels below R-38 in new construction. (Note that building codes have the smallest impact of these four classes of naturally occurring efficiency, given that they only apply to new construction.)

Compiling Energy Efficiency Technology Data

Cadmus created a comprehensive list of electric and natural gas energy efficiency measures applicable to the Company's service territory. We included the following measures from our database:

- Measures included in Cadmus' 2013 study of DSM potential assessment
- All measures currently included in the Company's prescriptive programs
- Efficiency tiers from the Consortium for Energy Efficiency and ENERGY STAR
- Measures from Cadmus' extensive database that includes measures in regional or national databases (e.g., DEER) and TRMs
- Selected emerging technologies and particular technologies identified by the Company as relevant to the study.

The emerging technologies in this study included behavioral measures, CO_2 heat pump water heaters, and commercial active chilled beam cooling systems. We focused on emerging technologies approaching commercialization or those that may become cost-effective within the next five years.

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[9] https://law.resource.org/pub/us/code/ibr/icc.iecc.2012.pdf

After creating a list of electric energy efficiency measures applicable to the Company's service territory, Cadmus classified measures into two categories:

1. High-efficiency equipment measures, which directly affect end-use equipment (e.g., high-efficiency central air conditioners), and follow normal replacement patterns, based on expected lifetimes.
2. Non-equipment measures, which affect end-use consumption without replacing end-use equipment (e.g., insulation). Such measures, which do not include timing constraints from equipment turnover (except for new construction), are considered discretionary, as savings can be acquired at any point over the planning horizon.

For this study, Cadmus assumed that all high-efficiency equipment measures are installed at the end of the existing equipment's remaining useful life. We did not assess energy efficiency potential for early replacement, because most measures will naturally be replaced within the study horizon, and long-run technical potential from early replacement measures will equal savings from replace-on-burnout measures. However, incremental costs for early replacement measures are much higher than for replace-on-burnout measures because they reflect the full measure cost, not incremental costs. The economic potential, therefore, depends on the allocation of early replacement and replace-on-burnout measures. Including these early replacement measures would contribute to estimates of technical and economic potential that are inconsistent with their definitions.[10]

Early replacement, however, can be considered in estimates of program potential. Short-run savings from early replacement measures may exceed savings from replace-on-burnout iterations because early replacement savings are calculated using a below-standard baseline. Because this study did not include an estimate of program potential, Cadmus excluded early replacement measures from the analysis.

The following are relevant inputs for equipment and non-equipment measures:

- Energy savings—average annual savings attributable to installing the measure, in absolute and/or percentage terms
- Equipment cost—full or incremental, depending on the nature of the measure and the application
- Labor cost—the expense of installing the measure
- Measure life—the expected life of measure equipment

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[10] Cadmus did consider refrigerator, freezer, and room air conditioner recycling to estimate savings associated with the removal of below-standard secondary units. These measures, however, are not considered early replacement because they are not based on the secondary unit being replaced with an efficient unit.

The following are relevant inputs for non-equipment measures only:

- Technical feasibility—the percentage of buildings where customers can install this measure, accounting for physical constraints
- Percentage incomplete—the percentage of buildings where customers have not installed the measure, but where it could technically feasible be installed
- Measure competition—for mutually exclusive measures, the percentage of each measure likely installed (to avoid double-counting savings)
- Measure interaction—the end-use interactions between measures (e.g., a decrease in lighting power density causing heating loads to increase)

As shown in Table 18, Cadmus used a number of sources to characterize savings, costs, and measure lifetimes.

Table 18. Measure Characterization Data Sources

Input	Residential	Commercial
Energy savings	Cadmus' 2013 potential study and the Company's 2013 program evaluation, ENERGY STAR, other statewide TRMs, U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy (EERE) technical documents, RTF, Cadmus research	LG&E and KU 2013 potential study and 2013 program evaluation, CBECS 2013 microdata, ENERGY STAR, DEER*, other statewide TRMs, DOE/EERE, RTF, Cadmus research
Equipment and labor costs	National Residential Efficiency Measures Database,*** RSMeans,+ ENERGY STAR, DOE/EERE, DEER*, incremental cost studies, online retailers, Cadmus research	RSMeans, ENERGY STAR, DOE/EERE, DEER*, RTF, regional TRMs, incremental cost studies, online retailers, Cadmus research
Measure life	ENERGY STAR, DEER*, Cadmus research	ENERGY STAR, DEER*, Cadmus research
Technical feasibility	Cadmus research	Cadmus research
Percentage incomplete	Primary data collection phone surveys, LG&E and KU program accomplishments, EIA RECS, Cadmus research	Primary data collection phone surveys, LG&E and KU program accomplishments, Cadmus research

** U.S. Department of Energy Office of Energy Efficiency and Renewable Technology. http://energy.gov/eere/office-energy-efficiency-renewable-energy

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* California Energy Commission. "Database for Energy Efficient Resources." Available online: http://www.deeresources.com/

*** National Renewable Energy Laboratory. "National Residential Efficiency Measures Database." Available online: http://www.nrel.gov/ap/retrofits/

+ RSMeans. "Cost Data." Available online: https://www.rsmeans.com/products/books/2016-cost-data-books.aspx

Energy Savings and Measure Interactions

For each energy efficiency measure, Cadmus estimates energy savings both as savings per unit (kWh or MCF) and savings as a percentage of end-use consumption. For these estimates, we accounted for the interaction of savings and use across end uses (e.g., cooling load will decrease when efficient lighting is installed because of the reduction of waste heat). We relied on a number of sources to develop savings estimates, including:

- ***The 2013 LG&E and KU residential and commercial energy efficiency potential study:*** Cadmus characterized measure savings for the 2013 potential study; most of these estimates are still valid because we developed them using standard protocols for estimating energy savings.
- ***LG&E's and KU's most recent program evaluations and program data:*** Program evaluations can inform estimates of energy savings. Many program evaluations either use engineering algorithms (such as those found in TRMs), billing analyses, or building simulations to estimate savings for energy efficiency measures. Evaluations of LG&E's and KU's existing programs are an excellent source of savings because they reflect actual measures installed in the Company's customers' homes and businesses.
- ***Other utility program evaluations:*** Cadmus benchmarked estimates against other utilities' program evaluations. We also referred to these when characterizing measures that LG&E and KU do not offer through existing prescriptive programs.
- ***The DOE Uniform Methods Project or other standard evaluation protocols:*** DOE's Uniform Methods Project defines standard calculations to estimate energy savings for a number of measures. Cadmus' savings calculations are consistent with such industry standards.
- ***ENERGY STAR calculators:*** EPA's ENERGY STAR calculators provide estimates of per-unit savings for a number of measures, including efficient appliances (refrigerators, freezers, clothes washers, etc.) and efficient home electronics (televisions, computers, monitors, etc.).
- ***Regional TRMs**:* TRMs from other states and regions such as Pennsylvania, California (DEER), and the Northwest provide formulas to estimate per-unit energy savings. When Cadmus used a regional TRM, we ensured that the calculations incorporated Kentucky-specific inputs.

Equipment, Labor, and Annual Operation and Maintenance Costs

Cadmus estimated the equipment, labor, and annual operation and maintenance O&M costs for each energy efficiency measure. We used these costs to calculate benefit/cost ratios and estimate potential program expenditures. Costs can change significantly over a short period of time; therefore, Cadmus reviewed each measure and determined whether the costs used in Cadmus' 2013 potential study are still relevant. In addition to data from the 2013 potential study, other cost data sources included:

- ***LG&E's and KU's most recent program evaluations and program data:*** Where available, Cadmus incorporated the Company's program data to produce cost estimates.
- ***National Renewable Energy Laboratory (NREL) National Residential Efficiency Measures Database:*** NREL maintains a detailed, up-to-date data set of measure costs for a number of energy efficiency measures.

- ***RSMeans:*** RSMeans provides construction cost data, including costs for a number of home retrofits (such as weatherization, windows, and other various shell upgrades). We used data from 2016 RSMeans, which is the most recent version.
- ***ENERGY STAR:*** EPA provides current equipment costs for a number of ENERGY STAR-rated units.
- ***DOE EERE technical support documents:*** The DOE EERE includes estimates of equipment and labor costs in their technical support documents for a number of different types of energy-efficient equipment
- ***Regional TRMs and incremental cost studies:*** TRMs often require incremental cost studies, which typically show both baseline and efficiency measure costs (labor, equipment, and O&M). States frequently update these studies to incorporate the most recent cost data. These studies include the measures most commonly offered through utility-sponsored energy efficiency programs.
- ***Online retailers:*** Cadmus staff continuously review the prices listed on manufacturer or retailer websites. While online retailers may not provide estimates of installation (labor) or annual O&M costs, they do provide reliable equipment costs.

Measure Life

Cadmus uses estimates of each measure's effective useful life (EUL) to calculate the lifetime NPV benefits and costs for each energy efficiency measure. Many of the data sources for measure savings and costs (described above) also provide estimates for measure lifetimes. We updated measure lives from Cadmus' 2013 potential assessment using the following sources:

- LG&E's and KU's most recent program evaluations and program data
- NREL National Residential Efficiency Measures Database
- EUL studies, which included the Northeast Energy Efficiency Partnership's 2007 EUL study[11] or EULs derived by the Association of Home Appliance Manufacturers
- ENERGY STAR
- DOE EERE technical support documents
- Regional TRMs

Technical Feasibility

Technical feasibility factors represent the percentage of homes or buildings where an energy efficiency measure could feasibly be installed. Technical limitations include equipment capability or space limitations. For example, solar water heaters cannot be feasibly installed in all buildings because some

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[11] Northeast Energy Efficiency Partnership. "Load Shape Research and Data." Available online: http://www.neep.org/initiatives/emv-forum/forum-products#Loadshape Research and Data Catalog/

buildings do not have the required roof orientation and pitch. Cadmus updated technical feasibility factors from the 2013 assessment using the following sources:

- ***Stock assessments and surveys such as EIA's RECS and CBECS:*** These assessments include building characteristics that can inform estimates of technical feasibility. For instance, some floor insulation measures require a basement or a crawlspace, and Cadmus used EIA's RECS to determine the proportion of homes that have a basement or crawlspace and can, therefore, feasibly have this measure installed.
- ***Utility energy efficiency program evaluations:*** Some utility energy efficiency program evaluations include research to identify technical barriers to installing energy efficiency measures.
- ***Northwest Power Planning and Conservation Council Power Plans and other potential studies:*** Regional potential studies, such as the Northwest Power Planning and Conservation Council's Sixth and Seventh Power Plans, provide estimates of the technical feasibility for common energy efficiency measures.[12]
- ***Third-party research including the Federal Energy Management Program, DOE, or Toolbase.org:*** Various third-party measure characterization reports identify the technical limitations for energy efficiency measures. Cadmus used these assessments to estimate the proportion of homes or businesses where each measure can feasibly be installed.

Percentage Incomplete

Percentage incomplete factors represent the percentage of remaining homes or businesses that have yet to install an energy efficiency measure. This is equivalent to 100% minus the current saturation of the energy efficiency measure. Similar to efficiency shares, Cadmus updated percentage incomplete factors to account for LG&E's and KU's program accomplishments, building energy codes and standards, and the natural adoption of efficiency measures. Cadmus relied on the following sources to update these factors:

- LG&E's and KU's most recent program evaluations and program data
- Recent stock assessments and surveys such as EIA's RECS and CBECS
- ENERGY STAR reports
- DOE EERE technical support documents

Populating the Measure Databases

Cadmus characterized the underlying measure assumptions and analysis in Excel workbooks (by measure), with examples shown in Figure 11. These measure workbooks contain detailed saving calculations, cost research, EUL data, applicability factor values, and measure assumptions, as well as well-documented source descriptions. We aggregated all measure data into a final master input file for the potential model.

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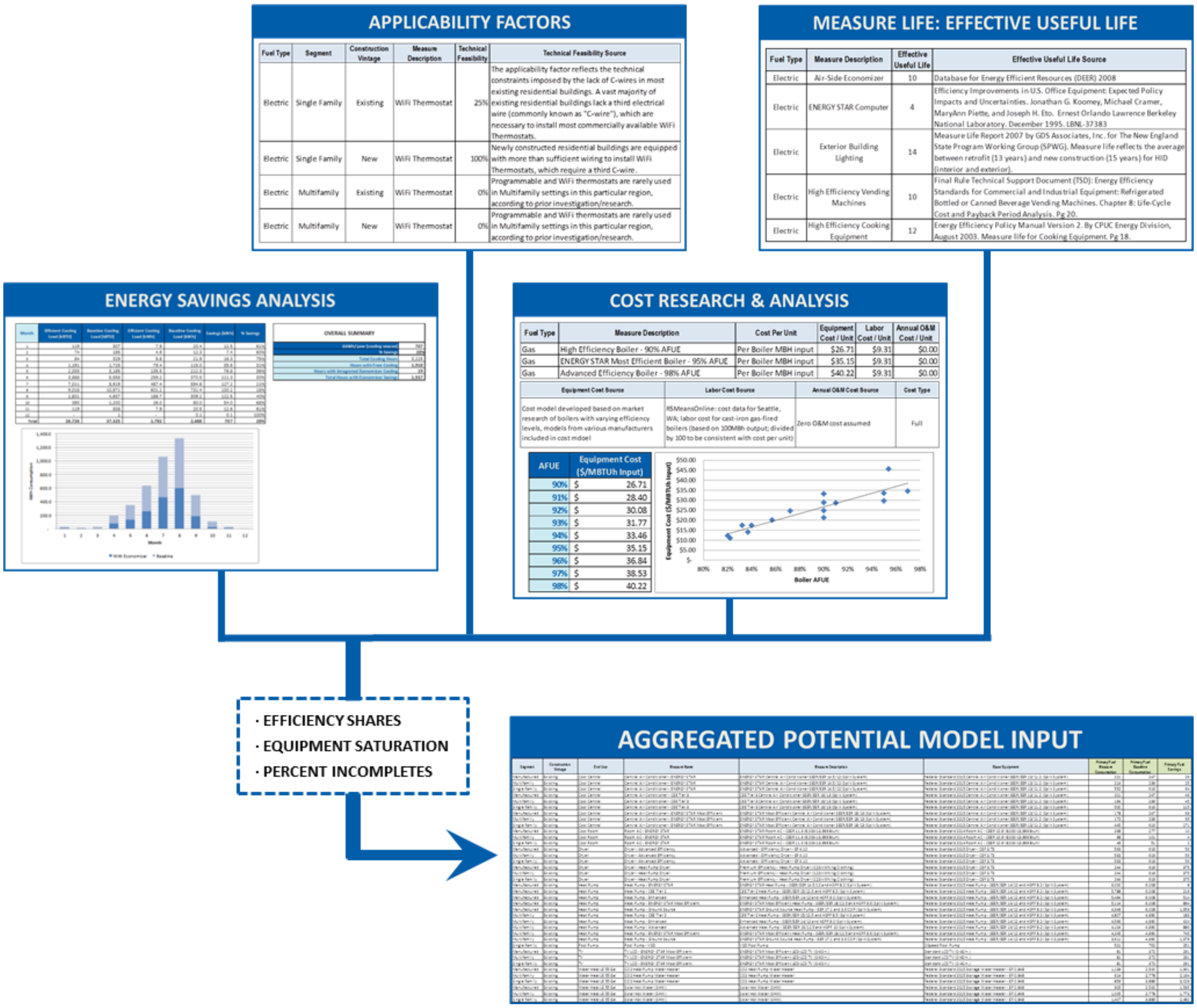
[12] Northwest Power and Conservation Council

Exhibit GSL-3

Figure 11. Example of Measure Workbooks



APPLICABILITY FACTORS

Fuel Type	Segment	Construction Vintage	Measure Description	Technical Feasibility	Technical Feasibility Source
Electric	Single Family	Existing	WiFi Thermostat	25%	The applicability factor reflects the technical constraints imposed by the lack of C-wires in most existing residential buildings. A vast majority of existing residential buildings lack a third electrical wire (commonly known as "C-wire"), which are necessary to install most commercially available WiFi Thermostats.
Electric	Single Family	New	WiFi Thermostat	100%	Newly constructed residential buildings are equipped with more than sufficient wiring to install WiFi Thermostats, which require a third C-wire.
Electric	Multifamily	Existing	WiFi Thermostat	0%	Programmable and WiFi thermostats are rarely used in Multifamily settings in this particular region, according to prior investigation/research.
Electric	Multifamily	New	WiFi Thermostat	0%	Programmable and WiFi thermostats are rarely used in Multifamily settings in this particular region, according to prior investigation/research.

MEASURE LIFE: EFFECTIVE USEFUL LIFE

Fuel Type	Measure Description	Effective Useful Life	Effective Useful Life Source
Electric	Air-Side Economizer	10	Database for Energy Efficient Resources (DEER) 2008
Electric	ENERGY STAR Computer	4	Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties. Jonathan G. Koomey, Michael Cramer, MaryAnn Piette, and Joseph H. Eto. Ernest Orlando Lawrence Berkeley National Laboratory. December 1995. LBNL-37383
Electric	Exterior Building Lighting	14	Measure Life Report 2007 by GDS Associates, Inc. for The New England State Program Working Group (SPWG). Measure life reflects the average between retrofit (13 years) and new construction (15 years) for HID (interior and exterior).
Electric	High Efficiency Vending Machines	10	Final Rule Technical Support Document (TSD): Energy Efficiency Standards for Commercial and Industrial Equipment: Refrigerated Bottled or Canned Beverage Vending Machines. Chapter 8: Life-Cycle Cost and Payback Period Analysis. Pg 20.
Electric	High Efficiency Cooking Equipment	12	Energy Efficiency Policy Manual Version 2. By CPUC Energy Division, August 2003. Measure life for Cooking Equipment. Pg 18.

ENERGY SAVINGS ANALYSIS

COST RESEARCH & ANALYSIS

Fuel Type	Measure Description	Cost Per Unit	Equipment Cost / Unit	Labor Cost / Unit	Annual O&M Cost / Unit
Gas	High Efficiency Boiler - 90% AFUE	Per Boiler MBH input	$26.71	$9.31	$0.00
Gas	ENERGY STAR Most Efficient Boiler - 95% AFUE	Per Boiler MBH input	$35.15	$9.31	$0.00
Gas	Advanced Efficiency Boiler - 98% AFUE	Per Boiler MBH input	$40.22	$9.31	$0.00

Equipment Cost Source	Labor Cost Source	Annual O&M Cost Source	Cost Type
Cost model developed based on market research of boilers with varying efficiency levels, models from various manufacturers included in cost mdoel	RSMeansOnline: cost data for Seattle, WA; labor cost for cast-iron gas-fired boilers (based on 100MBh output; divided by 100 to be consistent with cost per unit)	Zero O&M cost assumed	Full

AFUE	Equipment Cost ($/MBTUh Input)
90%	$ 26.71
91%	$ 28.40
92%	$ 30.08
93%	$ 31.77
94%	$ 33.46
95%	$ 35.15
96%	$ 36.84
97%	$ 38.53
98%	$ 40.22

Estimating Technical Potential

After Cadmus populated the measure database, we used the measure-level inputs to estimate technical potential over the planning horizon. We began this process by estimating savings from all measures included in the analysis, then aggregating the results to the end use, market segment, and sector levels.

For this approach, we began by characterizing individual measure savings, first in terms of the percentage of end-use consumption. For each non-equipment measure, we estimated absolute savings using the following basic relationship:

$$SAVE_{ijm} = EUI_{ije} * PCTSAV_{ijem} * APP_{ijem}$$

Where:

$SAVE_{ijm}$ = Annual energy savings for measure *m* for end use *j* in customer segment *i*

EUI_{ije} = Calibrated annual end-use energy consumption for equipment *e* for end use *j* and customer segment *i*

$PCTSAV_{ijem}$ = The percentage savings of measure *m,* relative to the base usage for the equipment configuration *ije*, accounting for interactions among measures, such as by calibrating lighting and HVAC to annual end-use energy consumption

APP_{ijem} = Measure applicability: a fraction representing a combination of the technical feasibility, existing measure saturation, end-use interaction, and any adjustments to account for competing measures

For example, for wall insulation saving 10% of space heating consumption, the final percentage of the end use saved would be 5%, assuming an overall applicability of 50%. This value represents the percentage of baseline consumption the measure saved in an average home.

To capture all applicable measures, Cadmus examined many instances where multiple measures affected a single end use. To avoid overestimating total savings in assessing cumulative impacts, we accounted for interactions among the various measures—a treatment known as measure stacking. The primary method to account for stacking effects is to establish a rolling, reduced baseline, then apply it sequentially to assessments of measures in the stack. The equations below illustrate this technique, applying measures 1, 2, and 3 to the same end use:

$$SAVE_{ij1} = EUI_{ije} * PCTSAV_{ije1} * APP_{ije1}$$

$$SAVE_{ij2} = (EUI_{ije} - SAVE_{ij1}) * PCTSAV_{ije2} * APP_{ije2}$$

$$SAVE_{ij3} = (EUI_{ije} - SAVE_{ij1} - SAVE_{ij2}) * PCTSAV_{ije3} * APP_{ije3}$$

After iterating all measures in a bundle, the final percentage of the reduced end-use consumption provided the sum of the individual measures' stacked savings, which we then divided by the original baseline consumption.

Estimating Economic Potential

Cadmus based our methodology for estimating economic potential on the methods described in the California Standard Practice Manual,[13] which establishes the procedures for economic evaluation from the perspectives of participants, the utility (or program administrator), total resource costs, society, and all ratepayers. Consistent with standard industry practice for the analysis of economic potential, Cadmus relied on the TRC test as the criterion for screening energy efficiency measures for cost-effectiveness.

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[13] California Public Utilities Commission. "California Standard Practice Manual for Economic Analysis of Demand-Side Programs and Projects." 2002.

For each measure, we applied TRC by first calculating the measure benefits, as measured by the avoided long-run energy and capacity costs and avoided line losses, and comparing the result to the measure's costs. For equipment measures, we calculated costs based on the measure's incremental costs (compared with the cost of baseline technology). For retrofit measures, measure costs included the total installed cost of the measure. For this study, Cadmus considered a measure to be cost-effective if the NPV of its benefits exceeded the NPV of its costs as measured according to the TRC test, that is:

$$\frac{\text{TRC Benefits}}{\text{TRC Costs}} \geq 1$$

Where:

$$\text{TRC Benefits} = NPV\left(\sum_{year=1}^{measurelife}\left(\sum_{i}^{i=8760}(impact_i \times avoided\cos t_i)\right)\right)$$

$$\text{TRC Costs} = \text{NPV (incremental or total installed measure cost)}$$

Economic potential represents the savings from the subset of measures that passed the cost-effectiveness criterion according to the TRC test.

To calculate each measure's TRC test benefits, Cadmus used the following data:

- ***End-use load shapes***, or consumption patterns by costing period, applied to electric and natural gas measures, and capturing the time-differentiated value of energy savings to determine the amount of savings during peak periods.
- ***Line losses*** representing energy lost between the generator and the customer meter. Thus, energy and capacity savings at the customer meter are gross, capturing the true value of savings. Cadmus used electric line loss of 5.8% for LG&E, 6.2% for KU, and a natural gas line loss of 1.93%, as provided by the Company.
- ***Discount rate*** of 6.51% for both utilities.
- ***Utility avoided energy costs***, which are the Company's projections of time and seasonally differentiated electric energy and natural gas commodity costs.
- ***Utility avoided capacity costs***, or the Company's projections of the cost of supplying power during peak periods, estimated by the Company as $0 per kW per year for the base scenario, and additional scenarios with avoided capacity costs of $33, $68, and $100 per kW per year.

The line loss factor, discount rate, avoided energy costs, and avoided capacity costs were provided to Cadmus by the Company.

Based on the results from the cost-effectiveness analysis, and using the same method described in the Estimating Technical Potential section above, Cadmus developed a supply curve consisting of measures that passed the cost-effectiveness criterion from the TRC perspective.

Why Economic Potential Can Exceed Technical Potential for Individual Measures

Economic potential can exceed technical potential when a second measure that interacts with a given measure fails the benefit/cost screen. For instance, suppose a homeowner installs an efficient air conditioner that reduces their baseline cooling consumption from 1,000 kWh to 900 kWh. Then the homeowner installs a weatherization measure that saves 10% of the baseline cooling consumption. The technical potential for this weatherization measure would equal 90 kWh (900 x 10%). Now suppose the efficient air conditioner measure is not cost-effective—the homeowner's baseline consumption will remain at 1,000 kWh. If the weatherization measure is cost-effective, the 10% savings will yield economic potential equal to 100 kWh (1,000 x 10%). In this case, economic potential for the weatherization measure will exceed the technical potential.

Technical and Economic Potential

Scope of Analysis

Cadmus separately assessed technical potential and economic potential for electricity and natural gas in the residential and commercial sectors. Within each utility's sector-level assessment, we further distinguished among market segments or business types, vintage, and applicable end uses, as follows:

- Six residential segments (existing and new construction for single family, multifamily, and manufactured)[14]
- Twenty-two commercial segments (11 building types within existing and new construction)

Cadmus began the analysis by assessing the technical potential for 364 unique electric and 198 unique natural gas energy efficiency measures (shown in Table 19), representing a comprehensive set of electric and natural gas energy efficiency measures applicable to local climate and customer characteristics.

Table 19. Energy Efficiency Measure Counts

Sector	Unique Measures	Permutations by Utility, Market Segment, and Vintage
Electric		
Residential	141	2,248
Commercial	223	9,714
Natural Gas		
Residential	103	521
Commercial	95	2,102

Summary of Results

Electric Energy Efficiency Potential

Study results indicate 7,072 GWh of technically feasible electric energy efficiency potential by 2038, the end of the 20-year planning horizon, with approximately 1,988 GWh of these resources proving cost-effective (as shown in Table 20). The identified economic potential amounts to 9% of forecast load in 2038.

Cadmus estimated savings using forecasts of future consumption, absent utility program activities. While consumption forecasts account for the past savings each utility has acquired, we estimated potential inclusive of—not in addition to—current or forecasted program savings.

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[14] Cadmus did not model manufactured homes for LG&E's service territory due to the small number of manufactured homes in Louisville. We did include manufactured homes in KU's service territory.

Table 20. Technical and Economic Electric Energy Efficiency Potential by Utility – Energy (GWh)

Sector	Baseline Sales 2038	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
LGE						
Residential	5,012	1,752	472	35%	9%	27%
Commercial	4,627	1,237	359	27%	8%	29%
Subtotal	**9,639**	**2,989**	**831**	**31%**	**9%**	**28%**
KU						
Residential	6,440	2,390	621	37%	10%	26%
Commercial	5,573	1,693	536	30%	10%	32%
Subtotal	**12,013**	**4,083**	**1,157**	**34%**	**10%**	**28%**
Total						
Residential	11,453	4,143	1,093	36%	10%	26%
Commercial	10,200	2,930	895	29%	9%	31%
Total	**21,652**	**7,072**	**1,988**	**33%**	**9%**	**28%**

Table 21 shows technical and economic demand reduction for each utility and sector. Overall, technical potential is 2,069 MW of demand reduction by 2038, and economic potential is 303 MW. This is equivalent to 35% and 5% of baseline peak demand, respectively. Cadmus calculated demand reduction using the Company's 8760 end-use load shapes. We identified the Company's summer coincident peak hour and multiplied annual energy savings by the peak hour coincidence factor to determine demand reduction for each measure.

Table 21. Technical and Economic Electric Energy Efficiency Potential by Utility – Demand (MW)

Sector	Baseline Sales 2038	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
LGE						
Residential	1,695	672	47	40%	3%	7%
Commercial	944	246	69	26%	7%	28%
Subtotal	**2,639**	**917**	**116**	**35%**	**4%**	**13%**
KU						
Residential	2,148	823	91	38%	4%	11%
Commercial	1,125	329	97	29%	9%	29%
Subtotal	**3,273**	**1,152**	**187**	**35%**	**6%**	**16%**
Total						
Residential	3,843	1,495	138	39%	4%	9%
Commercial	2,069	574	166	28%	8%	29%
Total	**5,912**	**2,069**	**303**	**35%**	**5%**	**15%**

Natural Gas Energy Efficiency Potential

Table 22 presents 2038 forecasted baseline sales and potential by sector. The study results indicate over 11.7 million MCF of technically feasible, natural gas energy efficiency potential by 2038. The identified economic potential of 4.0 million MCF amounts to 15% of forecast load in 2038.

Table 22. Technical and Economic Natural Gas Energy Efficiency Potential (MCF)

Sector	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Residential	17,872,105	8,794,324	3,082,896	49%	17%	35%
Commercial	8,775,436	2,974,937	937,691	34%	11%	32%
Subtotal	26,647,541	11,769,261	4,020,586	44%	15%	34%

The residential sector accounts for 75% of the total technical potential and 77% of the total economic potential. The commercial sector accounts for the remaining 25% and 23% of technical and economic potential, respectively.

Detailed Energy Efficiency Potentials

Electric Energy Efficiency

Residential Sector

The study results indicate that residential customers account for about 58% of forecasted electricity retail sales. The single family, manufactured, and multifamily potential savings measures included:

- Equipment efficiency upgrades (e.g., air conditioning, refrigerators)
- Improvements to building shells (e.g., insulation, windows, air sealing)
- Increases in lighting efficiency (e.g., CFLs, LED interior lighting)
- Behavioral measures, such as energy feedback

Table 23 is based on resources included in this assessment, showing the estimated residential sector electric economic potential of 1,093 GWh over 20 years, corresponding to a cumulative 10% reduction (9% for LG&E and 10% for KU) in 2038 residential usage.

Table 23. Residential Electric Energy Efficiency Potential by Utility – Energy (GWh)

Segment	Baseline Sales	Cumulative 2038		Percentage of Baseline	
		Technical	Economic	Technical	Economic
LG&E					
Single Family	4,231	1,505	414	36%	10%
Multifamily	782	248	57	32%	7%
Subtotal	**5,012**	**1,752**	**472**	**35%**	**9%**
KU					
Single Family	5,299	2,002	527	38%	10%
Multifamily	492	152	36	31%	7%
Manufactured	650	236	58	36%	9%
Subtotal	**6,440**	**2,390**	**621**	**37%**	**10%**
Total					
Single Family	9,530	3,506	942	37%	10%
Multifamily	1,273	400	93	31%	7%
Manufactured	650	236	58	36%	9%
Total	**11,453**	**4,143**	**1,093**	**36%**	**10%**

Table 24 shows residential sector technical and economic demand reduction potential for each segment. Economic potential is 138 MW by 2038, which is equivalent to 4% of baseline residential peak demand.

Table 24. Residential Electric Energy Efficiency Potential by Utility – Demand (MW)

Segment	Baseline Sales	Cumulative 2036		Percentage of Baseline	
		Technical	Economic	Technical	Economic
LG&E					
Single Family	1,511	606	42	40%	3%
Multifamily	184	65	5	36%	3%
Subtotal	**1,695**	**672**	**47**	**40%**	**3%**
KU					
Single Family	1,878	727	81	39%	4%
Multifamily	119	40	3	33%	3%
Manufactured	152	56	6	37%	4%
Subtotal	**2,148**	**823**	**91**	**38%**	**4%**
Total					
Single Family	3,389	1,334	122	39%	4%
Multifamily	303	105	9	35%	3%
Manufactured	152	56	6	37%	4%
Total	**3,843**	**1,495**	**138**	**39%**	**4%**

The single family segment accounts for 86% (Figure 12) of total residential sector potential energy savings (economic) and 89% of demand reduction (Figure 13).

Figure 12. Residential Sector Electric Economic Potential by Segment – Energy (GWh)

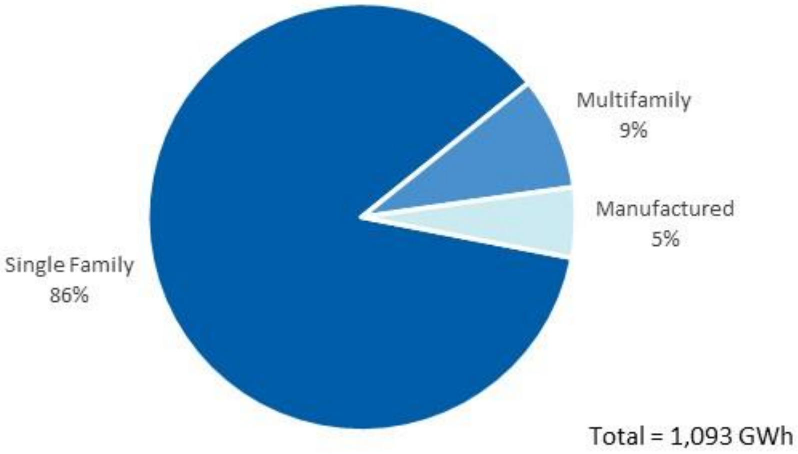

Figure 13. Residential Sector Electric Economic Potential by Segment – Demand (MW)

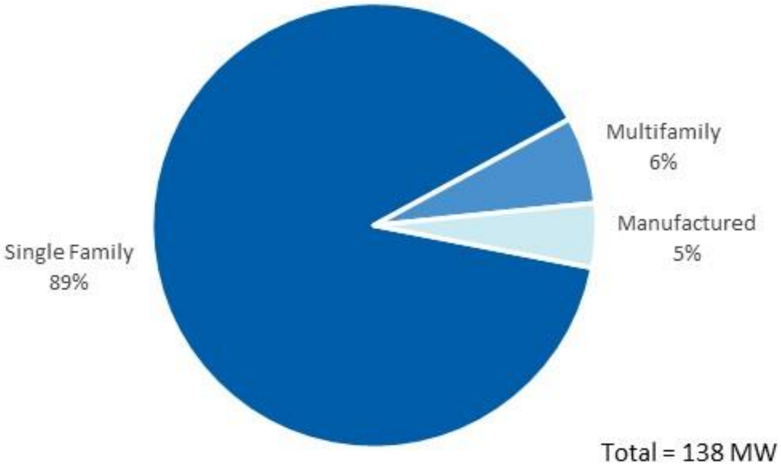

Figure 14 and Figure 15 show the distribution of residential sector economic potential (energy and demand, respectively) by end use group. Water heating measures account for 27% of total residential sector energy savings, but only 14% of demand reduction. Lighting accounts for 30% of energy savings and 10% of demand reduction. Cooling and heat pump measures produce the highest potential demand reduction (25% and 32% of total, respectively), but a smaller portion of energy savings (15% and 5% of total, respectively).

Figure 14. Residential Sector Electric Economic Potential by Measure Type – Energy (GWh)

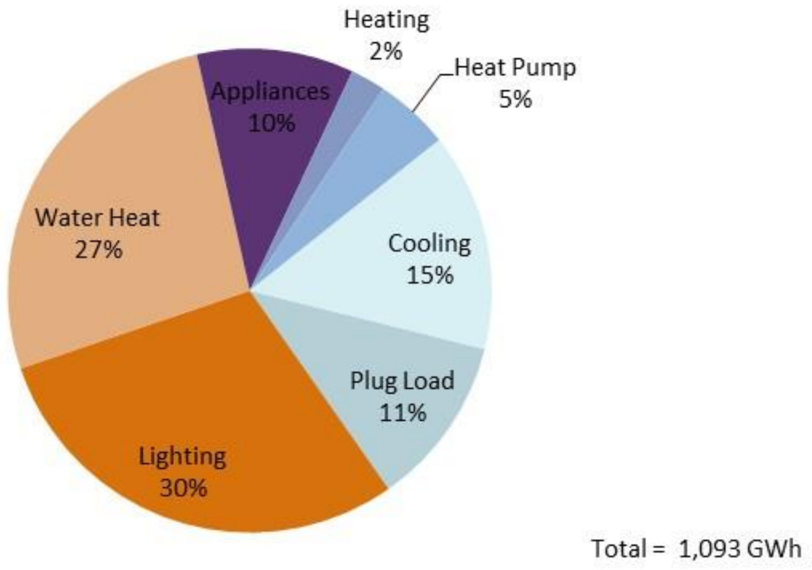

Figure 15. Residential Sector Electric Economic Potential by Measure Type – Demand (MW)

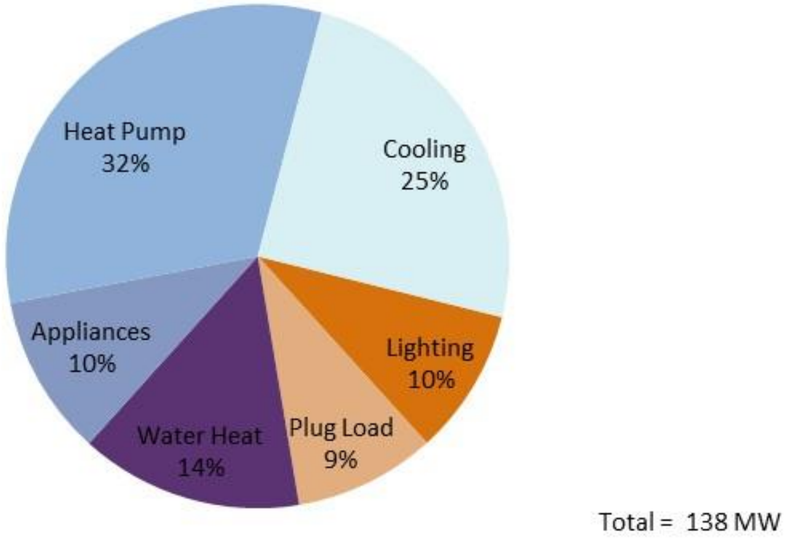

Table 25 and Table 26 show residential sector technical and economic potential by end use group for energy and demand, respectively.

Table 25. Residential Sector Electric Energy Efficiency Potential by End-Use Category – Energy (GWh)

End Use Group	Baseline Sales	Cumulative 2038		Percentage of Baseline	
		Technical	Economic	Technical	Economic
Plug Load	2,227	264	125	12%	6%
Cooking	155	9	0	6%	0%
Cooling	2,304	1,055	159	46%	7%
Appliances	1,361	652	115	48%	8%
Heating	1,578	662	26	42%	2%
Heat Pump	1,818	707	55	39%	3%
Lighting	890	281	323	32%	36%
Ventilation and Circulation	0.3	0.03	0.00	10%	0%
Water Heat	1,119	513	292	46%	26%
Total	**11,453**	**4,143**	**1,093**	**36%**	**10%**

Table 26. Residential Sector Electric Energy Efficiency Potential by End-Use Category – Demand (MW)

End Use Group	Baseline Sales	Cumulative 2038		Percentage of Baseline	
		Technical	Economic	Technical	Economic
Plug Load	228	27	13	12%	5%
Cooking	15	1	0	6%	0%
Cooling	1,853	769	34	42%	2%
Appliances	172	83	14	48%	8%
Heating	0.052	0.018	0.000	34%	0%
Heat Pump	1,463	569	44	39%	3%
Lighting	36	11	13	32%	36%
Ventilation and Circulation	< 1	< 1	0	10%	0%
Water Heat	76	35	20	46%	26%
Total	**3,843**	**1,495**	**138**	**39%**	**4%**

Table 27 shows the top saving measures, sorted by technical potential. Enhanced central air conditioners (SEER 20), above code wall insulation (R-13), ultrasonic dryers, and tier 2 windows (with a U-Value = 0.25) have high technical potential, but none of these measures are cost-effective.

Table 27. Top Saving Residential Measures – Sorted by Technical Potential

Measure Name	2038 (MWh)		Percentage of Total	
	Technical	Economic	Technical	Economic
Central Air Conditioner - Enhanced	449,820	0	11%	0%
Dryer - Ultrasonic Dryer	363,158	0	9%	0%
Wall Insulation (KY) - Maximum Feasible	313,985	0	8%	0%
Window (KY) - Tier 2 Above Code	272,680	0	7%	0%
Heat Pump - Air-Source Enhanced	181,175	0	4%	0%
Lighting General Service Lamp - Premium Efficiency LED	168,613	258,320	4%	24%
Home Energy Reports	130,825	153,959	3%	14%
Refrigerator - CEE Tier 3	122,188	0	3%	0%
CO2 Heat Pump Water Heater	108,426	0	3%	0%
Low-Flow Showerhead	108,039	177,708	3%	16%

Table 28 shows the highest-saving cost-effective residential measures. LED lighting accounts for approximately 24% of the residential sector’s economic potential.

Table 28. Top Saving Residential Measures – Sorted by Economic Potential

Measure Name	2038 (MWh)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Lighting General Service Lamp - Premium Efficiency LED	168,613	258,320	4%	24%
Low-Flow Showerhead	108,039	177,708	3%	16%
Home Energy Reports	130,825	153,959	3%	14%
Refrigerator - Removal of Secondary	77,953	101,378	2%	9%
Pool Pump - Two Speed	0	61,228	0%	6%
Lighting Specialty Lamp - Premium Efficiency LED	76,168	55,358	2%	5%
Low-Flow Faucet Aerator - Kitchen	32,220	52,554	1%	5%
Programmable Thermostat	22,704	51,455	1%	5%
Low-Flow Faucet Aerator - Bathroom	22,543	37,427	1%	3%
Office Multifunction Device - ENERGY STAR	37,350	37,350	1%	3%

*Economic potential exceeds technical potential for individual measures due to reduced interactive effects.

Commercial Sector

Based on resources included in this assessment, Table 29 shows the estimated electric economic potential in the commercial sector, as approximately 895 GWh over the 20-year planning horizon. This corresponds to a 9% reduction of forecasted 2038 commercial usage for the Company (8% for LG&E and 10% for KU).

Table 29. Commercial Sector Electric Energy Efficiency Potential by Utility – Energy (GWh)

Segment	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
LGE	4,627	1,237	359	27%	8%	29%
KU	5,573	1,693	536	30%	10%	32%
Total	**10,200**	**2,930**	**895**	**29%**	**9%**	**31%**

The potential cost-effective reduction of peak demand in the commercial sector is 166 MW (cumulative by 2038; see Table 30). This is equivalent to an 8% reduction in the commercials sector's baseline peak demand.

Table 30. Commercial Sector Electric Energy Efficiency Potential by Utility – Demand (MW)

Company	Baseline Peak	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
LGE	944	246	69	26%	7%	28%
KU	1,125	329	97	29%	9%	29%
Total	**2,069**	**574**	**166**	**28%**	**8%**	**29%**

Figure 16 and Figure 17 show the distribution of economic potential by market segment (for energy and demand, respectively).

Figure 16. Commercial Sector Electric Economic Potential by Segment – Energy

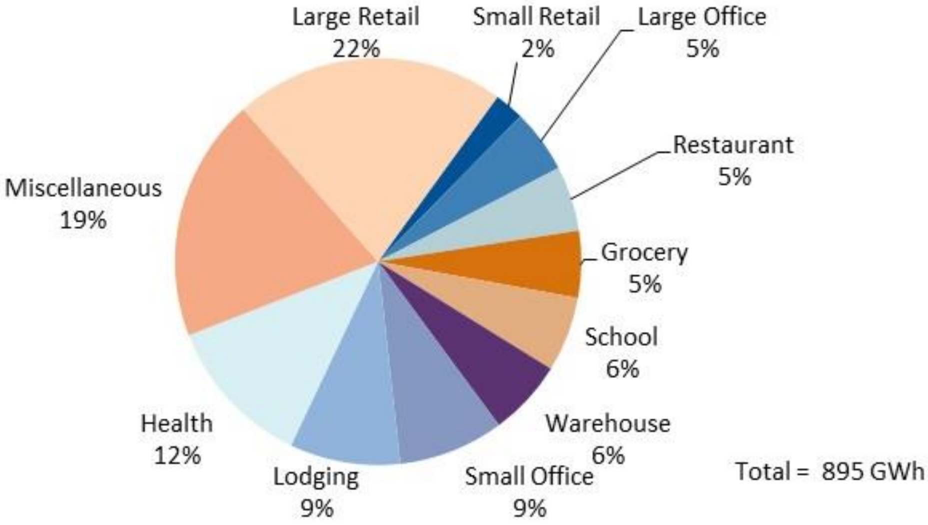

Figure 17. Commercial Sector Electric Economic Potential by Segment – Demand

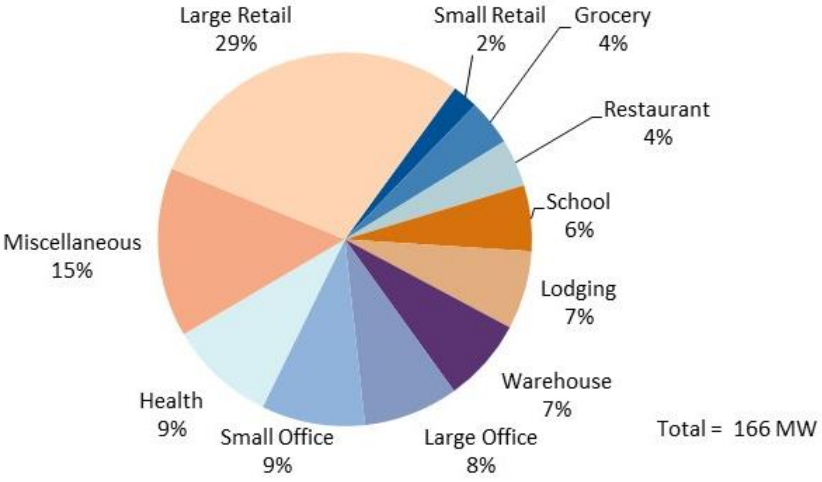

Figure 18 and Figure 19 show the distribution of economic potential in the commercial sector for energy and demand, respectively. Lighting accounts for nearly two-thirds (65%) of cost-effective energy savings and 46% of demand reduction. Cooling accounts for 29% of demand reduction, but only 10% of energy savings.

Figure 18. Commercial Sector Electric Economic Potential by End Use Group – Energy

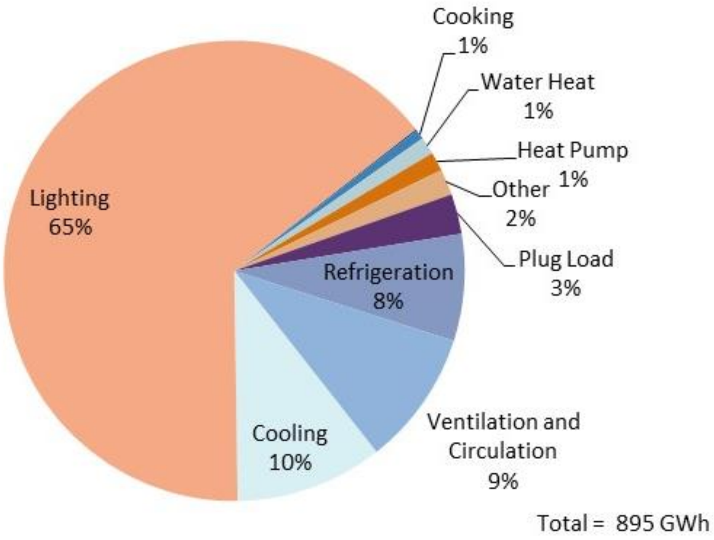

Figure 19. Commercial Sector Electric Energy Efficiency Potential by End-Use Category – Demand

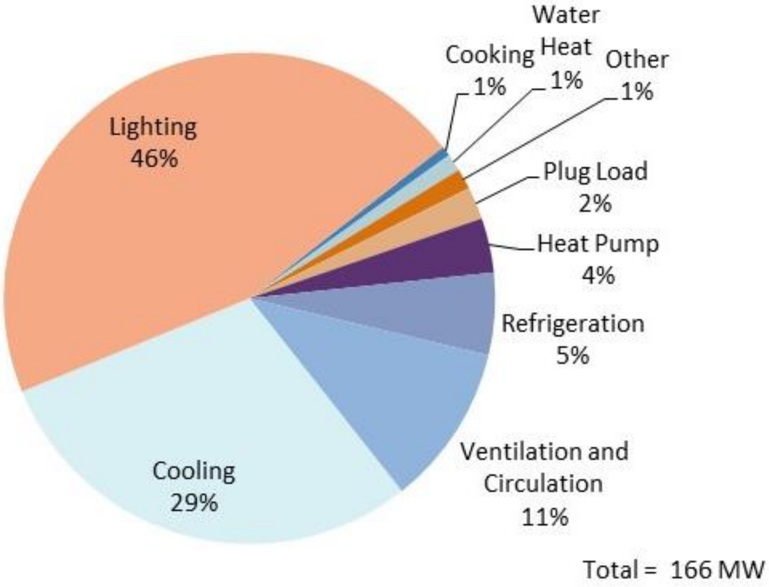

Table 31 and Table 32 show detailed commercial sector technical and economic potential for each end use group, for energy and demand, respectively.

Table 31. Commercial Electric Technical and Economic Potential by End use – Energy (GWh)

End Use	Baseline Sales	Cumulative 2038		Percentage of Baseline	
		Technical	Economic	Technical	Economic
Cooking	38	8	6	20%	15%
Cooling	1,029	345	93	34%	9%
Heat Pump	476	113	12	24%	3%
Heating	110	33	1	30%	1%
Lighting	4,435	1,798	579	41%	13%
Other	58	17	16	29%	28%
Plug Load	1,885	70	25	4%	1%
Refrigeration	1,005	347	67	35%	7%
Ventilation and Circulation	1,043	132	85	13%	8%
Water Heat	120	67	11	55%	9%
Total	**10,200**	**2,930**	**895**	**29%**	**9%**

Table 32. Commercial Electric Technical and Economic Potential by End use – Demand (MW)

End Use	Baseline Sales	Cumulative 2038		Percentage of Baseline	
		Technical	Economic	Technical	Economic
Cooking	6.5	1.4	1.1	22%	17%
Cooling	522	180	49	34%	9%
Heat Pump	231	58	6	25%	3%
Heating	0.05	0.01	0.00	31%	0%
Lighting	646	239	76	37%	12%
Other	8	2	2	29%	28%
Plug Load	289	10	4	3%	1%
Refrigeration	134	46	9	34%	7%
Ventilation and Circulation	212	28	18	13%	8%
Water Heat	20	11	2	55%	10%
Total	**2,069**	**574**	**166**	**28%**	**8%**

Table 33 lists commercial measures in order of cumulative technical potential. LED replacements for linear fluorescent lighting (TLEDs) have the highest technical potential—this measure accounts for 31% of technical potential in the commercial sector. However, this measure is rarely cost-effective. TLEDs only account for 7% of total economic potential.

Table 33. Top-Saving Commercial Electric Measures – Sorted by Technical Potential

Measure Name	2038 (MWh)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Lighting Interior - TLED - Above Standard	900,442	62,128	31%	7%
LED Exterior Wall Pack	260,820	0	9%	0%
Occupancy Sensor Control	208,288	285,297	7%	32%
Lighting Interior - High Bay LED - Above Standard	109,118	0	4%	0%
Night Covers for Display Cases	96,068	0	3%	0%
Motor - Pump and Fan System - Variable Speed Control	76,486	69,769	3%	8%
Refrigeration Commissioning or Recommissioning	72,499	5,795	2%	1%
Daylighting Controls, Outdoors (Photocell)	70,168	69,422	2%	8%
Recommissioning	67,838	0	2%	0%
DX Package 240 to 760 kBtuh - Premium Efficiency	52,970	849	2%	0%

*Economic potential exceeds technical potential for individual measures due to reduced interactive effects.

Table 34 lists the highest saving cost-effective energy efficiency measures in the commercial sector.

Table 34. Top-Saving Commercial Electric Measures – Sorted by Economic Potential

Measure Name	2038 (MWh)		Percentage of Total	
	Technical	Economic	Technical	Economic
Occupancy Sensor Control	208,288	285,297	7%	32%
Motor - Pump and Fan System - Variable Speed Control	76,486	69,769	3%	8%
Daylighting Controls, Outdoors (Photocell)	70,168	69,422	2%	8%
Lighting Interior - TLED - Above Standard	900,442	62,128	31%	7%
Lighting Interior - Efficient Metal Halide - Above Standard	0	45,798	0%	5%
Lighting Interior - Screw-Base LED - Above Standard	43,728	44,575	1%	5%
Direct/Indirect Evaporative Cooling, Pre-Cooling	28,229	32,487	1%	4%
Case Replacement Low Temp	25,187	25,187	1%	3%
Lighting Package - Advanced Efficiency	37,646	24,461	1%	3%
Exit Sign - Photoluminescent or Tritium	23,480	23,662	1%	3%

Natural Gas

Residential Sector

Single family homes represent 90% of total economic residential potential, followed by multifamily homes. Multifamily homes represent a smaller share of natural gas potential largely due to a lower saturation of natural gas furnaces.

Table 35. Residential Sector Natural Gas Technical and Economic Potential by Segment (MCF)

Segment	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Single Family	16,160,909	8,131,286	2,829,161	50%	18%	35%
Multifamily	1,711,196	663,038	253,735	39%	15%	38%
Total	17,872,105	8,794,324	3,082,896	49%	17%	35%

Figure 20 presents distributions of natural gas economic potential by measure type. The largest portion of economic potential in the residential sector derives from measures impacting central furnaces (68%) followed by water heating (32%).

Figure 20. Residential Sector Economic Potential by End Use

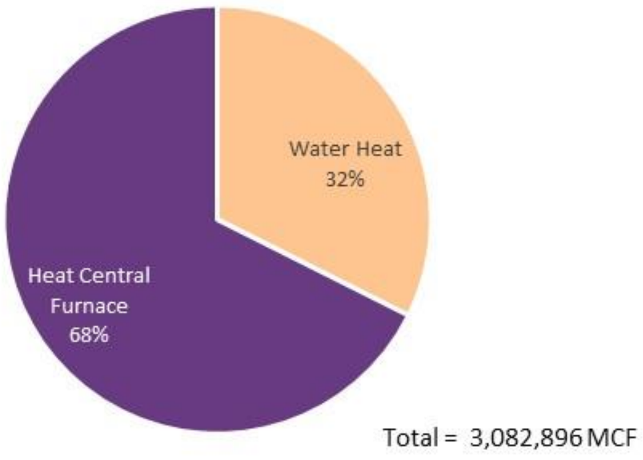

Table 36 provides technical and economic potential by end-use category. As shown, central gas furnaces offer significant technical potential—measures affecting this end use can could technically produce a 50% reduction in baseline usage and cost-effectively produce a 16% reduction in baseline usage. Water heating measures produce economic potential equivalent to roughly 26% of baseline water heating natural gas consumption.

Table 36. Residential Sector Natural Gas Technical and Economic Potential by End Use (MCF)

End Use Group	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Cooking Oven	1,191	234	0	20%	0%	0%
Cooking Range	3,354	0	0	0%	0%	-
Dryer	1,696	236	0	14%	0%	0%
Heat Central Furnace	132,809	66,955	20,844	50%	16%	31%
Pool Heat	1,848	291	0	16%	0%	0%
Water Heat	37,822	20,227	9,985	53%	26%	49%
Total	**178,721**	**87,943**	**30,829**	**49%**	**17%**	**35%**

Table 37 and Table 38 show the highest-savings residential natural gas measures, sorted by technical and economic potential, respectively.

Table 37. Top-Saving Residential Natural Gas Measures – Sorted by Technical Potential

Measure Name	2038 (MCF)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Wall Insulation (KY) - Maximum Feasible	1,635,282	0	19%	0%
Window (KY) - Tier 2 Above Code	1,124,926	0	13%	0%
Furnace - Premium Efficiency 98% AFUE	1,109,798	1,814,667	13%	59%
Low-Flow Showerhead	495,838	729,417	6%	24%
Wi-Fi Thermostat	422,493	0	5%	0%
Floor Insulation (KY) - Above Code	406,199	0	5%	0%
Water Heater - ENERGY STAR Tankless	386,605	0	4%	0%
Ceiling Insulation (KY) - Code	365,512	0	4%	0%
Integrated Space Heating and Water Heating	345,428	0	4%	0%
Tune-Up - Boiler	326,164	0	4%	0%

*Economic potential can exceed technical for individual measures due to interactive effects. See the explanation in the *Why Economic Potential Can Exceed Technical Potential* of this report.

Table 38. Top-Saving Residential Natural Gas Measures – Sorted by Economic Potential

Measure Name	2038 (MCF)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Furnace - Premium Efficiency 98% AFUE	1,109,798	1,814,667	13%	59%
Low-Flow Showerhead	495,838	729,417	6%	24%
Programmable Thermostat	98,742	269,771	1%	9%
Low-Flow Faucet Aerator - Kitchen	89,037	123,520	1%	4%
Low-Flow Faucet Aerator - Bathroom	73,071	101,393	1%	3%
Low-Flow Showerhead - Federal Standard 1994	24,884	36,570	0.3%	1%
Pipe Insulation - Water Heater	7,391	7,557	0.1%	0.2%

*Economic potential can exceed technical for individual measures due to interactive effects. See the explanation in the *Why Economic Potential Can Exceed Technical Potential* of this report.

Commercial Sector

As shown in Figure 21, miscellaneous buildings and health facilities represent the largest shares of natural gas economic potential in the commercial sector (26% and 20%, respectively). As with the commercial electric sector, the miscellaneous segment includes a combination of business segments that do not fit into the other categories, or that presented insufficient information to be classified.

Figure 21. Commercial Natural Gas Economic Potential by Segment

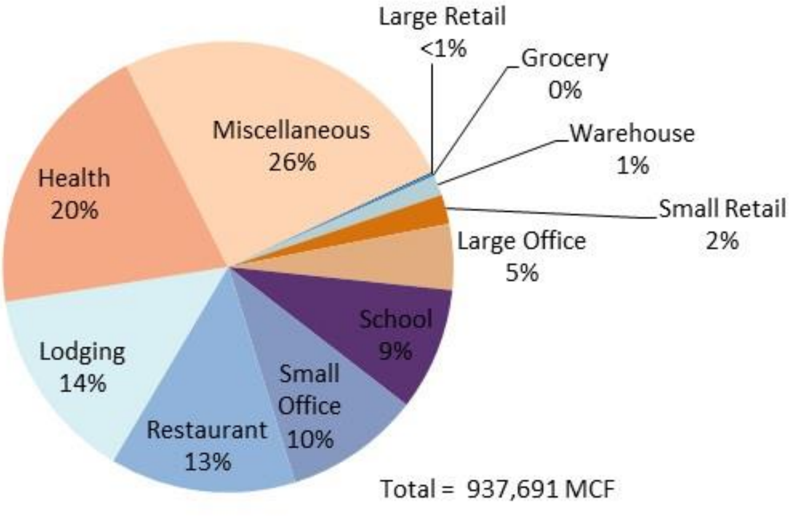

Table 39 shows the commercial sector's baseline sales, cumulative technical potential, and cumulative economic potential in 2038, for natural gas in each commercial segment.

Table 39. Commercial Sector Natural Gas Technical and Economic Potential by Segment (MCF)

Segment	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Grocery	17,963	5,985	1,853	33%	10%	31%
Health	1,205,237	417,390	187,680	35%	16%	45%
Large Office	245,617	103,757	44,242	42%	18%	43%
Large Retail	1,263,026	479,492	1,195	38%	0%	0%
Lodging	1,428,266	315,639	131,260	22%	9%	42%
Miscellaneous	2,231,711	798,988	239,223	36%	11%	30%
Restaurant	607,753	220,707	124,988	36%	21%	57%
School	750,630	275,588	82,715	37%	11%	30%
Small Office	715,792	252,132	91,252	35%	13%	36%
Small Retail	171,923	59,276	19,781	34%	12%	33%
Warehouse	137,518	45,984	13,501	33%	10%	29%
Total	8,775,436	2,974,937	937,691	34%	11%	32%

Figure 22 presents distributions of natural gas energy efficiency economic potential by measure type. The largest portion of economic potential in the commercial sector comes from the furnace end uses (56%), followed by water heating (27%). Boilers account for 10% of economic potential, and cooking accounts for the remaining 7% of economic potential.

Figure 22. Commercial Sector Natural Gas Economic Potential by End Use

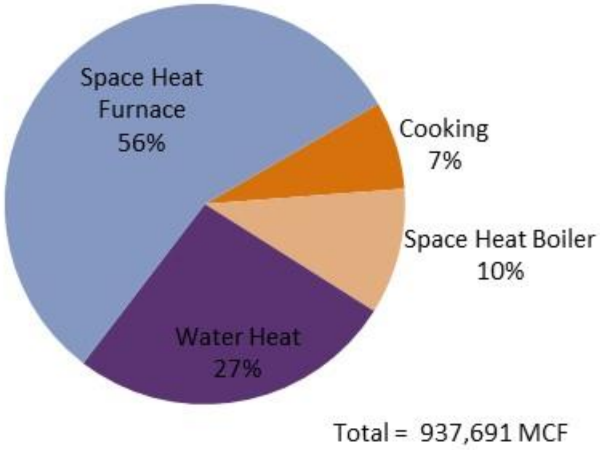

Table 40 shows the commercial sector's baseline sales, cumulative technical potential, and cumulative economic potential in 2038, for natural gas in each end use group.

Table 40. Commercial Sector Natural Gas Technical and Economic Potential by End Use (MCF)

End Use	Baseline Sales	Cumulative 2038		Percentage of Baseline		Economic as a Percentage of Technical
		Technical	Economic	Technical	Economic	
Cooking	627,255	131,130	66,681	21%	11%	51%
Space Heat Boiler	1,004,465	421,810	95,508	42%	10%	23%
Space Heat Furnace	5,103,328	2,052,102	527,684	40%	10%	26%
Water Heat	1,025,012	304,688	247,817	30%	24%	81%
Pool Heat	1,015,376	65,206	0	6%	0%	0%
Total	8,775,436	2,974,937	937,691	34%	11%	32%

Table 41 lists the energy efficiency measures with the highest natural gas technical potential in the commercial sector. Recommissioning accounts for 18% of total technical potential (over 500,000 MCF by 2038), however, this measure is not cost-effective. The second highest-saving measure—advanced efficiency furnaces—offers both high technically feasible and cost-effective savings. Generally, building shell measures, such as ceiling insulation and floor insulation, have high technical potential but low economic potential.

Table 41. Top-Saving Commercial Natural Gas Measures Sorted by Technical Potential

Measure Name	2038 (MCF)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Recommissioning	531,020	0	18%	0%
Furnace < 225 kBtuh - Advanced Efficiency	354,397	385,890	12%	41%
Ceiling Insulation - Code	314,217	10,949	11%	1%
Direct Digital Control System-Installation	243,674	0	8%	0%
Floor Insulation - Non-Sla) - Code	201,085	8,654	7%	1%
Water Heater Less than 55 Gal - Condensing - High Efficiency	163,438	162,790	5.5%	17%
Automated Ventilation VFD Control (Occupancy Sensors/CO2 Sensors)	112,784	0	3.8%	0%
Tune-Up - Furnace Maintenance	100,696	50,168	3%	5%
Convert Constant Volume Air System to VAV	94,674	0	3%	0%
Wall Insulation - Code	75,697	0	3%	0%

*Economic potential can exceed technical for individual measures due to interactive effects. See the explanation in the *Why Economic Potential Can Exceed Technical Potential* of this report.

Table 42 lists the highest-saving cost-effective natural gas energy efficiency measures in the commercial sector. Highly efficient equipment, such as advanced efficiency furnaces and condensing water heaters, account for a significant share of total natural gas economic potential in the commercial sector. Equipment measures are generally cost-effective because their incremental costs are low, yet savings are relatively high. Retrofit measures, such as weatherization and controls measures, are generally not cost-effective due to relatively high incremental costs.

Exhibit GSL-3

Table 42. Top-Saving Commercial Natural Gas Measures Sorted by Economic Potential

Measure Name	2038 (MCF)		Percentage of Total	
	Technical	Economic*	Technical	Economic
Furnace < 225 kBtuh - Advanced Efficiency	354,397	385,890	12%	41%
Water Heater less than 55 Gal - Condensing - High Efficiency	163,438	162,790	5%	17%
Boiler < 300 kBtuh - Advanced Efficiency	50,070	75,477	2%	8%
Tune-Up - Furnace Maintenance	100,696	50,168	3%	5%
Water Heater greater than 55 Gal - Tankless - ENERGY STAR	44,406	44,375	1%	5%
Steam Cooker	43,568	43,568	1.5%	5%
Infiltration Reduction	36,982	31,901	1.2%	3.4%
Dishwashing - Commercial - Low Temperature	24,507	24,663	1%	3%
Duct Insulation - Code	43,014	19,984	1%	2%
Fryer	19,726	19,726	1%	2%

*Economic potential can exceed technical for individual measures due to interactive effects. See the explanation in the *Why Economic Potential Can Exceed Technical Potential* of this report.

Avoided Cost Sensitivity

To assess how estimates of economic potential may change given increases to avoided costs, Cadmus produced three additional avoided cost scenarios. In this section, we compare the results of Cadmus' base scenario, in which we used avoided capacity costs of $0 per kW, to scenarios with avoided capacity costs of $33, $68, and $100 per kW. Table 43 shows 20-year cumulative economic potential for each avoided cost scenario. Changing avoided capacity costs from $0 per kW to $100 per kW increases economic potential from 9% of baseline sales to just under 15% of baseline sales. Higher avoided capacity costs produce more cost-effective measures, primarily in cooling end uses for which usage is largely coincident with the Company's peak.

Table 43. Economic Potential with Different Avoided Capacity Costs

Sector	Cumulative 2038 Economic Potential (GWh)			
	$0/kW	$33/kW	$68/kW	$100/kW
Residential	1,046	1,268	1,545	1,954
Commercial	895	1,031	1,133	1,225
Total	**1,941**	**2,299**	**2,678**	**3,179**
Percentage of Baseline				
Residential	9.1%	11.1%	13.5%	17.0%
Commercial	8.8%	10.1%	11.1%	12.0%
Total	**9.0%**	**10.6%**	**12.4%**	**14.7%**

Economic potential reflects the savings potential for *all measures that have a benefit/cost ratio greater than or equal to 1.0.* The relationship between avoided costs and economic potential is not linear, but stepwise. If, for example, a large number of high saving measures have a benefit/cost ratio slightly below 1.0, a small increase in avoided costs could result in a large increase in economic potential. However, if a large number of high saving measures have low benefit/cost ratios, even a large increase in avoided costs would have no impact on economic potential.

Achievable Potential

Achievable potential is the portion of economic potential that can be targeted and acquired through energy efficiency programs offered by the Company. Therefore, Cadmus measured achievable potential as a fraction (percentage) of economic potential. While estimating technical and economic potentials is fundamentally based on engineering and accounting endeavors, and industry standard practices and methodologies, achievable potential is more difficult to quantify and reliably predict, as it depends on many behavioral factors, which tend to change unpredictably over time.

Several factors account for the gap between economic and achievable potential, including customer awareness, perceptions of the value of energy efficiency, and the upfront costs for energy efficiency measures. In the case of new measures and programs, there are additional practical constraints regarding the availability of delivery infrastructure. These barriers have been well documented in energy efficiency literature.[15]

The Company can mitigate some of these market barriers through program design and delivery processes, while others barriers remain out of reach. For example, the Company can reduce first-cost barriers by providing financial incentives to lower the upfront costs and improve customer paybacks. However, since utility incentives only cover a portion of the incremental costs for most measures, incentives may not be sufficient to motivate a customer to adopt energy efficiency measures. This is particularly true for the commercial sector and for large equipment in the residential sector, where upfront costs tend to be high. Therefore, Cadmus determined which barriers the Company can overcome over the course of the planning horizon, and how much economic potential can be deemed reasonably achievable.

To assess the fraction of customers who would likely adopt an energy efficiency measure, Cadmus used telephone survey data from our 2013 study that included a battery of questions to elicit information about customers' willingness to adopt measures under different hypothetical incentive scenarios. For a number of measure types (e.g., heating, cooling, lighting, weatherization), we first asked survey respondents if they would adopt efficient measures if the Company did not provide an incentive—corresponding to the low achievable scenario. Then we asked if the customer would adopt the efficient measure if the Company covered 50% of the measure incremental cost (the cost to upgrade)—corresponding to the medium achievable scenario. Finally, we asked if a customer would adopt the efficient measure if the Company covered 75% of the measure incremental cost—corresponding to the high achievable scenario. Figure 23 and Figure 24 show residential and commercial customers' willingness to adopt efficient measures under the different incentive scenarios, respectively.

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[15] See, for example: Golove, William H. and J. H. Eto. "Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency." LBL-38059 UC-1322. March 1996.

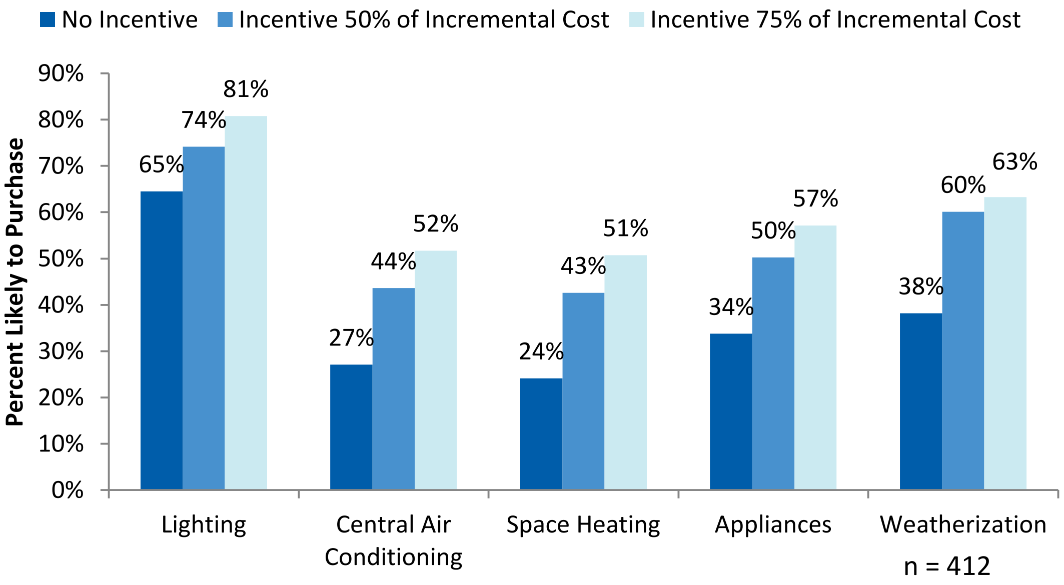

Figure 23. Residential Customers' Willingness to Adopt by Measure Type

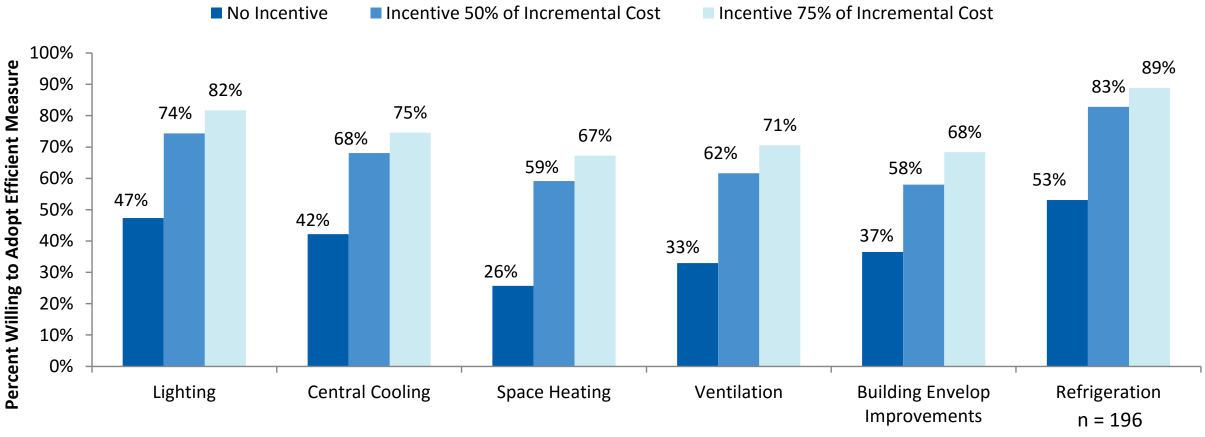

Figure 24. Commercial Customers' Willingness to Adopt by Measure Type

The results indicate a range of 864 GWh to 1,400 GWh of achievable electricity savings, representing, respectively, 4.0% and 6.5% of retail sales in 2038. The estimated savings have a medium value of 1,255 GWh, which represents 5.8% of the baseline sales (Table 44).

Table 44. Electric Achievable Energy Potential by Sector-Energy (GWh)

Sector	Baseline Sales	Cumulative 2038			Percentage of Baseline		
		Low	Medium	High	Low	Medium	High
LGE							
Residential	5,012	213	278	310	4.3%	5.5%	6.2%
Commercial	4,627	155	248	276	3.3%	5.4%	6.0%
Subtotal	**9,639**	**368**	**526**	**587**	**3.8%**	**5.5%**	**6.1%**
KU							
Residential	6,440	264	357	400	4.1%	5.5%	6.2%
Commercial	5,573	232	371	413	4.2%	6.7%	7.4%
Subtotal	**12,013**	**496**	**728**	**813**	**4.1%**	**6.1%**	**6.8%**
Total							
Residential	11,453	477	635	710	4.2%	5.5%	6.2%
Commercial	10,200	387	620	689	3.8%	6.1%	6.8%
Total	**21,652**	**864**	**1,255**	**1,400**	**4.0%**	**5.8%**	**6.5%**

Achievable demand reduction is between 120 MW and 207 MW, which is equivalent to a range of 2.0% to 3.5% of baseline peak demand (Table 45).

Table 45. Electric Achievable Energy Potential by Sector-Demand (MW)

Sector	Baseline Sales	Cumulative 2038			Percentage of Baseline		
		Low	Medium	High	Low	Medium	High
LGE							
Residential	1,695	18	26	29	1.1%	1.5%	1.7%
Commercial	944	29	47	52	3.1%	4.9%	5.5%
Subtotal	**2,639**	**47**	**72**	**81**	**1.8%**	**2.7%**	**3.1%**
KU							
Residential	2,148	32	48	54	1.5%	2.2%	2.5%
Commercial	1,125	40	65	73	3.6%	5.8%	6.5%
Subtotal	**3,273**	**73**	**113**	**127**	**2.2%**	**3.5%**	**3.9%**
Total							
Residential	3,843	51	74	83	1.3%	1.9%	2.2%
Commercial	2,069	69	112	125	3.3%	5.4%	6.0%
Total	**5,912**	**120**	**186**	**207**	**2.0%**	**3.1%**	**3.5%**

Demand Response

This section summarizes demand response potential assumptions and results for the residential and commercial sectors in LG&E and KU service territories. In conducting this analysis, Cadmus considered three types of demand response programs: DLC, pricing programs (including TOU and CPP), and commercial load curtailment.

Demand response objectives may be met through a broad array of programs, including price-based (such as time-varying rates or interruptible tariffs) and incentive-based (such as DLC) programs. Demand response programs can reduce peak demand during system emergencies or periods of extreme market prices, promote improved system reliability, and, in some cases, balance variable-load resources (particularly wind energy).

Focused on reducing a utility's short-term capacity needs, demand response programs rely on flexible loads, which may be curtailed or shifted during system emergencies or when marginal electricity costs exceed the costs to use demand response. These programs reduce peak demand, promote improved system reliability, and decrease supply costs. In some cases, the programs may defer investments in delivery and generation infrastructure.

In this assessment, Cadmus considered three demand response strategies (DLC, pricing, and load curtailment) across the five following programs:

- ***Demand Conservation Program.*** LG&E and KU offer a DLC program for residential and small commercial customers. During four-hour peak events, load control switches cycle air conditioning units off for approximately 33% of the time. Water heaters and pool pumps are fully curtailed during four-hour peak events.
- ***Wi-Fi thermostat option.*** LG&E and KU offer an existing Wi-Fi thermostat DLC program for residential customers. During peak events, the utility controls residential air conditioning loads. Customers must purchase and install an approved Wi-Fi-enabled smart thermostat. The Company controls Wi-Fi thermostats in partnership with a third-party vendor via the Internet during four-hour peak events, rather than through the radio or a paging infrastructure. Smart thermostats can increase temperature set points or cycle air conditioners to reduce load. Some smart thermostats can pre-cool a customer's home prior to an event, provided proper notice is given. Pre-cooling improves customer comfort and decreases event opt-out rates. Third parties typically implement smart thermostat programs, providing a customer web portal, licensing, and software hosting.
- ***Time-of-day energy rates.*** LG&E and KU currently offer a TOU program with a two-tiered rate schedule. TOU programs generally operate based on two- or three-tiered, time-differentiated tariff structures, in which there are fixed usage prices during different blocks of time (typically on- and off-peak prices, by season). The TOU rate design more closely reflects the marginal costs of generating and delivering power. Participation in the program requires AMI.

- ***CPP***. LG&E and KU currently do not offer a residential CPP program. These programs reduce system demand by encouraging customers to reduce their loads for a limited number of hours during peak load events. When CPP events occur, customers receive notice[16] and may curtail or shift energy use to a different time to avoid paying substantially higher retail rates. CPP programs integrate a pricing structure similar to a TOU program, though CPPs include a more extreme price signal during critical peak events.
- ***Load curtailment.*** LG&E and KU currently offer a commercial curtailment program. These programs require contractual arrangements between a utility and a third-party aggregator who administers the program and recruits commercial and industrial customers. The third-party aggregator typically guarantees a specific curtailment level to the utility during an event period by aggregating individual customer load-curtailment pledges.

Cadmus estimated market potential and the corresponding levelized cost per kW-year for each of these DR products. Levelized costs can show how a DR product relates to the Company's avoided capacity cost, as well as other DR products. However, this study does not conclude whether a given DR product is cost-effective.

Methodology

Overview

Cadmus conducted this demand response potential assessment in two stages: a research (benchmarking) stage and a data modeling stage. In the benchmarking stage, we researched typical program characteristics for demand response programs, reviewing several data sources to determine the appropriate program assumptions.

First, we reviewed the Federal Energy Regulatory Commission (FERC) 2012 *Assessment of Demand Response and Advanced Metering Staff Report*. We supplemented this with information from the following:

- Demand response program evaluations conducted for various utilities in North America
- DOE program reports
- Demand Response Research Center at the LBNL
- Oak Ridge National Laboratory
- California Measurement Advisory Council database
- Association for Demand Response and Smart Grid

Cadmus also used LG&E and KU demand conservation and commercial curtailment program data for program costs, event impacts, and participation (as available).

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[16] Customer notifications can include the use of in-home-devices such as smart thermostats, energy dashboard displays, emails, and text messages.

For the data modeling stage, Cadmus employed two approaches: For pricing and curtailment programs, we relied on a proprietary demand response model, using a top-down approach. For the Demand Conservation Program and the Wi-Fi Smart Thermostat option, we relied on a bottom-up analysis. The following sections describe these approaches in greater detail.

Modeling Approach

Top-Down Model

Cadmus relied on a top-down model to estimate achievable load reduction for the TOU, CPP, and curtailment programs. We disaggregated system loads by sector, segment, and applicable end uses. We also applied program-specific assumptions (e.g., technical potential, program participation, event participation) to disaggregated loads at the end-use level. We used the following general steps to perform the analysis:

1. ***Define customer sectors, market segments, and applicable end uses.*** In estimating the load basis, Cadmus defined customer segments and applicable end uses, similar to those used in estimating energy efficiency potentials. We further disaggregated segment load shares into the end uses.
2. ***Compile utility specific, end-use loads for each sector.*** To establish reliable estimates of demand response potential, Cadmus required accurate characterizations of sector, segment, and end-use loads. LG&E and KU each provided system load profiles, as well as annual percentages of sales for each segment in their respective territories. Cadmus used the end-use load profiles provided for energy efficiency potential to estimate the contribution of each end-use load to system peak loads.
3. ***Estimate technical potential***. Next, Cadmus estimated the reduction in load possible for each end use by each specific demand response option. For pricing and curtailment options, we assumed a constant technical load reduction potential (i.e., the percentage of end-use load) for the study duration, specific to the residential and commercial market segments.
4. ***Estimate market potential***. Market potential accounts for customers' ability and willingness to participate in demand response, subject to their unique priorities, operating requirements, and economic (price) considerations. Cadmus derived market potential estimates by adjusting the technical potential for expected program participation rates and for expected event participation rates (the percentage of program participants that will participate in a particular demand response event). Cadmus used benchmarking data for both program participation and event participation rates.[17]
5. ***Estimate costs.*** Finally, we calculated the levelized cost (i.e., the cost per kW per year) of each program and option using estimates of program development, technology, incentives,

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[17] We did not conduct a customer survey in 2016 to estimate program participation in any of the demand response programs.

administration, and communications costs drawn from LG&E and KU data (where available) and from benchmarking of similar programs.

Bottom-Up Model

Cadmus used a bottom-up model to estimate the achievable load reduction for the Demand Conservation and Wi-Fi Thermostat Option programs. The bottom-up model quantifies achievable load reduction for DLC programs as the product of five variables:

- Number of eligible customers
- Equipment saturation rates
- Program participation rates
- Expected per-unit (kW) impacts[18]
- Expected event participation rates

Cadmus used baseline customer forecasts (starting in 2016), in conjunction with equipment saturation rates from the energy efficiency potential study, to determine the number of eligible customers. The product of customer counts and equipment saturation rates determined eligible participation, as customers had to have the equipment required (air conditioners, electric water heaters, and pool pumps) to have loads controlled. We applied estimated program participation rates to the number of eligible customers to determine final program participation. Event participation represented the average number of program participants that actually participated when load control events were called. We assumed programs would have a portion of customers who opt out of an event or who have nonresponsive load control devices. The final program impact was the product of average event participation and average impacts per device.

Program Assumptions and Results

The following sections present program assumptions and analysis results. For each of the five programs, we provide brief program descriptions, followed by program assumptions and analysis results. Programs are presented in the preceding order, with residential results for the Demand Conservation Program presented prior to the Small Commercial Program.

LG&E and KU Demand Conservation Program

Modeled after existing LG&E and KU DLC programs for residential, residential multifamily, and small commercial customers, the Company controls residential and small commercial air conditioning, water heat, and pool pump loads using a one-way paging infrastructure. Peak events last four hours and can be called during June through September. LG&E and KU provided inputs for the analysis based on

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[18] For the Demand Conservation Program, Cadmus used LG&E's and KU's evaluated impacts per air conditioning switch for low scenario impacts. For all other impacts, we relied on benchmarked values from similar programs.

evaluated impacts from the existing program for residential and commercial air conditioning devices.[19] Participants received a $20 incentive (i.e., $5 per month for each of the four peak months) plus a one-time $25 bonus incentive for each appliance enrolled.

Residential Demand Conservation Program Assumptions

Table 46 shows assumptions for the Residential DLC Program, with each low and high scenario variable listed along with the sources. For attrition, Cadmus derived the 1% high scenario assumption from a recent impact evaluation (Tetra Tech 2015), while the low scenario value reflects benchmarking of other similar programs. For the low scenario per-customer impacts for central air conditioning, we relied on draft evaluation results (Tetra Tech 2015). All other impacts are based on typical benchmarking values from similar programs.

Cadmus used current participation levels (device counts) provided by LG&E and KU as the assumptions for program participation. The low scenario program implementation costs per participant are based on an average of non-incentive costs from the 2011 and 2014 filings. The high scenario has increased program costs to reduce high levels of NRDs, as estimated by LG&E and KU for the program. We based the low scenario event participation on LG&E's and KU's estimates for NRDs, while we relied on the upper end of the range of values from similar programs for the high scenario.

For the winter peak, we assumed a 1.4 kW impact for central heating and heat pumps. We assumed water heating impacts to be the same, but excluded pool pumps from the winter peak analysis. The Demand Conservation Program's winter achievable load reduction includes Wi-Fi thermostat option participants. As winter assumptions were identical for the Demand Conservation Program and the Wi-Fi thermostat option, the programs did not require separation.

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[19] Tetra Tech. *Residential and Small Commercial Demand Conservation Impact Evaluation – DRAFT.* December 18, 2015.

Table 46. Residential Demand Conservation Program Study Assumptions

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Annual Attrition	1.0%	5.0%	High scenario based on LG&E and KU program evaluation (which is similar to other switch-based programs: Missouri River Energy Services 1% (2014) and PacifiCorp 7% (2012). Benchmarked thermostat DLC programs ranged from 2% to 9%: (Colorado Springs Utilities 1.5% [2015], MRES 1% [2014], Rocky Mountain Power 2% [2010], Interstate Power and Light 3% [2014-2018], Con Edison 3.8% [2012], Avista Utilities 4%, Bonneville Power Administration [BPA] Kootenai Pilot 5%, and Xcel Energy Colorado 9% [2013]).
Per Customer Impacts	Central air conditioner single family: 1.0 kW Central air conditioner multifamily: 0.6 kW Water heat: 0.35 kW Pool pump: 1.91 kW Space heat: 1.4 kW	Central air conditioner single family: 0.45 kW Central air conditioner multifamily: 0.139 kW Water heat: 0.35 kWs Pool pump: 1.36 kW Space heat: 1.4 kW	LG&E and KU program estimated 0.45 kW single family and 0.139 kW multifamily. Benchmarking included: Xcel Energy single family 0.62 kW and multifamily 0.47 kW (2015), MRES 1.0 Kw (2014), Duke Energy Indiana1.0 kW to 1.5 kW (2015), Duke Energy Ohio 0.9 kW to 1.8 kW (2015), Duke Energy Carolinas 1.19 kW to 1.57 kW, PSO and OG&E 1.0 kW per air conditioner and 0.35 kW per water heater (2014), PacifiCorp 1.0 kW per air conditioner and 0.5 kW per water heater (2013), California Codes and Standards Program 1.1 kW to 2.3 kW per pool pump (2013), SDG&E 1.91 kW (2013), and SCE 1.36 kW (2008). Winter space heating impacts included: PSE 1.74 kW; BPA Kootenai 1.65 kW (including water heat; Xcel Energy Minnesota 1.42 kW.
Technology Cost	$150 per air conditioner $200 per water heat and pool pump	$150 per air conditioner $200 per water heat and pool pump	Based on LG&E and KU data. Similar programs had costs in the range of $140 to $280: MRES $200, PSO $200 plus $80 install, OG&E $200 plus $80 install, PacifiCorp $60 per switch plus $80 install.
Program Costs	$35 per participant	$30 per participant	Average non-incentive costs from LG&E and KU data. Accounted for program administrative costs and communications costs for load control devices.
Incentive (annual costs)	Central air conditioner single family: $25 Central air conditioner multifamily: $20 Water heat and pool pump: $10	Central air conditioner single family: $20 Central air conditioner multifamily: $8 Water heat and pool pump: $8	For low scenario Cadmus assumed LG&E and KU incentives; we increased by 25% for high scenario to drive higher participation. Other programs offered similar incentives, including: MRES $22 per customer (2014), Duke Energy Carolina $32 per customer (2015), Duke Energy Ohio and Duke Energy Indiana $32 to $67 per customer (2015); PSO and OG&E $25 per central air conditioner and $10 per water heat (both 2014), and PacifiCorp $20 per central air conditioner and $10 per water heat (2013).

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Program Participation	29%	29%	LG&E and KU participant counts for single family was 141,057 and for multifamily was 35,696 based on evaluation disaggregated by end use and service territory. Similar programs ranged from PacifiCorp 12.5% (2013, reflecting California, Idaho, Oregon, Washington, and Wyoming) to PSO 30% (2014). A Brattle study (2012) found a range of 10% to 30%. Various programs' participation fell within this range.
Event Participation	95%	70%	LG&E and KU estimated that 30% of devices were NRD. Event participation in benchmarked programs was generally quite high, ranging from Duke Energy Indiana 79% (2015) to PacifiCorp 100% (when including NRDs; 2013). Event participation for most programs was above 90%: MRES 95% (2014), SDG&E 97% (2011), Duke Energy Carolinas 94% (2015), Duke Energy Indiana 79% (2015), Duke Energy Ohio 85% (2015), and OG&E 95% (2014).

Residential Demand Conservation Program Results

Table 47 shows the residential Demand Conservation Program's achievable load reduction for summer and winter peak. KU's low scenario summer potential is 32 MW, and the high scenario is 96 MW (1% and 3% of the summer peak, respectively). LG&E's low scenario summer potential totaled 33 MW, and the high scenario is 105 MW (1% and 4% of the summer peak, respectively). Winter achievable load reductions were higher than summer, with KU having a winter achievable potential of 84 MW and 114 MW for the low and high scenarios, and LG&E having a winter achievable potential of 78 MW and 106 MW for the low and high scenarios, respectively.

Table 47. Residential Demand Conservation Program Results

Utility	Peak Season	Achievable Load Reduction in 2038*		Percentage Peak Reduction**		Levelized Cost per Year ($/kW-year)***	
		Low	High	Low	High	Low	High
KU	Summer	32	96	1%	3%	$232	$75
	Winter	84	114	6%	8%	$87	$63
LG&E	Summer	33	105	1%	4%	$223	$76
	Winter	78	106	7%	10%	$129	$94

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction by the market basis (peak load) for both residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.;

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

To determine the summer low scenario, Cadmus relied on LG&E's and KU's evaluated cooling demand impacts and event participation. The high scenario results indicated that an additional incremental summer load reduction of 65 MW for KU and 72 MW for LG&E is achievable. The two key drivers of the additional potential were the per-unit cooling demand impact and the event participation. LG&E and KU evaluated per-unit cooling impacts of 0.45 kW, compared to a typical 1.0 kW benchmarking value used in the high scenario. One factor contributing to the lower impact was LG&E and KU employing an approximately 33% control strategy, while most benchmarked programs use a 50% control strategy. Additionally, event participation was low compared to benchmarking, with LG&E and KU reporting that 30% of load control switches were NRDs. In the high scenario, Cadmus increased program costs and incentives to limit NRDs and to allow the Company to provide additional incentives to increase the control strategy to 50%.

Small Commercial Demand Conservation Program Assumptions

Table 48 shows assumptions for LG&E's and KU's Small Commercial Demand Conservation Program. The peak load control events and equipment cycling strategy were the same as for the residential program. For the low scenario, Cadmus used the average per-unit central air conditioner demand reduction from Tetra Tech's evaluation of the Company's Small Commercial Demand Conservation program. For the high scenario demand reduction, we used typical values from benchmarking. For the low scenario incentives and program costs, we used LG&E and KU program data.

In the high scenario, Cadmus raised incentive and program costs to align with increased program and event participation. We estimated program participation for the low scenario using LG&E's and KU's current device counts, and used a typical benchmarking value for the high scenario. We determined eligible participants by applying heat pump saturations to small office and small retail sector customer counts. Dividing the LG&E and KU switch counts evenly across residential and small commercial customer counts resulted in 10% program participation, which we used in the low scenario. For event participation in the low scenario, we used LG&E's and KU's estimate for NRDs; and for the high scenario we relied on typical benchmarking.

Table 48. Small Commercial Demand Conservation Program Potential Study Assumptions

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Annual Attrition (%)	3.0%	3.0%	Based on LG&E's and KU's Small Commercial Demand Conservation program evaluation.
Per Customer Impacts (kW)	Central air conditioner: 1.3 kW Water heat: 0.35 kW	Central air conditioner: 0.43 kW Water heat: 0.35 kW	LG&E and KU evaluated savings were 0.43 kW per switch. Benchmarking of similar programs had a range of: 0.4 kW to 1.9 kW: PacifiCorp 1.25 kW per air conditioner and 0.5 kW per water heat (2012), Long Island Power Authority 1.35 kW (2002), Austin Energy 1.4 kW per air conditioner;, Xcel Energy 1.9 kW (2015; Brattle); CPS Energy 0.4 kW per air conditioner (Brattle); FERC 2 kW to 4 kW (2010).
Technology Cost	$150	$150	Based on LG&E and KU data. Similar programs had costs in the range of $140 to $280: MRES $200, PSO $200 plus $80 install, OG&E $200 plus $80 install, PacifiCorp $60 per switch plus $80 install, Xcel Energy $150 per customer (2015).
Program Costs	$60 per participant	$50 per participant	Average non-incentive costs from LG&E and KU data. Accounts for program administrative costs and communications costs for load control devices.
Incentive (annual costs)	$25 per switch	$20 per switch	Low scenario based on LG&E's and KU's impact memo provided to Cadmus in December 2015. High scenario adjusted upward to drive increased participation.
Program Participation	15%	10%	Low scenario allocates LG&E and KU devices counts based on customer counts and results in 10%, which aligns with benchmarking range of 5% to 30%: Texas 5%-10% (2012),

Inputs	High Scenario	Low Scenario	Sources or Assumptions
			PSO 20% (2014), OG&E 15% (2104), PacifiCorp 12.5% to 26% (2013).
Event Participation	95%	70%	LG&E and KU estimated that 30% of devices were NRD. Benchmarked event participation ranged from 90% to 100%: PSO 90% (2014), OG&E 90% (2014), PacifiCorp 100% (2013).

Small Commercial Demand Conservation Program Results

Table 49 shows results from Cadmus' assessment of the Small Commercial Demand Conservation Program's achievable load reduction for summer peak. KU's achievable summer potential is 0.5 MW (0.01% of load) for the low scenario and 2.6 MW (0.1% of summer peak) for the high scenario. LG&E's low scenario summer potential is 0.04 MW, with a high scenario summer potential of 0.1 MW (0.001% and 0.003% of the summer peak, respectively).

Table 49. Small Commercial Demand Conservation Program Results

Utility	Peak Season	Achievable Load Reduction in 2038*		Percentage Peak Reduction**		Levelized Cost per Year ($/kW)***	
		Low	High	Low	High	Low	High
KU	Summer	0.49	2.65	0.015%	0.081%	$278	$86
LG&E	Summer	0.04	0.10	0.001%	0.003%	$304	$140

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction the market basis (peak load) for both residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

The small commercial sector had a limited amount of eligible participants with residential-style central air conditioning systems in the small retail and small office segments. This limited customer eligibility results in small achievable potential compared to other programs with larger eligible customer bases. Similar to the residential DLC program, the high scenario includes additional program costs to increase event participation by decreasing NRDs. Cadmus also added additional incentives in the high scenario to increase the air conditioning control strategy to 50%.

Wi-Fi Thermostat Option for Demand Conservation

During four-hour peak events, LG&E and KU control participating residential air conditioning loads by controlling Wi-Fi smart thermostats. Customers must purchase and install an approved device to participate.[20] During peak events, smart thermostats will either increase the temperature set point or cycle the unit to reduce cooling loads. Participants receive a $20 incentive, consisting of $5 per month for each of the four peak months (June through September). In the current plan year, the Company is offering an additional, one-time program enrollment incentive of $25. This is reviewed on an annual basis.

Wi-Fi Thermostat Option Program Assumptions

Table 50 shows assumptions for the Smart Thermostat Program. We determined annual attrition in the high scenario from the draft program evaluation, and used benchmarking for the low scenario. For the low scenario customer demand reduction, Cadmus adjusted the average 0.45 kW impact from the Company's draft evaluation upward to 0.6 kW to reflect benchmarking and the estimated impact range from the program implementer. The high scenario impact of 1.0 kW was typical of benchmarked programs, and was consistent with the program implementer's estimated impact rage of 0.7 kW to 1.5 kW.

We assumed program participation of 1% of single family customers with air conditioning, based on the number of surveyed demand conservation participants who had purchased a programmable thermostat since enrolling (Tetra Tech 2015). Cadmus based the customer support and software hosting costs, along with vendor licensing costs, on benchmarking values from similar smart thermostat pilots. Marketing costs in the high scenario reflect continuing LG&E's and KU's additional incentive, currently offered to new participants.

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[20] This program design is often referred to as Bring Your Own Device (BYOD).

Table 50. Wi-Fi Smart Thermostat Option Potential Study Assumptions

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Annual Attrition	1%	5%	Benchmarking range of 2% to 9%: MRES 1%, Western utility 1.5% (2015), Rocky Mountain Power 2% (2010), IPL 3% (2014-2018 plan), Con Edison 3.8% (2012), Avista Utilities 4% (YEAR), BPA Kootenai 5% (pilot), Xcel Energy Colorado 9% (2013, pilot).
Per Customer Impacts	1.0 kW	0.6 kW	Cadmus adjusted LG&E and KU existing DLC program results of 0.45 kW upward to reflect benchmarking. Implementer (Energy Hub) estimated impacts in the range of 0.7 kW to 1.5 kW. DLC program benchmarking ranged from 1.5 kW to 0.62 KW: Duke Indiana 1.04 kW; MRES 1.0 kW (2014), Xcel Energy Minnesota 1.05 kW to 0.62 kW, Hoosier Indiana 0.995 kW (2013), Alliant Energy Iowa 0.75 kW (YEAR), Esource benchmarking report 1.53 kW to 0.75 kW per switch.
Customer Support and Software Hosting	$2.50 per participant	$3.25 per participant	Based on similar Western utility pilot program costs. Low scenario based on costs associated with less than 2,000 participants. Costs per participant decreased with increased participation.
Technology Vendor /Licensing	$30 per participant	$25 per participant	Based on a similar Western utility pilot Wi-Fi program costs, and consistent with Energy Hub estimates for software, licensing, and information technology setup of $25 to $35.
Technology Cost	$0 BYOD	$0 BYOD	A similar Western utility pilot program had cost of $145 for thermostat and $148 installation. Energy Hub provided Wi-Fi thermostats from $120 to $250 with installation costs from $100 to $200.
Marketing Cost	$25 per new participant	$0 per participant	LG&E and KU did not expect to have direct marketing expenses for the program. For the high scenario we used LG&E's and KU's $25 existing enrollment incentive as a proxy. Benchmarking ranged from $10 to $94 per new customer, depending on the program: Con Edison $10 (Cool New York pilot) and DLC thermostats are 3% of total program costs; Tennessee Valley Authority $50 (2011).
Incentive (annual costs)	$25	$20	LG&E's and KU's existing annual incentive was $20. Benchmarked thermostat incentives were: PG&E $25, Xcel Energy Colorado $50 towards purchase, $5 per event, Austin Energy BYOD $85, Con Edison $25. Benchmarked incentives for DLC switches were: PSE $50 for space heat and water heat, Con Edison $10 for room air conditioner and $25 for ResSmart, Entergy Arkansas $25 yearly for 50% cycle and $40 for 100% cycle (YEAR), TVA $55 (potential study), ESource benchmarking $5 to $32. Con Edison bring-your-own-device (BYOD) incentive of $85 for enrollment plus $25 additional rebate (ESource); Orange & Rockland BYOD incentive of $85 for enrollment and $25 for participation the following summer (ESource).

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Eligible Load	100% - DLC participants	100% - DLC participants	Based on assumption that all central air conditioner and heat pump customers and associated loads were eligible for the program.
Program Participation (single family)	1%	1%	Participation was in addition to existing Demand Conservation Program and reflects the surveys with participants that purchased programmable thermostats. Benchmarking included: Xcel Energy Colorado CPA expanded BAU 50% (2014), Xcel Energy Minnesota 55%, Xcel Energy Colorado 38%; Duke Energy North Carolina 15%, NV Energy 16% (2013), Avista Utilities 11.5% (2013), FERC 10% to 30% (2010).
Event Participation	90%	75%	Benchmarking results were: CSU 8.5% opted out at least 1 hour (2005), NV Energy 10% to 13% NRD (YEAR), Company 20% (1990s), Xcel Energy Colorado 54% of tech impact when including opt-out and offline equipment (YEAR); San Diego Gas and Electric (SDGE) 56% overall, with 22% opt-out, 8% signal failure, 17% equipment not in use during event.

Wi-Fi Thermostat Option Program Results

Table 51 shows the Wi-Fi Thermostat Option Program's achievable load reductions for summer peak. Both LG&E and KU had low scenario potential of approximately 2 MW (0.06% of summer peak load) and the high scenario totaled 4 MW (0.1% of summer peak load). Cadmus did not model the winter peak impacts because we included 1% of program participants in the winter potential for the Demand Conservation Program.

Table 51. Wi-Fi Smart Thermostat Option Program Results

Utility	Peak Season	Achievable Load Reduction in 2038*		Percentage Peak Reduction**		Levelized Cost per Year ($/kW)***	
		Low	High	Low	High	Low	High
KU	Summer	2.0	4.0	0.06%	0.1%	$79	$48
LG&E	Summer	1.9	3.8	0.06%	0.1%	$59	$44

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction by the market basis (peak load) for residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

The low overall impact was a result of the 1% residential program participation. The program competed with the existing demand conservation program, which has a high level of participation. Additionally, participants were required to supply and install the devices, further limiting program participation. Similar benchmarked programs installed the thermostat for participants in a fully developed program and offered BYOD as an option. BYOD design can also be used for an initial pilot, with the utility then transitioning to provide higher incentives or provide devices in a larger program deployment. Given the program's low levelized cost, transitioning participation away from the demand conservation program to a Wi-Fi- or AMI-based, two-way, communicating thermostat program could present a viable option for the Company.

Residential Time of Day Pricing Program

TOU customers receive a discount on their normal retail rates during non-peak periods in exchange for paying predetermined, premium prices during peak periods. As the peak price has been set in advance, customers maintain some degree of certainty regarding participation costs. TOU participation generally increases when the rate structures lead to larger average bill savings for participating customers. Table 52 shows LG&E and KU pricing tiers, with LG&E having a peak to off-peak price ratio of 4.1 and KU having a ratio of 5.1. LG&E and KU's price ratios were similar to other programs Cadmus reviewed.

Table 52. LG&E and KU TOU Pricing Tiers

	LG&E	KU
Off-Peak $/kWh	$0.0557	$0.0538
On-Peak $/kWh	$0.2271	$0.2728
Price Ratio	**4.1**	**5.1**

Residential Time of Day Pricing Program Assumptions

Table 53 shows assumptions for the Residential TOU Program. Cadmus estimated low and high scenario technical potential using benchmarking from programs with similar peak to off-peak price ratios as those of LG&E and KU. We also based program participation on benchmarking, in addition to a recent price responsiveness survey for a similar TOU program.

Table 53. Residential TOU – Potential Study Assumptions

Inputs	High Scenario	Low Scenario	Sources or Assumptions
Annual Administrative Costs	15%	15%	Cadmus assumed an administrative adder of 15%.
Technology Cost (per new participant)	$210	$210	Benchmarking included: OG&E/PSO $350, TVA $180, PSE $515 including AMI costs. Benchmarking costs were similar to programs with only AMI, with AMI meter and communications estimates ranging from $165 to $220.
Marketing Cost (per new participant)	$30	$25	Cadmus based low scenario marketing costs on one-half full-time equivalent (FTE) of staff time, valued at $50/hour (fully loaded); for the high scenario we added 25% to reflect additional effort.
Incentives (annual costs per participant)	N/A	N/A	Though no customer incentives were offered, customers could have lower bills than on a standard rate.
Communication Costs (per customer per year)	N/A	N/A	Cadmus estimated AMI meter costs to include communications infrastructure.
Overhead: First Costs	$0	$0	This is a standard program development assumption, including necessary internal labor, research, and IT/billing system changes. Cadmus assumed this will be $0 as the TOU program is deployed.
Eligible Load	100%	100%	All residential customers are eligible.
Technical Potential	10%	7%	Benchmarking of summer programs included: Xcel Energy 7.4% (2015), PSO 8% (2014), SMUD 9% (2014), Nevada Energy 10.74% (2015), and OG&E 14%
Program Participation of Eligible Customers	15%	6%	Participation estimates aligned with recent Xcel Energy Minnesota (2015) price responsiveness survey and program benchmarking. Pilot programs had lower penetration as they were not fully deployed: FERC <1% of total residential meters,

Inputs	High Scenario	Low Scenario	Sources or Assumptions
			SMUD 5%, TVA 5%, OG&E 20%, PGE 2% increasing to 40% in 2028.
Event Participation	100%	100%	Event participation was captured in the average load impact.

Residential Time of Day Pricing Program Results

Table 54 shows the Residential Time of Day Pricing Program's achievable load reduction potentials for summer and winter peak. KU's low scenario summer potential is 9 MW, and the high scenario is 33 MW (0.3% and 1% of the summer peak, respectively). LG&E's low scenario summer potential is 7 MW, and the high scenario is 26 MW (0.2% and 0.8% of the summer peak load, respectively). KU's low scenario winter potential is 3 MW, and the high scenario is 10 MW (0.1% and 0.3% of the winter peak, respectively). LG&E's low scenario winter potential is 2 MW, and the high scenario is 7 MW (0.1% and 0.2% of the winter peak load, respectively).

Table 54. Residential Time of Day Pricing Program Results

Utility	Peak Season	Achievable Load Reduction in 2038*		Percentage Peak Reduction**		Levelized Cost per Year ($/kW)***	
		Low	High	Low	High	Low	High
KU	Summer	9	33	0.3%	1.0%	$155	$88
	Winter	3	10	0.1%	0.3%	$549	$314
LG&E	Summer	7	26	0.2%	0.8%	$200	$113
	Winter	2	7	0.1%	0.2%	$766	$432

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction by the market basis (peak load) for both residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

Most benchmarked programs showed increased program participation in later years similar to or higher than the high scenario's assumed participation. Initially, participation was limited by the current AMI deployment schedule of 5,000 meters by 2018. For this analysis, Cadmus assumed full AMI meter deployment by 2022. The Detailed Demand Response Results section of this report (specifically Figure 25 and Figure 30 for KU, and Figure 38 and Figure 39 for LG&E) shows program ramp estimates.

Levelized costs for the TOU program were higher than for other programs in this assessment, since $210 of AMI-related costs were attributed to the program.[21]

Residential Critical Peak Pricing

LG&E and KU do not currently offer CPP programs for the residential sector. While the Company TOU programs have been well established, they are now completing pilot phases for many dynamic pricing programs using AMI. With AMI, customers can view energy use data using a web portal or using technology such as in-home displays (IHDs). Most of the benchmarked pilot programs compared results of traditional CPP programs to programs that combine CPP-enabling technologies (e.g., IHDs, programmable communicating thermostats [PCTs]).

CPP with Programmable Communicating Thermostats Versus Without

The OG&E pilot results showed a 38% reduction in demand with PCTs and a 12% reduction without PCTs; the SMUD pilot showed a 26% reduction with an IHD and 22% without. OG&E moved to full implementation of its program, combining DLC (PCTs) with CPP, servings as an example of CPP and DLC programs merging.

Residential Critical Peak Pricing Program Assumptions

Cadmus conducted the CPP analysis as an alternative to the existing TOU program; as such, the results are not additive, but show an alternative to the TOU program, with the Company only implementing one program. Cadmus based all the CPP program assumptions (shown in Table 55) on values we identified through benchmarking.

Table 55. Residential CPP – Potential Study Assumptions

Inputs	Value	Sources or Assumptions
Annual Administrative Costs	15%	Cadmus assumed an administrative adder of 15%.
Technology Cost (per new participant)	$220	Cadmus estimated AMI meter costs as $220. Benchmarking results were: Ameren $165 (2012); FERC $226 for meter plus capital communications costs; PECO $210 (2013), eMeter.com $221 (2010).
Marketing Cost (per new participant)	$25	Cadmus based marketing costs on one-half hour of staff time, valued at $50/hour (fully-loaded).
Incentives (annual costs per participant)	N/A	There were no customer incentives; customers could have a lower bill than on a standard rate.
Communication Costs (per customer per year)	N/A	Cadmus estimated AMI meter costs to include communications infrastructure.
Overhead: First Costs	$100,000	Cadmus assumed one-half the standard cost, divided across LG&E and KU, as the Company already deployed the TOU program. The standard program development assumption—including necessary internal labor,

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[21] If we exclude AMI costs from the program, summer levelized costs fall below $20 per MW.

Inputs	Value	Sources or Assumptions
		research, and IT/billing system changes—for the TVA potential study was $400,000.
Eligible Load	100%	All residential customers would be eligible.
Technical Potential	12%	Benchmarked results for summer were: PGE 20% reduced for summer pilots without technology with range of 11% to 20%, Pepco DC 13% winter impact. Benchmarked results for winter were: PGE 20% with 4.4 price ratio and a 12% impact for TOU, Pepco DC 13%. Benchmarked results for summer programs without PCTs were: OGE 12%, Green Mountain Power 11% to 14%, TVA 17% (potential study), Sioux Valley 24%.
Program Participation (%)	10%	Pilot programs had lower penetration, as they were not fully deployed. Benchmarked results were: FERC <1%, SMUD 5%, OG&E 20%, PGE 2% increasing to 40% in 2028, TVA 5%.
Event Participation (%)	100%	Event participation was captured in the average load impact.

Residential Critical Peak Pricing Program Results

Table 56 shows the Residential CPP Program's achievable load reduction potential for summer and winter peak. KU's summer potential is 27 MW, and the winter potential is 8 MW (0.8% and 0.6% of the peak loads, respectively). LG&E's summer potential is 21 MW, and the winter achievable potential is 5 MW (0.8% and 0.5% of the peak loads, respectively).

Table 56. Residential CPP Program Results

Utility	Peak Season	Achievable Load Reduction in 2038*	Percentage Peak Reduction**	Levelized Cost per Year ($/kW)***
KU	Summer	27	0.8%	$98
	Winter	8	0.6%	$206
LG&E	Summer	21	0.8%	$114
	Winter	5	0.5%	$283

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction by the market basis (peak load) for both residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

Initially, program participation was limited by the current AMI deployment schedule of 5,000 meters by 2018. For this analysis, Cadmus assumed full AMI meter deployment by 2022. The Detailed Demand

Response Results section shows program ramp rates (specifically, this is Figure 31 for KU and Figure 40 for LG&E).

Load Curtailment Program

In load curtailment programs, there are established contractual arrangements between the utility, a third-party aggregator implementing the program, and utility nonresidential customers agreeing to curtail their operations (in whole or part) for a predetermined period when requested by the utility. In most cases for the benchmarked programs, the utility requires mandatory participation or liquidated damage payment for nonparticipation once customers enroll in the program; however, contract terms limited the number of curtailment requests—both in total and on a daily basis.

Generally, the Company did not pay customers for individual events, but provided compensation through a fixed annual amount per kW of pledged curtailable load or through a rate discount. Typically, the program contracts require customers to curtail their connected loads by a set percentage or to a predetermined level. Similar benchmarked programs often involve long-term contracts, with penalties for noncompliance ranging from simply dropping the customer from the program to more punitive actions, such as requiring the customer to repay the utility for the committed (but not curtailed) energy at market rates.

Load Curtailment Program Assumptions

Table 57 shows the assumptions for the Load Curtailment Program. Program implementation costs, such as new participant enablement costs, incentives, and vendor costs, are from LG&E's and KU's existing program data. Cadmus based all other program assumptions on benchmarking results.

Table 57. Load Curtailment Program – Potential Study Assumptions

Inputs	Value	Sources or Assumptions
Annual Administrative Costs	5%	Cadmus assumed an administrative adder of 5%.
Enablement per new participant	$[redacted]	The value matches the enablement per customer site for EnerNOC's Commercial Demand Conservation Program.
Incentives (annual costs per participating kW)	High scenario: $50 per kW Low scenario: $25 per kW	LG&E and KU customers received up to $25 per kW curtailed (incentives varied by actual kW reduction and number of events). Benchmarking results were: PSO $32 per kW and an additional 5% bonus to customers who participated in all events, CenterPoint Energy $35 per kW, Duke Energy $57 per kW, for many benchmarked programs, a customer-specific incentive was determined based on the amount of kW pledged to the program.
Overhead: First Costs	$[redacted]	Cadmus did not include this cost, as LG&E and KU have an existing program. The program startup fee from a third-party implementer for a similar program was typically $100,000.
Vendor Costs	$[redacted] per year	This matches the EnerNOC annual subscription fee for the Commercial Demand Conservation Program plus a portfolio management fee.

Inputs	Value	Sources or Assumptions
Technical Potential for Load Shed	30%	Customers shed between 27% and 34% of load for day-of and day-ahead events, respectively (2010 and 2011 Statewide Aggregator Demand Response Programs: Final Report, Christensen Associates). LBNL data centers 12% (2012).
Program Participation	High scenario: 30% Low scenario: 20%	Customer surveys from benchmarked programs revealed that between 25% and 30% of customers are willing to participate in a curtailment program, given incentives levels of $30 and $50, respectively. Benchmarked participation rates from 4.5% for Mid-American Curtailment Program to 30% for Georgia Power and Indiana Michigan Power Company. Assessment of Industrial Load for Demand Response across the Western Interconnect varied by segment from 10-40% (Oak Ridge National Laboratory).
Event Participation	95%	Range of PJM and MidAm programs (90%-95%).
Participation Criteria (eligibility)	200 kW	Cadmus assumed a minimum demand of 200 kW as an eligibility criterion.

Commercial Load Curtailment Program Results

Table 58 shows the Commercial Load Curtailment Program achievable load reduction for summer and winter peak. KU’s low scenario summer potential is 27 MW, and the high scenario summer potential is 40 MW (0.8% and 1.2% of summer peak, respectively). LG&E’s low scenario summer potential is 27 MW, and the high scenario summer potential is 41 MW (0.8% and 1.3% of the summer peak, respectively). KU’s low scenario winter potential is 18 MW, and the high scenario is 27 MW (0.5% and 0.8% of winter peak, respectively). LG&E’s low scenario winter potential is 22 MW, and the high scenario winter potential totaled is 34 MW (0.7% and 1.0% of the winter peak, respectively).

Table 58. Commercial Load Curtailment Results

Utility	Peak Season	Achievable Load Reduction in 2038*		Percentage Peak Reduction**		Levelized Cost per Year ($/kW)***	
		Low	High	Low	High	Low	High
KU	Summer	27	40	0.8%	1.2%	$55	$80
	Winter	18	27	0.5%	0.8%	$69	$92
LG&E	Summer	27	41	0.8%	1.3%	$52	$77
	Winter	22	34	0.7%	1.0%	$58	$82

* This load reduction was at generation and includes line losses.

** To determine these values, Cadmus divided the achievable load reduction by the market basis (peak load) for both residential and commercial loads during the top 40 hours (10 four-hour events).

*** We discounted future values using a 6.5% rate, and escalated program and technology costs for future years using a 1.9% inflation rate.

Levelized costs reflect net present value costs divided by the potential demand savings over the 20-year study horizon. If the Company were to offer a new DR product, or expand an existing product, we expect the cost will be roughly equal to the $/kW-year levelized cost. Cadmus did not compare DR products to the Company's avoided capacity cost, nor did we assess whether an individual product is cost-effective.

The high scenario for summer peak, with program participation increasing by 20% to 30% compared to the low scenario, indicated additional achievable load reduction of 15 MW for KU and 14 MW for LG&E. While Cadmus doubled the high scenario incentives to increase participation, levelized costs were still reasonable, at $81 per kW and $78 per kW for KU and LG&E, respectively.

Conclusions and Recommendations

Cadmus' findings reveal that there is additional potential in the existing KU and LG&E DLC programs, as the high scenario results across the portfolio of demand response programs provides additional demand reduction of 353 MW for the Company, combined (as was shown above in Figure 9). The high scenario portfolios result in an estimated 5% summer peak load reduction for KU and a 6% summer peak load reduction for LG&E. Given the additional potential in the high scenario, we offer the following recommendations for the existing demand response programs:

- ***Consider modifying the residential DLC program to Wi-Fi- or AMI-controlled thermostats.*** This shift would allow the control strategy to increase from between 35% and 40% to 50%, a rate typical for cooling programs. Two-way communications can be used to identify NRD, improving event participation beyond the existing 70%.
- ***Consider expanding the residential TOU program beyond the pilot size.*** Currently evaluated participation or results were not available for the TOU program, and AMI deployment plans are limited to 5,000 units for each territory in 2018. In this analysis, Cadmus assumed full AMI deployment by 2022.
- ***Consider implementing a residential winter DLC pilot program.*** The analysis revealed significant potential for winter peak reduction in the low scenario, of 6% for KU and 8% for LG&E. The

Company could target Wi-Fi thermostat participants for the pilot, providing a more accurate estimate of the demand impacts.

- ***Consider combining the DLC program with a pricing program (TOU or CPP) or a peak time rebate.*** Programs that combine pricing with enabling technology have achieved better results than those that are implemented separately. Additionally, more utilities are considering peak-time rebates as an option to TOU or CPP programs.

Detailed Demand Response Results

KU Results by Year

Figure 25 through Figure 33 show achievable load reduction by year for KU demand response programs.

Figure 25. KU Residential DLC Summer Results by Year

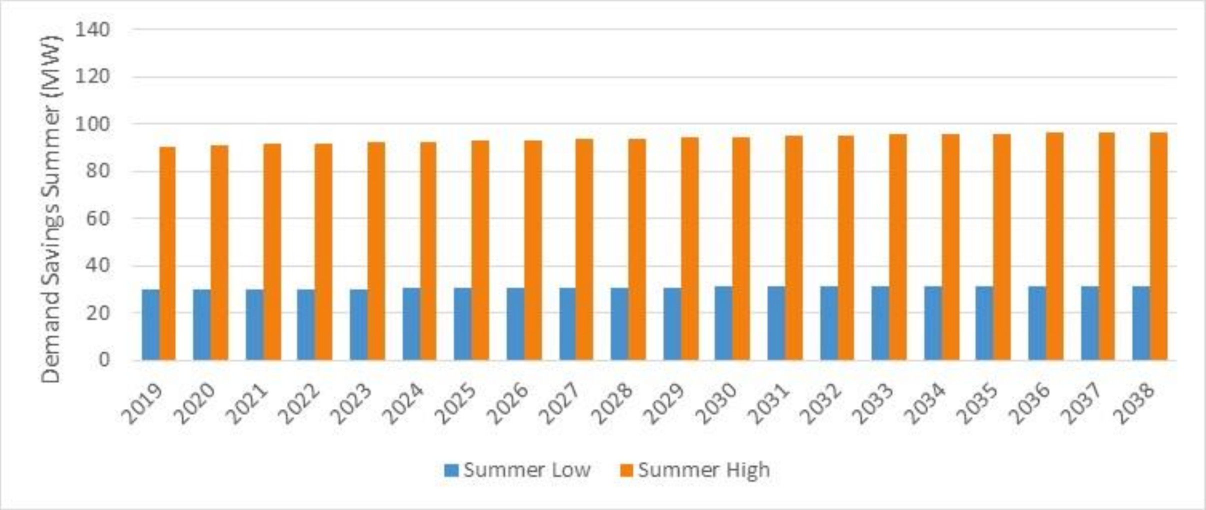


Figure 26. KU Residential DLC Winter Results by Year

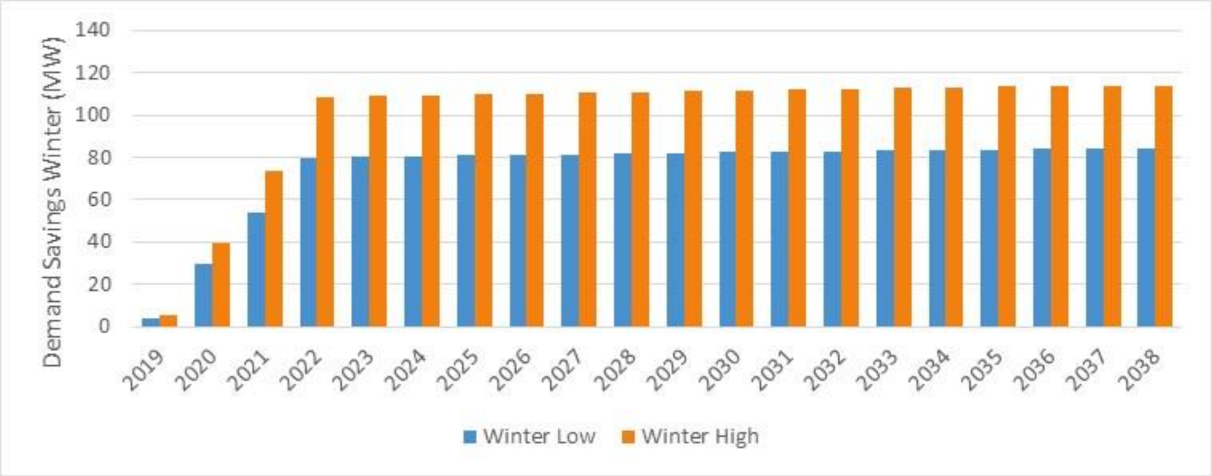


Figure 27. KU Commercial DLC Summer Results by Year

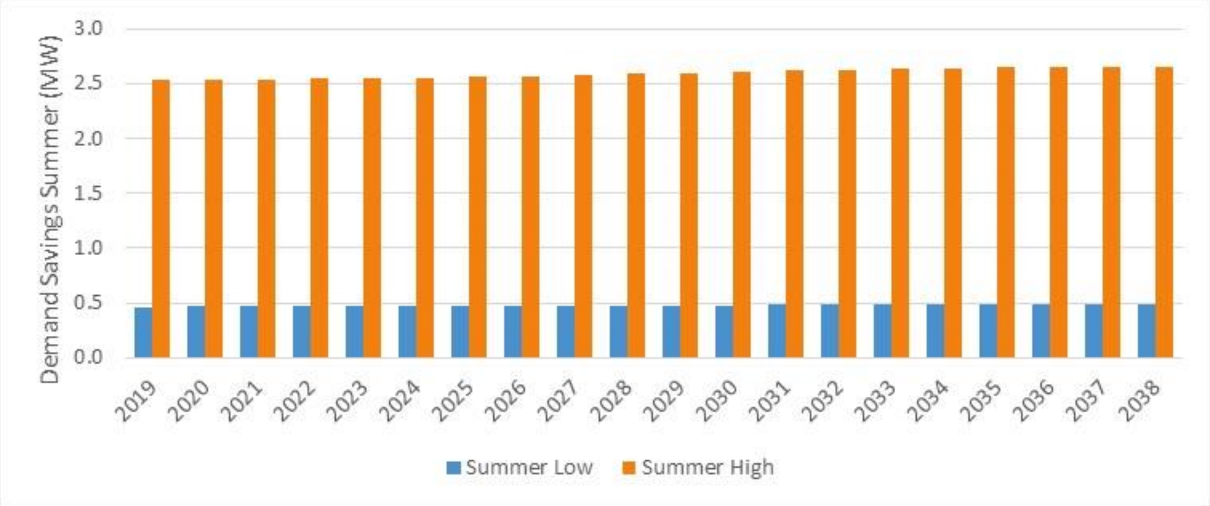


Figure 28. KU Residential Wi-Fi Smart Thermostat Summer Results by Year

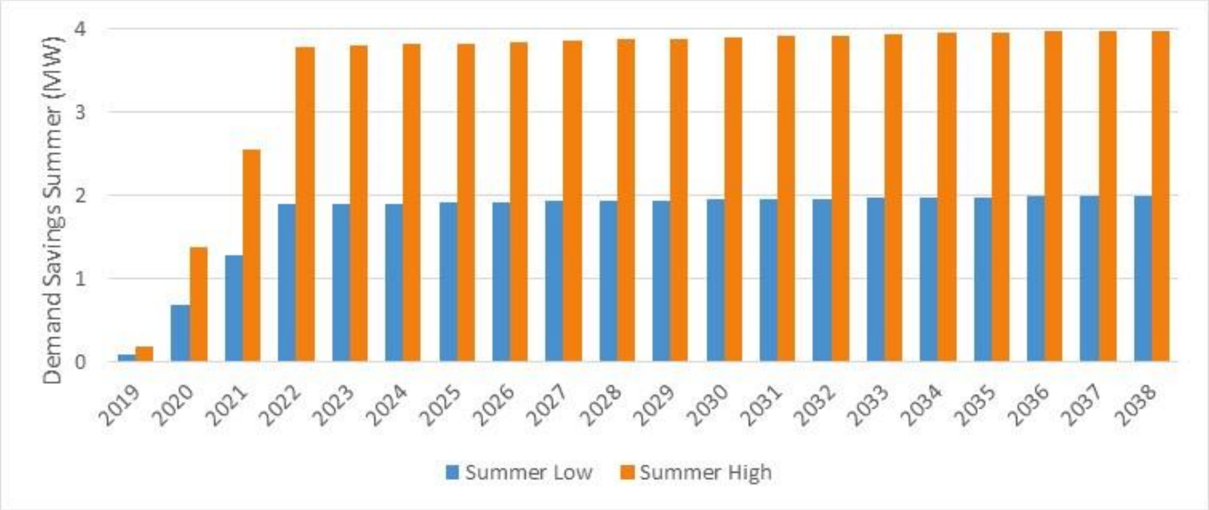


Figure 29. KU Residential TOU Summer Results by Year

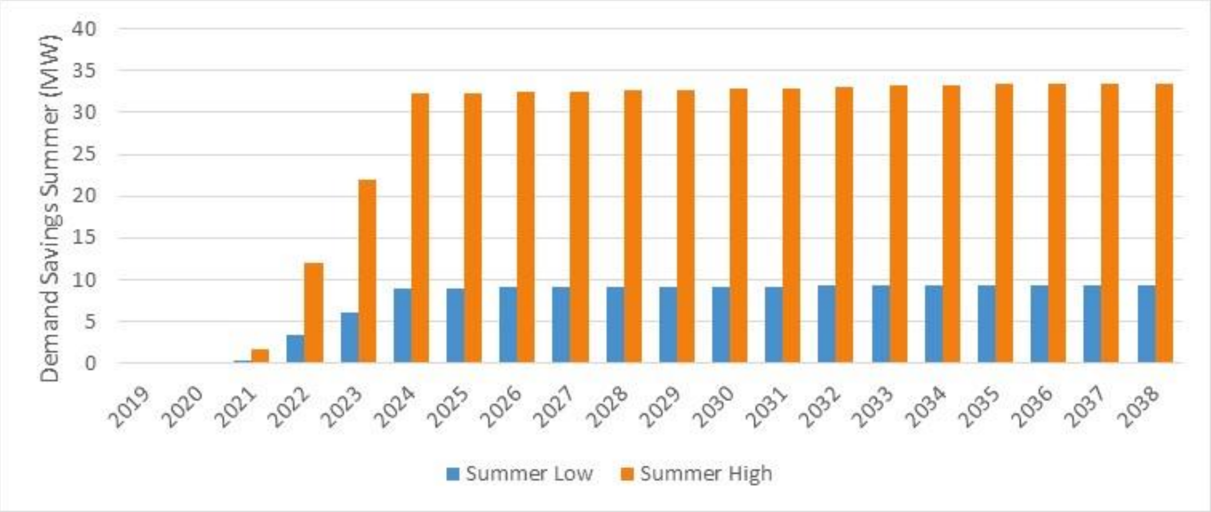


Figure 30. KU Residential TOU Winter Results by Year

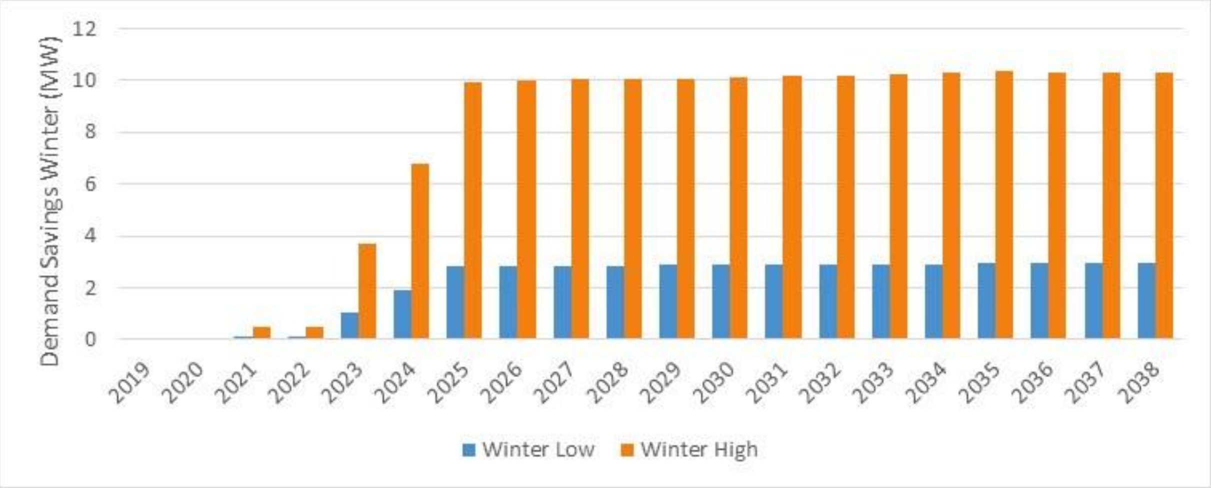


Figure 31. KU Residential CPP Summer and Winter Results by Year

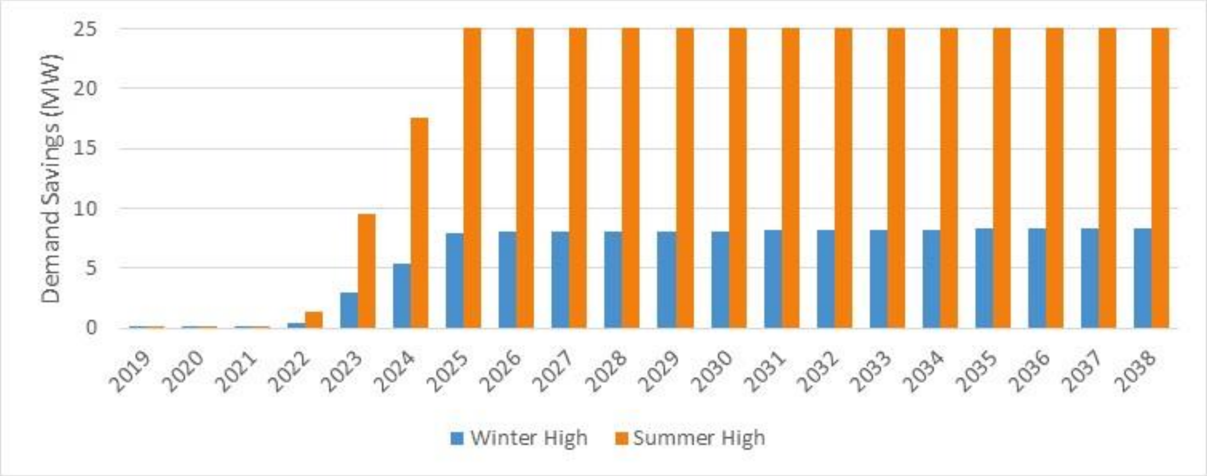


Figure 32. KU Commercial Curtailment Summer Results by Year

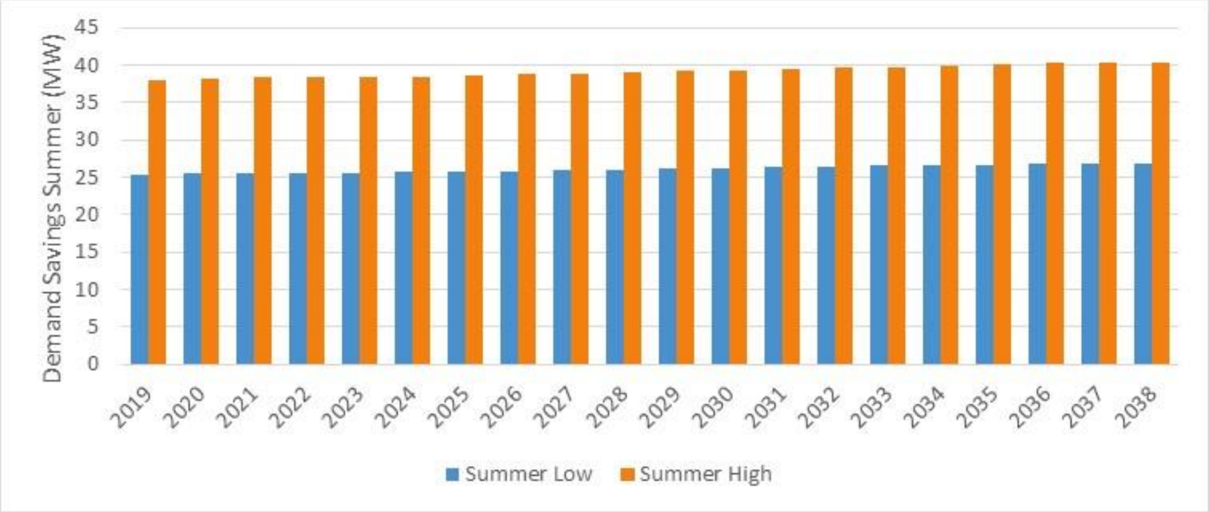
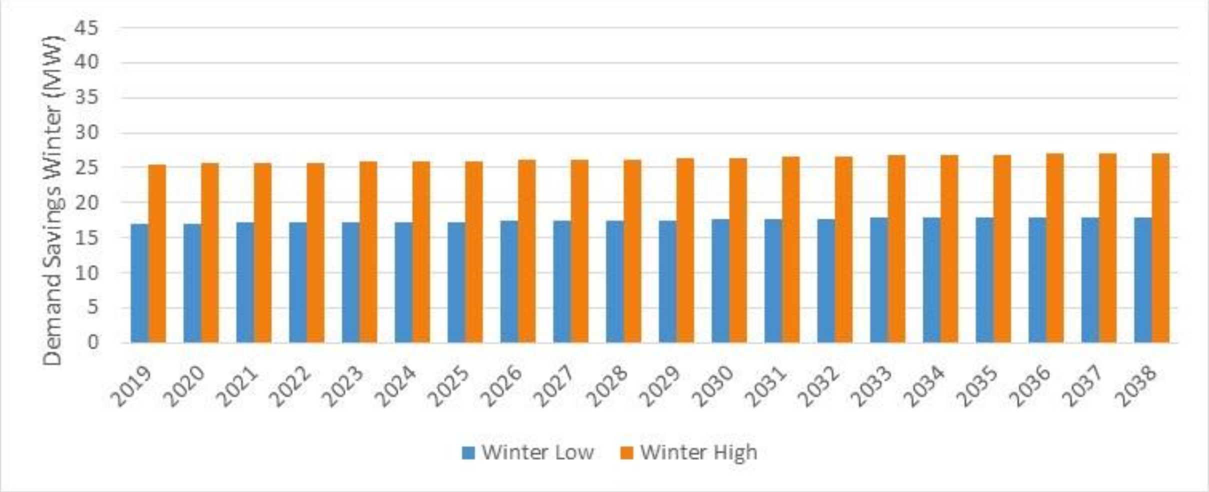


Figure 33. KU Commercial Curtailment Winter Results by Year



LG&E Results by Year

Figure 34 through Figure 42 show achievable load reduction by year for LG&E demand response programs.

Figure 34. LG&E Residential DLC Summer Results by Year

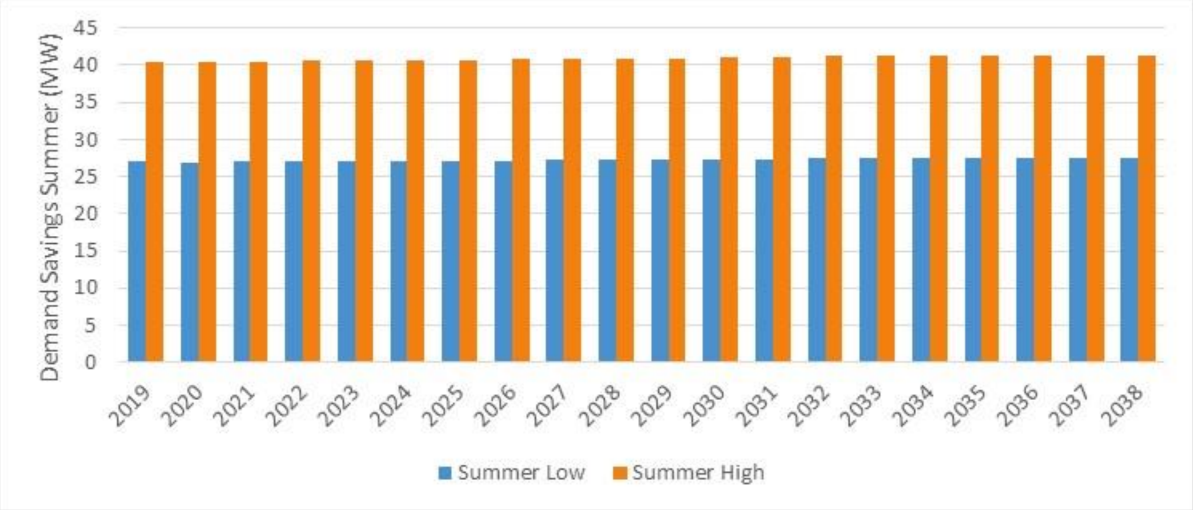


Figure 35. LG&E Residential DLC Winter Results by Year

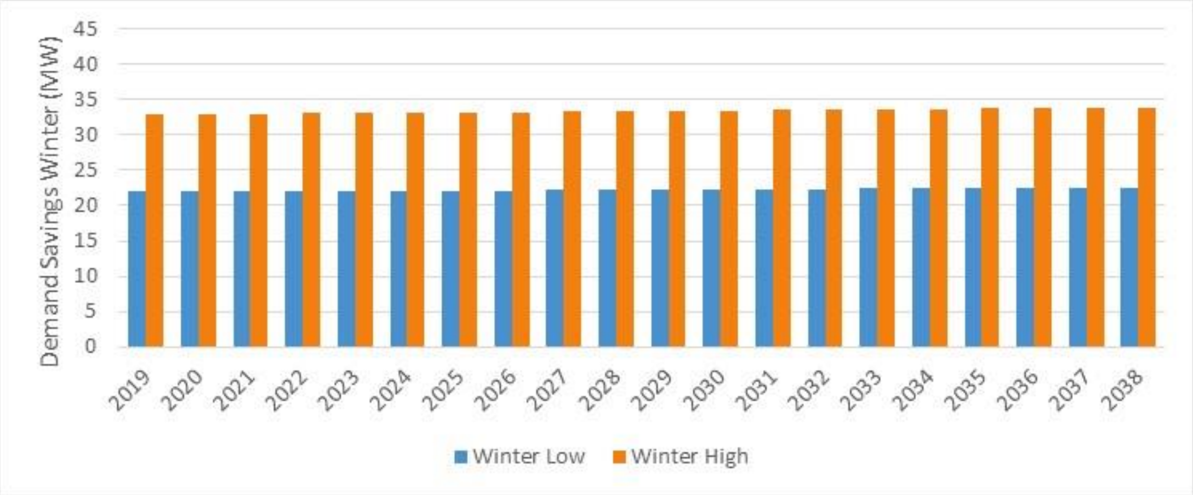


Figure 36. LG&E Commercial DLC Summer Results by Year

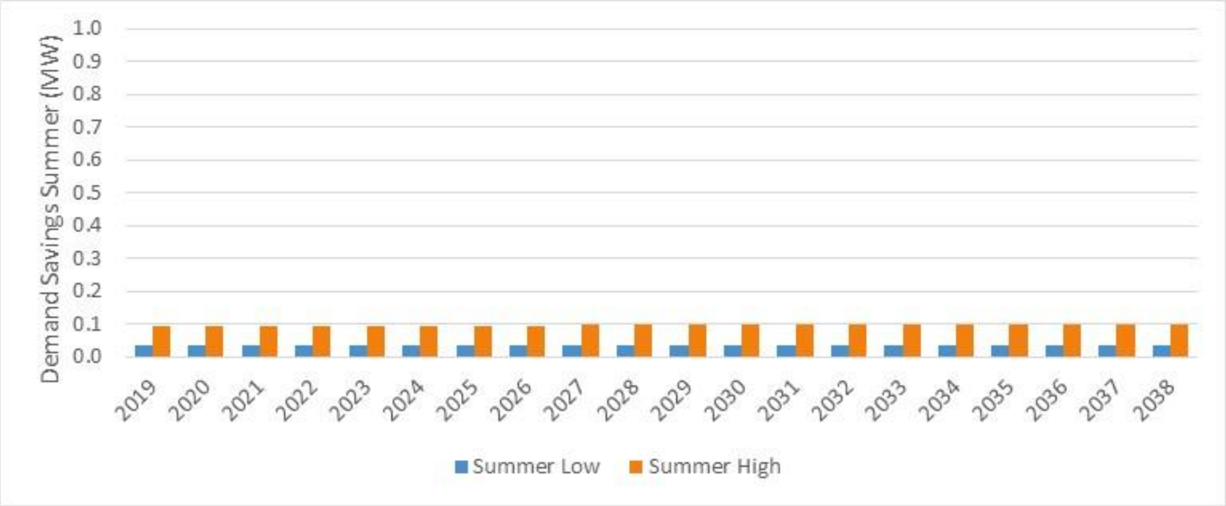


Figure 37. LG&E Residential Wi-Fi 33 Smart Thermostat Summer Results by Year

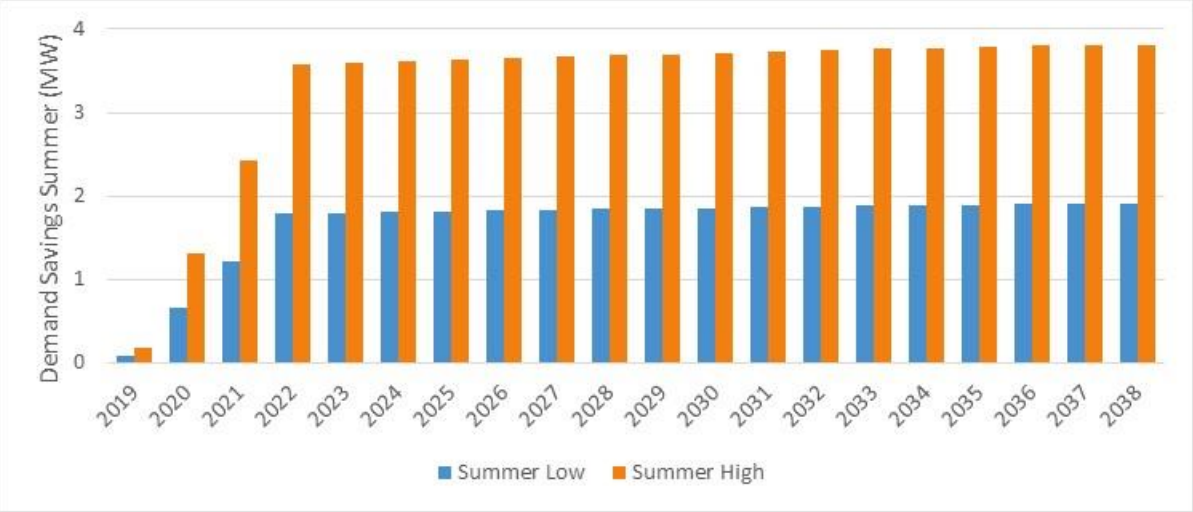


Figure 38. LG&E Residential TOU Summer Results by Year

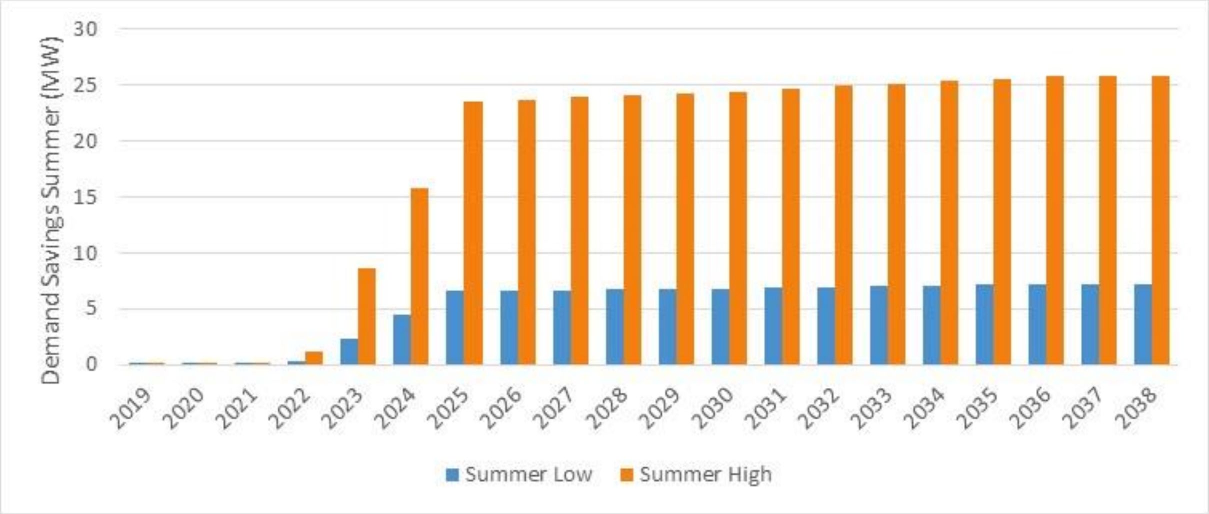


Figure 39. LG&E Residential TOU Winter Results by Year

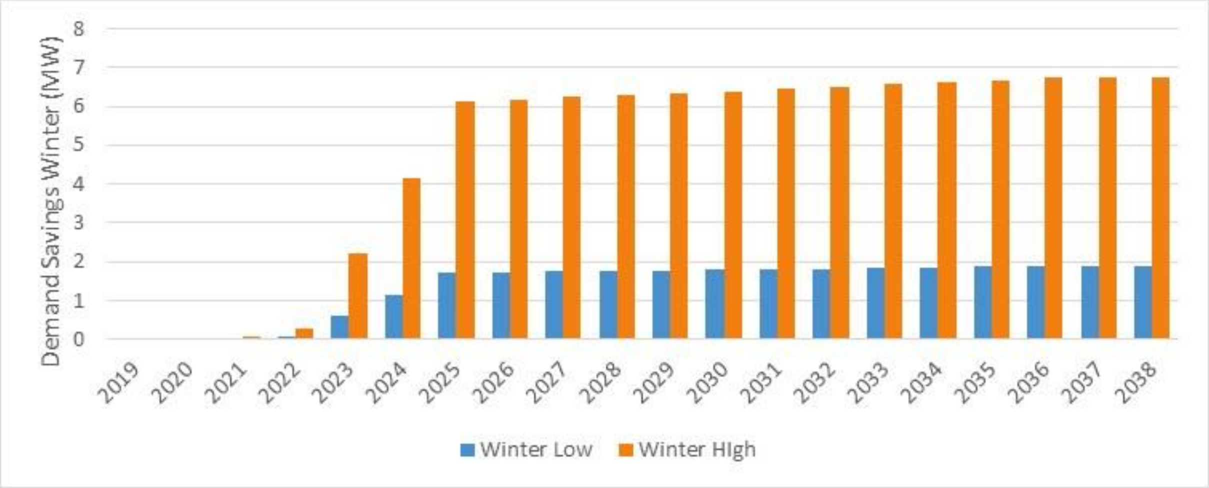


Figure 40. LG&E Residential CPP Summer and Winter Results by Year

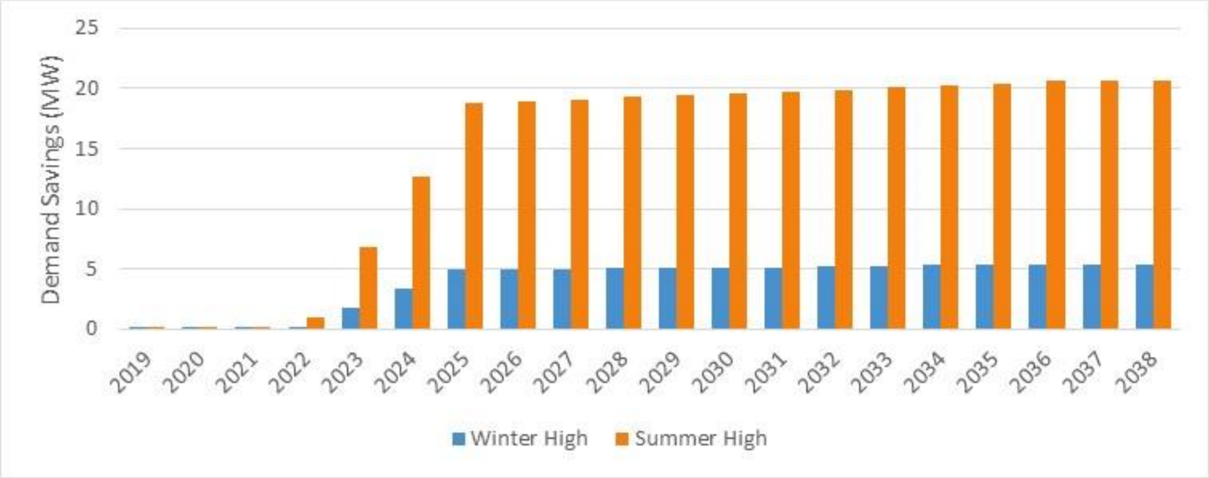


Figure 41. LG&E Commercial Curtailment Summer Results by Year

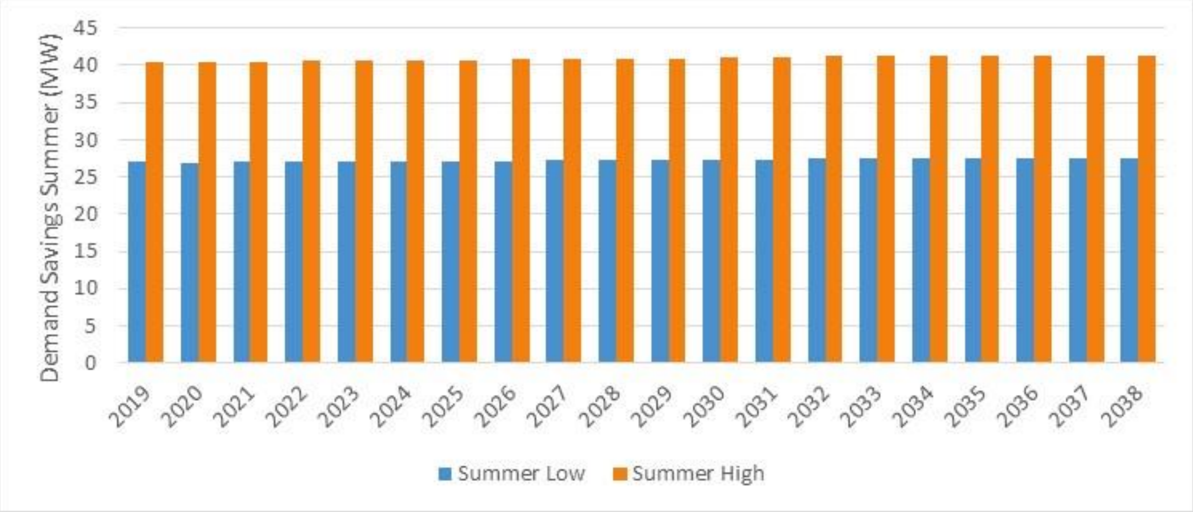
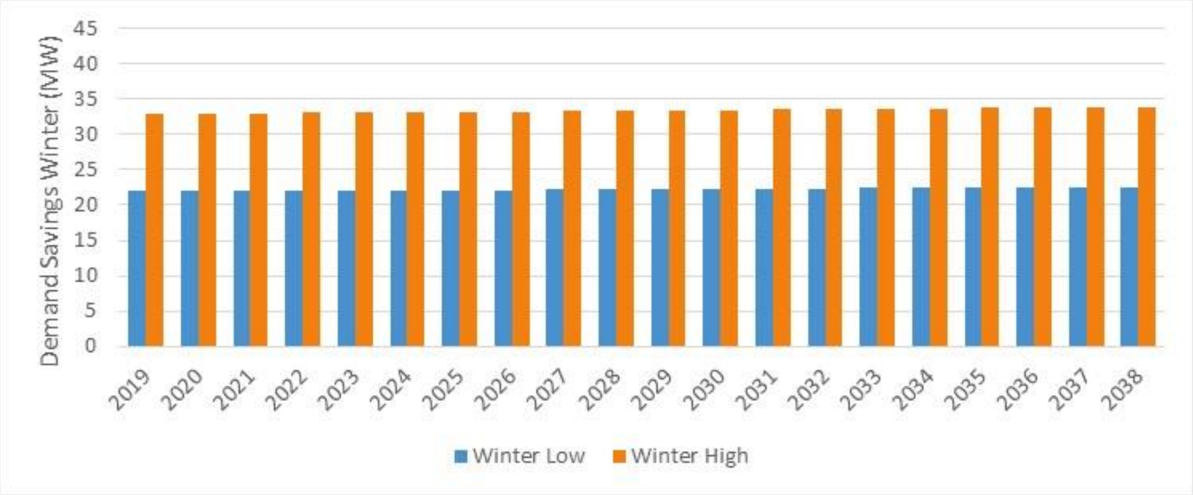


Figure 42. LG&E Commercial Curtailment Winter Results by Year



Glossary of Terms

GLOSSARY OF TERMS[22]

Benefit-cost ratio: The ratio (as determined by the Total Resource Cost test) of the discounted total benefits of the program to the discounted total costs over some specified time period.

Cost-effectiveness: A measure of the relevant economic effects resulting from the implementation of an energy efficiency measure. If the benefits of this selection outweigh its cost, the measure is said to be cost-effective.

Economic potential: Refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources.

End use: A category of equipment or service that consumes energy (e.g., lighting, refrigeration, heating, process heat).

End Use Consumption: Used for the residential sector, the per unit energy consumption for a given end use, expressed in annual kWh per unit. Also referred to as unit energy consumption (UEC).

End-use intensities: Used in the commercial and institution sectors, the energy consumption per square foot for a given end use, expressed in annual kWh per square foot per unit.

Energy efficiency: The use of less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way.

Effective useful life: An estimate of the duration of savings from a measure. EUL is estimated through various means, including median number of years that the energy efficiency measures installed under a program are still in place and operable. Also, EUL is sometimes defined as the date at which 50% of Installed units are still in place and operational.

Levelized cost: The result of a computational approach used to compare the cost of different projects or technologies. The stream of each project's net costs is discounted to a single year using a discount rate (creating a net present value) and divided by the project's expected lifetime output (megawatt-hours or MCF).

Lost opportunity: Refers to an efficiency measure or efficiency program that seeks to encourage the selection of higher-efficiency equipment or building practices than would typically be chosen at the time of a purchase or design decision.

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[22] These definitions draw heavily from the NAPEE Guide for Conducting Energy Efficiency Potential Studies and the State and Local Energy Efficiency Action Network, 2012. *Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc., www.seeaction.energy.gov

Achievable potential: The amount of energy use that efficiency can realistically be expected to displace assuming different incentive scenarios (e.g., providing end-users with payments for the entire incremental cost of more efficiency equipment).

Measure: Installation of equipment, subsystems, or systems, or modification of equipment, subsystems, systems, or operations on the customer side of the meter, in order to improve energy efficiency.

Portfolio: Either (a) a collection of similar programs addressing the same market, technology, or mechanisms or (b) the set of all programs conducted by one organization.

Potential study: A quantitative analysis of the amount of energy savings that either exists, is cost-effective, or could potentially be realized through the implementation of energy efficient programs and policies.

Program: A group of projects with similar characteristics and installed in similar applications.

Program potential: Energy efficiency potential possible given specific program funding levels and designs.

Retrofit: Refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher efficiency units (also called “early-retirement”) or the installation of additional controls, equipment, or materials in existing facilities for purposes of reducing energy consumption (e.g., increased insulation, lighting occupancy controls, economizer ventilation systems).

Technical potential: The theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures.

Total resource cost (TRC) test: A cost-effectiveness test that assesses the impacts of a portfolio of energy efficiency initiatives on the economy at large. The test compares the present value of costs of efficiency for all members of society (including costs to participants and program administrators) compared to the present value of benefits, including avoided energy supply and demand costs.

Utility cost test (UCT): A cost-effectiveness test that evaluates the impacts of the efficiency initiatives on the administrator or energy system. It compares the administrator costs (e.g. incentives paid, staff labor, marketing, printing, data tracking, and report) to accrued benefits, including avoided energy and demand supply costs. Also referred to as the Program Administrator Cost Test (PACT).

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR REVIEW, MODIFICATION, AND CONTINUATION OF CERTAIN EXISTING DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAMS	**)))))))**	**CASE NO. 2017-00441**

DIRECT TESTIMONY OF
DAVID E. HUFF
DIRECTOR OF CUSTOMER ENERGY EFFICIENCY AND EMERGING TECHNOLOGIES
LG&E AND KU SERVICES COMPANY

Filed: December 6, 2017

Q. Please state your name, position, and business address.

A. My name is David E. Huff. I am the Director of Customer Energy Efficiency and Emerging Technologies for LG&E and KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, "Companies"). My business address is 220 West Main Street, Louisville, Kentucky. A statement of my qualifications is attached as Appendix A.

Q. Have you previously testified before the Commission?

A. Yes. I testified most recently in Case No. 2016-00274, *Joint Application of Kentucky Utilities Company and Louisville Gas and Electric Company for Approval of an Optional Solar Share Program Rider*.

Q. Are you sponsoring any exhibits?

A. Yes, I am co-sponsoring the following exhibit with Gregory S. Lawson:

Exhibit GSL-1: 2019-2025 Demand-Side Management and Energy Efficiency Program Plan

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide an overview of the history of the Companies' DSM-EE programs, describe the circumstances that led to the changes proposed in this Application, and explain how the Companies' industrial customers will participate in the Companies' 2019-2025 Demand-Side Management and Energy Efficiency Program Plan ("Proposed DSM-EE Program Plan"). Specifics regarding the analysis, budgets, and program revisions are in Mr. Lawson's testimony and the Companies' Proposed DSM-EE Program Plan (Exhibit GSL-1).

History of the Companies' DSM-EE Achievements

Q. Please provide a brief history of the Companies' DSM-EE programs.

A. The Companies have over 20 years of experience designing, implementing, and refining DSM-EE programs. In 1994, LG&E implemented its initial DSM-EE programs with input from its DSM Advisory Group ("DSM Advisory Group"). Since then, the Companies have worked with their DSM Advisory Group in connection with six subsequent DSM-EE filings. The Commission approved the Companies' previous DSM-EE proposals in 1994, 1996, 1998, 2008, 2011, and 2014.

Today, the Companies have a suite of successful DSM-EE programs, which the Commission approved in its November 14, 2014 Order in Case No. 2014-00003. The Companies' current DSM-EE programs are:

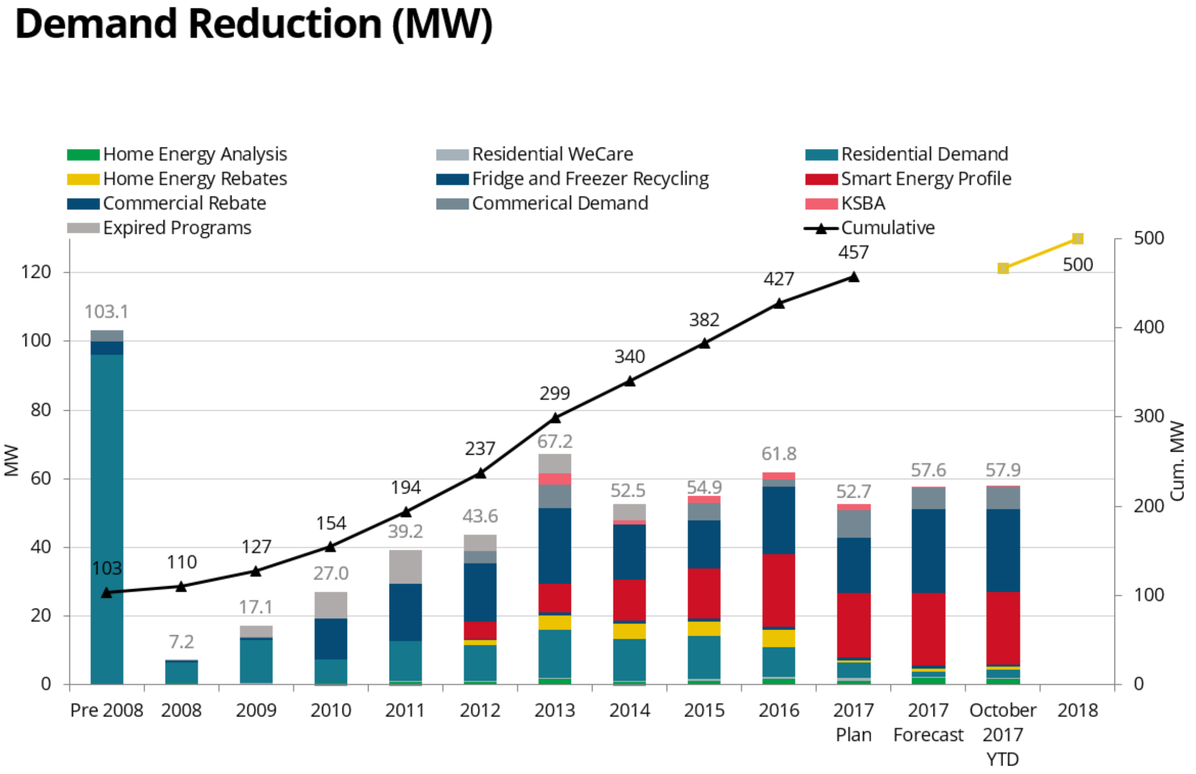
- Smart Energy Profile
- Residential Load Management/Demand Conservation Program
- Residential Refrigerator Removal Program
- Residential Low Income Weatherization Program ("WeCare")
- Program Development and Administration
- Commercial Load Management/Demand Conservation Program
- Residential Incentives Program
- Customer Education and Public Information Program
- Commercial Conservation/Commercial Incentives Program
- Residential Conservation/Home Energy Performance

In addition, the Companies offer and operate through their DSM-EE portfolio the Advanced Metering Systems ("AMS") Customer Service Offering, which the Commission also approved in Case No. 2014-00003.

Q. How have the Companies' current DSM-EE programs performed to date?

A. The Companies' DSM-EE programs have been highly successful. Through October 2017, the Companies' DSM-EE programs have produced cumulative energy and gas savings of approximately 1,077 GWh and 5.9 million Ccf, along with a cumulative demand reduction of over 450 MW. Figures 1 and 2 below show the electrical demand and energy savings the Companies' DSM-EE programs have created:[1]

Figure 1. – Demand Reduction



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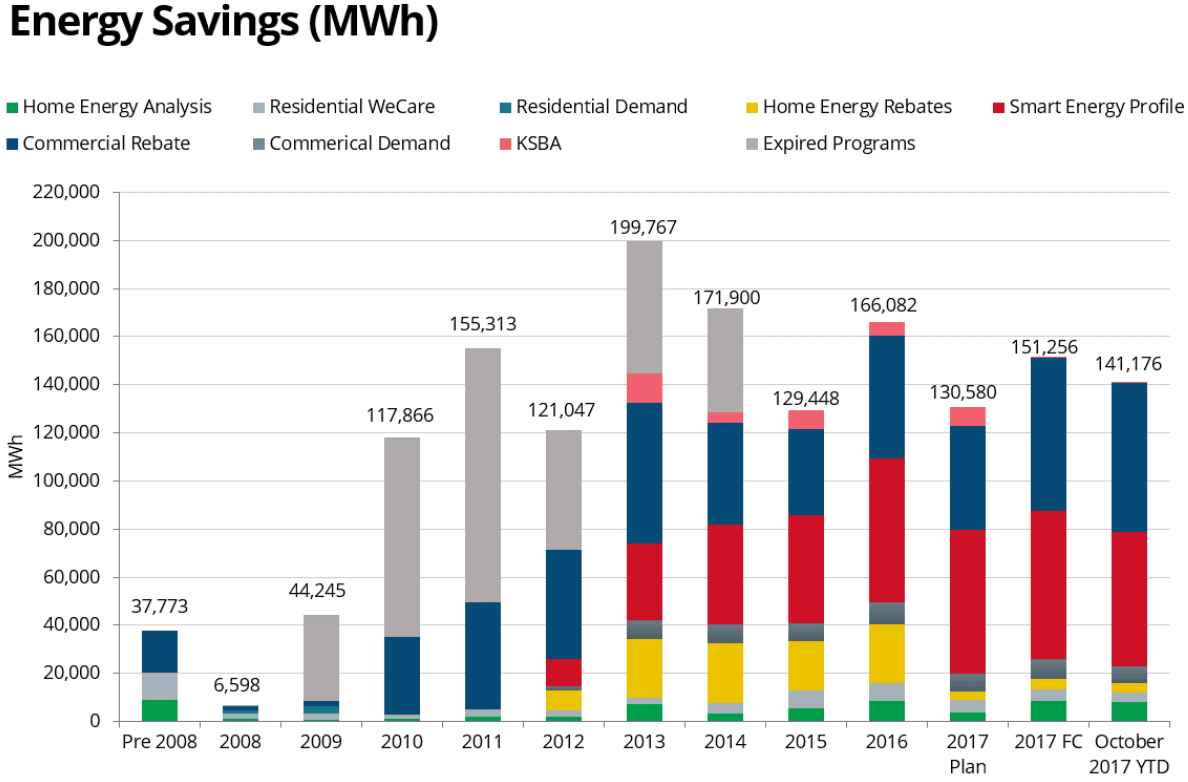
[1] Yearly incremental values for demand and energy will not add to cumulative totals as behavioral programs SEP and KSBA have a one year measure life.

Figure 2 – DSM Energy Savings (MWh)



In addition, the Companies' low-income weatherization DSM-EE program, WeCare, made energy-efficiency improvements to 19,677 homes as of October 31, 2017, improving the comfort and energy-efficiency of those homes for some of the Companies' most vulnerable customers.

These savings and achievements are the result of over $300 million of investment in DSM-EE programs. By way of comparison, the avoided costs of capacity and energy resulting from these programs exceeds $400 million. In short, the Companies' DSM-EE programs have produced significant net savings for customers over the more than 20 years the Companies have conducted DSM-EE programs. By any reasonable measure, they have been successful and prudent investments.

Q. It appears the Companies have allowed certain DSM-EE programs to expire in the past. Why has that occurred?

A. A particular DSM-EE program's past success does not necessarily mean it should be continued indefinitely into the future. Indeed, as the Companies have noted in past DSM-EE applications, the Companies routinely review and evaluate their DSM-EE programs to determine if they are continuing to provide value for customers' dollars. When it appears a program is not performing as it should, the Companies review the program and then take appropriate action if any is needed.

Also, market conditions can change for a variety of reasons, which can cause a program that was previously cost-effective to cease to be so. For example, the Companies allowed their High-Efficiency Lighting Program, which had distributed compact fluorescent lightbulbs ("CFLs") to customers who requested them, to expire at the end of the approved 2014 budget cycle.[2] The program had been successful and cost-effective when incandescent lightbulbs were widely available for purchase and occupied most customers' lighting sockets. But when federal law began prohibiting manufacture of most incandescent bulbs beginning in 2012, the program ceased to be cost-effective, as any replacement bulb purchased would necessarily have been a CFL or an even more efficient bulb, negating any savings attributable to the program going forward. Therefore, it was appropriate to allow the program to end, which the Commission approved.[3] Changes of market conditions that result in programs like

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[2] *In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Review, Modification, and Continuation of Existing, and Addition of New Demand-Side Management and Energy-Efficiency Programs,* Case No. 2014-00003, Order at 3 (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

[3] *Id.*

the High-Efficiency Lighting Program no longer being necessary are, from an energy-efficiency perspective, positive developments.

Q. Have any major changes in market conditions relevant to DSM-EE programming recently occurred?

A. Yes. Load forecasts have significantly decreased from just a few years ago, and the decreased projections appear not to result from an economic downturn or similar drivers of customer behavior; rather, energy efficiency appears to play a major role in the downward-revised forecasts. At the national level, the U.S. Department of Energy reduced its forecasted total energy sales for 2025 from 4,454 TWh in the 2014 Annual Energy Outlook to 4,025 TWh in the 2016 Annual Energy Outlook—a nearly 10% reduction in projected energy sales.[4] And in Kentucky, several utilities have drastically reduced their load forecasts over the same period. For example, Kentucky Power Company reduced its energy-requirements forecast for 2028, from 7,158 GWh in 2013 to 6,254 GWh in 2016 (a 12.6% reduction).[5] Similarly, Kentucky Power Company reduced its summer and winter peak-demand forecasts for 2028, from a 1,459 MW winter demand in 2013 to 1,329 MW winter demand in 2016 (an 8.9% reduction) and a 1,179 MW winter demand in 2013 to 1,038 MW winter demand in 2016 (a 12% reduction).[6] And Big Rivers Electric Corporation reduced its projected native energy requirements for 2027 from 3,644 GWh in 2014 to 3,509 GWh in

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[4] 2014 Annual Energy Outlook available at https://www.eia.gov/outlooks/archive/aeo14/pdf/0383(2014).pdf at Table CP4, AEO2014 reference case (accessed Sept. 13, 2017); 2016 Annual Energy Outlook Available at https://www.eia.gov/outlooks/aeo/pdf/0383(2016).pdf at Table CP4, AEO2016 No CPP (accessed Sept. 13, 2017).

[5] *In the Matter of: 2016 Integrated Resource Plan of Kentucky Power Company*, Application Exhibit C-11 (Ky. Pub. Serv. Comm’n Dec. 20, 2016).

[6] *Id*. at Application Exhibit C-13.

2017.[7] Similarly, Big Rivers Electric Corporation reduced its projected native peak demand for 2026 from 719 MW in 2014 to 683 MW in 2017.[8]

The Companies have similarly reduced their load forecasts between 2014 and 2016, as KU noted in its September 20, 2017 filing with the Commission in Case No. 2016-00370.[9] For example, in 2014 the Companies had projected a summer 2025 net peak load of 7,260 MW.[10] In their 2016 rate cases, the Companies projected a summer 2025 net peak load of just 6,561 MW—a decrease of nearly 700 MW, i.e., almost 10% of the 2014 projection.[11] Figure 3 below shows that the Companies' retail electricity sales are also expected to be significantly lower than projected just a few years ago:

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[7] *In the Matter of: Big Rivers Electric Corporation's 2017 Integrated Resource Plan,* Application Table 3.2 at 35 (Ky. Pub. Serv. Comm'n Sep. 21, 2017).

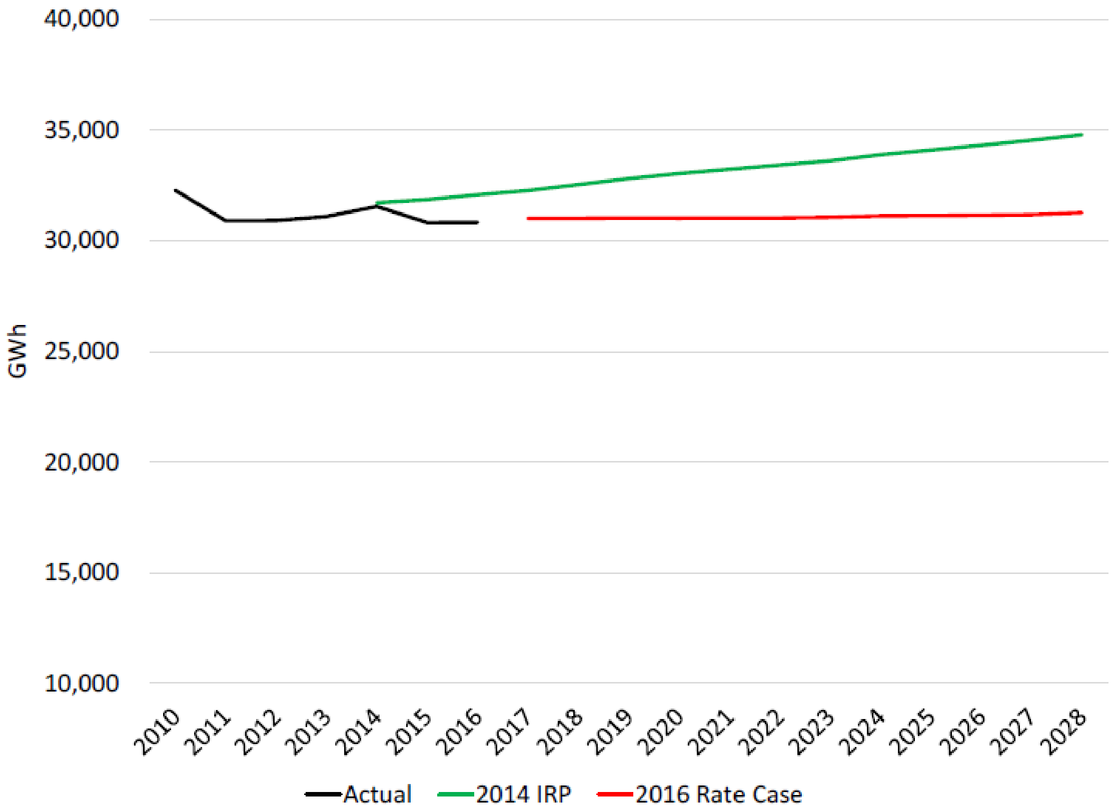
[8] *Id.* Table 3.3 at 36.

[9] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00370, KU Response (Ky. Pub. Serv. Comm'n Sep. 20, 2017).

[10] *Id.* at 5.

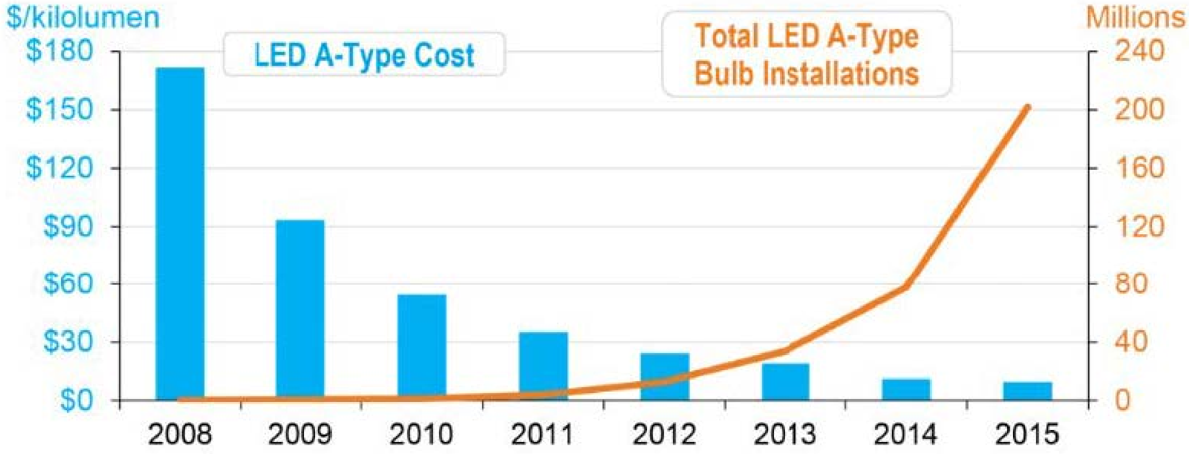
[11] *Id.* at 6.

Figure 3: Actual and Projected Electricity Sales for the Companies



Load and energy-sales decreases of these magnitudes are unprecedented, and it appears they have been and are being driven largely by energy efficiency well beyond what utilities are sponsoring. For example, the summer 2025 load projection decrease noted above for the Companies is a net load decrease, meaning it has already taken into account the effect of the Companies' DSM-EE programs; in other words, the projected load and energy decreases are well in excess of those resulting from the Companies' DSM-EE programs. As shown in Figure 4 below, at least part of those decreases, both nationally and locally, appear to result from the rapid and broad adoption of LED lighting, not all of which results from utility-run DSM-EE programming:

Figure 4: LED Lighting: Global Cost and Installation Trends[12]



The move to LED lighting has had a significant impact on residential and commercial usage, of which 15 to 30 percent had been used for lighting prior to these advanced lighting options being broadly available and affordable.[13]

In addition, the Companies have observed, as shown in the chart below, a net movement of customers from more rural areas, where per-customer usage tends to be higher, to more urban areas, where per-customer energy usage tends to be lower:

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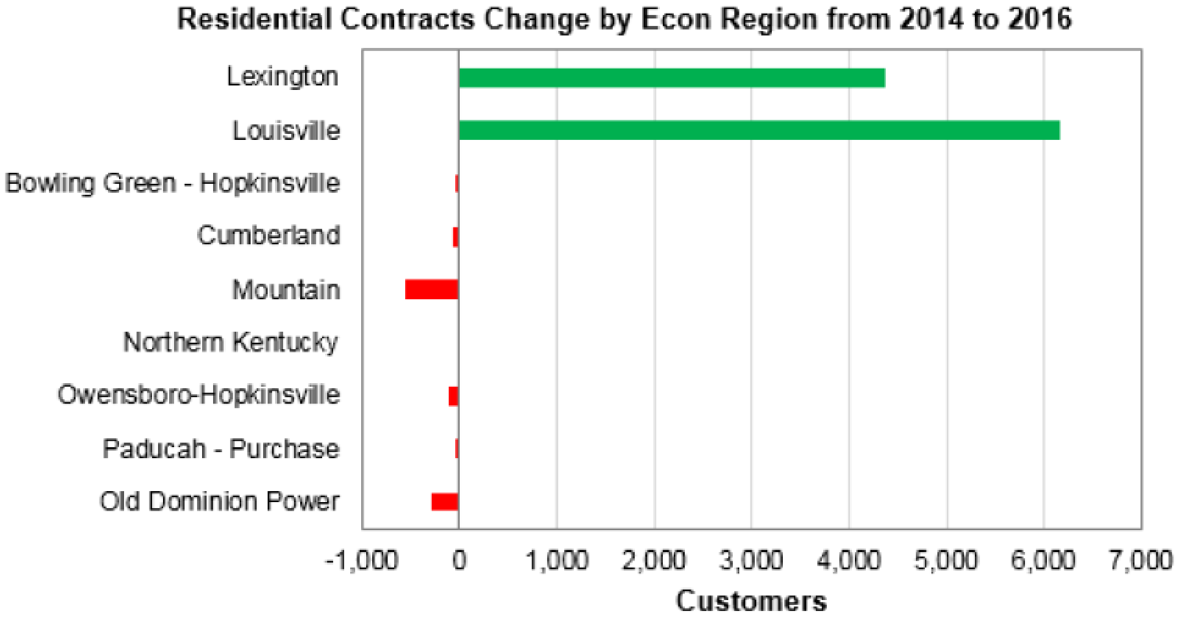
[12] *Id.* at 8.
[13] *Id.* at 7.

Figure 5: Rural to Urban Population Shift[14]



These significant shifts in customer behavior and load patterns have altered the background against which utility-run DSM-EE programs must show their value. But there is an important sense in which these shifts are evidence of the past value of DSM-EE programs: customers are taking up the energy-efficiency baton and running with it, which was always a goal of such programs.

Q. Are there other recent changes that are affecting the value of utility-run DSM-EE programs?

A. Yes, there are a number of such factors. For example, electric-consuming devices are more energy-efficient now than they were just a few years ago, and the percentage of Energy Star-compliant devices sold each year continues to increase.[15] Therefore, even without necessarily intending to do so, customers are becoming more energy

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[14] *Id*. at 8.

[15] Energy Star, *Unit Shipment and Sales Data Archives*, available at https://www.energystar.gov/index.cfm?c=partners.unit_shipment_data_archives (accessed Oct. 27, 2017)

efficient as they replace older, less-efficient devices with newer, more-efficient devices.

In addition, large customers, both commercial and industrial, have invested in energy efficiency beyond utility-run DSM-EE programs. For example, Wal-Mart has testified before this Commission concerning its own substantial energy-efficiency efforts.[16] In 2014, Wal-Mart testified that it had deployed sub-metering systems in approximately 1,650 facilities in the United States, heat reclamation from refrigeration systems capable of meeting up to 70 percent of that store's hot water needs, highly efficient HVAC systems, and LED lighting.[17] And the Kentucky Industrial Utility Customers, Inc. has testified before this Commission that industrial customers expend significant financial resources on energy efficiency and often have employees dedicated to finding ways to achieve energy efficiency.[18]

In sum, energy efficiency is now broadly understood and practiced, well beyond the scope of the Companies' DSM-EE programs, though at least some of the broader customer awareness of the importance of energy efficiency has resulted from the Companies' DSM-EE efforts. Regardless, the broad success of energy efficiency is laudable.

In addition, an unrelated but important change that will likely affect the value of utility-run DSM-EE programs for decades to come is the reduction in fossil-fuel prices resulting from the hydraulic fracturing (fracking) revolution. Historically low

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[16] Case No. 2014-00003, Direct Testimony of Kenneth E. Baker at 3-4 (Ky. Pub. Serv. Comm'n April 14, 2014).

[17] *Id.*

[18] Case No. 2014-00003, Post-Hearing Brief of Kentucky Industrial Utility Customers, Inc. at 3 (Ky. Pub. Serv. Comm'n Sep. 30, 2014).

natural gas prices have put downward pressure on coal prices, with the result that the marginal cost of each unit of energy is lower today than it was a few years ago. In the Companies' case, whereas the avoided cost of energy used in the cost-benefit analyses supporting the 2015-2018 DSM-EE Program Plan was over $0.04/kWh, the avoided cost of energy used in formulating the proposed DSM-EE Program Plan is now less than $0.03/kWh.

Q. How have these marketplace changes affected the ongoing value of the Companies' DSM-EE programs?

A. Unsurprisingly, the increasingly energy-efficient marketplace has made it more challenging for utility-run DSM-EE programs to be cost-effective; when energy efficiency is the well-established marketplace norm, it is more costly to exceed the background level of energy-efficiency. In other words, there are diminishing returns to additional efficiency expenditures against an already highly efficient background.

In addition, and as reflected in the testimony of Mr. Lawson and the Proposed DSM-EE Program Plan, the Companies' avoided costs of energy and capacity have substantially decreased. In the case of avoided capacity cost, whereas in previous DSM-EE Program Plan filings the Companies used an avoided capacity cost of about $100/kW-year,[19] which was the avoided cost of new simple-cycle combustion turbine capacity, the value used in the cost-benefit analyses provided in this filing is now $0/kW-year. As the Commission is aware from the Companies' recent base-rate cases, the recent dramatic decrease in projected customer load means the Companies

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[19] Case No. 2014-00003, Application Exhibit MEH-3 at 21 (Ky. Pub. Serv. Comm'n Jan. 17, 2014)

do not reasonably foresee a need for additional capacity for at least 30 years.[20] For that reason, a $0/kW-year avoided capacity cost is appropriate to use in analyzing DSM-EE programs.

Finally, as I noted above, lower fuel costs have resulted in lower avoided energy costs, falling from over $0.04/kWh in 2014 to the less than $0.03/kWh used in the cost-benefit analyses conducted when formulating the Proposed DSM-EE Program Plan. This decrease in avoided energy cost coupled with a more energy-efficient marketplace creates unfavorable cost-benefit ratios for almost all potential utility-run energy-efficiency programs.

Q. Are these factors why the Companies recently filed to modify and reduce expenditures for their approved DSM-EE programs for the 2018 program year?

A. Yes. On November 29, 2017, the Companies made their ordinary budget filing for the 2018 DSM-EE program year, which covers calendar year 2018. That filing contains significant reductions and alterations to the incentives in the Company's existing DSM-EE programs as follows:

- Residential Load Management/Demand Conservation. Monthly bill credit for June-September per air conditioning unit or heat pump on single family home decreases from $5 to $3; no property owner incentive for multi-family option.
- Commercial Load Management/Demand Conservation. Incentive to customer decreases from $25/kW to $15/kW on Customer Equipment

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[20] Case No. 2016-00370, Sinclair Rebuttal Testimony at 2 (Ky. Pub. Serv. Comm’n April 10, 2017)

Interface Option; monthly bill credit for June-September per air conditioning unit up to 5 tons decreases from $5 to $3.

- Commercial Conservation/Commercial Incentives. Incentives available to customers will be based on $0.03/kWh instead of $100/kW.
- Residential Conservation/Home Energy Performance Program. The Companies will no longer provide an incentive for the follow-up test portion of program for audits scheduled on or after April 1, 2018; full certified audits will still be available for $25. The follow-up test must be scheduled by September 1, 2018.
- Smart Energy Profile. No further profiles will be issued after March 31, 2018.
- Residential Incentives Program. A customer desiring an incentive must purchase a qualified item and request an application prior to April 1, 2018. All incentive applications, including proofs of purchase, must be received by September 1, 2018. No incentives will be paid after December 31, 2018.

Q. Explain the reason for discontinuing incentives after March 31, 2018.

A. The Companies believe it is important to communicate with our customers about upcoming changes to DSM-EE incentive levels for a reasonable time before the changes occur. The 2018 budget filing, which has an effective date of January 1, gives the Commission an opportunity to review the proposed changes, gives the Companies time to inform customers of an end date for those incentives, and time to process all customers' participation and incentive requests before the Commission's current approval of those programs expires at the end of 2018.

Q. What will happen if a customer requests an incentive after March 31, 2018, for an existing program?

A. The Companies would review the incentive application to determine if the customer participated prior to April 1, 2018. For example, if the customer requested an application and purchased a qualified appliance under the Residential Incentives program prior to April 1 and submitted a completed incentive application before September 1, 2018, the Companies would provide an incentive. The purpose of having an application-filing deadline of September 1, 2018, is to ensure ample time to process all filed applications and pay incentives prior to the end of the program's current authorization through December 31, 2018.

Q. Does the Proposed DSM-EE Program Plan contain additional program revisions and reductions?

A. Yes. The same factors I discussed above that necessitated the reductions proposed for the 2018 program year necessitate further reductions and revisions in the Proposed DSM-EE Program Plan. The California Standard Practice Manual cost-benefit test scores for the programs that were scaled back or whose incentive was set to $0 in the 2018 program year or in the Proposed DSM-EE Program Plan are below:

Program	TRC	PCT	RIM	PAC
Smart Energy Profile	0.59	N/A	0.21	0.59
Residential Incentives	0.24	1.14	0.20	0.47
Residential Refrigerator Removal	0.79	N/A	0.21	0.61
Residential Conservation	0.42	4.41	0.20	0.52

As the table above shows, the programs to be eliminated would not be cost-effective going forward, and the Companies do not believe there are other reasonable grounds to support continuing them.

The California Standard Practice Manual cost-benefit test scores for the programs included in the Proposed DSM-EE Program Plan are below:

Program	**TRC**	**PCT**	**RIM**	**PAC**
Nonresidential Rebates	1.14	2.14	0.49	4.23
PD&A	0.00	N/A	0.00	0.00
Total Energy Efficiency and PD&A	**1.06**	**2.14**	**0.47**	**3.31**
Residential and Small Nonresidential Demand Conservation	0.00	N/A	0.00	0.00
Large Nonresidential Demand Conservation	0.01	1.62	0.01	0.01
WeCare	0.44	N/A	0.19	0.44
SEMP/KSBA	0.30	N/A	0.19	0.30
AMS Customer Service Offering	0.00	N/A	0.00	0.00
Total Portfolio	**0.67**	**2.96**	**0.33**	**1.01**

Notably, the Nonresidential Rebates Program (formerly the Commercial Rebates Program) continues to be cost-effective with rebates based on energy savings rather than capacity savings, as Mr. Lawson further describes in his testimony. The Program Development and Administration line item (PD&A) is simply the administrative cost associated with DSM-EE programs generally, and will necessarily continue, though at a reduced level, as long as the Companies offer DSM-EE programs.

Q. Why do the Companies propose to continue to offer the Residential and Small Nonresidential Demand Conservation Program and the Large Nonresidential

Demand Conservation Program (also collectively known as direct load control) in view of their cost-benefit test scores?

A. Direct load control programs are the longest-standing of the Companies' DSM-EE programs; for the Companies and most utilities with DSM-EE programs, they were the first kind of DSM-EE programming offered. They are designed to allow utilities to reduce load at times of peak demand by cutting power to air conditioner compressors and other high-demand devices for limited periods of time. Although this provides demand reductions, it does not provide net energy savings, as the compressors and other devices tend to run longer when reenergized to make up for the time they were disconnected. With a $0/kW-year avoided cost of capacity, the California cost-benefit test scores are zero.

But that does not mean these programs have no value. Because the load control programs can be called upon on hot summer days to reduce customer load, the Companies evaluated these programs based on their impact to system reliability. The programs' impact to system reliability is a function of weather, which drives air conditioning load, and the number of customers enrolled in the programs. Because the future level of customer participation is uncertain, the Companies evaluated the programs' system reliability benefit over three customer participation scenarios and numerous weather scenarios. The assumed level of customer participation in each scenario is conservative; compared to today's participation levels, the participation levels in the customer participation scenarios are 24% to 50% lower. In addition, because the annual incentive for the load control programs will be paid only in years in which a load control event is called (as Mr. Lawson describes in his testimony), the analysis assumed the programs would be the last resources dispatched to serve customers' load.

Figure 6 below plots the programs' reliability benefit for each customer participation scenario over 44 weather scenarios that were developed based on actual weather over the past 44 years. The reliability benefits are computed based on the programs' impact to the Companies' annual expected unserved energy costs.[21] In Figure 6, the reliability benefits for each customer participation scenario have been sorted from lowest to highest. Because the programs are assumed to be the last resources used to serve customer load, a load control event is not called in most of the weather scenarios and the reliability benefit in those weather scenarios is zero. However, under the more extreme weather scenarios, the programs' reliability benefit exceeds the sum of the programs' annual stay-open costs ($2.4 million) and annual incentive costs ($0.9-1.3 million, depending on customer participation levels).[22]

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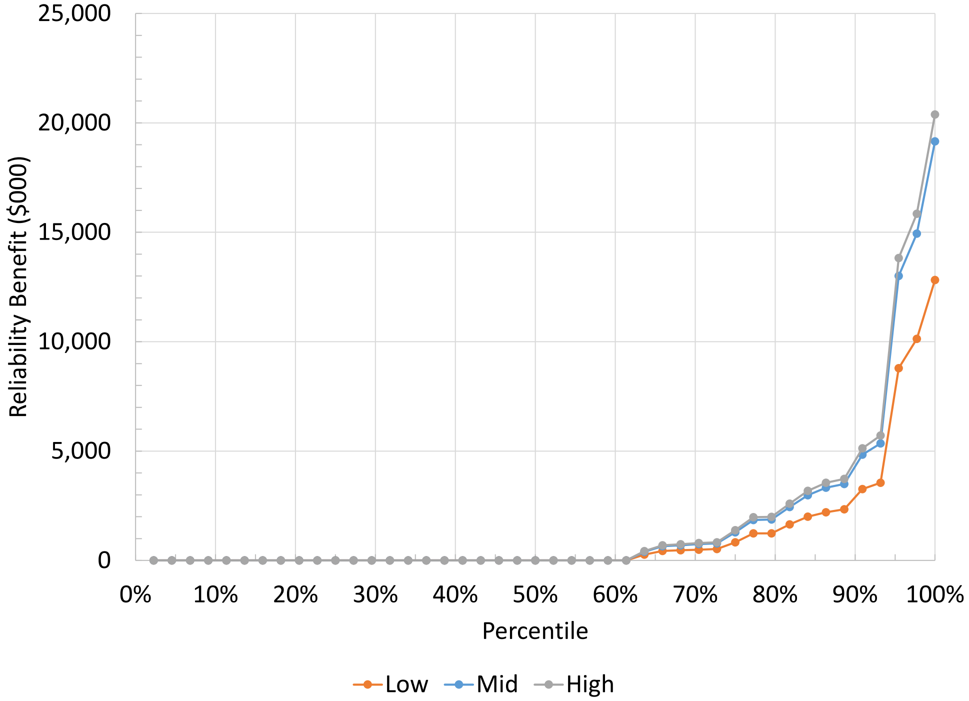
[21] Consistent with the Companies' 2014 IRP Reserve Margin Analysis, the cost of unserved energy is assumed to be $18,000/MWh; $18,000/MWh (in 2020 dollars) was computed by escalating the assumed cost of unserved energy in the 2014 IRP Reserve Margin Analysis ($17,200/MWh in 2018 dollars) by 2.3% per year.

[22] Stay-open costs are the ongoing fixed costs required to maintain the programs. Stay-open costs exclude the cost of removing load control units from customers' homes or businesses because this cost is assumed to be sunk.

Figure 6: Reliability Benefit of Load Control Programs



Consistent with the 2014 IRP Reserve Margin Analysis, this analysis evaluates the programs based on the 85th and 90th percentile of the reliability benefit distribution in Figure 6.[23] In the High and Mid customer participation scenarios, the programs add value for customers. In the Low customer participation scenario, the value of the program is unfavorable. Therefore, the Companies are proposing to continue these programs in a "maintenance" mode and closely monitor customer participation levels.

The Companies have a net capital investment of over $10 million for the load-control switches deployed through these programs. In a "maintenance" mode, the Companies will provide reduced incentives for customers to participate and will not

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[23] See *In the Matter of: 2014 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company*, Case No. 2014-00131, IRP Volume III, Reserve Margin Study at 22-23 (Apr. 21, 2014).

invest new capital in the programs, but will move existing load-control switches between customers as some customers exit the program and others seek to join. This will ensure customers continue to receive use and benefit of these assets while gradually phasing out the programs as the switches eventually cease to operate.

Q. Why do the Companies propose to continue to offer the WeCare Program in view of its cost-benefit test scores?

A. The Companies believe it is both important and the right thing to do to continue to assist our most vulnerable customers to obtain the benefits of increased energy efficiency. Although other customers might be able to replace older, less efficient devices with new, more-efficient devices, or to make energy-efficiency improvements to their homes, the Companies' low-income customers often are not so fortunate. The Companies therefore propose to continue this program in the Proposed DSM-EE Program Plan.

In addition, WeCare could be characterized as home energy assistance program under KRS 278.285(4).[24] Such programs are not subject to evaluation under the cost-benefit requirements applicable to other DSM-EE programs; rather, by statute they are required only to be unsubsidized by other customer classes and to be part of a plan developed in consultation with customer representatives and the Office of the Attorney General. WeCare, which is available only to low-income residential customers and low-income residents of master-metered multi-family housing complexes, was developed as part of the Proposed DSM-EE Program Plan discussed

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[24] KRS 278.285(4) states, "Home energy assistance programs may be part of a demand-side management program. In considering a home energy assistance program, the commission shall only utilize the criteria set forth in subsections (1)(f) and (3) of this section."

with customer representatives and the Office of the Attorney General, as I describe below. Therefore, WeCare meets the statutory criteria for approval under KRS 278.285(4).

Q. Why do the Companies propose to continue to offer the AMS Customer Service Offering?

A. The AMS Customer Service Offering continues to be a success on the terms under which the Commission approved the offering as part of the Companies' 2015-2018 DSM-EE Program Plan.[25] The offering became available to customers later in the 2015 program year; as of November 30, 2017, 7,125 customers have enrolled, with over 5,500 AMS meters now deployed. Those customers have demonstrated increased awareness of their energy usage and have reported implementing energy-efficiency behaviors and efforts as a result of that awareness. For example, approximately 60% of participants surveyed reported upgrading to LED bulbs to save energy as a result of participating in the AMS Customer Service Offering, and nearly half of participants surveyed reported adjusting their thermostat settings as a result of participation.[26] This offering is therefore performing well, as anticipated when the Commission approved it in 2014, and the Companies propose to continue it in the Proposed DSM-EE Program Plan.

The Companies previously sought a certificate of public convenience and necessity for the full deployment of AMS, and subsequently withdrew their request in accordance with the Commission-approved Stipulation and Recommendation in Case Nos. 2016-00370 and 2016-00371. If the Companies receive approval for the full

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[25] Case No. 2014-00003, Order at 31 (Ky. Pub. Serv. Comm'n Nov. 14, 2014).

[26] Case No. 2016-00370, Application Exhibit JPM-1 at 87 (Ky. Pub. Serv. Comm'n Nov. 23, 2016).

AMS deployment in future proceedings, the Companies will simultaneously request to phase out the AMS Customer Service Offering. The Companies presently anticipate filing an application with the Commission in January 2018 seeking approval for full AMS deployment.

Q. Why do the Companies propose to continue the School Energy Management Program ("SEMP")?

A. As part of the settlement of the Companies' 2016 base-rate cases, the Companies committed to apply to the Commission to continue the SEMP program at its current funding level. Mr. Lawson further describes the program in his testimony.

Q. Will the Proposed DSM-EE Program Plan result in reduced charges for residential customers under the Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism")?

A. Yes. As Mr. Lawson describes in his testimony, compared to the DSM-EE programs and their costs for the 2017 program year, the Proposed DSM-EE Program Plan will result in significant DSM Mechanism charge reductions for residential customers beginning with the 2019 program year. These savings are the dividend of customers' own energy efficiency efforts. The Companies would encourage customers to use some or all of the savings to invest in their own energy-efficiency efforts so they can enjoy even greater savings in the future.

Q. If the DSM-EE program changes in the 2018 program year and the Proposed DSM-EE Program Plan result in less DSM-EE program participation than the Companies anticipate in their annual DSM-EE budget filings, is there a mechanism to ensure customers will not pay for unused DSM-EE programming?

A. Yes. The DSM Balancing Adjustment component of the Companies' DSM Mechanisms ensures that customers ultimately are billed only for the costs incurred for the programs, as well as the appropriate level of lost sales and DSM-EE incentive recovery. If customers do not participate in the programs as anticipated, DSM Mechanism billings are trued up for actual participation levels in subsequent billings. DSM Balancing Adjustment filings are made in the first quarter of each calendar year to true up for actual program performance for the previous calendar year, and the Balancing Adjustment component of DSM Mechanism charges are reset each April 1.

Q. Did the Companies consult with the DSM Advisory Group in formulating the Proposed DSM-EE Program Plan?

A. Yes. The attendees at these meetings at different times included residential and commercial stakeholders, industrial customer representatives, and representatives of the Office of the Attorney General. As I describe below concerning industrial DSM-EE participation, and as Mr. Lawson describes in his testimony and in the Proposed DSM-EE Program Plan document more generally, the Companies held multiple meetings with the DSM Advisory Group concerning industrial participation in DSM-EE programs and concerning this filing.

Q. Do the Companies remain committed to providing cost-effective DSM-EE programming?

A. Yes. Indeed, the Companies' more than 20-year history with offering DSM-EE programs and offering the most robust DSM-EE portfolio in the Commonwealth to date prove that commitment. In keeping with that commitment, the Companies will continue to provide periodic messaging to their customers offering energy-saving tips and encouraging energy efficiency even though the Companies are ending their DSM-EE-based consumer education program.

But the Companies also remain committed to providing programs that are cost-effective or otherwise serve their customers well and consistently with the applicable requirements of KRS 278.285. Therefore, if the Companies become aware of other potential DSM-EE programs that meet the necessary criteria, they will not wait until the end of the Proposed DSM-EE Program Plan to propose such programs; rather, as the Companies have in the past, they will propose such programs when the Companies are confident they will provide value, and always in consultation with the Companies' DSM Advisory Group. Likewise, if programs cease to provide value and do not meet the criteria of KRS 278.285, the Companies will propose to end them, again in consultation with the DSM Advisory Group.

Q. Given the changes anticipated for the 2018 program year and the 2019-2015 DSM-EE Program Plan, how often do the Companies intend to meet with the DSM Advisory Group?

A. Through the process of reviewing the changes associated with this filing the DSM Advisory Group expressed some concern about the future. More specifically, they would like to meet at least annually to discuss program performance. The Companies plan to hold an annual meeting across the program plan to continue the DSM Advisory group process.

Including Industrial Customers in DSM-EE Programs

Q. Discuss the inclusion of industrial customers in the Nonresidential Rebates Program.

A. In accordance with the Commission's Order in the Companies' 2014 DSM-EE proceeding, the Companies conducted an industrial potential or market-characterization study ("Industrial Potential Study") to determine whether the Companies should offer DSM-EE programs to industrial customers. The Companies initiated the Industrial Potential Study in early 2015 and filed it with the Commission on May 26, 2016.[27] The Industrial Potential Study showed cost-effective DSM-EE potential in the Companies' industrial customer segment. Therefore, beginning in 2019 industrial customers will be included in the Companies' DSM Mechanism, and will be eligible for all nonresidential program offerings unless they meet the opt-out criteria and elect to opt out their eligible meters.

Q. How did the Companies' DSM Advisory Group participate in the decision-making process regarding industrial DSM-EE offerings?

A. The Companies' DSM Advisory Group met three times in 2016 concerning including industrial customers in the Companies' DSM-EE programs. All three meetings included representatives of industrial customers, including representation from the Kentucky Industrial Utility Customers, Inc. These meetings were held on June 23, August 24, and October 13 in Louisville, Kentucky. During the first meeting, the results of the Industrial Potential Study were presented. Discussions ensued regarding the industrial exemption from DSM-EE charges and how KRS 278.285(3) permits industrial customers to pursue independent DSM-EE measures and not be charged costs associated with utility-run DSM-EE programs. As requested by the customer-stakeholders, the second meeting included a representative from the Midwest Energy

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[27] Case No. 2014-00003, LG&E and KU Industrial DSM Potential Assessment (Ky. Pub. Serv. Comm'n May 26, 2016)

Efficiency Alliance ("MEEA") to present a review of DSM-EE opt-out rules in other states. Next, in accordance with the Commission's Orders in Case Nos. 2014-00371 and 2014-00372, there was a discussion on the definition of "industrial" and whether the North American Industry Classification System ("NAICS") codes should be used to define "industrial."[28] At the final meeting of 2016, the current and proposed "industrial" definitions were presented, the definition of "energy intensive" was discussed, and the steps required to opt out were presented. In short, the DSM Advisory Group was instrumental in the decision-making process regarding the industrial opt-out proposed in the Companies' application.

Q. Please explain the opt-out process available to industrial customers.

A. In short, an industrial customer may opt out of DSM Mechanism charges and DSM-EE program participation for individual meters served under energy-intensive rates if the customer has installed cost-effective energy-efficiency measures not subsidized by other rate classes for the loads served by such meters. For purposes of the Companies' DSM-EE Programs, energy-intensive rates are Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), and Time-of-Day Primary Service (Rate TODP) for electric service and rates Industrial Gas Service (Rate IGS), As-Available Gas Service (Rate AAGS), Substitute Gas Sales Service (Rate SGSS), and Firm Transportation Service (Rate FT) for gas service. An industrial customer with multiple meters will be able to opt out of DSM-EE programs and charges for individual eligible meters, but will not be able to opt out of DSM-EE programs and

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[28] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates*, Case No. 2014-00371, Order at 9 (June 30, 2015); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates*, Case No. 2014-00372, Order at 9-10 (June 30, 2015).

charges for any other meters. Industrial customers electing to opt-out of the Companies' DSM-EE programs must submit to the Companies a completed opt-out form (see Exhibits REL-8 and REL-9 to Mr. Lovekamp's testimony). Once the opt-out is approved, the industrial customer's eligible meters will be exempt from the Companies' DSM-EE programs and charges for a minimum of one year, and will remain opted-out until the customer applies to opt back into DSM-EE charges

Also, if an industrial customer opts out a meter and subsequently opts the meter back into DSM-EE charges, the customer will be billed under the DSM Mechanism for that meter for a period of 3 years from the opt-in date or the last date in which the customer participated in DSM-EE programming with respect to the load served by the meter, whichever is later, before being eligible to opt out again. This three-year requirement mitigates the risk of customers opting into the DSM Mechanism to participate in a program only to opt back out and avoid future charges.

Industrial customer representatives indicated during DSM Advisory Group meetings on these topics that they were generally in agreement with this opt-out procedure.

Recommendation and Conclusion

Q. What is your recommendation concerning the Companies' Application for their Proposed DSM-EE Program Plan?

A. I recommend that the Commission approve the Companies' Application, which will allow important and beneficial DSM-EE programs to continue while substantially reducing overall DSM-EE programming and spending in recognition of the broad success of energy efficiency in the Companies' service territories. The Companies view this reduction in DSM-EE offerings as a natural and welcome consequence of increased energy-efficiency awareness and efforts by customers. The Companies believe customers will also welcome the resulting bill reductions associated with decreased DSM-EE program costs, and would encourage customers to use some of the savings to invest in their own energy-efficiency efforts.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **David E. Huff**, being duly sworn, deposes and says that he is Director of Customer Energy Efficiency and Emerging Technology for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

David E. Huff

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 6th day of December 2017.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:
JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

David E. Huff
LG&E and KU Energy LLC
220 West Main Street
Louisville, Kentucky 40202

Education

MBA, Indiana University
BSME, Rose-Hulman Institute of Technology

Professional Experience

Louisville Gas and Electric and Kentucky Utilities

Director, Customer Energy Efficiency and Smart Grid Strategy	March 2010 - Present
Director, Distribution Operations	March 2003 – March 2010

LG&E Energy

Director, Revenue Collection Process	January 2000 – March 2003

Louisville Gas and Electric

Director, Gas Operations Support & Interim Mktg Director	June 1997 – January 2000
Wholesale Excellence Team Leader	November 1995 – June 1997
Division Manager – Trimble County Station	July 1994 – November 1995
Operations Manager – Mill Creek Station	January 1992 – July 1994
Mechanical Engineer	1983 - 1992

Professional Memberships

Registered Professional Engineer – Kentucky
Kentucky Clean Fuels Coalition – Board Member
University of Louisville Conn Center for Renewable Energy Research -- Technical Advisory Board Member
University of Louisville Speed School of Engineering – Advisory Board Member of Electric & Computer Engineering Department
E-Source DSM Executive Council Member

Civic Activities

Boy Scouts of America Executive Committee Member and Volunteer – Lincoln Heritage Council
Past Project WARM Board Member
Committee Member of Boy Scout Troop 15
Eagle Scout

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR REVIEW, MODIFICATION, AND CONTINUATION OF CERTAIN EXISTING DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAMS	**)))))))**	**CASE NO. 2017-00441**

TESTIMONY OF
RICK E. LOVEKAMP
MANAGER, REGULATORY AFFAIRS/TARIFFS
LG&E AND KU SERVICES COMPANY

Filed: December 6, 2017

Q. Please state your name, position, and business address.

A. My name is Rick E. Lovekamp. I am Manager of Regulatory Affairs/Tariffs for LG&E and KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, the "Companies"). My business address is 220 West Main Street, Louisville, Kentucky. A statement of my qualifications and work experience is attached as Appendix A.

Q. Have you previously testified before the Kentucky Public Service Commission?

A. Yes. I testified before this Commission most recently in Case No. 2016-00274, *Joint Application of Kentucky Utilities Company and Louisville Gas and Electric Company for Approval of an Optional Solar Share Program Rider*.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism").

Q. Are you supporting any exhibits to your testimony?

A. Yes, I am supporting clean and redlined versions of the revised DSM Mechanism tariff sheets for each utility, as well as supporting calculations for each set of revised tariff sheets, which are attached hereto as Exhibits REL-1 (for KU), REL-2 (for LG&E electric), and REL-3 (for LG&E gas). In addition, I am supporting revised Fluctuating Load Service (Rate FLS) tariff sheets for both Companies (Exhibit REL-4 for KU; Exhibit REL-5 for LG&E), the only change to which is adding the DSM Mechanism to the adjustment clauses applicable to service under Rate FLS. Finally, I am supporting the Industrial Opt-In and Opt-Out Notification Forms, which are attached hereto as Exhibits REL-6 (KU Industrial Opt-In), REL-7 (LG&E Industrial Opt-In), REL-8 (KU Industrial Opt-Out), and REL-9 (LG&E Industrial Opt-Out).

Proposed Effective Date

Q. Please explain why the Companies' Application asks the Commission to issue a final order in this proceeding to permit the Companies' revised tariff sheets to be effective for service rendered on and after January 1, 2019.

A. The tariff sheets filed with this Application show a proposed effective date of January 5, 2018, which is thirty days after the December 6, 2017 filing date. The Companies expect the Commission, prior to the expiration of this 30-day notice, to suspend the operation of the DSM Mechanism tariff sheets filed with this Application for a period extending up to five months, and following the expiration of the five-month suspension period, to issue a final order by June 6, 2018. But in their Application the Companies are requesting that the Commission enter an order by June 1, 2018, approving the School Energy Management Program, thereby permitting the program to continue uninterrupted. The Companies are also requesting that the Commission enter a final order September 1, 2018, approving the remaining DSM-EE programs and tariffs to be effective for service rendered on and after January 1, 2019. The commencement of the DSM-EE programs and recovery of their costs through the DSM Mechanism beginning January 1, 2019, will allow the Companies to wind-up the current DSM-EE programs that will not be continued and continue the remaining DSM-EE programs as requested in this Application.

Proposed Changes to the DSM Mechanism Tariff Sheets

Q. What is the current DSM Mechanism formula?

A. The current DSM Mechanism formula includes components for DSM cost recovery ("DCR") (excluding costs capitalized), DSM revenue from lost sales ("DRLS"), DSM incentives ("DSMI"), DSM balancing adjustments ("DBA"), and DSM Capital Cost Recovery ("DCCR"). The formula for calculating the DSM Cost Recovery Component ("DSMRC") is:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR

Q. Do the Companies propose any significant or fundamental changes to the DSM Mechanism or the DSM tariff?

A. No. The DSM Mechanism has operated successfully for many years, providing customers a clear and certain line item on their bills for the Companies' DSM-EE programs. Also, the Companies' annual DSM-EE filings have provided the Commission information in a form that facilitates the Commission's continuous review and oversight.

Q. Do the Companies propose any changes to the terms of their DSM Capital Cost Recovery component?

A. No. The Companies propose to continue to use the DSM Capital Cost Recovery component to recover and earn a return on the capital deployed through DSM-EE programs, though at a reduced return on equity of 10.20% (reduced from the current 10.50% return on equity for DSM-EE-related capital). The reduced return on equity provides a 50-basis-point incentive compared to the Commission's most recently awarded base-rate return on equity for the Companies of 9.70%.[1] The Companies'

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[1] *In the Matter of: Electronic Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates and for Certificates of Public Convenience and Necessity*, Case No. 2016-00370, Order (June 29, 2017); *In the Matter of: Electronic Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and*

proposed 2019-2025 Demand-Side Management and Energy Efficiency Program Plan ("Proposed DSM-EE Program Plan") includes three programs with capital components: Residential and Small Nonresidential Demand Conservation Program (previously filed as the Residential Load Management/Demand Conservation Program), Large Nonresidential Demand Conservation Program (previously filed as Commercial Load Management/Demand Conservation Program), and the Advanced Metering Systems Customer Service Offering.

Q. What changes do the Companies propose to make to their DSM Mechanism tariff sheets?

A. The Companies propose changes to the language contained in the Companies' tariff sheets. These changes address the descriptions of the Companies' DSM-EE programs and the incentives available to customers who participate. The Companies further propose changes to the Energy Charges used to calculate the Monthly Adjustment Factors in the DSM Mechanism. These changes address program modifications identified in the Proposed DSM-EE Program Plan (Exhibit GSL-1). The revised tariff sheets (clean and redlined versions) and the supporting calculations are attached hereto as Exhibits REL-1 (for KU), REL-2 (for LG&E electric), and REL-3 (for LG&E gas).

Notably, the routine calculation of the DSM Incentive ("DSMI") component of the DSM Mechanism for the Proposed DSM-EE Program Plan portfolio results in a zero DSMI component based on current budgets and savings projections for calendar year 2019. If, however, the Companies' DSM-EE programs produce net

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Gas Rates and for Certificates of Public Convenience and Necessity, Case No. 2016-00371, Order (June 29, 2017).

resource savings in the future, the Companies will include a non-zero DSMI component in future DSM Mechanism calculations and charges. In other words, the Companies are not proposing to change the calculation of the DSMI component; indeed, the Companies have performed the calculations in Exhibits REl-1 through REL-3 in the same manner the Commission has previously approved. Rather, due to currently projected program costs and resulting savings for calendar year 2019, the DSMI component for 2019 will be zero, though the DSMI component could change in future years if the Companies' DSM-EE programs' costs or savings change.

Q. What changes do the Companies propose to make to their DSM Mechanism tariff sheets regarding the industrial-customer opt-out process?

A. As described in the testimony of David E. Huff, beginning in 2019 industrial customers will be eligible to participate in DSM-EE programs for nonresidential customers, and therefore will be billed charges under the Companies' DSM Mechanism. But the Companies are also proposing to permit industrial customers to opt out eligible meters under the opt-out procedures the Companies are proposing in this proceeding, which the Companies believe comply with the statutory industrial opt-out requirements in KRS 278.285(3).[2] Therefore, the Companies propose several changes to address the inclusion of industrial customers in nonresidential programs, the definition of energy-intensive industrial customers, and the administration of the industrial-customer opt-out process.

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[2] KRS 278.285(3) provides in pertinent part: "The commission shall allow individual industrial customers with energy intensive processes to implement cost-effective energy efficiency measures in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs."

The Companies are proposing to add industrial opt-out provisions to their electric and gas tariffs for the first time. For the definition of "industrial" customer, the Companies propose to eliminate the use of North American Industry Classification System codes. Instead, "industrial" customers are defined as non-residential customers engaged in activities primarily using energy (electricity or gas) in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. Industrial customers' electric meters served under Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), and Time-of-Day Primary Service (Rate TODP) are defined as "energy intensive" and are eligible for exclusion from charges under the DSM Mechanism if the customers have also implemented for the loads served by the eligible electric meters cost-effective energy-efficiency measures not subsidized by other rate classes. Industrial customers' gas meters served under Firm Industrial Gas Service (IGS), As-Available Gas Service (AAGS), Substitute Gas Sales Service (SGSS), and Firm Transportation Service (Transportation Only) (FT) are also eligible for exclusion from charges under the DSM Mechanism if the customers have also implemented for the loads served by the eligible gas meters cost-effective energy-efficiency measures not subsidized by other rate classes.

To exclude eligible meters from charges under the DSM Mechanism, an industrial customer must submit an opt-out form (see Exhibits REL-8 and REL-9). The form requires the customer to certify that it meets the definition of "industrial," identify eligible meters served under energy-intensive rates, and certify that the customer has implemented at each eligible meter cost-effective energy efficiency measures not subsidized by other customer classes. Once the opt-out is approved, the industrial customer's eligible meters will be exempt from the Companies' DSM-EE Mechanism for a minimum of one year (i.e., 12 full billing cycles). Each meter a customer opts out will remain opted-out and exempt from the Companies' DSM-EE Mechanism until the customer later elects to opt the meter back into DSM Mechanism charges.

If an industrial customer participates in a DSM-EE program with respect to an eligible meter, or opts out and subsequently opts back in with respect to an eligible meter, the customer will be billed under the DSM Mechanism for that meter for a period of three years after the customer ceases participating in a DSM-EE program or opts into the DSM Mechanism, whichever is later, before being eligible to opt out again. This three-year requirement mitigates the risk of customers participating in a program only to opt back out and avoid future DSM-EE charges. And in accordance with KRS 278.285(3), a customer that participates in a DSM-EE program may not subsequently rely on the program's measures to justify the customer's request to opt out of the DSM Mechanism.

As noted above, industrial customers electing to opt-out of the Companies DSM-EE programs must do so on a meter-by-meter basis. Therefore, (1) an industrial customer with multiple meters will be able to opt out of DSM-EE programs and charges for individual, eligible meters, but will not be able to opt out of DSM-EE programs and charges for individual, ineligible meters, i.e., meters served on rates other than FLS, RTS, TODP, IGS, AAGS, SGSS, and FT, or meters serving facilities for which non-subsidized energy-efficiency measures have not been deployed; (2)

energy-efficiency measures deployed at a facility served by one meter cannot be used to satisfy the opt-out criteria for a facility served by another meter; and (3) participation in the Companies' DSM-EE programs at a facility served by one meter will not prevent a customer from seeking an opt-out at a facility served by a different meter.

Q. Do you have any recommendations for the Commission?

A. Yes. The Commission should approve the Companies' Application in this proceeding. As demonstrated in the testimony of Gregory S. Lawson and Mr. Huff, the Companies conducted comprehensive evaluation of the current and proposed DSM-EE programming and consulted with numerous representatives of consumer groups about the programs proposed in this Application.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Rick E. Lovekamp**, being duly sworn, deposes and says that he is Manager Regulatory Affairs/Tariffs for Louisville Gas and Electric Company and Kentucky Utilities Company, an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Rick E Lovekamp

Rick E. Lovekamp

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 6th day of December 2017.

Judy Schooler (SEAL)

Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Rick E. Lovekamp
Manager, Regulatory Affairs/Tariffs
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-3780

Previous Positions

LG&E and KU Services Company and Louisville Gas and Electric Company

Manager Regulatory Affairs	2006 – 2015
Manager Financial Systems	1998 – 2006
Manager Payroll	1997 – 1998
Acting Manager Payroll	1996 – 1997
Accounting Analyst III	1995 – 1996
Accounting Analyst II	1992 – 1995

S.B.S. Packaging Films, Inc.

Founding Partner	1991 – 1992

Illinois Power Company

Accounting Analyst	1989 – 1991

Education

Indiana University, Masters of Business Administration
Eastern Illinois University, B.S.B./Accounting

Kentucky Utilities Company
Electric Tariffs
Clean Version

Exhibit REL-1

Kentucky Utilities Company

P.S.C. No. 18, First Revision of Original Sheet No. 86
Cancelling P.S.C. No. 18, Original Sheet No. 86

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to the Company's Standard Rate Schedules RS, RTOD-Energy, RTOD-Demand, VFD, GS, AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL. Descriptions of available Demand-Side Management and Energy Efficiency ("DSM-EE") programs begin on Sheet No. 86.4. T N

INDUSTRIAL OPT-OUT

An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate RTS, FLS, or TODP) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using electricity in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rate RTS, FLS, or TODP) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE

The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per kilowatt hour of monthly consumption in accordance with the following formula:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR

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ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Lexington, Kentucky

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2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

RATE (continued)

Where:

DCR = DSM COST RECOVERY

The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process (“approved programs”). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.

DRLS = DSM REVENUE FROM LOST SALES

Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1) For each upcoming twelve-month period, the estimated reduction in customer usage (in kWh) as determined for the approved programs shall be multiplied by the non-variable revenue requirement per kWh for purposes of determining the lost revenue to be recovered hereunder from each customer class. The non-variable revenue requirement for the RS, RTOD-Energy, VFD, GS and AES customer classes is defined as the weighted average price per kWh of expected billings under the energy charges contained in the RS, RTOD-Energy, VFD, GS, and AES rate schedules in the upcoming twelve-month period after deducting the variable costs included in such energy charges. The non-variable revenue requirement for each of the customer classes that are billed under demand and energy rates (rate schedules RTOD-Demand, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL) is defined as the weighted average price per kWh represented by the composite of the expected billings under the respective demand and energy charges in the upcoming twelve-month period, after deducting the variable costs included in the energy charges.

2) The lost revenues for each customer class shall then be divided by the estimated class sales (in kWh) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenue from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case, whichever comes first. Revenues from lost sales will be assigned for recovery purposes to the rate classes whose programs resulted in the lost sales.

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Adjustment Clause DSM
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA) component.

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE
For all Energy Impact Programs except Residential and Small Nonresidential Demand Conservation and the Large Nonresidential Demand Conservation Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount related to programs for Rates RS, RTOD-Energy, RTOD-Demand, VFD, GS, T
AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL shall be divided by the expected N
kilowatt-hour sales for the upcoming twelve-month period to determine the DSMI for such rate
class. DSMI amounts will be assigned for recovery purposes to the rate classes whose programs T
created the incentive.

DBA = DSM BALANCE ADJUSTMENT
The DBA shall be calculated on a calendar-year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.
2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period. T

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period.
4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period. N
5) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period. T

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest applied to the monthly amounts, such interest to be calculated at a rate equal to the average of the “Three-Month Commercial Paper Rate” for the immediately preceding twelve-month period. The total of the balance adjustment amounts shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DBA for such rate class. DSM balance adjustment amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY
The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. T
The Company calculates the DCCR component as follows:

$$DCCR = [(RB) (ROR + (ROR – DR) (TR / (1 – TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company’s various DSM-related capital investment(s).

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State Regulation and Rates
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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC T

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE Programs are available to residential customers receiving service from the Company on the RS, RTOD-Energy, RTOD-Demand, and VFD Standard Electric Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program T
This program employs switches to help reduce the demand for electricity during peak times. T
The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or N
pool pumps will be equipped with switches under this program. N

Low Income Weatherization Program (WeCare) T
This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

RESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: D

The following offering is available to residential customers receiving service from the Company on the RS Rate Schedule. T

Advanced Metering Systems Customer Service Offering
This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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State Regulation and Rates
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NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE programs are available to nonresidential customers receiving service from the Company on the GS, AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL Standard Electric Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program

This program employs switches to help reduce the demand for electricity during peak times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or pool pumps will be equipped with switches under this program.

Large Nonresidential Demand Conservation Program

This program employs interfaces to customer equipment to help reduce the demand for electricity during peak times. The program communicates with the interfaces to cycle equipment. This program has an approved flexible incentive structure.

Nonresidential Rebates Program

This program is designed to increase the implementation of energy efficiency measures by providing financial incentives to assist with the replacement of aging and less efficient equipment and for new construction built beyond code requirements. The Program also offers an online tool providing recommendations for energy-efficiency improvements. Incentives available to all nonresidential customers are based upon the avoided cost of energy for calculated efficiency improvements. A prescriptive list provides customers with incentive values for various efficiency improvement projects. Additionally, a custom rebate is available based upon company engineering validation of sustainable energy savings. New construction rebates are available on savings over code plus bonus rebates for LEED certification.

- Maximum annual incentive per facility is $50,000
- Customers can receive multi-year incentives in a single year where such multi-year incentives do not exceed the aggregate of $100,000 per facility and no incentive was provided in the immediately preceding year
- Applicable for combined Prescriptive, Custom, and New Construction Rebates

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2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

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Low Income Weatherization Program (WeCare)

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

School Energy Management Program

The School Energy Management program will facilitate the hiring and retention of qualified, trained energy specialists by public school districts to support facilitation of energy efficiency measures for public and independent schools under KRS 160.325.

NONRESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE:

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The following offering is available to customers receiving service from the Company on the GS Rate Schedule.

Advanced Metering Systems Customer Service Offering

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This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

PROGRAM INCENTIVE STRUCTURES: T

Residential and Small Nonresidential Demand Conservation Program

For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season. If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit, heat pump, electric water heater, and pool pump enabled with a switch. Load Control Events do not include short-duration switch activations (i.e., ten minutes or less) called SCRAM events.

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Large Nonresidential Demand Conservation T

This program is tailored to a large nonresidential customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event.

- $15 per kW for verified load reduction. For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season; and (2) the participant was enrolled in the program during at least one Load Control Event that season.
- The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program.
- Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.

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Kentucky Utilities Company

P.S.C. No. 18, First Revision of Original Sheet No. 86.8 T
Cancelling P.S.C. No. 18, Original Sheet No. 86.8 T

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T
Monthly Adjustment Factors: T

Rates RS, RTOD-Energy, RTOD-Demand, VFD	Energy Charge		T
DSM Cost Recovery (DCR)	$ 0.00054	per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00006	per kWh	I
DSM Incentive (DSMI)	$ 0.00000	per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00047	per kWh	R
DSM Balance Adjustment (DBA)	$(0.00003)	per kWh	
Total DSMRC for Rates RS, RTOD-Energy, RTOD-Demand, VFD	**$ 0.00104**	**per kWh**	T/R

Rate GS	Energy Charge		T
DSM Cost Recovery (DCR)	$ 0.00048	per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00026	per kWh	I
DSM Incentive (DSMI)	$ 0.00000	per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00007	per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00025	per kWh	
Total DSMRC for Rate GS	**$ 0.00106**	**per kWh**	T/R

Rate AES	Energy Charge		T
DSM Cost Recovery (DCR)	$ 0.00139	per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00107	per kWh	I
DSM Incentive (DSMI)	$ 0.00000	per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00105	per kWh	I
DSM Balance Adjustment (DBA)	$ 0.00006	per kWh	
Total DSMRC for Rate AES	**$ 0.00357**	**per kWh**	T/I

Rates PS, TODS, TODP, RTS, FLS, SPS, STOD, OSL	Energy Charge		T
DSM Cost Recovery (DCR)	$ 0.00031	per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00023	per kWh	I
DSM Incentive (DSMI)	$ 0.00000	per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00010	per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00003	per kWh	
Total DSMRC for Rates PS, TODS, TODP, RTS, FLS, SPS, STOD, OSL	**$ 0.00067**	**per kWh**	T/I

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Kentucky Utilities Company
Electric Tariffs
Red-Line Version

Exhibit REL-1

Kentucky Utilities Company

P.S.C. No. 18, First Revision of Original Sheet No. 86
Cancelling P.S.C. No. 18, Original Sheet No. 86

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to the Company's Standard Rate Schedules RS, RTOD-Energy, T
RTOD-Demand, VFD, GS, AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL. N
Descriptions of available Demand-Side Management and Energy Efficiency ("DSM-EE") programs begin on Sheet No. 86.4.

INDUSTRIAL OPT-OUT

An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate RTS, FLS, or TODP) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using electricity in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rate RTS, FLS, or TODP) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE

The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per kilowatt hour of monthly consumption in accordance with the following formula:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR

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Deleted: Residential Service Rate

Deleted: Residential Time-of-Day Energy Rate

Deleted: Residential Time-of-Day Demand Rate

Deleted: Volunteer Fire Department Service Rate

Deleted: General Service Rate

Deleted: All Electric School Rate

Deleted: Power Service Rate

Deleted: Time-of-Day Secondary Service Rate

Deleted: Time-of-Day Primary Service Rate

Deleted: Retail Transmission Service Rate

Deleted: School Power Service Rate

Deleted: School Time-of-Day Service Rate

Deleted: Outdoor Sports Lighting Service Rate

Deleted: Industrial customers who elect not to participate in a demand-side management program hereunder shall not be assessed a charge pursuant to this mechanism. For purposes of rate application hereunder, non-residential customers will be considered "industrial" if they are primarily engaged in a process or processes that create or change raw or unfinished materials into another form or product, and/or in accordance with the North American Industry Classification System, Sections 21, 22, 31, 32, and 33. All other non-residential customers will be defined as "commercial."

Deleted: Where:¶
DCR = DSM COST RECOVERY¶
The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for demand-side management programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.¶
¶
DRLS = DSM REVENUE FROM LOST SALES¶ ...

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Kentucky Utilities Company

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Cancelling P.S.C. No. 18, Original Sheet No. 86.1

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued)

Where: T

DCR = DSM COST RECOVERY

The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process (“approved programs”). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.

DRLS = DSM REVENUE FROM LOST SALES

Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1) For each upcoming twelve-month period, the estimated reduction in customer usage (in kWh) as determined for the approved programs shall be multiplied by the non-variable revenue requirement per kWh for purposes of determining the lost revenue to be recovered hereunder from each customer class. The non-variable revenue requirement for the RS, RTOD-Energy, VFD, GS and AES customer classes is defined as the weighted average price per kWh of expected billings under the energy charges contained in the RS, RTOD-Energy, VFD, GS, and AES rate schedules in the upcoming twelve-month period after deducting the variable costs included in such energy charges. The non-variable revenue requirement for each of the customer classes that are billed under demand and energy rates (rate schedules RTOD-Demand, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL) is defined as the weighted average price per kWh represented by the composite of the expected billings under the respective demand and energy charges in the upcoming twelve-month period, after deducting the variable costs included in the energy charges. T N

2) The lost revenues for each customer class shall then be divided by the estimated class sales (in kWh) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenue from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case, whichever comes first. Revenues from lost sales will be assigned for recovery purposes to the rate classes whose programs resulted in the lost sales. T

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Deleted: Residential, Residential Time-of-Day Energy Service, Volunteer Fire Department, General Service, and All Electric School

Deleted: Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA) component.¶
¶
A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in ***<object>***both (a) the retroactive true-up provided for under the DSM Balance Adjustment and (b) the prospective future lost revenues collected hereunder.¶
¶
DSMI = DSM INCENTIVE¶
For all Energy Impact Programs except Direct Load Control, the DSM incentive amount shall be computed by multiplying the net resource savings expected from the approved

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Adjustment Clause DSM
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA) component.

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE
For all Energy Impact Programs except Residential and Small Nonresidential Demand Conservation and the Large Nonresidential Demand Conservation Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount related to programs for Rates RS, RTOD-Energy, RTOD-Demand, VFD, GS, AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DSMI for such rate class. DSMI amounts will be assigned for recovery purposes to the rate classes whose programs created the incentive. T N T

DBA = DSM BALANCE ADJUSTMENT
The DBA shall be calculated on a calendar-year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.
2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period. T

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4) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period.¶
¶

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued)

3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period. T
4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period. N
5) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period. T

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest applied to the monthly amounts, such interest to be calculated at a rate equal to the average of the "Three-Month Commercial Paper Rate" for the immediately preceding twelve-month period. The total of the balance adjustment amounts shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DBA for such rate class. DSM balance adjustment amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY
The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. The Company calculates the DCCR component as follows: T

$$DCCR = [(RB)\ (ROR + (ROR – DR)\ (TR / (1 – TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company's various DSM-related capital investment(s). T

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Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective period for billing. Each filing shall include the following information as applicable:¶
¶
1) A detailed description of each DSM program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.¶
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.¶
¶
Each change in the DSMRC shall be placed into effect with bills rendered on and after the effective date of such change.¶
¶

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC T

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE Programs are available to residential customers receiving service from the Company on the RS, RTOD-Energy, RTOD-Demand, and VFD Standard Electric Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program T

This program employs switches to help reduce the demand for electricity during peak times. T The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or N pool pumps will be equipped with switches under this program. N

Low Income Weatherization Program (WeCare) T

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

RESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: D

The following offering is available to residential customers receiving service from the Company on the RS Rate Schedule. T

Advanced Metering Systems Customer Service Offering

This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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The on-site audit offers a comprehensive audit from a certified auditor and incentives for residential customers to support the implementation of energy saving measures for a fee of $25. Customers are eligible for incentives of $150 or $1,000 based on customer purchased and installed energy efficiency measures and validated through a follow-up test. ¶
¶
Residential

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The Smart Energy Profile Program provides a portion of KU's highest consuming residential customers with a customized report of tips, tools and energy efficiency programming recommendations based on individual household energy consumption. These reports are benchmarked against similar local properties. The report will help the customer understand and make better informed choices as it relates to energy usage and the associated costs. Information presented in the report will include a comparison of the customer's energy usage to that of similar houses (collectively) and a comparison to the customer's own energy usage in the prior year.

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Adjustment Clause DSM

Demand-Side Management Cost Recovery Mechanism¶

¶

Residential Incentives Program¶

The Residential Incentives Program encourages customers to purchase and install various ENERGY STAR® appliances, HVAC equipment, or window films that meet certain requirements, qualifying them for an incentive as noted in the table below. ¶

Category	Item
Appliances	Heat Pump Water Heaters (HPWH)
	Washing Machine
	Refrigerator
	Freezer
	Dishwasher
Window Film	Window Film
HVAC	Central Air Conditioner
	Electric Air-Source Heat Pump

¶

Residential Refrigerator Removal Program¶

The Residential Refrigerator Removal Program is designed to provide removal and recycling of working, inefficient secondary refrigerators and freezers from KU customer households. Customers participating in this program will be provided a one-time incentive. This program has an approved flexible incentive structure. The current program offering is defined on Sheet No 86.8.¶

¶

Customer Education and Public Information¶

This program helps customers make sound energy-use decisions, increase control over energy bills and empower them to actively manage their energy usage. Customer Education and Public Information is accomplished through three processes: a mass-media campaign, an elementary- and middle-school program, and training for home construction professionals. The mass media campaign includes public-service advertisements that encourage customers to implement steps to reduce their energy usage. The elementary and middle school program provides professional development and innovative materials to K-8 schools to teach concepts such as basic energy and energy efficiency concepts. The training for home construction professionals provides education about new building codes, standards and energy efficient construction practices which support high performance residential construction.¶

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P.S.C. No. 18, First Revision of Original Sheet No. 86.5 T
Cancelling P.S.C. No. 18, Original Sheet No. 86.5 T

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES: T

The following DSM-EE programs are available to nonresidential customers receiving service from the T
Company on the GS, AES, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL Standard Electric N
Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program N

This program employs switches to help reduce the demand for electricity during peak times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or pool pumps will be equipped with switches under this program.

Large Nonresidential Demand Conservation Program T

This program employs interfaces to customer equipment to help reduce the demand for electricity during peak times. The program communicates with the interfaces to cycle equipment. This program has an approved flexible incentive structure.

Nonresidential Rebates Program

This program is designed to increase the implementation of energy efficiency measures by
providing financial incentives to assist with the replacement of aging and less efficient
equipment and for new construction built beyond code requirements. The Program also
offers an online tool providing recommendations for energy-efficiency improvements.
Incentives available to all nonresidential customers are based upon the avoided cost of T
energy for calculated efficiency improvements. A prescriptive list provides customers with T
incentive values for various efficiency improvement projects. Additionally, a custom rebate
is available based upon company engineering validation of sustainable energy savings. T
New construction rebates are available on savings over code plus bonus rebates for LEED T
certification.

- Maximum annual incentive per facility is $50,000
- Customers can receive multi-year incentives in a single year where such multi-year incentives do not exceed the aggregate of $100,000 per facility and no incentive was provided in the immediately preceding year
- Applicable for combined Prescriptive, Custom, and New Construction Rebates

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The following Demand Side Management offering is available to residential customers receiving service from the Company on the RS Rate Schedule.¶
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Advanced Metering Systems¶
The Advanced Metering Systems offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The Program employs advanced meters to communicate hourly consumption data to customers through a website.¶

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Cancelling P.S.C. No. 18, Original Sheet No. 86.6 T

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

Low Income Weatherization Program (WeCare) D N
This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

School Energy Management Program
The School Energy Management program will facilitate the hiring and retention of qualified, trained energy specialists by public school districts to support facilitation of energy efficiency measures for public and independent schools under KRS 160.325.

NONRESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: T
The following offering is available to customers receiving service from the Company on the GS Rate Schedule.

Advanced Metering Systems Customer Service Offering T
This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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This program helps customers make sound energy-use decisions, increase control over energy bills and empower them to actively manage their energy usage. Customer Education and Public Information is accomplished through three processes: a mass-media campaign, an elementary- and middle-school program, and training for home construction professionals. The mass media campaign includes public-service advertisements that encourage customers to implement steps to reduce their energy usage. The elementary and middle school program provides professional development and innovative materials to K-8 schools to teach concepts such as basic energy and energy efficiency concepts. The training for home construction professionals provides education about new building codes, standards and energy efficient construction practices which support high performance residential construction.¶

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

PROGRAM INCENTIVE STRUCTURES: T

Residential and Small Nonresidential Demand Conservation Program
For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season. If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit, heat pump, electric water heater, and pool pump enabled with a switch. Load Control Events do not include short-duration switch activations (i.e., ten minutes or less) called SCRAM events. D

Large Nonresidential Demand Conservation T
This program is tailored to a large nonresidential customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event.

- $15 per kW for verified load reduction. For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season; and (2) the participant was enrolled in the program during at least one Load Control Event that season.
- The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program.
- Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.

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$5/month bill credit for June, July, August, and September per air conditioning unit or heat pump on single family home.

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$2/month bill credit for June, July, August, and September per electric water heater (40 gallon minimum) or swimming pool pump on single family home.¶
If new customer registers by December 31, 2017, then a $25 gift card per air-conditioning unit or heat pump, water-heater (40 gallon minimum) and/or swimming pool pump switch installed.¶
Customers in a tenant-landlord relationship will receive the entire $25 new customer incentive.

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Tenant - $2/month bill credit per customer for June, July, August, and September per air conditioning unit, heat pump, or electric water heater (40 gallon minimum).¶
Entire Complex Enrollment – Property owner receives $2/month incentive per air conditioning or heat pump switch to the premise owner for June, July, August, and September.¶
If new customer registers by December 31, 2017, then a $25 gift card per air-conditioning unit or heat pump installed, where: ¶
Customers in a tenant/property owner relationship where the entire complex participates, the property owner will receive a $25 bonus incentive per air conditioning unit, heat pump, or water heater (40 gallon minimum).¶
Customers in a tenant-landlord relationship where only a portion of the complex participates, the tenant will receive a $25 gift card new customer incentive.¶
¶
¶
Residential Refrigerator Removal Program¶
The program provides $50 per working refrigerator or freezer.¶
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Demand-Side Management Cost Recovery Mechanism¶
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Commercial Load Management / Demand Conservation¶
Switch Option¶
$5 per month bill credit for June, July, August, and September for air conditioning units up to 5 tons. An additional $1 per month bill credit for each additional ton of air conditioning above 5 tons based upon unit rated capacity.¶
Customer Equipment Interface Option¶
The Company will offer a Load Management / Demand Response program tailored to a commercial customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event. ¶
$25 per kW for verified load reduction; during June, July, August, and September.¶
The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program. ¶
Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.¶
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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T

Monthly Adjustment Factors: T

Rates RS, RTOD-Energy, RTOD-Demand, VFD	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00054 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00006 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00047 per kWh	R
DSM Balance Adjustment (DBA)	$(0.00003) per kWh	
Total DSMRC for Rates RS, RTOD-Energy, RTOD-Demand, VFD	**$ 0.00104 per kWh**	T/R

Rate GS	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00048 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00026 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00007 per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00025 per kWh	
Total DSMRC for Rate GS	**$ 0.00106 per kWh**	T/R

Rate AES	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00139 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00107 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00105 per kWh	I
DSM Balance Adjustment (DBA)	$ 0.00006 per kWh	
Total DSMRC for Rate AES	**$ 0.00357 per kWh**	T/I

Rates PS, TODS, TODP, RTS, FLS, SPS, STOD, OSL	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00031 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00023 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00010 per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00003 per kWh	
Total DSMRC for Rates PS, TODS, TODP, RTS, FLS, SPS, STOD, OSL	**$ 0.00067 per kWh**	T/I

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Kentucky Utilities Company
Electric Tariffs
Supporting Calculations for DSM Cost Recovery Mechanism

Exhibit REL-1

KENTUCKY UTILITIES COMPANY

Supporting Calculations for the

DSM Cost Recovery Mechanism

ELECTRIC SERVICE

Twelve-Month Period Beginning January 1, 2019
and Ending December 31, 2019

Kentucky Utilities - Electric Service
DSMRC Summary

Summary of Total DSM Recovery Component (DSMRC)
12-Month Period Beginning January 1, 2019

Rate Schedule	Cost Recovery Component (DCR)	Lost Sales Component (DRLS)	Incentive Component (DSMI)	Capital Cost Recovery Component (DCCR)	Balance Adj Component (DBA)	DSM Recovery Component (DSMRC)	
RS, RTOD-Energy RTOD-Demand & VFD	0.054	0.006	0.000	0.047	(0.003)	0.104	¢/kWh
GS	0.048	0.026	0.000	0.007	0.025	0.106	¢/kWh
AES	0.139	0.107	0.000	0.105	0.006	0.357	¢/kWh
PS, RTS, FLS, TODP, TODS, STOD, SPS & OSL	0.031	0.023	0.000	0.010	0.003	0.067	¢/kWh

Kentucky Utilities - Electric Service
DCR Summary

Summary of DSM Revenues from DSM Cost Recovery Component (DCR)

12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Cost Recovery Total Amount		Estimated Billing Determinants		DSM Cost Recovery Component (DCR)	
	RS, RTOD-Energy RTOD-Demand & VFD	$	3,233,300	5,937,999,736	kWh	0.054	¢/kWh
	GS	$	833,057	1,731,846,043	kWh	0.048	¢/kWh
	AES	$	193,408	139,096,970	kWh	0.139	¢/kWh
	PS, RTS, FLS, TODP, TODS, STOD, SPS & OSL	$	1,496,851	4,803,241,912	kWh	0.031	¢/kWh
Total DCR Amount		$	5,756,616				

Program costs, which are categorized by residential, commercial, and industrial must be allocated to the individual rate schedules. The first step, allocation between gas and electric, and between LGE and KU, is shown on "DSM Budget Allocation" page.

Next, the DSM Program costs are further assigned to the rate schedules, which is the second and final step of the cost allocation process and is shown on the "Calculation of DCR Component from Forecast Sales" page. The total amount to be collected for each rate class is divided by the forecasted sales for that rate class to calculate the component rate in terms of ¢ / kWh.

Kentucky Utilities - Electric Service
DCR Summary

DSM Budget Allocation

Program	Allocation	2019
Total of All Programs		
LGE: RS et al	24.8%	2,849,843
LGE: RGS et al	3.4%	392,611
LGE: GS et al	6.6%	759,376
LGE: PS et al	11.7%	1,349,911
LGE: TOD et al	2.9%	336,276
LGE: CGS et al	0.6%	68,600
KU: RS et al	**28.1%**	**3,233,300**
KU: GS	**7.2%**	**833,057**
KU: AES	**1.7%**	**193,408**
KU: PS/TOD et al	**13.0%**	**1,496,851**
Total	100.0%	11,513,235
Residential WeCare		
LGE: RS et al	36.2%	2,293,242
LGE: RGS et al	3.9%	247,062
LGE: GS et al	3.0%	190,048
LGE: PS et al	3.0%	190,048
LGE: TOD et al	3.0%	190,048
LGE: CGS et al	0.9%	57,014
KU: RS et al	40.0%	2,533,969
KU: GS	5.0%	316,746
KU: AES	0.0%	0
KU: PS/TOD et al	5.0%	316,746
Total	100.0%	6,334,923

Program	Allocation	2019
Development & Administration		
LGE: RS et al	25.0%	181,032
LGE: RGS et al	20.1%	145,549
LGE: GS et al	3.0%	21,724
LGE: PS et al	0.2%	1,448
LGE: TOD et al	0.1%	724
LGE: CGS et al	1.6%	11,586
KU: RS et al	41.5%	300,512
KU: GS	7.9%	57,206
KU: AES	0.1%	724
KU: PS/TOD et al	0.5%	3,621
Total	100.0%	724,126
KSBA		
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	33.6%	243,600
LGE: PS et al	15.1%	109,475
LGE: TOD et al	1.3%	9,425
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	24.6%	178,350
KU: AES	12.5%	90,625
KU: PS/TOD et al	12.9%	93,525
Total	100.0%	725,000

Program	Allocation	2019
Non-Residential Rebates		
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	8.2%	232,468
LGE: PS et al	37.0%	1,048,940
LGE: TOD et al	4.8%	136,079
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	8.2%	232,468
KU: AES	3.6%	102,059
KU: PS/TOD et al	38.2%	1,082,960
Total	100.0%	2,834,973
AMS		
LGE: RS et al	42.0%	375,569
LGE: RGS et al	0.0%	0
LGE: GS et al	8.0%	71,537
LGE: PS et al	0.0%	0
LGE: TOD et al	0.0%	0
LGE: CGS et al	0.0%	0
KU: RS et al	44.6%	398,819
KU: GS	5.4%	48,288
KU: AES	0.0%	0
KU: PS/TOD et al	0.0%	0
Total	100.0%	894,213

Note: Residential DLC, Commercial DLC and Advance Metering Systems all run through the DCCR component of the DSM Mechanism.

Kentucky Utilities - Electric Service
DCR Summary

Calculation of DCR Component from Forecast Sales

12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	All Electric Schools AES	Power Service and TOD PS/TOD et al
January 2019	668,473,905	157,960,368	14,512,887	396,094,786
February 2019	670,927,419	157,720,453	13,737,736	380,495,964
March 2019	567,763,494	144,873,043	12,752,294	376,953,209
April 2019	413,063,031	124,231,119	11,251,809	371,537,008
May 2019	340,729,390	121,225,830	10,382,429	378,743,693
June 2019	425,135,312	142,680,985	9,940,758	417,789,854
July 2019	524,412,782	159,373,224	8,782,146	435,467,117
August 2019	541,273,797	163,191,888	9,873,302	447,182,099
September 2019	493,345,705	158,856,519	12,950,116	448,694,137
October 2019	364,959,387	134,061,937	11,050,359	392,760,718
November 2019	378,241,657	124,771,424	10,203,664	372,188,872
December 2019	549,673,857	142,899,253	13,659,470	385,334,455
Total	5,937,999,736	1,731,846,043	139,096,970	4,803,241,912
Total Program Costs	$ 3,233,300	$ 833,057	$ 193,408	$ 1,496,851
DCR Factor in ¢ per kWh	0.054	0.048	0.139	0.031

Summary of DSM Revenues from DSM Lost Sales Component (DRLS)

12-Month Period Beginning January 1, 2019

Rate Schedule		Lost Net Revenues Total Amount		Estimated Billing Determinants		DSM Revenue from Lost Sales Component (DRLS)	
	RS, RTOD-Energy RTOD-Demand & VFD	$	361,761	5,937,999,736	kWh	0.006	¢/kWh
	GS	$	455,605	1,731,846,043	kWh	0.026	¢/kWh
	AES	$	148,701	139,096,970	kWh	0.107	¢/kWh
	PS, RTS, FLS, TODP, TODS, STOD, SPS & OSL	$	1,128,708	4,803,241,912	kWh	0.023	¢/kWh
Total DRLS Amount		$	2,094,774				

Kentucky Utilities - Electric Service
DRLS Summary

Calculation of DRLS Component from Forecast Sales

12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	All Electric Schools AES	Power Service and TOD PS/TOD et al
January 2019	668,473,905	157,960,368	14,512,887	396,094,786
February 2019	670,927,419	157,720,453	13,737,736	380,495,964
March 2019	567,763,494	144,873,043	12,752,294	376,953,209
April 2019	413,063,031	124,231,119	11,251,809	371,537,008
May 2019	340,729,390	121,225,830	10,382,429	378,743,693
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August 2019	541,273,797	163,191,888	9,873,302	447,182,099
September 2019	493,345,705	158,856,519	12,950,116	448,694,137
October 2019	364,959,387	134,061,937	11,050,359	392,760,718
November 2019	378,241,657	124,771,424	10,203,664	372,188,872
December 2019	549,673,857	142,899,253	13,659,470	385,334,455
Total	5,937,999,736	1,731,846,043	139,096,970	4,803,241,912
Total Energy Savings	6,565,532	6,987,806	3,078,695	19,871,615
Non-variable Revenue per kWh	0.0551	0.0652	0.0483	0.0568
Lost Net Revenue	$ 361,761	$ 455,605	$ 148,701	$ 1,128,708
DRLS Factor in ¢ per kWh	0.006	0.026	0.107	0.023

Summary of DSM Revenues from DSM Incentive Component (DSMI)

12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Incentive Total Amount	Estimated Billing Determinants		DSM Incentive Component (DSMI)	
	RS, RTOD-Energy RTOD-Demand & VFD	$ -	5,937,999,736	kWh	0.000	¢/kWh
	GS	$ -	1,731,846,043	kWh	0.000	¢/kWh
	AES	$ -	139,096,970	kWh	0.000	¢/kWh
	PS, RTS, FLS, TODP, TODS, STOD, SPS & OSL	$ -	4,803,241,912	kWh	0.000	¢/kWh
Total DSMI Amount		$ -				

Incentives for each individual program is calculated as 15% of Net Resource Benefits (as specified in the California Standardized Tests) capped at 5% of program costs. The incentive by programs is then allocated across the rate classes using the same method as the cost recovery component.

Kentucky Utilities - Electric Service
DSMI Summary

Calculation of DSMI Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	All Electric Schools AES	Power Service and TOD PS/TOD et al
January 2019	668,473,905	157,960,368	14,512,887	396,094,786
February 2019	670,927,419	157,720,453	13,737,736	380,495,964
March 2019	567,763,494	144,873,043	12,752,294	376,953,209
April 2019	413,063,031	124,231,119	11,251,809	371,537,008
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November 2019	378,241,657	124,771,424	10,203,664	372,188,872
December 2019	549,673,857	142,899,253	13,659,470	385,334,455
Total	5,937,999,736	1,731,846,043	139,096,970	4,803,241,912
Total Program Incentive	$ -	$ -	$ -	$ -
DSMI Factor in ¢ per kWh	0.000	0.000	0.000	0.000

Kentucky Utilities - Electric Service
DCCR Summary

Summary of DSM Revenues from DSM Capital Cost Recovery (DCCR)

12-Month Period Beginning January 1, 2019

Rate Schedule			DSM Capital Cost Recovery Total Amount	Estimated Billing Determinants		DSM Capital Cost Recovery Component (DCCR)	
	RS, RTOD-Energy RTOD-Demand & VFD	$	2,801,821	5,937,999,736	kWh	0.047	¢/kWh
	GS	$	118,936	1,731,846,043	kWh	0.007	¢/kWh
	AES	$	146,127	139,096,970	kWh	0.105	¢/kWh
	PS, RTS, FLS, TODP, TODS, STOD, SPS & OSL	$	495,989	4,803,241,912	kWh	0.010	¢/kWh
Total DCCR Amount		$	3,562,873				

The DSM Capital Cost Recovery (DCCR), allows the Companies’ to earn an approved rate of return on equity exclusively for the capital expenditures. The Companies' return on equity is equal to 10.20%.

Kentucky Utilities - Electric Service
DCCR Summary

Calculation of Total E(m) and Juridictional Surcharge Billing Factor

12-Month Period Beginning January 1, 2019

Calculation of Total E(m)

E(m) = [(RB) (ROR+(ROR -DR)(TR/(1-TR)))] + OE, where

RB = DSM Rate Base = $ 4,710,131
ROR = Rate of Return on the DSM Rate Base = 7.31%
DR = Debt Rate (both short-term and long-term debt) = 1.93%
TR = Composite Federal & State Income Tax Rate = 38.90%
OE = Operating Expenses

DSM Plans

RB	=	$	4,710,131
(ROR + (ROR - DR) (TR / (1 - TR)))	=		10.73%
Return on Rate Base	=	$	505,397
OE	=	$	3,057,476
E(m)	=	$	3,562,873

E(m) by Rate Class

Electric	Residential Service	RS et al	$	2,801,821
	General Service	GS	$	118,936
	All Electric Schools	AES	$	146,127
	PS / TOD	PS/TOD et al	$	495,989
	Total		$	3,562,873

Kentucky Utilities - Electric Service
DCCR Summary

Calculation of Base Rate and Operating Expense

12-Month Period Beginning January 1, 2019

Determination of DSM Rate Base

Eligible Plant / Capital Expenditures In Service	$	9,443,340		
Eligible Accumulated Depreciation	$	(2,388,077)		
CWIP Amount Excluding AFUDC	$	0		
Eligible Net Plant / Capital Expenditures In Service			$	7,055,263
Deferred Tax Balance as of January 1, 2019			$	(2,345,132)
Yearly Depreciation Expense			$	0
Yearly Property Tax Expense			$	0
Total			$	4,710,131

Determination of DSM Operating Expenses

			O&M		Depreciation Expense		Property Tax Expense
Demand Load Conservation	Residential	$	1,793,243	$	340,847	$	67,898
	Commercial	$	469,558	$	112,805	$	22,155
	Total	$	2,262,801	$	453,652	$	90,053

			O&M		Depreciation Expense		Property Tax Expense
AMI / Smart Grid	Residential	$	165,504	$	30,024	$	15,283
	Commercial	$	31,525	$	5,719	$	2,915
	Total	$	197,029	$	35,743	$	18,198

			Total Operating Expenses
	Residential	$	2,412,799
	Commercial	$	644,677
Total Operating Expenses	Total	$	3,057,476

Kentucky Utilities - Electric Service
DCCR Summary

Calculation of DCCR Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	All Electric Schools AES	Power Service and TOD PS/TOD et al
January 2019	668,473,905	157,960,368	14,512,887	396,094,786
February 2019	670,927,419	157,720,453	13,737,736	380,495,964
March 2019	567,763,494	144,873,043	12,752,294	376,953,209
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August 2019	541,273,797	163,191,888	9,873,302	447,182,099
September 2019	493,345,705	158,856,519	12,950,116	448,694,137
October 2019	364,959,387	134,061,937	11,050,359	392,760,718
November 2019	378,241,657	124,771,424	10,203,664	372,188,872
December 2019	549,673,857	142,899,253	13,659,470	385,334,455
Total	5,937,999,736	1,731,846,043	139,096,970	4,803,241,912
Total DCCR Program Component	$ 2,801,821	$ 118,936	$ 146,127	$ 495,989
DCCR Factor in ¢ per kWh	0.047	0.007	0.105	0.010

Kentucky Utilities - Electric Service
DCCR Summary

Rate Base by Program

12-Month Period Beginning January 1, 2019

Rate Base by Program

Demand Load Conservation	Residential	$	2,728,739
	Commercial	$	913,471
	Total	$	3,642,210
AMS / Smart Grid	Residential	$	896,816
	Commercial	$	171,105
	Total	$	1,067,921

Allocation between Residential and Commercial			
	Residential	$	3,625,555
	Commercial	$	1,084,576
	Total	$	4,710,131

Louisville Gas and Electric Company
Electric Tariffs
Clean Version

Exhibit REL-2

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to the Company's Standard Rate Schedules RS, RTOD-Energy, RTOD-Demand, VFD, GS, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL. Descriptions of available Demand-Side Management and Energy Efficiency ("DSM-EE") programs begin on Sheet No. 86.4.

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INDUSTRIAL OPT-OUT

An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate RTS, FLS, or TODP) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using electricity in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rate RTS, FLS, or TODP) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE

The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per kilowatt hour of monthly consumption in accordance with the following formula:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T
Where:

DCR = DSM COST RECOVERY
The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.

DRLS = DSM REVENUE FROM LOST SALES
Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1) For each upcoming twelve-month period, the estimated reduction in customer usage (in
kWh) as determined for the approved programs shall be multiplied by the non-variable
revenue requirement per kWh for purposes of determining the lost revenue to be
recovered hereunder from each customer class. The non-variable revenue requirement
for the RS, RTOD-Energy, VFD, and GS customer classes is defined as the weighted T
average price per kWh of expected billings under the energy charges contained in the
RS, RTOD-Energy, VFD, and GS rate schedules in the upcoming twelve-month period
after deducting the variable costs included in such energy charges. The non-variable
revenue requirement for each of the customer classes that are billed under demand and
energy rates (rate schedules RTOD-Demand, PS, TODS, TODP, RTS, FLS, SPS,
STOD, and OSL) is defined as the weighted average price per kWh represented by the N
composite of the expected billings under the respective demand and energy charges in
the upcoming twelve-month period, after deducting the variable costs included in the
energy charges.

2) The lost revenues for each customer class shall then be divided by the estimated class sales (in kWh) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenue from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case, whichever comes first. Revenues from lost sales will be assigned for recovery purposes to the rate classes whose programs resulted in the lost sales.

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DATE OF ISSUE: December 6, 2017

DATE EFFECTIVE: January 5, 2018

ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA).

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE
For all Energy Impact Programs except Residential and Small Nonresidential Demand Conservation and the Large Nonresidential Demand Conservation Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount related to programs for Rates RS, RTOD-Energy, RTOD-Demand, VFD, GS, T
PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL shall be divided by the expected kilowatt- N
hour sales for the upcoming twelve-month period to determine the DSMI for such rate class. DSMI
amounts will be assigned for recovery purposes to the rate classes whose programs created the T
incentive.

DBA = DSM BALANCE ADJUSTMENT
The DBA shall be calculated on a calendar-year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.
2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period. T

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period.
4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period. N
5) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period. T

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest applied to the monthly amounts, such interest to be calculated at a rate equal to the average of the "Three-Month Commercial Paper Rate" for the immediately preceding twelve-month period. The total of the balance adjustment amounts shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DBA for such rate class. DSM balance adjustment amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY

The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. T
The Company calculates the DCCR component as follows:

$$DCCR = [(RB)\ (ROR + (ROR - DR)\ (TR / (1 - TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company's various DSM-related capital investment(s).

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DATE OF ISSUE: December 6, 2017

DATE EFFECTIVE: January 5, 2018

ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

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Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC T

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE Programs are available to residential customers receiving service from the Company on the RS, RTOD-Energy, RTOD-Demand, and VFD Standard Electric Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program T

This program employs switches to help reduce the demand for electricity during peak T
times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric N
water heaters or pool pumps will be equipped with switches under this program. N

Low Income Weatherization Program (WeCare) T

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

RESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: D

The following offering is available to residential customers receiving service from the Company T
on the RS Rate Schedule.

Advanced Metering Systems Customer Service Offering

This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES: T
The following DSM-EE programs are available to nonresidential customers receiving service from the T
Company on the GS, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL Standard Electric Rate N
Schedules.

Residential and Small Nonresidential Demand Conservation Program N

This program employs switches to help reduce the demand for electricity during peak times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or pool pumps will be equipped with switches under this program.

Large Nonresidential Demand Conservation Program T

This program employs interfaces to customer equipment to help reduce the demand for electricity during peak times. The program communicates with the interfaces to cycle equipment. This program has an approved flexible incentive structure.

Nonresidential Rebates Program

This program is designed to increase the implementation of energy efficiency measures by providing financial incentives to assist with the replacement of aging and less efficient equipment and for new construction built beyond code requirements. The Program also offers an online tool providing recommendations for energy-efficiency improvements.
Incentives available to all nonresidential customers are based upon the avoided cost of T
energy for calculated efficiency improvements. A prescriptive list provides customers with T
incentive values for various efficiency improvement projects. Additionally, a custom rebate
is available based upon company engineering validation of sustainable energy savings. T
New construction rebates are available on savings over code plus bonus rebates for LEED T
certification.

- Maximum annual incentive per facility is $50,000
- Customers can receive multi-year incentives in a single year where such multi-year incentives do not exceed the aggregate of $100,000 per facility and no incentive was provided in the immediately preceding year
- Applicable for combined Prescriptive, Custom, and New Construction Rebates

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

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Low Income Weatherization Program (WeCare)
This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

School Energy Management Program
The School Energy Management program will facilitate the hiring and retention of qualified, trained energy specialists by public school districts to support facilitation of energy efficiency measures for public and independent schools under KRS 160.325.

NONRESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: T
The following offering is available to customers receiving service from the Company on the GS Rate Schedule.

Advanced Metering Systems Customer Service Offering T
This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

PROGRAM INCENTIVE STRUCTURES: T

Residential and Small Nonresidential Demand Conservation Program
For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season. If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit, heat pump, electric water heater, and pool pump enabled with a switch. Load Control Events do not include short-duration switch activations (i.e., ten minutes or less) called SCRAM events.

D

Large Nonresidential Demand Conservation T
This program is tailored to a large nonresidential customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event.

- $15 per kW for verified load reduction. For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season; and (2) the participant was enrolled in the program during at least one Load Control Event that season.
- The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program.
- Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T
Monthly Adjustment Factors: T

Rates RS, RTOD-Energy, RTOD-Demand, VFD	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00069 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00008 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00078 per kWh	R
DSM Balance Adjustment (DBA)	$ (0.00001) per kWh	
Total DSMRC for Rates RS, RTOD-Energy, RTOD-Demand, VFD	**$ 0.00154 per kWh**	T/R

Rate GS	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00059 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00039 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00021 per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00016 per kWh	
Total DSMRC for Rate GS	**$ 0.00135 per kWh**	T/I

Rates PS, SPS	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00069 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00055 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00012 per kWh	R
DSM Balance Adjustment (DBA)	$ (0.00004) per kWh	
Total DSMRC for Rates PS, SPS	**$ 0.00132 per kWh**	T/I

Rates TODS, TODP, RTS, FLS, STOD, OSL	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00019 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00006 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00012 per kWh	I
DSM Balance Adjustment (DBA)	$ (0.00001) per kWh	
Total DSMRC for Rates TODS, TODP, RTS, FLS, STOD, OSL	**$ 0.00036 per kWh**	T/I

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Louisville Gas and Electric Company
Electric Tariffs
Red-line Version

Exhibit REL-2

Louisville Gas and Electric Company

P.S.C. Electric No. 11, First Revision of Original Sheet No. 86
Cancelling P.S.C. Electric No. 11, Original Sheet No. 86

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to the Company's Standard Rate Schedules RS, RTOD-Energy, RTOD-Demand, VFD, GS, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL. Descriptions of available Demand-Side Management and Energy Efficiency ("DSM-EE") programs begin on Sheet No. 86.4. T N

INDUSTRIAL OPT-OUT

An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate RTS, FLS, or TODP) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using electricity in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rate RTS, FLS, or TODP) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE

The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per kilowatt hour of monthly consumption in accordance with the following formula:

$$DSMRC = DCR + DRLS + DSMI + DBA + DCCR$$

T

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Deleted: Retail Transmission Service Rate

Deleted: School Power Service Rate

Deleted: School Time-of-Day Service Rate

Deleted: Outdoor Sports Lighting Service Rate

Deleted: Industrial customers who elect not to participate in a demand-side management program hereunder shall not be assessed a charge pursuant to this mechanism. For purposes of rate application hereunder, non-residential customers will be considered "industrial" if they are primarily engaged in a process or processes that create or change raw or unfinished materials into another form or product, and/or in accordance with the North American Industry Classification System, Sections 21, 22, 31, 32, and 33. All other non-residential customers will be defined as "commercial."

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¶
DCR = DSM COST RECOVERY¶
The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for demand-side management programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.¶
¶
DRLS = DSM REVENUE FROM LOST SALES¶
Revenues from lost sales due to DSM programs implemented on and after the effective date of this tariff will be recovered as follows:

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

Where:

DCR = DSM COST RECOVERY
The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees, and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DCR for each such rate class.

DRLS = DSM REVENUE FROM LOST SALES
Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1) For each upcoming twelve-month period, the estimated reduction in customer usage (in kWh) as determined for the approved programs shall be multiplied by the non-variable revenue requirement per kWh for purposes of determining the lost revenue to be recovered hereunder from each customer class. The non-variable revenue requirement for the RS, RTOD-Energy, VFD, and GS customer classes is defined as the weighted average price per kWh of expected billings under the energy charges contained in the RS, RTOD-Energy, VFD, and GS rate schedules in the upcoming twelve-month period after deducting the variable costs included in such energy charges. The non-variable revenue requirement for each of the customer classes that are billed under demand and energy rates (rate schedules RTOD-Demand, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL) is defined as the weighted average price per kWh represented by the composite of the expected billings under the respective demand and energy charges in the upcoming twelve-month period, after deducting the variable costs included in the energy charges. T N

2) The lost revenues for each customer class shall then be divided by the estimated class sales (in kWh) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenue from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case, whichever comes first. Revenues from lost sales will be assigned for recovery purposes to the rate classes whose programs resulted in the lost sales. T

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Deleted: Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA) component.¶
¶
A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in ***<object>***both (a) the retroactive true-up provided for under the DSM Balance Adjustment and (b) the prospective future lost revenues collected hereunder.¶
¶
DSMI = DSM INCENTIVE¶
For all Energy Impact Programs except Direct Load Control, the DSM incentive amount shall be computed by multiplying the net resource savings expected from the approved

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued)

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation, and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA).

T

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE
For all Energy Impact Programs except Residential and Small Nonresidential Demand Conservation and the Large Nonresidential Demand Conservation Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount related to programs for Rates RS, RTOD-Energy, RTOD-Demand, VFD, GS, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DSMI for such rate class. DSMI amounts will be assigned for recovery purposes to the rate classes whose programs created the incentive.

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DBA = DSM BALANCE ADJUSTMENT
The DBA shall be calculated on a calendar-year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.
2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period.

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4) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period.¶
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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued)

3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period.
4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period.
5) For the DBA, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DBA and the balance adjustment amount established for the same twelve-month period.

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest applied to the monthly amounts, such interest to be calculated at a rate equal to the average of the “Three-Month Commercial Paper Rate” for the immediately preceding twelve-month period. The total of the balance adjustment amounts shall be divided by the expected kilowatt-hour sales for the upcoming twelve-month period to determine the DBA for such rate class. DSM balance adjustment amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY
The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. The Company calculates the DCCR component as follows:

$$DCCR = [(RB) (ROR + (ROR – DR) (TR / (1 – TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company’s various DSM-related capital investment(s).

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Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective period for billing. Each filing shall include the following information as applicable:¶
1) A detailed description of each DSM program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.¶
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.¶
¶
Each change in the DSMRC shall be placed into effect with bills rendered on and after the effective date of such change.

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC T

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.
2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR, and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE Programs are available to residential customers receiving service from the Company on the RS, RTOD-Energy, RTOD-Demand, and VFD Standard Electric Rate Schedules.

Residential and Small Nonresidential Demand Conservation Program T

This program employs switches to help reduce the demand for electricity during peak times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or pool pumps will be equipped with switches under this program. T N N

Low Income Weatherization Program (WeCare) T

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

D

RESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: T

The following offering is available to residential customers receiving service from the Company on the RS Rate Schedule.

Advanced Metering Systems Customer Service Offering

This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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The on-site audit offers a comprehensive audit from a certified auditor and incentives for residential customers to support the implementation of energy saving measures for a fee of $25. Customers are eligible for incentives of $150 or $1,000 based on customer purchased and installed energy efficiency measures and validated through a follow-up test. ¶
¶
Residential

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Deleted: Smart Energy Profile¶
The Smart Energy Profile Program provides a portion of LG&E's highest consuming residential customers with a customized report of tips, tools and energy efficiency programming recommendations based on individual household energy consumption. These reports are benchmarked against similar local properties. The report will help the customer understand and make better informed choices as it relates to energy usage and the associated costs. Information presented in the report will include a comparison of the customer's energy usage to that of similar houses (collectively) and a comparison to the customer's own energy usage in the prior year.

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Adjustment Clause DSM

Demand-Side Management Cost Recovery Mechanism¶

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Residential Incentives Program¶

The Residential Incentives Program encourages customers to purchase and install various ENERGY STAR® appliances, HVAC equipment, or window films that meet certain requirements, qualifying them for an incentive as noted in the table below. ¶

Category	**Item**
Appliances	Heat Pump Water Heaters (HPWH)
	Washing Machine
	Refrigerator
	Freezer
	Dishwasher
Window Film	Window Film
HVAC	Central Air Conditioner
	Electric Air-Source Heat Pump

Residential Refrigerator Removal Program¶

The Residential Refrigerator Removal Program is designed to provide removal and recycling of working, inefficient secondary refrigerators and freezers from LG&E customer households. Customers participating in this program will be provided a one-time incentive. This program has an approved flexible incentive structure. The current program offering is defined on Sheet No 86.8.¶

¶

Customer Education and Public Information¶

This program helps customers make sound energy-use decisions, increase control over energy bills and empower them to actively manage their energy usage. Customer Education and Public Information is accomplished through three processes: a mass-media campaign, an elementary- and middle-school program, and training for home construction professionals. The mass media campaign includes public-service advertisements that encourage customers to implement steps to reduce their energy usage. The elementary and middle school program provides professional development and innovative materials to K-8 schools to teach concepts such as basic energy and energy efficiency concepts. The training for home construction professionals provides education about new building codes, standards and energy efficient construction practices which support high performance residential construction.¶

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DATE OF ISSUE: July 7, 2017¶

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DATE EFFECTIVE: With Service Rendered On¶

and After January 1, 2015

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ISSUED BY: /s/ Robert M. Conroy, Vice President ¶

State Regulation and Rates ¶

Louisville, Kentucky¶

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES: T

The following DSM-EE programs are available to nonresidential customers receiving service from the Company on the GS, PS, TODS, TODP, RTS, FLS, SPS, STOD, and OSL Standard Electric Rate Schedules. T N

Residential and Small Nonresidential Demand Conservation Program N

This program employs switches to help reduce the demand for electricity during peak times. The program communicates with the switches to cycle central air conditioning units, heat pumps, electric water heaters, and pool pumps off and on through a predetermined sequence. As of the Date Effective shown below, no additional electric water heaters or pool pumps will be equipped with switches under this program.

Large Nonresidential Demand Conservation Program T

This program employs interfaces to customer equipment to help reduce the demand for electricity during peak times. The program communicates with the interfaces to cycle equipment. This program has an approved flexible incentive structure.

Nonresidential Rebates Program

This program is designed to increase the implementation of energy efficiency measures by providing financial incentives to assist with the replacement of aging and less efficient equipment and for new construction built beyond code requirements. The Program also offers an online tool providing recommendations for energy-efficiency improvements. Incentives available to all nonresidential customers are based upon the avoided cost of energy for calculated efficiency improvements. A prescriptive list provides customers with incentive values for various efficiency improvement projects. Additionally, a custom rebate is available based upon company engineering validation of sustainable energy savings. New construction rebates are available on savings over code plus bonus rebates for LEED certification. T T T T

- Maximum annual incentive per facility is $50,000
- Customers can receive multi-year incentives in a single year where such multi-year incentives do not exceed the aggregate of $100,000 per facility and no incentive was provided in the immediately preceding year
- Applicable for combined Prescriptive, Custom, and New Construction Rebates

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The following Demand Side Management offering is available to residential customers receiving service from the Company on the RS Rate Schedule.¶
¶
Advanced Metering Systems¶
The Advanced Metering Systems offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The Program employs advanced meters to communicate hourly consumption data to customers through a website.¶

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Louisville Gas and Electric Company

P.S.C. Electric No. 11, First Revision of Original Sheet No. 86.6 T
Cancelling P.S.C. Electric No. 11, Original Sheet No. 86.6 T

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

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Low Income Weatherization Program (WeCare)
This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the results of an energy audit.

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This program helps customers make sound energy-use decisions, increase control over energy bills and empower them to actively manage their energy usage. Customer Education and Public Information is accomplished through three processes: a mass-media campaign and an elementary- and middle-school program, and training for home construction professionals. The mass media campaign includes public-service advertisements that encourage customers to implement steps to reduce their energy usage. The elementary and middle school program provides professional development and innovative materials to K-8 schools to teach concepts such as basic energy and energy efficiency concepts. The training for home construction professionals provides education about new building codes, standards and energy efficient construction practices which support high performance residential construction.

School Energy Management Program
The School Energy Management program will facilitate the hiring and retention of qualified, trained energy specialists by public school districts to support facilitation of energy efficiency measures for public and independent schools under KRS 160.325.

NONRESIDENTIAL ADVANCED METERING SYSTEMS INCENTIVE: T
The following offering is available to customers receiving service from the Company on the GS Rate Schedule.

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Advanced Metering Systems Customer Service Offering T
This offering is designed to provide energy consumption data to customers on a more frequent basis than is traditionally available through monthly billing. The program employs advanced meters to communicate hourly consumption data to customers through a website.

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P.S.C. Electric No. 11, First Revision of Original Sheet No. 86.7 T
Cancelling P.S.C. Electric No. 11, Original Sheet No. 86.7 T

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

PROGRAM INCENTIVE STRUCTURES: T

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Residential and Small Nonresidential Demand Conservation Program

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For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season and (2) the participant was enrolled in the program during at least one Load Control Event that season. If these conditions are met, then an end-of-season bill credit of $5 will be paid for each central air conditioning unit, heat pump, electric water heater, and pool pump enabled with a switch. Load Control Events do not include short-duration switch activations (i.e., ten minutes or less) called SCRAM events.

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$5/month bill credit

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Deleted: for June, July, August, and September per air conditioning unit or heat pump on single family home.¶
$2/month bill credit for June, July, August, and September per electric water heater (40 gallon minimum) or swimming pool pump on single family home.¶
If new customer registers by December 31, 2017, then a $25 gift card per air-conditioning unit, heat pump, water heater (40 gallon minimum) and/or swimming pool pump switch installed.¶
Customers in a tenant-landlord relationship will receive the entire $25 new customer incentive. ¶
¶
Multi-family Option:¶
Tenant - $2/month bill credit per customer for June, July, August, and September per air conditioning unit, heat pump, or water heater (40 gallon minimum).¶
Entire Complex Enrollment – Property owner receives $2/month incentive per air conditioning or heat pump switch to the premise owner for June, July, August, and September.¶
If new customer registers by December 31, 2017, then a $25 gift card per air-conditioning unit or heat pump installed, where: ¶
Customers in a tenant/property owner relationship where the entire complex participates, the property owner will receive a $25 bonus incentive per air conditioning unit, heat pump, or water heater (40 gallon minimum).¶
Customers in a tenant-landlord relationship where only a portion of the complex participates, the tenant will receive a $25 gift card new customer incentive.¶
¶
¶
Residential Refrigerator Removal Program¶
The program provides $50 per working refrigerator or freezer.

T

Large Nonresidential Demand Conservation
This program is tailored to a large nonresidential customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event.

- $15 per kW for verified load reduction. For each load-control season (June 1 through September 30), a participant will receive an end-of-season incentive only if both of the following conditions are met: (1) a Load Control Event is called during that season; and (2) the participant was enrolled in the program during at least one Load Control Event that season.
- The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program.
- Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.

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Adjustment Clause DSM
Demand-Side Management Cost Recovery Mechanism¶
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Commercial Load Management / Demand Conservation¶
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Switch Option¶
$5 bill credit for June, July, August, and September for air conditioning units up to 5 tons. An additional $1 per month bill credit for each additional ton of air conditioning above 5 tons based upon unit rated capacity.¶
¶
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Customer Equipment Interface Option¶
The Company will offer a Load Management / Demand Response program tailored to a commercial customer's ability to reduce load. Program participants must commit to a minimum of 50 kW demand reduction per control event. ¶
$25 per kW for verified load reduction during June, July, August, and September. ¶
The customer will have access to at least hourly load data for every month of the year which they remain enrolled in the program.¶
Additional customer charges may be incurred for metering equipment necessary for this program at costs under other tariffs.¶
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DATE EFFECTIVE: With Service Rendered On¶
and After January 1, 2015 ¶
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Louisville, Kentucky¶
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2014-00003 dated November 14, 2014

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P.S.C. Electric No. 11, First Revision of Original Sheet No. 86.8 T
Cancelling P.S.C. Electric No. 11, Original Sheet No. 86.8 T

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T
Monthly Adjustment Factors: T

Rates RS, RTOD-Energy, RTOD-Demand, VFD	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00069 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00008 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00078 per kWh	R
DSM Balance Adjustment (DBA)	$ (0.00001) per kWh	
Total DSMRC for Rates RS, RTOD-Energy, RTOD-Demand, VFD	**$ 0.00154 per kWh**	T/R

Rate GS	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00059 per kWh	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00039 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00021 per kWh	R
DSM Balance Adjustment (DBA)	$ 0.00016 per kWh	
Total DSMRC for Rate GS	**$ 0.00135 per kWh**	T/I

Rates PS, SPS	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00069 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00055 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00012 per kWh	R
DSM Balance Adjustment (DBA)	$ (0.00004) per kWh	
Total DSMRC for Rates PS, SPS	**$ 0.00132 per kWh**	T/I

Rates TODS, TODP, RTS, FLS, STOD, OSL	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00019 per kWh	I
DSM Revenues from Lost Sales (DRLS)	$ 0.00006 per kWh	I
DSM Incentive (DSMI)	$ 0.00000 per kWh	R
DSM Capital Cost Recovery (DCCR)	$ 0.00012 per kWh	I
DSM Balance Adjustment (DBA)	$ (0.00001) per kWh	
Total DSMRC for Rates TODS, TODP, RTS, FLS, STOD, OSL	**$ 0.00036 per kWh**	T/I

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DATE EFFECTIVE: January 5, 2018

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2017-00441 dated XXXX, 2018

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Louisville Gas and Electric Company
Electric Tariffs
Supporting Calculations for DSM Cost Recovery Mechanism

Exhibit REL-2

LOUISVILLE GAS & ELECTRIC COMPANY

Supporting Calculations for the

DSM Cost Recovery Mechanism

ELECTRIC SERVICE

Twelve-Month Period Beginning January 1, 2019
and Ending December 31, 2019

Louisville Gas and Electric - Electric Service
DSMRC Summary

Summary of Total DSM Recovery Component (DSMRC)

12-Month Period Beginning January 1, 2019

Rate Schedule	Cost Recovery Component (DCR)	Lost Sales Component (DRLS)	Incentive Component (DSMI)	Capital Cost Recovery Component (DCCR)	Balance Adj Component (DBA)	DSM Recovery Component (DSMRC)	
RS, VFD, RTOD-Energy & RTOD-Demand	0.069	0.008	0.000	0.078	(0.001)	0.154	¢/kWh
GS	0.059	0.039	0.000	0.021	0.016	0.135	¢/kWh
PS & SPS	0.069	0.055	0.000	0.012	(0.004)	0.132	¢/kWh
RTS, FLS, TODP, TODS, STOD & OSL	0.019	0.006	0.000	0.012	(0.001)	0.036	¢/kWh

Louisville Gas and Electric - Electric Service
DCR Summary

Summary of DSM Revenues from DSM Cost Recovery Component (DCR)
12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Cost Recovery Total Amount		Estimated Billing Determinants		DSM Cost Recovery Component (DCR)	
	RS, VFD, RTOD-Energy & RTOD-Demand	$	2,849,843	4,107,082,730	kWh	0.069	¢/kWh
	GS	$	759,376	1,279,953,373	kWh	0.059	¢/kWh
	PS & SPS	$	1,349,911	1,967,865,356	kWh	0.069	¢/kWh
	RTS, FLS, TODP, TODS, STOD & OSL	$	336,276	1,779,682,532	kWh	0.019	¢/kWh
Total DCR Amount		$	5,295,406				

Program costs, which are categorized by residential, commercial, and industrial must be allocated to the individual rate schedules. The first step, allocation between gas and electric, and between LGE and KU, is shown on "DSM Budget Allocation" page.

Next, the DSM Program costs are further assigned to the rate schedules, which is the second and final step of the cost allocation process and is shown on the "Calculation of DCR Component from Forecast Sales" page. The total amount to be collected for each rate class is divided by the forecasted sales for that rate class to calculate the component rate in terms of ¢ / kWh.

Louisville Gas and Electric - Electric Service
DCR Summary

DSM Budget Allocation

Total of All Programs

Program	Allocation	2019
LGE: RS et al	**24.8%**	**2,849,843**
LGE: RGS et al	3.4%	392,611
LGE: GS et al	**6.6%**	**759,376**
LGE: PS	**11.7%**	**1,349,911**
LGE: TOD et al	**2.9%**	**336,276**
LGE: CGS et al	0.6%	68,600
KU: RS et al	28.1%	3,233,300
KU: GS	7.2%	833,057
KU: AES	1.7%	193,408
KU: PS et al	13.0%	1,496,851
Total	100.0%	11,513,235

Development & Administration

Program	Allocation	2019
LGE: RS et al	25.0%	181,032
LGE: RGS et al	20.1%	145,549
LGE: GS et al	3.0%	21,724
LGE: PS et al	0.2%	1,448
LGE: TOD et al	0.1%	724
LGE: CGS et al	1.6%	11,586
KU: RS et al	41.5%	300,512
KU: GS	7.9%	57,206
KU: AES	0.1%	724
KU: PS/TOD et al	0.5%	3,621
Total	100.0%	724,126

Non-Residential Rebates

Program	Allocation	2019
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	8.2%	232,468
LGE: PS et al	37.0%	1,048,940
LGE: TOD et al	4.8%	136,079
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	8.2%	232,468
KU: AES	3.6%	102,059
KU: PS/TOD et al	38.2%	1,082,960
Total	100.0%	2,834,973

Residential WeCare

Program	Allocation	2019
LGE: RS et al	36.2%	2,293,242
LGE: RGS et al	3.9%	247,062
LGE: GS et al	3.0%	190,048
LGE: PS et al	3.0%	190,048
LGE: TOD et al	3.0%	190,048
LGE: CGS et al	0.9%	57,014
KU: RS et al	40.0%	2,533,969
KU: GS	5.0%	316,746
KU: AES	0.0%	0
KU: PS/TOD et al	5.0%	316,746
Total	100.0%	6,334,923

KSBA

Program	Allocation	2019
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	33.6%	243,600
LGE: PS et al	15.1%	109,475
LGE: TOD et al	1.3%	9,425
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	24.6%	178,350
KU: AES	12.5%	90,625
KU: PS/TOD et al	12.9%	93,525
Total	100.0%	725,000

AMS

Program	Allocation	2019
LGE: RS et al	42.0%	375,569
LGE: RGS et al	0.0%	0
LGE: GS et al	8.0%	71,537
LGE: PS et al	0.0%	0
LGE: TOD et al	0.0%	0
LGE: CGS et al	0.0%	0
KU: RS et al	44.6%	398,819
KU: GS	5.4%	48,288
KU: AES	0.0%	0
KU: PS/TOD et al	0.0%	0
Total	100.0%	894,213

Note: Residential DLC, Commercial DLC and Advanced Metering Systems all run through the DCCR component of the DSM Mechanism.

Louisville Gas and Electric - Electric Service
DCR Summary

Calculation of DCR Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	Power Service PS et al	Time of Day TOD et al
January 2019	359,282,862	103,604,163	160,432,056	147,330,357
February 2019	342,773,153	102,890,257	149,292,335	140,692,179
March 2019	312,459,990	100,055,254	147,795,217	142,059,898
April 2019	252,646,333	91,253,143	147,745,587	137,546,806
May 2019	253,931,220	95,027,812	156,125,506	136,692,598
June 2019	355,130,574	114,187,785	177,642,930	155,127,102
July 2019	468,572,604	128,026,191	186,895,811	161,535,745
August 2019	478,325,433	128,566,798	189,787,573	165,707,855
September 2019	430,933,099	124,361,483	190,104,463	165,457,685
October 2019	290,655,452	102,424,612	159,458,650	145,900,380
November 2019	252,096,553	92,291,827	147,946,309	138,497,886
December 2019	310,275,457	97,264,048	154,638,919	143,134,041
Total	4,107,082,730	1,279,953,373	1,967,865,356	1,779,682,532
Total Program Costs	$ 2,849,843	$ 759,376	$ 1,349,911	$ 336,276
DCR Factor in ¢ per kWh	0.069	0.059	0.069	0.019

Louisville Gas and Electric - Electric Service
DRLS Summary

Summary of DSM Revenues from DSM Lost Sales Component (DRLS)

12-Month Period Beginning January 1, 2019

Rate Schedule		Lost Net Revenues Total Amount		Estimated Billing Determinants		DSM Revenue from Lost Sales Component (DRLS)	
	RS, VFD, RTOD-Energy & RTOD-Demand	$	335,466	4,107,082,730	kWh	0.008	¢/kWh
	GS	$	496,606	1,279,953,373	kWh	0.039	¢/kWh
	PS & SPS	$	1,089,599	1,967,865,356	kWh	0.055	¢/kWh
	RTS, FLS, TODP, TODS, STOD & OSL	$	109,072	1,779,682,532	kWh	0.006	¢/kWh
Total DRLS Amount		$	2,030,743				

Louisville Gas and Electric - Electric Service
DRLS Summary

Calculation of DRLS Component from Forecast Sales

12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	Power Service PS et al	Time of Day TOD et al
January 2019	359,282,862	103,604,163	160,432,056	147,330,357
February 2019	342,773,153	102,890,257	149,292,335	140,692,179
March 2019	312,459,990	100,055,254	147,795,217	142,059,898
April 2019	252,646,333	91,253,143	147,745,587	137,546,806
May 2019	253,931,220	95,027,812	156,125,506	136,692,598
June 2019	355,130,574	114,187,785	177,642,930	155,127,102
July 2019	468,572,604	128,026,191	186,895,811	161,535,745
August 2019	478,325,433	128,566,798	189,787,573	165,707,855
September 2019	430,933,099	124,361,483	190,104,463	165,457,685
October 2019	290,655,452	102,424,612	159,458,650	145,900,380
November 2019	252,096,553	92,291,827	147,946,309	138,497,886
December 2019	310,275,457	97,264,048	154,638,919	143,134,041
Total	4,107,082,730	1,279,953,373	1,967,865,356	1,779,682,532
Total Energy Savings	5,834,198	7,820,570	19,387,875	2,653,811
Non-variable Revenue per kWh	0.0575	0.0635	0.0562	0.0411
Lost Net Revenue	$ 335,466	$ 496,606	$ 1,089,599	$ 109,072
DRLS Factor in ¢ per kWh	0.008	0.039	0.055	0.006

Louisville Gas and Electric - Electric Service
DSMI Summary

Summary of DSM Revenues from DSM Incentive Component (DSMI)

12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Incentive Total Amount		Estimated Billing Determinants		DSM Incentive Component (DSMI)	
	RS, VFD, RTOD-Energy & RTOD-Demand	$	-	4,107,082,730	kWh	0.000	¢/kWh
	GS	$	-	1,279,953,373	kWh	0.000	¢/kWh
	PS & SPS	$	-	1,967,865,356	kWh	0.000	¢/kWh
	RTS, FLS, TODP, TODS, STOD & OSL	$	-	1,779,682,532	kWh	0.000	¢/kWh
Total DSMI Amount		$	-				

Incentives for each individual program is calculated as 15% of Net Resource Benefits (as specified in the California Standardized Tests) capped at 5% of program costs. The incentive by programs is then allocated across the rate classes using the same method as the cost recovery component.

Louisville Gas and Electric - Electric Service
DSMI Summary

Calculation of DSMI Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	Power Service PS et al	Time of Day TOD et al
January 2019	359,282,862	103,604,163	160,432,056	147,330,357
February 2019	342,773,153	102,890,257	149,292,335	140,692,179
March 2019	312,459,990	100,055,254	147,795,217	142,059,898
April 2019	252,646,333	91,253,143	147,745,587	137,546,806
May 2019	253,931,220	95,027,812	156,125,506	136,692,598
June 2019	355,130,574	114,187,785	177,642,930	155,127,102
July 2019	468,572,604	128,026,191	186,895,811	161,535,745
August 2019	478,325,433	128,566,798	189,787,573	165,707,855
September 2019	430,933,099	124,361,483	190,104,463	165,457,685
October 2019	290,655,452	102,424,612	159,458,650	145,900,380
November 2019	252,096,553	92,291,827	147,946,309	138,497,886
December 2019	310,275,457	97,264,048	154,638,919	143,134,041
Total	4,107,082,730	1,279,953,373	1,967,865,356	1,779,682,532
Total Program Incentive	$ -	$ -	$ -	$ -
DSMI Factor in ¢ per kWh	0.000	0.000	0.000	0.000

Louisville Gas and Electric - Electric Service
DCCR Summary

Summary of DSM Revenues from DSM Capital Cost Recovery (DCCR)
12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Capital Cost Recovery Total Amount		Estimated Billing Determinants		DSM Capital Cost Recovery Component (DCCR)	
	RS, VFD, RTOD-Energy & RTOD-Demand	$	3,208,684	4,107,082,730	kWh	0.078	¢/kWh
	GS	$	272,551	1,279,953,373	kWh	0.021	¢/kWh
	PS & SPS	$	231,931	1,967,865,356	kWh	0.012	¢/kWh
	RTS, FLS, TODP, TODS, STOD & OSL	$	209,271	1,779,682,532	kWh	0.012	¢/kWh
Total DCCR Amount		$	3,922,437				

The DSM Capital Cost Recovery (DCCR), allows the Companies’ to earn an approved rate of return on equity exclusively for the capital expenditures. The Companies' return on equity is equal to 10.20%.

Louisville Gas and Electric - Electric Service
DCCR Summary

Calculation of Total E(m) and Juridictional Surcharge Billing Factor

12-Month Period Beginning January 1, 2019

Calculation of Total E(m)

E(m) = [(RB) (ROR+(ROR -DR)(TR/(1-TR)))] + OE, where

RB	=	DSM Rate Base	=	$	3,348,188
ROR	=	Rate of Return on the DSM Rate Base	=		7.38%
DR	=	Debt Rate (both short-term and long-term debt)	=		1.99%
TR	=	Composite Federal & State Income Tax Rate	=		38.90%
OE	=	Operating Expenses			

DSM Plans

RB	=	$	3,348,188
(ROR + (ROR - DR) (TR / (1 - TR)))	=		10.82%
Return on Rate Base	=	$	362,274
OE	=	$	3,560,163
E(m)	=	$	3,922,437

E(m) by Rate Class

Electric	Residential Service	RS et al	$	3,208,684
	General Service	GS	$	272,551
	Power Service	PS et al	$	231,931
	Time-of-Day	TOD et al	$	209,271
	Total		$	3,922,437

Louisville Gas and Electric - Electric Service
DCCR Summary

Calculation of Base Rate and Operating Expense

12-Month Period Beginning January 1, 2019

Determination of DSM Rate Base

Eligible Plant / Capital Expenditures In Service	$	9,440,540		
Eligible Accumulated Depreciation	$	(4,462,075)		
CWIP Amount Excluding AFUDC	$	0		
Eligible Net Plant / Capital Expenditures In Service			$	4,978,465
Deferred Tax Balance as of January 1, 2019			$	(1,630,277)
Yearly Depreciation Expense			$	0
Yearly Property Tax Expense			$	0
Total			$	3,348,188

Determination of DSM Operating Expenses

			O&M		Depreciation Expense		Property Tax Expense
Demand Load Conservation	Residential	$	1,793,243	$	784,653	$	54,532
	Commercial	$	469,558	$	152,771	$	10,403
	Total	$	2,262,801	$	937,424	$	64,935

			O&M		Depreciation Expense		Property Tax Expense
AMS / Smart Grid	Residential	$	175,356	$	59,379	$	27,855
	Commercial	$	21,673	$	7,339	$	3,401
	Total	$	197,029	$	66,718	$	31,256

			Total Operating Expenses
	Residential	$	2,895,018
	Commercial	$	665,145
Total Operating Expenses	Total	$	3,560,163

Louisville Gas and Electric - Electric Service
DCCR Summary

Calculation of DCCR Component from Forecast Sales

12-Month Period Beginning January 1, 2019

Forecast Sales kWh	Residential Service RS et al	General Service GS	Power Service PS et al	Time of Day TOD et al
January 2019	359,282,862	103,604,163	160,432,056	147,330,357
February 2019	342,773,153	102,890,257	149,292,335	140,692,179
March 2019	312,459,990	100,055,254	147,795,217	142,059,898
April 2019	252,646,333	91,253,143	147,745,587	137,546,806
May 2019	253,931,220	95,027,812	156,125,506	136,692,598
June 2019	355,130,574	114,187,785	177,642,930	155,127,102
July 2019	468,572,604	128,026,191	186,895,811	161,535,745
August 2019	478,325,433	128,566,798	189,787,573	165,707,855
September 2019	430,933,099	124,361,483	190,104,463	165,457,685
October 2019	290,655,452	102,424,612	159,458,650	145,900,380
November 2019	252,096,553	92,291,827	147,946,309	138,497,886
December 2019	310,275,457	97,264,048	154,638,919	143,134,041
Total	4,107,082,730	1,279,953,373	1,967,865,356	1,779,682,532
Total DCCR Program Component	$ 3,208,684	$ 272,551	$ 231,931	$ 209,271
DCCR Factor in ¢ per kWh	0.078	0.021	0.012	0.012

Louisville Gas and Electric - Electric Service
DCCR Summary

Rate Base by Program

12-Month Period Beginning January 1, 2019

Rate Base by Program

Demand Load Conservation	Residential	$	1,559,760
	Commercial	$	311,801
	Total	$	1,871,561
AMS / Smart Grid	Residential	$	1,339,183
	Commercial	$	137,444
	Total	$	1,476,627

Allocation between Residential and Commercial			
	Residential	$	2,898,943
	Commercial	$	449,245
	Total	$	3,348,188

Louisville Gas and Electric Company
Gas Tariffs
Clean Version

Exhibit REL-3

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

APPLICABLE
In all territory served.

AVAILABILITY OF SERVICE
This schedule is mandatory to the Company's Standard Gas Rate Schedules RGS, VFD, CGS, IGS, T
AAGS, SGSS, and FT. Descriptions of available Demand-Side Management and Energy Efficiency N
("DSM-EE") programs begin on Sheet No. 86.4.

INDUSTRIAL OPT-OUT
An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate IGS, AAGS, SGSS or FT) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using gas in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rates IGS, AAGS, SGSS or FT) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE
The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per 100 cubic feet (Ccf) of monthly gas consumption in accordance with the following formula:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR

T

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ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

RATE (continued) T

Where:

DCR = DSM COST RECOVERY

The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DCR for such rate class.

DRLS = DSM REVENUE FROM LOST SALES

Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1. For each upcoming twelve-month period, the estimated reduction in customer usage (in Ccf) as determined for the approved programs shall be multiplied by the non-variable revenue requirement per Ccf for purposes of determining the lost revenue to be recovered hereunder for each customer class. The non-variable revenue requirement is defined as the weighted average price per Ccf of expected Distribution Charge billings for the customer classes.

2. The lost revenues for each customer class shall then be divided by the estimated class sales (in Ccf) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenues from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case. For recovery purposes, the lost sales revenues will be assigned to the rate classes whose programs resulted in the lost sales.

T

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

RATE (continued) T

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA).

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE.
For all Energy Impact Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DSMI. DSMI amounts will be assigned for recovery purposes to the rate classes whose programs created the incentive.

DBA = DSM BALANCE ADJUSTMENT
The DBA shall be calculated on a calendar year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

(1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.

(2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period. T

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State Regulation and Rates
Louisville, Kentucky

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Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

(3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period.

(4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period. N

(5) For the DBA, the balance adjustment amount will be determined by calculating the difference between the amount billed during the twelve-month period from application of the DBA unit charges and the balance adjustment amount established for the same twelve-month period. T

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest to be calculated at a rate equal to the average of the “Three-Month Commercial Paper Rate” for the immediately preceding twelve-month period. The balance adjustment amounts, plus interest, shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DBA for each rate class. DBA amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY

The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. The Company calculates the DCCR component as follows: T

$$DCCR = [(RB) (ROR + (ROR – DR) (TR / (1 – TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company’s various DSM-related capital investment(s). T

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC

T

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

(1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.

(2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE program is available to residential customers receiving service from the Company on the RGS and VFD Standard Gas Rate Schedules.

Low Income Weatherization Program (WeCare)
This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the customer’s most recent twelve month energy usage and results of an energy audit.

NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

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The following DSM-EE program is available to nonresidential customers receiving service from the Company on the CGS, IGS, AAGS, SGSS, and FT Standard Gas Rate Schedules for nonresidential, master-metered multi-family buildings.

Low Income Weatherization Program (WeCare)

N

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the customer’s most recent twelve month energy usage and results of an energy audit.

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State Regulation and Rates
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P.S.C. Gas No. 11, First Revision of Original Sheet No. 86.5 T
Cancelling P.S.C. Gas No. 11, Original Sheet No. 86.5 T

Adjustment Clause **DSM**

Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T
Monthly Adjustment Factors:

Rates RGS, VFD	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00202 per Ccf	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00042 per Ccf	I
DSM Incentive (DSMI)	$ 0.00000 per Ccf	R
DSM Capital Cost Recovery (DCCR)	$ 0.00000 per Ccf	
DSM Balance Adjustment (DBA)	$ (0.00158) per Ccf	
Total DSMRC for Rates RGS, VFD	**$ 0.00086 per Ccf**	R

Rates CGS, IGS, AAGS, SGSS, FT	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00062 per Ccf	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00010 per Ccf	I
DSM Incentive (DSMI)	$ 0.00000 per Ccf	
DSM Capital Cost Recovery (DCCR)	$ 0.00000 per Ccf	
DSM Balance Adjustment (DBA)	$ 0.00003 per Ccf	
Total DSMRC for Rates CGS, IGS, AAGS, SGSS, FT	**$ 0.00075 per Ccf**	R

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ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

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Louisville Gas and Electric Company
Gas Tariffs
Red-line Version

Exhibit REL-3

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to the Company's Standard Gas Rate Schedules RGS, VFD, CGS, IGS, AAGS, SGSS, and FT. Descriptions of available Demand-Side Management and Energy Efficiency ("DSM-EE") programs begin on Sheet No. 86.4. T N

Deleted: Residential Gas Service Rate

Deleted: Volunteer Fire Department Service Rate

Deleted: Firm Commercial Gas Service Rate

Deleted: Firm Industrial Gas Service Rate

Deleted: As-Available Gas Service Rate

Deleted: Substitute Gas Sales Service Rate

Deleted: Firm Transportation Rate

INDUSTRIAL OPT-OUT

An industrial customer may elect not to participate in any DSM-EE programs hereunder, and therefore shall not be assessed a charge pursuant to this mechanism, with respect to any of the customer's energy-intensive meters (i.e., a meter served under Rate IGS, AAGS, SGSS or FT) if the customer has implemented with respect to the load served by each such meter cost-effective energy-efficiency measures not subsidized by other rate classes. Nonresidential customers will be considered "industrial" for the purposes of Adjustment Clause DSM if they are engaged in activities primarily using gas in a process or processes involving either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. To opt out, an industrial customer must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting out and any subsequent opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-Out Notification Form. Only those industrial customer meters that are energy intensive (i.e., served under Rates IGS, AAGS, SGSS or FT) may be exempted from charges under Adjustment Clause DSM; an industrial customer's other accounts will be subject to Adjustment Clause DSM.

An industrial customer desiring to opt back into charges under this mechanism for one or more opted-out meters must complete and return to Company the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form (available at the Company's website at http://www.lge-ku.com). The full terms and conditions of opting in are contained in the Demand-Side Management and Energy Efficiency Industrial Opt-In Notification Form.

RATE

The monthly amount computed under each of the rate schedules to which this Demand-Side Management Cost Recovery Mechanism is applicable shall be increased or decreased by the DSM Cost Recovery Component (DSMRC) at a rate per 100 cubic feet (Ccf) of monthly gas consumption in accordance with the following formula:

DSMRC = DCR + DRLS + DSMI + DBA + DCCR T

Deleted: Where: ¶
DCR = DSM COST RECOVERY ¶
The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for demand-side management programs that have been developed through a collaborative advisory process ("approved programs"). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DCR for such rate class.¶
¶
¶
DRLS = DSM REVENUE FROM LOST SALES¶
Revenues from lost sales due to DSM programs implemented on and after the effective date of this tariff will be recovered as follows:¶

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State Regulation and Rates
Louisville, Kentucky

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Deleted: 2016-00371 dated June 22, 2017 and modified June 29, 2017

Louisville Gas and Electric Company

P.S.C. Gas No. 11, First Revision of Original Sheet No. 86.1
Cancelling P.S.C. Gas No. 11, Original Sheet No. 86.1

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

Where:

DCR = DSM COST RECOVERY

The DCR shall include all expected costs that have been approved by the Commission for each twelve-month period for DSM-EE programs that have been developed through a collaborative advisory process (“approved programs”). Such program costs shall include the cost of planning, developing, implementing, monitoring, and evaluating DSM-EE programs. Program costs will be assigned for recovery purposes to the rate classes whose customers are directly participating in the program. In addition, all costs incurred by or on behalf of the collaborative process, including but not limited to costs for consultants, employees and administrative expenses, will be recovered through the DCR. Administrative costs that are allocable to more than one rate class will be recovered from those classes and allocated by rate class on the basis of the estimated budget from each program. The cost of approved programs shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DCR for such rate class.

DRLS = DSM REVENUE FROM LOST SALES

Revenues from lost sales due to DSM-EE programs implemented on and after the effective date of this tariff will be recovered as follows:

1. For each upcoming twelve-month period, the estimated reduction in customer usage (in Ccf) as determined for the approved programs shall be multiplied by the non-variable revenue requirement per Ccf for purposes of determining the lost revenue to be recovered hereunder for each customer class. The non-variable revenue requirement is defined as the weighted average price per Ccf of expected Distribution Charge billings for the customer classes.
2. The lost revenues for each customer class shall then be divided by the estimated class sales (in Ccf) for the upcoming twelve-month period to determine the applicable DRLS surcharge. Recovery of revenues from lost sales calculated for a twelve-month period shall be included in the DRLS for thirty-six (36) months or until implementation of new rates pursuant to a general rate case. For recovery purposes, the lost sales revenues will be assigned to the rate classes whose programs resulted in the lost sales.

T

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State Regulation and Rates
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Deleted: DRLS = DSM REVENUE FROM LOST SALES (continued)

Deleted: Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA) component.¶
¶
A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in <*object*>both (a) the retroactive true-up provided for under the DSM Balance Adjustment and (b) the prospective future lost revenues collected hereunder.¶
¶
¶
DSMI = DSM INCENTIVE. ¶
For all Energy Impact Programs except Direct Load Control, the DSM incentive amount shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings. For the Energy Education Program, the DSM incentive amount shall be computed by multiplying the annual cost of the approved program times five (5) percent.¶

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Deleted: 2016-00371 dated June 22, 2017 and modified June 29, 2017

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued)

Revenues collected hereunder are based on engineering estimates of energy savings, expected program participation and estimated sales for the upcoming twelve-month period. At the end of each such period, any difference between the lost revenues actually collected hereunder and the lost revenues determined after any revisions of the engineering estimates and actual program participation are accounted for shall be reconciled in future billings under the DSM Balance Adjustment (DBA).

A program evaluation vendor will be selected to provide evaluation criteria against which energy savings will be estimated for that program. Each program will be evaluated after implementation and any revision of the original engineering estimates will be reflected in both (a) the retroactive true-up provided for under the DBA and (b) the prospective future lost revenues collected hereunder.

DSMI = DSM INCENTIVE.

For all Energy Impact Programs, the DSMI shall be computed by multiplying the net resource savings expected from the approved programs that are to be installed during the upcoming twelve-month period times fifteen (15) percent, not to exceed five (5) percent of program expenditures. Net resource savings are defined as program benefits less utility program costs and participant costs where program benefits will be calculated on the basis of the present value of Company's avoided costs over the expected life of the program, and will include both capacity and energy savings.

The DSMI amount shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DSMI. DSMI amounts will be assigned for recovery purposes to the rate classes whose programs created the incentive.

DBA = DSM BALANCE ADJUSTMENT

The DBA shall be calculated on a calendar year basis and is used to reconcile the difference between the amount of revenues actually billed through the DCR, DRLS, DSMI, DCCR, and previous application of the DBA and the revenues that should have been billed, as follows:

(1) For the DCR, the balance adjustment amount will be the difference between the amount billed in a twelve-month period from the application of the DCR unit charge and the actual cost of the approved programs during the same twelve-month period.

(2) For the DRLS the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DRLS unit charge and the amount of lost revenues determined for the actual DSM measures implemented during the twelve-month period.

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

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¶
For the DBA, the balance adjustment amount will be determined by calculating the difference between the amount billed during the twelve-month period from application of the DBA unit charges and the balance adjustment amount established for the same twelve-month period.¶
¶
The balance adjustment amounts determined on the basis of the above paragraphs (1)-(4) shall include interest to be calculated at a rate equal to the average of the "Three-Month Commercial Paper Rate" for the immediately preceding twelve-month period. The balance adjustment amounts, plus interest, shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DBA for each rate class. DSM balance adjustment amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.¶

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After December 31, 2011

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Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

RATE (continued) T

(3) For the DSMI, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DSMI unit charge and the incentive amount determined for the actual DSM measures implemented during the twelve-month period.

(4) For the DCCR, the balance adjustment amount will be the difference between the amount billed during the twelve-month period from application of the DCCR unit charge and the capital cost recovery amount determined for the actual capital costs of the approved programs during the twelve-month period. N

(5) For the DBA, the balance adjustment amount will be determined by calculating the difference between the amount billed during the twelve-month period from application of the DBA unit charges and the balance adjustment amount established for the same twelve-month period. T

The balance adjustment amounts determined on the basis of the above paragraphs (1)-(5) shall include interest to be calculated at a rate equal to the average of the “Three-Month Commercial Paper Rate” for the immediately preceding twelve-month period. The balance adjustment amounts, plus interest, shall be divided by the expected Ccf sales for the upcoming twelve-month period to determine the DBA for each rate class. DBA amounts will be assigned for recovery purposes to the rate classes for which over- or under-recoveries of DSM amounts were realized.

DCCR = DSM CAPITAL COST RECOVERY
The DCCR component is the means by which the Company recovers its capital investments made for DSM-EE programs, as well as an approved rate of return on such capital investments. The Company calculates the DCCR component as follows: T

$$DCCR = [(RB) (ROR + (ROR – DR) (TR / (1 – TR))] + OE$$

a) RB is the total rate base for DCCR projects.
b) ROR is the overall rate of return on DSM Rate Base (RB).
c) DR is the composite debt rate (i.e., the cost of short- and long-term debt) embedded in ROR.
d) TR is the composite federal and state income tax rate that applies to the equity return component of ROR.
e) OE is the sum of the capital-related operating expenses (i.e., depreciation and amortization expense, property taxes, and insurance expense) of the DSM projects to which DCCR applies.

The Company then allocates the DCCR component to the rate class(es) benefitting from the Company’s various DSM-related capital investment(s). T

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State Regulation and Rates
Louisville, Kentucky

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The filing of modifications to the DSMRC that require changes in the DCR component shall be made at least two (2) months prior to the beginning of the effective period for billing. Modifications to other components of the DSMRC shall be made at least thirty (30) days prior to the effective period for billing. Each filing shall include the following information as applicable:

(1) A detailed description of each DSM program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.

(2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA and DSMRC.

Each change in the DSMRC shall be placed into effect with bills rendered on and after the effective date of such change.

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Louisville Gas and Electric Company

P.S.C. Gas No. 11, First Revision of Original Sheet No. 86.4
Cancelling P.S.C. Gas No. 11, Original Sheet No. 86.4

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

CHANGES TO DSMRC

Modifications to components of the DSMRC shall be made at least thirty (30) days prior to the effective date. Each filing shall include the following information as applicable:

(1) A detailed description of each DSM-EE program developed by the collaborative process, the total cost of each program over the twelve-month period, an analysis of expected resource savings, information concerning the specific DSM or efficiency measures to be installed, and any applicable studies that have been performed, as available.

(2) A statement setting forth the detailed calculation of the DCR, DRLS, DSMI, DBA, DCCR and DSMRC.

Each change in the DSMRC shall be placed into effect with service rendered on and after the effective date of such change.

T

RESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE program is available to residential customers receiving service from the Company on the RGS and VFD Standard Gas Rate Schedules.

Low Income Weatherization Program (WeCare)

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the customer's most recent twelve month energy usage and results of an energy audit.

T

NONRESIDENTIAL CUSTOMER PROGRAM PARTICIPATION INCENTIVES:

The following DSM-EE program is available to nonresidential customers receiving service from the Company on the CGS, IGS, AAGS, SGSS, and FT Standard Gas Rate Schedules for nonresidential, master-metered multi-family buildings.

N

Low Income Weatherization Program (WeCare)

This is an education and weatherization program designed to reduce energy consumption of income-qualified customers. The program provides energy audits, energy education, and installation of weatherization and energy conservation measures in qualified single-family homes as well as tenant units and common areas of qualifying multifamily properties. Qualified customers could receive energy conservation measures ranging from $0 to $2,100 based upon the customer's most recent twelve month energy usage and results of an energy audit.

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State Regulation and Rates
Louisville, Kentucky

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2017-00441 dated XXXX, 2018

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The on-site audit offers a comprehensive audit from a certified auditor and incentives for residential customers to support the implementation of energy saving measures for a fee of $25. Customers are eligible for incentives of $150 or $1,000 based on customer purchased and installed energy efficiency measures and validated through a follow-up test. ¶
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Smart Energy Profile¶
The Smart Energy Profile Program provides a portion of LG&E's highest consuming residential customers with a customized report of tips, tools and energy efficiency programming recommendations based on individual household energy consumption. These reports are benchmarked against similar local properties. The report will help the customer understand and make better informed choices as it relates to energy usage and the associated costs. Information presented in the report will include a comparison of the customer's energy usage to that of similar houses (collectively) and a comparison to the customer's own energy usage in the prior year. ¶
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Louisville Gas and Electric Company

P.S.C. Gas No. 11, First Revision of Original Sheet No. 86.5 T
Cancelling P.S.C. Gas No. 11, Original Sheet No. 86.5 T

Adjustment Clause **DSM**
Demand-Side Management Cost Recovery Mechanism

DSM Cost Recovery Component (DSMRC) T
Monthly Adjustment Factors:

Rates RGS, VFD	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00202 per Ccf	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00042 per Ccf	I
DSM Incentive (DSMI)	$ 0.00000 per Ccf	R
DSM Capital Cost Recovery (DCCR)	$ 0.00000 per Ccf	
DSM Balance Adjustment (DBA)	$ (0.00158) per Ccf	
Total DSMRC for Rates RGS, VFD	**$ 0.00086 per Ccf**	R

Rates CGS, IGS, AAGS, SGSS, FT	Energy Charge	T
DSM Cost Recovery (DCR)	$ 0.00062 per Ccf	R
DSM Revenues from Lost Sales (DRLS)	$ 0.00010 per Ccf	I
DSM Incentive (DSMI)	$ 0.00000 per Ccf	
DSM Capital Cost Recovery (DCCR)	$ 0.00000 per Ccf	
DSM Balance Adjustment (DBA)	$ 0.00003 per Ccf	
Total DSMRC for Rates CGS, IGS, AAGS, SGSS, FT	**$ 0.00075 per Ccf**	R

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State Regulation and Rates
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Louisville Gas and Electric Company
Gas Tariffs
Supporting Calculations for DSM Cost Recovery Mechanism

Exhibit REL-3

LOUISVILLE GAS & ELECTRIC COMPANY

Supporting Calculations for the

DSM Cost Recovery Mechanism

GAS SERVICE

Twelve-Month Period Beginning January 1, 2019
and Ending December 31, 2019

Louisville Gas and Electric - Gas Service
DSMRC Summary

Summary of Total DSM Recovery Component (DSMRC)

12-Month Period Beginning January 1, 2019

Rate Schedule	Cost Recovery Component (DCR)	Lost Sales Component (DRLS)	Incentive Component (DSMI)	Capital Cost Recovery Component (DCCR)	Balance Adj Component (DBA)	DSM Recovery Component (DSMRC)	
RGS & VFD	0.202	0.042	0.000	0.000	(0.158)	0.086	¢/Ccf
CGS, IGS, AAGS, SGSS, & FT	0.062	0.010	0.000	0.000	0.003	0.075	¢/Ccf

Louisville Gas and Electric - Gas Service
DCR Summary

Summary of DSM Revenues from DSM Cost Recovery Component (DCR)
12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Cost Recovery Total Amount		Estimated Billing Determinants		DSM Cost Recovery Component (DCR)	
	RGS & VFD	$	392,611	194,170,671	Ccf	0.202	¢/Ccf
	CGS, IGS, AAGS, SGSS, & FT	$	68,600	110,696,321	Ccf	0.062	¢/Ccf
Total DCR Amount		$	461,211				

Program costs, which are categorized by residential and commercial must be allocated to the individual rate schedules. The first step, allocation between gas and electric, and between LGE and KU, is shown on "DSM Budget Allocation" page.

Next, the DSM Program costs are further assigned to the rate schedules, which is the second and final step of the cost allocation process and is shown on the "Calculation of DCR Component from Forecast Sales" page. The total amount to be collected for each rate class is divided by the forecasted sales for that rate class to calculate the component rate in terms of ¢ / CCF.

Louisville Gas and Electric - Gas Service
DCR Summary

DSM Budget Allocation

Program	Allocation	2019
Total of All Programs		
LGE: RS et al	24.8%	2,849,843
LGE: RGS et al	**3.4%**	**392,611**
LGE: GS et al	6.6%	759,376
LGE: PS et al	11.7%	1,349,911
LGE: TOD et al	2.9%	336,276
LGE: CGS et al	**0.6%**	**68,600**
KU: RS et al	28.1%	3,233,300
KU: GS	7.2%	833,057
KU: AES	1.7%	193,408
KU: PS/TOD et al	13.0%	1,496,851
Total	100.0%	11,513,235
Residential WeCare		
LGE: RS et al	36.2%	2,293,242
LGE: RGS et al	3.9%	247,062
LGE: GS et al	3.0%	190,048
LGE: PS et al	3.0%	190,048
LGE: TOD et al	3.0%	190,048
LGE: CGS et al	0.9%	57,014
KU: RS et al	40.0%	2,533,969
KU: GS	5.0%	316,746
KU: AES	0.0%	0
KU: PS/TOD et al	5.0%	316,746
Total	100.0%	6,334,923

Program	Allocation	2019
Development & Administration		
LGE: RS et al	25.0%	181,032
LGE: RGS et al	20.1%	145,549
LGE: GS et al	3.0%	21,724
LGE: PS et al	0.2%	1,448
LGE: TOD et al	0.1%	724
LGE: CGS et al	1.6%	11,586
KU: RS et al	41.5%	300,512
KU: GS	7.9%	57,206
KU: AES	0.1%	724
KU: PS/TOD et al	0.5%	3,621
Total	100.0%	724,126
KSBA		
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	33.6%	243,600
LGE: PS et al	15.1%	109,475
LGE: TOD et al	1.3%	9,425
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	24.6%	178,350
KU: AES	12.5%	90,625
KU: PS/TOD et al	12.9%	93,525
Total	100.0%	725,000

Program	Allocation	2019
Non-Residential Rebates		
LGE: RS et al	0.0%	0
LGE: RGS et al	0.0%	0
LGE: GS et al	8.2%	232,468
LGE: PS et al	37.0%	1,048,940
LGE: TOD et al	4.8%	136,079
LGE: CGS et al	0.0%	0
KU: RS et al	0.0%	0
KU: GS	8.2%	232,468
KU: AES	3.6%	102,059
KU: PS/TOD et al	38.2%	1,082,960
Total	100.0%	2,834,973
AMS		
LGE: RS et al	42.0%	375,569
LGE: RGS et al	0.0%	0
LGE: GS et al	8.0%	71,537
LGE: PS et al	0.0%	0
LGE: TOD et al	0.0%	0
LGE: CGS et al	0.0%	0
KU: RS et al	44.6%	398,819
KU: GS	5.4%	48,288
KU: AES	0.0%	0
KU: PS/TOD et al	0.0%	0
Total	100.0%	894,213

Note: Residential DLC, Commercial DLC and Advance Metering Systems all run through the DCCR component of the DSM Mechanism.

Louisville Gas and Electric - Gas Service
DCR Summary

Calculation of DCR Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales Ccf	Residential Gas Service RGS et al	Commercial Gas Service CGS et al
January 2019	37,844,645	19,913,027
February 2019	38,562,890	19,472,456
March 2019	31,132,993	15,634,745
April 2019	16,356,821	9,458,729
May 2019	7,644,421	5,227,388
June 2019	4,617,462	3,713,761
July 2019	3,658,864	3,404,658
August 2019	3,358,052	3,346,978
September 2019	3,562,651	3,569,379
October 2019	5,051,396	4,373,560
November 2019	14,231,403	7,850,370
December 2019	28,149,073	14,731,270
Total	194,170,671	110,696,321
Total Program Costs	$ 392,611	$ 68,600
DCR Factor in ¢ per Ccf	0.202	0.062

Louisville Gas and Electric - Gas Service
DRLS Summary

Summary of DSM Revenues from DSM Lost Sales Component (DRLS)

12-Month Period Beginning January 1, 2019

Rate Schedule		Lost Net Revenues Total Amount		Estimated Billing Determinants		DSM Revenue from Lost Sales Component (DRLS)	
	RGS & VFD	$	81,817	194,170,671	Ccf	0.042	¢/Ccf
	CGS, IGS, AAGS, SGSS, & FT	$	11,212	110,696,321	Ccf	0.010	¢/Ccf
Total DRLS Amount		$	93,029				

Louisville Gas and Electric - Gas Service
DRLS Summary

Calculation of DRLS Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales Ccf	Residential Gas Service RGS et al	Commercial Gas Service CGS et al
January 2019	37,844,645	19,913,027
February 2019	38,562,890	19,472,456
March 2019	31,132,993	15,634,745
April 2019	16,356,821	9,458,729
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September 2019	3,562,651	3,569,379
October 2019	5,051,396	4,373,560
November 2019	14,231,403	7,850,370
December 2019	28,149,073	14,731,270
Total	194,170,671	110,696,321
Total Gas Savings	225,392	44,609
Non-variable Revenue per Ccf	0.3630	0.2513
Lost Net Revenue	$ 81,817	$ 11,212
DRLS Factor in ¢ per Ccf	0.042	0.010

Summary of DSM Revenues from DSM Incentive Component (DSMI)

12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Incentive Total Amount		Estimated Billing Determinants		DSM Incentive Component (DSMI)	
	RGS & VFD	$	-	194,170,671	Ccf	0.000	¢/Ccf
	CGS, IGS, AAGS, SGSS, & FT	$	-	110,696,321	Ccf	0.000	¢/Ccf
Total DSMI Amount		$	-				

Incentives for each individual program is calculated as 15% of Net Resource Benefits (as specified in the California Standardized Tests) capped at 5% of program costs. The incentive by programs is then allocated across the rate classes using the same method as the cost recovery component.

Louisville Gas and Electric - Gas Service
DSMI Summary

Calculation of DSMI Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales Ccf	Residential Gas Service RGS et al	Commercial Gas Service CGS et al
January 2019	37,844,645	19,913,027
February 2019	38,562,890	19,472,456
March 2019	31,132,993	15,634,745
April 2019	16,356,821	9,458,729
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September 2019	3,562,651	3,569,379
October 2019	5,051,396	4,373,560
November 2019	14,231,403	7,850,370
December 2019	28,149,073	14,731,270
Total	194,170,671	110,696,321
Total Program Incentive	$ -	$ -
DSMI Factor in ¢ per Ccf	0.000	0.000

Louisville Gas and Electric - Gas Service
DCCR Summary

Summary of DSM Revenues from DSM Capital Cost Recovery (DCCR)

12-Month Period Beginning January 1, 2019

Rate Schedule		DSM Capital Cost Recovery Total Amount	Estimated Billing Determinants		DSM Capital Cost Recovery Component (DCCR)	
	RGS & VFD	$ -	194,170,671	Ccf	0.000	¢/Ccf
	CGS, IGS, AAGS, SGSS, & FT	$ -	110,696,321	Ccf	0.000	¢/Ccf
Total DCCR Amount		$ -				

The DSM Capital Cost Recovery (DCCR), allows the Companies' to earn an approved rate of return on equity exclusively for the capital expenditures. The Companies' return on equity is equal to 10.20%.

Louisville Gas and Electric - Gas Service
DCCR Summary

Calculation of Total E(m) and Juridictional Surcharge Billing Factor

12-Month Period Beginning January 1, 2019

Calculation of Total E(m)

E(m) = [(RB) (ROR+(ROR - DR)(TR/(1-TR)))] + OE, where

RB = DSM Rate Base = $ 0
ROR = Rate of Return on the DSM Rate Base = 7.33%
DR = Debt Rate (both short-term and long-term debt) = 1.79%
TR = Composite Federal & State Income Tax Rate = 38.90%
OE = Operating Expenses

DSM Plans

RB = $ 0
(ROR + (ROR - DR) (TR / (1 - TR))) = 10.85%
Return on Rate Base = $ 0
OE = $ 0

E(m) = $ -

E(m) by Rate Class

Gas	Residential Service	RGS et al	$	-
	Commercial Gas Service	CGS et al	$	-
	Total		$	-

Louisville Gas and Electric - Gas Service
DCCR Summary

Calculation of Base Rate and Operating Expense
12-Month Period Beginning January 1, 2019

Determination of DSM Rate Base

Eligible Plant / Capital Expenditures In Service	$	0		
Eligible Accumulated Depreciation	$	0		
CWIP Amount Excluding AFUDC	$	0		
Eligible Net Plant / Capital Expenditures In Service			$	0
Deferred Tax Balance as of January 1, 2019			$	0
Yearly Depreciation Expense			$	0
Yearly Property Tax Expense			$	0
Total			$	0

Determination of DSM Operating Expenses

		O&M	Depreciation Expense	Property Tax Expense
Demand Load Conservation	Residential	$ -	$ -	$ -
	Commercial	$ -	$ -	$ -
	Total	$ -	$ -	$ -

		O&M	Depreciation Expense	Property Tax Expense
AMS / Smart Grid	Residential	$ -	$ -	$ -
	Commercial	$ -	$ -	$ -
	Total	$ -	$ -	$ -

		Total Operating Expenses
	Residential	$ -
	Commercial	$ -
Total Operating Expenses	Total	$ -

Louisville Gas and Electric - Gas Service
DCCR Summary

Calculation of DCCR Component from Forecast Sales
12-Month Period Beginning January 1, 2019

Forecast Sales Ccf	Residential Gas Service RGS et al	Commercial Gas Service CGS et al
January 2019	37,844,645	19,913,027
February 2019	38,562,890	19,472,456
March 2019	31,132,993	15,634,745
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September 2019	3,562,651	3,569,379
October 2019	5,051,396	4,373,560
November 2019	14,231,403	7,850,370
December 2019	28,149,073	14,731,270
Total	194,170,671	110,696,321
Total DCCR Program Component	$ -	$ -
DCCR Factor in ¢ per Ccf	0.000	0.000

Louisville Gas and Electric - Gas Service
DCCR Summary

Rate Base by Program

12-Month Period Beginning January 1, 2019

Rate Base by Program

Demand Load Conservation	Residential	$ 0
	Commercial	$ 0
	Total	$ 0
AMS / Smart Grid	Residential	$ 0
	Commercial	$ 0
	Total	$ 0

Allocation between Residential and Commercial		
	Residential	$ 0
	Commercial	$ 0
	Total	$ 0

Fluctuating Load Service (FLS)
Kentucky Utilities Company

Exhibit REL-4

Standard Rate **FLS**

Fluctuating Load Service

ADJUSTMENT CLAUSES

The bill amount computed at the charges specified above shall be increased or decreased in accordance with the following:

Fuel Adjustment Clause	Sheet No. 85	
Off-System Sales Adjustment Clause	Sheet No. 88	
Demand Side Management Cost Recovery Mechanism	Sheet No. 86	T
Environmental Cost Recovery Surcharge	Sheet No. 87	
Franchise Fee Rider	Sheet No. 90	
School Tax	Sheet No. 91	

DETERMINATION OF MAXIMUM LOAD

The load will be measured and will be the average kVA demand delivered to the customer during the 5-minute period of maximum use during the appropriate rating period each month.

RATING PERIODS

The rating periods applicable to the Maximum Load charges are established in Eastern Standard Time year round by season for weekdays and weekends, throughout Company's service area, and shall be as follows:

Summer peak months of May through September

	Base	Intermediate	Peak
Weekdays	All Hours	10 A.M. – 10 P.M.	1 P.M. – 7 P.M.
Weekends	All Hours		

All other months of October continuously through April

	Base	Intermediate	Peak
Weekdays	All Hours	6 A.M. – 10 P.M.	6 A.M. – 12 Noon
Weekends	All Hours		

DUE DATE OF BILL

Customer's payment will be due within sixteen (16) business days (no less than twenty-two (22) calendar days) from the date of the bill.

LATE PAYMENT CHARGE

If full payment is not received by the due date of the bill, a 1% late payment charge will be assessed on the current month's charges.

DATE OF ISSUE: December 6, 2017

DATE EFFECTIVE: January 5, 2018

ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

Kentucky Utilities Company

P.S.C. No. 18, First Revision of Original Sheet No. 30.1
Cancelling P.S.C. No. 18, Original Sheet No. 30.1

Standard Rate **FLS**

Fluctuating Load Service

ADJUSTMENT CLAUSES

The bill amount computed at the charges specified above shall be increased or decreased in accordance with the following:

Fuel Adjustment Clause	Sheet No. 85
Off-System Sales Adjustment Clause	Sheet No. 88
Demand Side Management Cost Recovery Mechanism	Sheet No. 86
Environmental Cost Recovery Surcharge	Sheet No. 87
Franchise Fee Rider	Sheet No. 90
School Tax	Sheet No. 91

DETERMINATION OF MAXIMUM LOAD

The load will be measured and will be the average kVA demand delivered to the customer during the 5-minute period of maximum use during the appropriate rating period each month.

RATING PERIODS

The rating periods applicable to the Maximum Load charges are established in Eastern Standard Time year round by season for weekdays and weekends, throughout Company's service area, and shall be as follows:

Summer peak months of May through September

	Base	Intermediate	Peak
Weekdays	All Hours	10 A.M. – 10 P.M.	1 P.M. – 7 P.M.
Weekends	All Hours		

All other months of October continuously through April

	Base	Intermediate	Peak
Weekdays	All Hours	6 A.M. – 10 P.M.	6 A.M. – 12 Noon
Weekends	All Hours		

DUE DATE OF BILL

Customer's payment will be due within sixteen (16) business days (no less than twenty-two (22) calendar days) from the date of the bill.

LATE PAYMENT CHARGE

If full payment is not received by the due date of the bill, a 1% late payment charge will be assessed on the current month's charges.

DATE OF ISSUE: December 6, 2017

Deleted: July 7

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ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the
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2017-00441 dated XXXX, 2018

Deleted: 2014

Deleted: 00371

Deleted: June 30, 2015

Fluctuating Load Service (FLS)
Louisville Gas and &Electric Company

Exhibit REL-5

Standard Rate

FLS
Fluctuating Load Service

ADJUSTMENT CLAUSES

The amount computed at the charges specified above shall be increased or decreased in accordance with the following:

Fuel Adjustment Clause	Sheet No. 85	
Off-System Sales Adjustment Clause	Sheet No. 88	
Demand-Side Management Cost Recovery Mechanism	Sheet No. 86	T
Environmental Cost Recovery Surcharge	Sheet No. 87	
Franchise Fee Rider	Sheet No. 90	
School Tax	Sheet No. 91	

DETERMINATION OF MAXIMUM LOAD

The load will be measured and will be the average kVA demand delivered to the customer during the 5-minute period of maximum use during the appropriate rating period each month.

RATING PERIODS

The rating periods applicable to the Maximum Load charges are established in Eastern Standard Time year round by season for weekdays and weekends, throughout Company's service area, and shall be as follows:

Summer peak months of May through September

	Base	Intermediate	Peak
Weekdays	All Hours	10 A.M. – 10 P.M.	1 P.M. – 7 P.M.
Weekends	All Hours		

All other months of October continuously through April

	Base	Intermediate	Peak
Weekdays	All Hours	6 A.M. – 10 P.M.	6 A.M. – 12 Noon
Weekends	All Hours		

DUE DATE OF BILL

Customer's payment will be due within sixteen (16) business days (no less than twenty-two (22) calendar days) from the date of the bill.

LATE PAYMENT CHARGE

If full payment is not received by the due date of the bill, a 1% late payment charge will be assessed on the current month's charges.

DATE OF ISSUE: December 6, 2017

DATE EFFECTIVE: January 5, 2018

ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

Standard Rate **FLS**

Fluctuating Load Service

ADJUSTMENT CLAUSES

The amount computed at the charges specified above shall be increased or decreased in accordance with the following:

Fuel Adjustment Clause	Sheet No. 85
Off-System Sales Adjustment Clause	Sheet No. 88
Demand-Side Management Cost Recovery Mechanism	Sheet No. 86
Environmental Cost Recovery Surcharge	Sheet No. 87
Franchise Fee Rider	Sheet No. 90
School Tax	Sheet No. 91

DETERMINATION OF MAXIMUM LOAD

The load will be measured and will be the average kVA demand delivered to the customer during the 5-minute period of maximum use during the appropriate rating period each month.

RATING PERIODS

The rating periods applicable to the Maximum Load charges are established in Eastern Standard Time year round by season for weekdays and weekends, throughout Company's service area, and shall be as follows:

Summer peak months of May through September

	Base	Intermediate	Peak
Weekdays	All Hours	10 A.M. – 10 P.M.	1 P.M. – 7 P.M.
Weekends	All Hours		

All other months of October continuously through April

	Base	Intermediate	Peak
Weekdays	All Hours	6 A.M. – 10 P.M.	6 A.M. – 12 Noon
Weekends	All Hours		

DUE DATE OF BILL

Customer's payment will be due within sixteen (16) business days (no less than twenty-two (22) calendar days) from the date of the bill.

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DATE OF ISSUE: December 6, 2017

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DATE EFFECTIVE: January 5, 2018

Deleted: July 1, 2015

ISSUED BY: /s/ Robert M. Conroy, Vice President
State Regulation and Rates
Louisville, Kentucky

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Public Service Commission in Case No.
2017-00441 dated XXXX, 2018

Deleted: 4

Deleted: 372

Deleted: June 30, 2015

Exhibit REL-6

Demand-Side Management and Energy Efficiency

Industrial Opt-In Notification Form

Purpose

This Industrial Opt-In Notification Form is for use by industrial customers that have previously opted Eligible Meters out of Kentucky Utilities Company's ("KU") demand-side management and energy efficiency ("DSM-EE") charges and programs.

An industrial customer that opts back into charges under KU's Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism") must identify which Eligible Meters are to be charged under the DSM Mechanism and eligible to participate in the KU's DSM-EE programs.

Instructions

Please complete this form to notify KU to opt back into charges under the DSM Mechanism, which will permit the industrial customer to participate in nonresidential DSM-EE programs regarding the previously opted-out Eligible Meters.

Please return this form via one of the following methods:

Email: xxxxx@lge-ku.com

Mail: LG&E and KU Energy, LLC
Attn: Energy Efficiency Operations
220 W. Main St.
Louisville, KY 40202

For more information about KU's DSM-EE programs and opt-in process, please visit our website at lge-ku.com/programs/business.

Definitions

Demand-Side Management Cost Recovery Mechanism: Tariff adjustment clause KU uses to collect and recover costs associated with DSM-EE programs approved by the Kentucky Public Service Commission ("Commission").

Eligible Meter: A meter that meets the KU's definitions of Industrial and Energy Intensive, and for which cost-effective energy efficiency measures not subsidized by other customer classes have been implemented for the load served by the meter.

Industrial: A non-residential customer is industrial if it is engaged in activities primarily using electricity in a process or processes that involves either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. All meters serving such a customer are "Industrial."

Energy Intensive: Any customer meter served under Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), or Time-of-Day Primary Service (Rate TODP).

Conditions and Requirements

In identifying and listing the Eligible Meters that are to be opted in, the following conditions and requirements apply:

- A customer electing to opt back into KU's DSM-EE programs must identify which Eligible Meters are to be opted in. Once opted in, the Eligible Meter will be eligible to participate in nonresidential DSM-EE programs and will be charged under the DSM Mechanism.
- Any customer that participates in a DSM-EE program with regard to an Eligible Meter, or opts out of and then subsequently opts back into the DSM Mechanism with regard to an Eligible Meter, will not be allowed to exercise an opt-out for that Eligible Meter for a period of three calendar years (i.e., 36 full billing cycles) after the Eligible Meter ceases participating in a DSM-EE program or opts back into the DSM Mechanism, whichever is later.

Exhibit REL-6

Customer Information and Certification Statement

Please provide account information exactly as it appears on your bill.

Account Number (12-digit)	Eligible Meter ID	Service Address (Street, City, Zip)	Applicable Rate (TODP, RTS, FLS)

By signing below, customer hereby certifies the following:

- Customer elects to opt into charges under the DSM Mechanism for the above-listed Eligible Meters and may participate in any of KU's nonresidential DSM-EE programs for such Eligible Meters.
- Customer has read, understands, and agrees to be bound by KU's Conditions and Requirements applicable to the Opt-In Notification Form.

Complete this section with information about the person who is authorized to make decisions concerning this form and the listed Eligible Meters.

First and Last Name (please print)

Title

Company Name (as it appears on your bill)

Phone No.

Mailing Address 1

Fax No.

Mailing Address 2

Email

City

State ZIP

Signature

Date

Exhibit REL-7

Demand-Side Management and Energy Efficiency

Industrial Opt-In Notification Form

Purpose

This Industrial Opt-In Notification Form is for use by industrial customers that have previously opted Eligible Meters out of Louisville Gas and Electric Company's ("LG&E") demand-side management and energy efficiency ("DSM-EE") charges and programs.

An industrial customer that opts back into charges under LG&E's Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism") must identify which Eligible Meters are to be charged under the DSM Mechanism and eligible to participate in the LG&E's DSM-EE programs.

Instructions

Please complete this form to notify LG&E to opt back into charges under the DSM Mechanism, which will permit the industrial customer to participate in nonresidential DSM-EE programs regarding the previously opted-out Eligible Meters.

Please return this form via one of the following methods:

Email: xxxxx@lge-ku.com

Mail: LG&E and KU Energy, LLC
Attn: Energy Efficiency Operations
220 W. Main St.
Louisville, KY 40202

For more information about LG&E's DSM-EE programs and opt-in process, please visit our website at lge-ku.com/programs/business.

Definitions

Demand-Side Management Cost Recovery Mechanism: Tariff adjustment clause LG&E uses to collect and recover costs associated with DSM-EE programs approved by the Kentucky Public Service Commission ("Commission").

Eligible Meter: A meter that meets the LG&E's definitions of Industrial and Energy Intensive, and for which cost-effective energy efficiency measures not subsidized by other customer classes have been implemented for the load served by the meter.

Industrial: A non-residential customer is industrial if it is engaged in activities primarily using electricity in a process or processes that involves either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. All meters serving such a customer are "Industrial."

Energy Intensive: Any electric customer meter served under Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), or Time-of-Day Primary Service (Rate TODP), or any gas customer meter served under Industrial Gas Service (Rate IGS), As-Available Gas Service (Rate AAGS), Substitute Gas Sales Service (Rate SGSS), or Firm Transportation Service (Rate FT).

Conditions and Requirements

In identifying and listing the Eligible Meters that are to be opted in, the following conditions and requirements apply:

- A customer electing to opt back into LG&E’s DSM-EE programs must identify which Eligible Meters are to be opted in. Once opted in, the Eligible Meter will be eligible to participate in nonresidential DSM-EE programs and will be charged under the DSM Mechanism.
- Any customer that participates in a DSM-EE program with regard to an Eligible Meter, or opts out of and then subsequently opts back into the DSM Mechanism with regard to an Eligible Meter, will not be allowed to exercise an opt-out for that Eligible Meter for a period of three calendar years (i.e., 36 full billing cycles) after the Eligible Meter ceases participating in a DSM-EE program or opts back into the DSM Mechanism, whichever is later.

Exhibit REL-7

Customer Information and Certification Statement

Please provide account information exactly as it appears on your bill.

Account Number (12-digit)	Eligible Meter ID	Service Address (Street, City, Zip)	Applicable Rate (TODP, RTS, FLS, IGS, AAGS, SGSS, or FT)

By signing below, customer hereby certifies the following:

- Customer elects to opt into charges under the DSM Mechanism for the above-listed Eligible Meters and may participate in any of LG&E's nonresidential DSM-EE programs for such Eligible Meters.
- Customer has read, understands, and agrees to be bound by LG&E's Conditions and Requirements applicable to the Opt-In Notification Form.

Complete this section with information about the person who is authorized to make decisions concerning this form and the listed Eligible Meters.

First and Last Name (please print)
Title

Company Name (as it appears on your bill)
Phone No.

Mailing Address 1
Fax No.

Mailing Address 2
Email

City
State ZIP

Signature
Date

Exhibit REL-8

Demand-Side Management and Energy Efficiency

Industrial Opt-Out Notification Form

Purpose

This Industrial Opt-Out Notification Form is for use by industrial customers with meters eligible to opt out of Kentucky Utilities Company's ("KU") demand-side management and energy efficiency ("DSM-EE") programs in accordance with KRS 278.285(3), which provides:

> "The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual industrial customers with energy intensive processes to implement cost-effective energy efficiency measures in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs."

Customer meters that opt out of KU's DSM-EE programs will not be charged under KU's Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism"). Customer meters that are not eligible to opt out or that remain opted in will be charged under the DSM Mechanism and the facilities served by those meters will remain eligible to participate in the KU's DSM-EE programs.

Instructions

Please complete this form to notify KU if your eligible qualifying meter(s) will not participate in KU's DSM-EE programs.

Please return this form via one of the following methods:

Email: xxxxx@lge-ku.com

Mail: LG&E and KU Energy, LLC
Attn: Energy Efficiency Operations
220 W. Main St.
Louisville, KY 40202

For more information about KU's DSM-EE programs and opt-out process, please visit our website at lge-ku.com/programs/business.

Definitions

Demand-Side Management Cost Recovery Mechanism: Tariff adjustment clause KU uses to collect and recover costs associated with DSM-EE programs approved by the Kentucky Public Service Commission ("Commission").

Eligible Meter: A meter that meets the KU's definitions of Industrial and Energy Intensive, and for which cost-effective energy efficiency measures not subsidized by other customer classes have been implemented for the load served by the meter.

Industrial: A non-residential customer is industrial if it is engaged in activities primarily using electricity in a process or processes that involves either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. All meters serving such a customer are "Industrial."

Energy Intensive: Any customer meter served under Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), or Time-of-Day Primary Service (Rate TODP).

Conditions and Requirements

In identifying and listing the accounts that are to be opted out, the following conditions and requirements apply:

- A customer electing to opt out of KU's DSM-EE programs must identify which Eligible Meters are to be opted out. A customer who opts out an Eligible Meter will not be able to participate in any DSM-EE programs regarding that meter and will not be charged under the DSM Mechanism for service to that meter. All of a customer's meters not opted out will continue to be charged under the DSM Mechanism, including any Eligible Meters not opted out.
- By opting out, each Eligible Meter will not be charged the DSM Mechanism beginning no later than the second full billing cycle following customer's submission of this fully and accurately completed form to KU regarding that Eligible Meter. Opted-out Eligible Meters will not be able to participate in DSM-EE programs while opted out. An opted-out Eligible Meter will not be able to opt back into DSM Mechanism for at least 12 full billing cycles of being opted out.
- Eligible Meters that are opted out will remain opted out until the customer subsequently elects to opt back into the DSM Mechanism.
- Any customer that participates in a DSM-EE program with regard to an Eligible Meter, or opts out of and then subsequently opts back into the DSM Mechanism with regard to an Eligible Meter, will not be allowed to exercise an opt-out for that Eligible Meter for a period of three calendar years (i.e., 36 full billing cycles) after the Eligible Meter ceases participating in a DSM-EE program or opts back into the DSM Mechanism, whichever is later.
- KU may be required to provide the Commission with a list of all Eligible Meters that have opted out of participation.

Customer Information and Certification Statement

Please provide account information exactly as it appears on your bill.

Account Number (12-digit)	Eligible Meter ID	Service Address (Street, City, Zip)	Applicable Rate (TODP, RTS, or FLS)

By signing below, customer hereby certifies the following:

- Customer elects not to participate in any of KU's DSM-EE programs regarding the above-listed Eligible Meters.
- Customer is Industrial.
- Customer has implemented cost-effective energy-efficiency measures that are not subsidized by other customer classes for all loads served by the above-listed Eligible Meters.
- Customer has read, understands, and agrees to be bound by KU's Conditions and Requirements applicable to the Opt-Out Notification Form.

Complete this section with information about the person who is authorized to make decisions concerning this form and the listed Eligible Meter(s).

First and Last Name (please print)

Title

Company Name (as it appears on your bill)

Phone No.

Mailing Address 1

Fax No.

Mailing Address 2

Email

City

State ZIP

Signature

Date

Exhibit REL-9

Demand-Side Management and Energy Efficiency

Industrial Opt-Out Notification Form

Purpose

This Industrial Opt-Out Notification Form is for use by industrial customers with meters eligible to opt out of Louisville Gas and Electric Company's ("LG&E") demand-side management and energy efficiency ("DSM-EE") programs in accordance with KRS 278.285(3), which provides:

> "The commission shall assign the cost of demand-side management programs only to the class or classes of customers which benefit from the programs. The commission shall allow individual industrial customers with energy intensive processes to implement cost-effective energy efficiency measures in lieu of measures approved as part of the utility's demand-side management programs if the alternative measures by these customers are not subsidized by other customer classes. Such individual industrial customers shall not be assigned the cost of demand-side management programs."

Customer meters that opt out of LG&E's DSM-EE programs will not be charged under LG&E's Demand-Side Management Cost Recovery Mechanism ("DSM Mechanism"). Customer meters that are not eligible to opt out or that remain opted in will be charged under the DSM Mechanism and the facilities served by those meters will remain eligible to participate in the LG&E's DSM-EE programs.

Instructions

Please complete this form to notify LG&E if your eligible qualifying meter(s) will not participate in LG&E's DSM-EE programs.

Please return this form via one of the following methods:

Email: xxxxx@lge-ku.com

Mail: LG&E and KU Energy, LLC
Attn: Energy Efficiency Operations
220 W. Main St.
Louisville, KY 40202

For more information about LG&E's DSM-EE programs and opt-out process, please visit our website at lge-ku.com/programs/business.

Definitions

Demand-Side Management Cost Recovery Mechanism: Tariff adjustment clause LG&E uses to collect and recover costs associated with DSM-EE programs approved by the Kentucky Public Service Commission ("Commission").

Eligible Meter: A meter that meets the LG&E's definitions of Industrial and Energy Intensive, and for which cost-effective energy efficiency measures not subsidized by other customer classes have been implemented for the load served by the meter.

Industrial: A non-residential customer is industrial if it is engaged in activities primarily using electricity in a process or processes that involves either the extraction of raw materials from the earth or a change of raw or unfinished materials into another form or product. All meters serving such a customer are ″Industrial.″

Energy Intensive: Any electric customer meter served under Fluctuating Load Service (Rate FLS), Retail Transmission Service (Rate RTS), or Time-of-Day Primary Service (Rate TODP), or any gas customer meter served under Industrial Gas Service (Rate IGS), As-Available Gas Service (Rate AAGS), Substitute Gas Sales Service (Rate SGSS), or Firm Transportation Service (Rate FT).

Conditions and Requirements

In identifying and listing the accounts that are to be opted out, the following conditions and requirements apply:

- A customer electing to opt out of LG&E's DSM-EE programs must identify which Eligible Meters are to be opted out. A customer who opts out an Eligible Meter will not be able to participate in any DSM-EE programs regarding that meter and will not be charged under the DSM Mechanism for service to that meter. All of a customer's meters not opted out will continue to be charged under the DSM Mechanism, including any Eligible Meters not opted out.
- By opting out, each Eligible Meter will not be charged the DSM Mechanism beginning no later than the second full billing cycle following customer's submission of this fully and accurately completed form to LG&E regarding that Eligible Meter. Opted-out Eligible Meters will not be able to participate in DSM-EE programs while opted out. An opted-out Eligible Meter will not be able to opt back into DSM Mechanism for at least 12 full billing cycles of being opted out.
- Eligible Meters that are opted out will remain opted out until the customer subsequently elects to opt back into the DSM Mechanism.
- Any customer that participates in a DSM-EE program with regard to an Eligible Meter, or opts out of and then subsequently opts back into the DSM Mechanism with regard to an Eligible Meter, will not be allowed to exercise an opt-out for that Eligible Meter for a period of three calendar years (i.e., 36 full billing cycles) after the Eligible Meter ceases participating in a DSM-EE program or opts back into the DSM Mechanism, whichever is later.
- LG&E may be required to provide the Commission with a list of all Eligible Meters that have opted out of participation.

Exhibit REL-9

Customer Information and Certification Statement

Please provide account information exactly as it appears on your bill.

Account Number (12-digit)	Eligible Meter ID	Service Address (Street, City, Zip)	Applicable Rate (TODP, RTS, FLS, IGS, AAGS, SGSS, or FT)

By signing below, customer hereby certifies the following:

- Customer elects not to participate in any of LG&E's DSM-EE programs regarding the above-listed Eligible Meters.
- Customer is Industrial.
- Customer has implemented cost-effective energy-efficiency measures that are not subsidized by other customer classes for all loads served by the above-listed Eligible Meters.
- Customer has read, understands, and agrees to be bound by LG&E's Conditions and Requirements applicable to the Opt-Out Notification Form.

Complete this section with information about the person who is authorized to make decisions concerning this form and the listed Eligible Meter(s).

First and Last Name (please print)

Title

Company Name (as it appears on your bill)

Phone No.

Mailing Address 1

Fax No.

Mailing Address 2

Email

City

State ZIP

Signature

Date