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EVALUATION OF AMERENUE'S COMMERCIAL ENERGY AUDIT AND ENERGY EFFICIENCY IMPROVEMENT REBATE PROGRAM

Prepared for

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Executive Summary

The Commercial Energy Audit and Energy Efficiency Improvement Rebate Program is designed to encourage more effective utilization of electric energy through energy efficiency improvements in the building shell or though the replacement of inefficient electrical equipment with efficient electrical equipment. AmerenUE provides a rebate for a portion of the costs of an energy audit and related upgrades that improve the efficient use of electricity. (A detailed description is provided in Section II.)

This program was run as a pilot program between 2003 and 2006. Program accomplishments during the pilot period include:

- 42 applications with 31 of 42 projects completed: 29 high-efficiency lighting or lighting controls; 5 HVAC improvements or HVAC controls; 1 installation of variable speed drives (VSD) and chillers[1]
- Over $131,000 in rebates provided to customers, with 71% of program budget committed
- Additional non-energy benefits reported by participants, including brighter and cleaner lighting
- Self-reported estimates by participants of over 5,724 MWh in annual energy savings from program supported projects, with verification of nearly 1,000 MWh.

These program accomplishments are described further in Section III.

The amount of funding available to participants during this pilot was small (i.e., a maximum of $5,000 per customer). For participants, these funds increased communications and overall satisfaction with AmerenUE; but while appreciated by customers, for *most* customers, the small amount of funding from the AmerenUE program does not appear to increase the efficiency level of the projects—there were, however, a few participants who said that it did help justify the measures and/or speed up the timing of the upgrades.

During the pilot period, this program was undersubscribed, and most notably, did not result in the energy savings that could have been achieved with the available program funding since only 71% of the available budget was used or committed. Notably, it was also administered at a low cost by AmerenUE (and with AmerenUE kicking in for the cost of the administrative efforts). As such, program tracking was kept to a minimum. This approach is understandable given the low level of funding for the projects; however, the lack of project documentation does not allow for an impact analysis to be conducted. The evaluation team was unable to verify program savings or report on the cost effectiveness of this program.

We did, however, examine impacts for seven of the 31 projects completed through this program. These projects appear to be cost effective. (See Sections IV and VII.)

[1] This is according to the program spreadsheet although our review of the final rebate applications indicates that at least one project (an HVAC project) is mislabeled as a lighting project in the program spreadsheet.

Based on the findings from our evaluation efforts, AmerenUE and the Collaborative should consider the following process recommendations for future commercial programs:

- Increase marketing efforts to promote program awareness and increase future participation
- Change the rebate structure to support additional projects and encourage projects that would not otherwise be done, and review size requirements
- Require an ROI of over three years to reduce freeridership
- Reexamine the role of the audits
- Consider a more formal pre-application notification process that limits the reservation of funds, and a stated policy for extension of deadlines
- Increase administrative oversight and program tracking efforts
- Collect additional data to allow for an impact analysis (details included in Section V)
- Verify documentation, installation and persistence of measures
- Conduct future evaluation efforts closer to project implementation

While the pilot was valuable—allowing AmerenUE to gain experience with a commercial program, before rolling out a larger program—AmerenUE should revisit the project design and ensure that all necessary information is being tracked. Addition information on each of the recommendations listed above is provided in Section V.

I. Introduction and Methodology

The Commercial Energy Audit and Energy Efficiency Improvement Rebate Program is designed to encourage more effective utilization of electric energy through energy efficiency improvements in the building shell or though the replacement of inefficient electrical equipment with efficient electrical equipment. AmerenUE provides a rebate for a portion of the costs of an energy audit and related upgrades that improve the efficient use of electricity.

This pilot program started on October 1, 2003 and allowed participation of up to 25 companies per funding cycle with rebates of up to $5,000 per company. Two rounds of program funding occurred between October 2003 and December 2006, for a total budget of $250,000.

This evaluation report is based on (1) our review of the participant tracking spreadsheet and available applications or other hard copy documentation, (2) our review of program materials (i.e., a short program description and the program application forms), (3) in-depth interviews with the AmerenUE program administrator and program stakeholders, and (4) telephone interviews with program participants. In all, we interviewed 13 program participants representing a total of 20 individual projects, of which 18 had been completed at the time of our interviews.[2]

We attempted to reach all customers listed in the participant database. Table 1 below presents the interview status of all 42 projects that had some contact information listed in the program spreadsheet.

Table 1: Interviews Status

	Number of Customers	Number of Projects
Completed interview [a]	13	20
Could not identify correct telephone number	5	8
Did not return call after multiple attempts to contact	12	12
Dropped from program	2	2
Total	32	42

a. Three of the interviewees did not have sufficient time to complete the entire interview and only provided high-level feedback about the program.

Because of the small number of participants in this program, we would need to speak with approximately 70% of the customers in the database (22 of the 32 customers) to present quantitative findings with 90% confidence ± 10% error. Thus, our findings below should be considered to be qualitative findings.

[2] Three of the interviewees did not have sufficient time to complete the entire interview and only provided high-level feedback about the program. Most of the impact and process findings in Sections IV and V below are therefore based on the responses of ten program participants, of which eight had completed their projects.

II. Program Description

The Commercial Energy Audit and Energy Efficiency Improvement Rebate Program is an incentive program designed to encourage customers to replace inefficient energy consumption equipment or otherwise improve the energy efficiency of commercial facilities. The program started on October 1, 2003 and was run as a pilot program through the end of 2006.
During this pilot program, there were two rounds of funding. Each round of funding allowed for 25 projects with a maximum rebate amount of $5,000 per project. The maximum program funding was $125,000 per year, for a total program budget of $250,000.

Energy-efficient measures eligible for rebates include high-efficiency lighting, space and water heating equipment, central air conditioning, and other measures. The target market is small commercial companies in Missouri that are served by AmerenUE. The design documents indicate that larger companies would not benefit as much from this program because it has a relative small rebate (up to $5,000 per customer), but they are still eligible to participate. Individual residential homes and manufacturing facilities are not eligible to participate in the program.

Prospective program participants completed the Customer Enrollment Application, which requests general information about the applicant and their business, e.g., contact information, building type and structure, and prior energy conservation projects. Applications were screened to determine that the customer was an AmerenUE Missouri customer, and that there were still openings in the program. No information on anticipated energy savings measures was collected in the enrollment application (although estimated savings is usually provided on the final rebate application), and savings and ROI were not required.

According to the program materials, the program consists of three main components – an initial energy audit, a follow-up energy audit, and implementation of energy audit recommendations – although participants do not need to complete all three components to receive a rebate. These three program components are described below.

Initial Energy Audit: The initial audit is a high-level walk-through and audit of all the systems listed under AmerenUE's standard energy audit.[3] Although the audit step is required to be in the program, there is no required forms to fill out unless the customer is requesting reimbursement. (Notably, only one participant received a rebate for the initial audit according to the program tracking spreadsheet.) Auditors usually submitted some form of paperwork (at times an invoice, other times a more detailed audit report.) According to the design documents, the initial audit is intended to identify potential cost-effective improvements and energy savings measures but the extent of this audit is not specified. AmerenUE makes available a list of approved Energy Auditor (EA) firms, but participants are not required to use a contractor from this list. The program provides a rebate of 50% of the cost of the initial energy audit, up to $500. In many cases, however, the contractors do not separately charge for the audit if they are also hired to implement the energy saving measures.

[3] This includes general building construction, heating and cooling systems, water heating system, refrigeration equipment, indoor and outdoor lighting, cooking equipment, office equipment, laundry equipment, hot tubs, spas, and swimming pools, elevators and escalators, interval usage data, and operations and maintenance procedures.

Follow-up Energy Audit: The follow-up audit is a detailed on-site audit of the systems identified as areas of potential energy savings during the initial audit. In this audit, which is not required to receive the implementation rebate, the auditor calculates specific energy savings from potential measures as well as the predicted potential total energy savings and the associated Return on Investments (ROI). Recommendations of energy saving measures are outlined in a report for the customer. According to the design document, AmerenUE would then review the recommendations to verify applicability to the program. After the follow-up energy audit is performed, the remaining 50% of the initial audit cost, up to another $500, is credited to the customer. It should be noted that none of the projects enrolled in the pilot program had a follow-up audit performed (so the follow-up audit component is by design, not in practice).

Implementation of Energy Audit Recommendations: The customer has 18 months from the application date to complete some or all audit recommendations. Once energy efficiency measures have been implemented, the customer completes the two-page "Application for Commercial Energy Audit & Energy Efficiency Rebate Program" which asks for the date complete, the annual kWh savings, the associated costs and ROI (estimated by the contractor) and submits this form to AmerenUE with documentation of project completion (generally an invoice). The AmerenUE program administrator verifies that the customer has the correct paperwork and then sends the application to AmerenUE's accounting department to offer the customer a rebate of 33% of the costs of the upgrades, up to a total of $5,000 (minus the previous audit credits, if any). Interactions between the customer and the program administrator are minimal. While the current pilot program does not require a specific ROI for participation, it is anticipated that future program revisions will require an ROI of greater than three years.
AmerenUE conducted minimal proactive promotional campaigns for this program given the minimal funds available during the pilot period. According to the program materials, promotional activities included:

- Press release at the beginning of the program.
- Description of the program on the Products and Services page in the Your Business section of www.ameren.com.[4]
- Description of the program to customers who could benefit from this program during routine discussions in the field and call center, and to customers requesting information about the program.

[4] This is believed to have been short and brief since the program was only available to 25 customers each round. No large scale marketing was done. Design documents indicate that messages would be available on the AmerenUE bills, but this was never done due to the limited availability of funding.

III. Program Accomplishments

Based on our findings, program accomplishments during the pilot period include:

- 42 applications with 31 of 42 projects completed: 29 high-efficiency lighting or lighting controls; 5 HVAC improvements or HVAC controls; 1 installation of variable speed drives (VSD) and chillers[5]
- Over $131,000 in rebates provided to customers, with 71% of program budget committed
- Non-energy benefits including brighter and cleaner lighting
- Self-reported estimates by contractors of over 5,724 MWh in annual energy savings from program supported projects, with nearly 1,000 MWhs verified through evaluation efforts.

These accomplishments are described in more detail below.

Thirty-One of 42 Projects Completed

Since the inception of the pilot program in October 2003, 42 individual projects have been initiated (of 50 possible spots) and 31 projects have been completed. In the first year, the program allowed for the same customer to submit multiple projects, so in all, these 31 projects were completed by 21 customers. (Note that this was changed in subsequent years so that each customer could only receive one rebate.)

Table 2 below presents a summary of the projects for the two funding cycles, 2003 and 2004, and for the overall program to-date.[6]

Table 2: Summary of Projects

	Round 1	Round 2	Total
Application Date	10/27/03 to 10/06/05	10/06/05 to 06/26/06	10/27/03 to 06/26/06
Date Implementation Completed	12/13/03 to 03/29/06	10/30/05 to 09/30/06	12/13/03 to 09/30/06
Number Initiated	25	17	42
(Unique Customers)	(15)	(17)	(32)
Number Completed as of March 2007	23	8	31
(Unique Customers)	(13)	(8)	(21)
Projects Started But Not Completed	-	9	9
Projects Dropped	1	1	2
Percent Completed	92%	47%	74%

The majority of the 31 completed projects are lighting projects, with a few other types, including HVAC, VSD, and chiller projects. All completed projects had an initial audit but only one was funded through the program; none had a follow-up audit.

[5] This is according to the program spreadsheet although our review of the final rebate applications indicates that at least one project (an HVAC project) is mislabeled as a lighting project in the program spreadsheet.
[6] The tables in this section include program information as of March 2007.

Table 3: Completed Projects Including Various Measures

Measures	Round 1	Round 2	Total
Total Number of Completed Projects	**23**	**8**	**31**
By Measure (some projects had multiple measures)			
Lighting / Lighting Controls[a]	22	7	29
HVAC / HVAC Controls	4	1	5
VSDs	-	1	1
Chillers	-	1	1
Initial Energy Audit	23	8	31
Initial Energy Audit Funded Through the Program	-	1	-
Follow-Up Energy Audit	-	-	-

a. Lighting controls include occupancy sensors; HVAC controls include DDC Controls, programmable T-stats, and thermostat controls for ceiling fans.

During in-depth interviews, three customers indicated that the AmerenUE program affected the timing of their project (moving it up), or that the program affected the efficiency level. Three others said that they "might or might not" have done the project without the AmerenUE funding. Many customers, however, (7 of 13) reported that while very satisfied with the program, they would have made the changes anyway. In all, four of 13 interviewees indicated that the incentive was very important in their decision to install the upgrade.

Over $131,000 In Rebates Given, With 71% of Budget Committed

AmerenUE provided a total of $131,000 in rebates, representing about 53% of the program budget, with an average rebate amount of $4,528 per project. In addition, up to $45,000 in additional rebates are earmarked for the nine projects that have been started but not completed (as of March 2007). If these rebates are given out in full, program rebates would total $176,000, or 71% of the program budget. Only one of the 31 completed projects requested a rebate for audit costs.

Total implementation costs for the completed projects by participants have totaled almost $5 million;[7] thus the AmerenUE rebates represent only 2.6% of the total funds for these projects (or 8% of total funds after removing one outlier). According to customers, the average ROI period, before the rebate, was 4.5 years, with 11 completed projects having an ROI of three years or less and 18 completed projects having an ROI of greater than three years.[8]

[7] Note that one project with a recorded implementation cost of $3.3 million accounts for 66% of total project costs.
[8] Note that two of the completed projects were missing ROI information in the database.

Table 4: Summary of Program Rebates and Funding

	Round 1	Round 2	Total
Total Rebates Available	$125,000	$125,000	$250,000
Rebates Provided	$109,309	$22,000	$131,309
Percent Rebates Used	87%	18%	53%
Average Rebate Amount	$4,753	$3,667	$4,528
Total Implementation Cost	$4,732,674	$223,232	$4,955,906
Average ROI	4.7	3.1	4.5
Number with ROI ≤ 3 years	7	4	11
Number with ROI > 3 years	16	2	18

Non-energy Benefits Including Brighter Cleaner Lighting

Through in-depth interviews with 13 participants, several participants indicated that the program-supported lighting improved the conditions of those in the space. Respondents (including the National Guard) frequently mentioned brighter, cleaner lighting as one non-energy benefit from the AmerenUE supported projects.

Over 5,724 MWhs in Annual Energy Savings from Program Supported Projects

While documentation was not available to conduct an impact assessment for this program (see detailed write-up below), participants were asked to provide estimates of annual kWh savings on the final rebate applications. The AmerenUE program spreadsheet estimates that the 31 completed projects account for annual energy savings of over 5,724 MWh. Nearly 1,000 MWhs of this was verified through our analysis. (See Section VII.) This program has the ability to result in a large amount of energy savings for AmerenUE and the Collaborative—more than nearly every other program in the portfolio besides the residential lighting program.

IV. Impacts

Over the pilot period, this program was administered in-house, at a low cost. As such, program tracking was kept to a minimum (as were administrative costs). This approach is understandable given the low level of funding for the projects; however, the lack of project documentation did not allow for an impact analysis to be conducted. Thus, we are unable to report total program savings or the cost effectiveness of this program.

We did, however, examine impacts for seven of the 31 projects that were supported with program funds (see table below). This included five lighting projects and two HVAC projects. Savings for the lighting projects ranged from 73,000 kWh to 258,000 kWh, while savings from the two HVAC projects were 44,192 and 275,000 kWh. Only one of the HVAC projects resulted in gas savings. (See table below.)

The total savings from these seven projects was approximately 1,000 MWh, and all seven were determined to be cost-effective. (See Section VII.) While we did not have enough information to extrapolate to the program as a whole (given the wide range of projects), these seven projects represent 23% of all completed projects.

Table 5: Savings from Seven Projects

	Project Type	Electricity Savings (kWh)	Gas Savings (therms)	Demand Reduction (KW)
Missouri Lutheran Synod—St. Louis	HVAC	275,949	--	70
WalMart—Ferguson	Lighting	258,546	-490	47.4
WalMart—Caruthersville	Lighting	148,477	-304	29.3
WalMart—Owensville	Lighting	108,354	-248	23.7
St. Anthony's—St. Louis	Lighting	74,460	--	20.4
Clean Uniform—O'Fallon	Lighting	73,251	--	23.5
Capitol Plaza Hotel--Jefferson	HVAC	42,192	1,044	24.7
TOTAL FOR 7 PROJECTS		981,229 kWh		

Through in-depth interviews with 13 participants, we also found that all measures are still installed (i.e., in-service rate appears to be 100%). Three of 13 participants indicated that the project resulted in increases in the use of the equipment (i.e., snapback). No spillover was reported by those interviewed.

Recommendations for data tracking, to allow for future impact evaluations, are provided in the process findings section below.

V. Process Findings and Recommendations

The Commercial Energy Audit and Energy Efficiency Improvement Rebate Program was undersubscribed during the pilot period, and most notably, did not result in the energy savings that could have been achieved with the available program funding since only 71% of the budget was used or committed during the pilot period.

Overall, however, there was a high level of satisfaction among the customers who enrolled in the pilot program. The interviewed participants found both the application and the rebate process to be very easy and thought that AmerenUE provided all the program information they needed. Some also mentioned that the AmerenUE program contact was helpful in guiding them through the process. None of the interviewed participants indicated having any problems with either the application or rebate process. Several interviewees indicated that the application process was "very easy" and that the AmerenUE contact person had been very helpful. One participant mentioned that the online application process was helpful. Participants were also highly satisfied with the new products they installed. The pilot Commercial Energy Audit and Energy Efficiency Improvement Rebate Program was clearly very popular with the interviewed program participants, and interviewees had very little criticism about any aspects of the program.

Based on our process related findings, AmerenUE and the Collaborative should consider the following recommendations for future programs:

- **Increase marketing efforts to promote program awareness and increase future participation**

  As mentioned above, this program was undersubscribed. During the pilot period, the program enrolled 42 of 50 possible projects. So far, proactive promotional campaigns for this program have been kept to a minimum, partially because the program was still in its pilot phase and was only available to Ameren's Missouri customers. The limited approach to marketing might have contributed to the under-subscription to the program in its second round of funding (only 17 of 25 potential projects were initiated).

  Going forward, we recommend increasing marketing efforts to encourage more participation in this program (assuming that the program grows). Because this program currently targets small commercial customers (who most likely do not have account representatives), AmerenUE should consider proactively reaching out to targeted customers, either on a one-on-one basis or through a contractor network. Notably, through in-depth interviews, participants in the pilot program reported learning about the program through a variety of sources, including contractors, Ameren's website, and by directly contacting AmerenUE to inquire about available incentives.
  We also recommend searching for a way to expand the program to Illinois customers if at all possible.

- **Consider changing the rebate structure to support additional projects and encourage projects that would not otherwise be done, and review size requirements**

  Interviewed participants were generally satisfied with the level of program incentives. For many (7 of 13), however, their satisfaction appears to be, in part, because they would

have implemented the program anyway, so the rebate was viewed as a bonus on top of the already expected energy savings.[9]

Only one interviewee, an energy auditor speaking on behalf of one customer, indicated that the rebate amounts should be much larger. This participant stated, "*because [the rebate] was a set amount…it didn't really incentivize them to do a much larger piece."*

Although only one of the participants that we spoke with mentioned increasing the rebate levels, AmerenUE may want to consider changing the rebate structure to help encourage additional energy efficiency upgrades. For example, removing the maximum funding level and/or providing rebate amounts that adjust based on total square footage may help to increase the number of participants and the number of energy efficiency projects that would not have otherwise occurred. Changing the rebate structure to offer assistance to customers considering larger projects, or with longer ROIs, can help increase participation in the future. However, this decision should be made in the context of understanding the size of participating customers. According to the program design, this program is intended for small customers; however, of 33 applications that were submitted with sq. footage information, 12 were for small spaces (<25,000 sq feet), 14 were for medium sized spaces (25,001 to 100,000 sq. ft), and seven were for larger spaces over 100,000 square feet (with the largest being for a 767,000 square foot space). If many of the current participants are large customers, it may be that the incentives are right for smaller customers, and that the size requirements should be reviewed.

Twenty of the 29 customers with available rebate information used the full $5,000 rebate. For these 20 customers, the average as well as the median rebate amount was 15% of implementation cost. There were, however, nine customers who used less than $5,000 because their rebate was capped at 33% of implementation costs.

Based on the participants interviews that we conducted, there doesn't appear to be any spillover as a result of the program since the funding was so limited that for many participants it did not have a huge affect on decisionmaking.

- **Require an ROI of over three years**

  Based on our research, we support AmerenUE's planned program modification to restrict participation to projects with an estimated ROI of more than three years. Of the 29 projects that had estimated ROIs, 11 had an ROI of less than three years and 18 had an ROI of more than three years. Many participants indicated that they would have implemented the project without the rebate because the energy savings alone were worth the additional capital outlays. By restricting participation to projects with estimated ROIs of more than three years, program funds could be better targeted to energy saving measures that would not be implemented without the program.

[9] Seven of the 10 interviewees who completed the entire interview indicated that they definitely or probably would have done the project even without the rebate; only three indicated that they might or might not have done the project without the rebate. However, an additional three interviewees indicated that the project definitely or probably would not have been done to the same level of efficiency. Four of 13 interviewees indicated that the incentive was very important in their decision to install the upgrade.

- **Reconsider the role of the audit**

  The program currently consists of three program components – two of which are energy audits. Only one participant, however, appears to have used the funding for an initial audit (although all included an initial audit date in the program database.) Moreover, there were not stated requirements for the audits, and the documentation (and nature) of these audits varied widely. It is unclear whether this initial audit is just a formality. Participants did not indicate much value in an audit. Moreover, the follow-up audit was not used at all. This may be due to the limited amount of funding (i.e., all funds were necessary for the measures). AmerenUE should consider why the program currently includes the promotion of energy audits, (i.e., are they just for the sake of getting an audit done or is the goal to increase energy savings from these audits), and then determine whether they are serving their intended purpose. If the audit component is kept, AmerenUE may want to consider setting priorities and detailing the calculation that are required to be done (as well as what factors should go into these calculations, for example, how to calculate ROI and whether savings from accompanying maintenance efforts should also be included).

- **Consider a more formal pre-application notification process that limits the reservation of funds and a stated policy for extension of deadlines**

  The program spreadsheet demonstrates that projects stretched out over a long period of time. During the 2003 funding period (Round 1 of funding), program applications were accepted from 10/27/03 until 10/06/05 – almost a two-year period. The enrollment time for the 2004 funding period (Round 2) was considerably shorter – 10/06/05 through 06/26/06, but only 17 of 25 potential projects were enrolled. As a result of the long enrollment period, nine projects still have not been completed, one from the first period and eight from the second period.

  All of the program spaces were also not filled. It appears that initial enrollment might have been slowed down by an informal reservation policy where AmerenUE reserved program funds based on an initial indication of interest from customers. In some cases, customers did not submit an application until 2005 after expressing initial interest in 2003. Because of the limited effort on oversight, the program administrator was also not able to follow-up with customers as much as would be necessary to understand whether the projects are going to be completed or not. (That is, some dropped out at various stages after the initial contact with AmerenUE, leading to an undersubscription since the program administrator thought that all of the spaces were filled.)

  A pre-application notification process is common in similar programs. However, due to the limited effort to promote this program, it appears that the reservation of funds ultimately led to reduced savings for this program. For future programs, AmerenUE should consider a more formal pre-application notification process that limits the reservation of funds and provides a deadline in the event that a formal application is not submitted.

The program also includes two official deadlines: A 60-day deadline to conduct the initial audit after submitting the application, and an 18-month deadline to implement the energy saving measures.[10]

All interviewees considered the program schedule and deadlines reasonable. Except for one interviewee, who admitted to having gotten a very late start, none of the interviewees had any problems meeting the 18-month implementation schedule. The interviewee with the late start had not contacted AmerenUE about an extension to the 18-month deadline. We recommend formalizing a policy for providing extensions to the program deadlines, if such a policy does not already exist. This would provide additional clarity and certainty for program participants.

- **Increase administrative oversight and program tracking efforts**

  In its pilot form, the program costs are minimal because the program is implemented by AmerenUE and the majority of their efforts are spent "just tracking" a limited number of projects. If this program grows, however, AmerenUE should consider additional staff (or outsourcing this effort) to increase marketing, oversight, and verification of the projects, as well as program tracking.

  Currently, program tracking is limited to an application form, inconsistent documentation of the initial audit report, a final rebate application, and various forms of implementation documentation including project descriptions and hard copies of contractor invoices. Key information is compiled in a one-page Excel spreadsheet, and other information was inconsistently available in hard-copy from AmerenUE.

  As the program grows, we recommend formalizing the program tracking process. For example, we recommend developing a final rebate application form that would require the customer to provide all the information of interest. This should include the size of the facility, number of units installed, what was replaced, name and contact information for both the participants and the contractor, and whether the contractor is approved by AmerenUE.

  In addition, we suggest modifying the Excel tracking spreadsheet. Our key observations with respect to the spreadsheet include:
  - Some of the described projects do not match applications
  - Contact information is not always correct and does not always match final rebate applications
  - Many projects are missing either kWh savings or monetary savings due to the project
  - A lot of the projects that have kWh savings and monetary savings list the same value for both.
  - It is not clear how the ROI is derived:
    - For some projects, ROI equals Implementation Cost/Annual Savings

[10] The requirement to complete the initial audit within 60 days of application is gleaned from the in-depth interview with the program administrator, who indicated that participants who do not meet this deadline are dropped from the program. We did not see this requirement in any other program information and recommend formalizing this policy, if it has not already been done.

  - For some projects, ROI is a hard-entered (undocumented) value
  - For some projects, ROI is linked to a file we do not have
  - For one project (2004, #11), it is linked to a blank cell in the spreadsheet
  - Some ROIs are expressed as ranges
- Two projects (2004, #14 and #15) were completed but the database has no rebate amounts.
- 2004 project #15 is also missing implementation date and cost, savings, and ROI.
- Several projects (4) list an "unknown" auditor.
- The annual totals for 2003 (row 31) omit projects #24 and #25.

The project tracking spreadsheet should be amended to include key information from the application (such as the size of the facility and business type), as well as details on what supporting hard copy information has been turned in by the customer (or alternatively, this information should be kept as electronic files.)

We also recommend tracking contact information for both customers and auditors. Six of the 42 initiated projects only list an energy auditor as a contact person. In our interviews, we encountered limitations with respect to the type of information auditors had available. Going forward, we recommend tracking contact information for both the customer and the contractor. This will facilitate any future follow-up and/or information collection.

- **Collect additional data to allow for impact analysis**

There was a wide range of supporting documentation for the projects completed by the customers who participated in the Commercial Audit Program. Some of the documentation, such as the lighting project documentation for the Wal-Mart stores was complete and very detailed, but in many cases there was either no documentation associated with a project, or the documentation was incomplete. In order to complete an impact evaluation on a project, it is essential to review engineering calculations or building simulation model information that includes model inputs and which clearly state which variables in the calculation are assumed and which were either measured or based on nameplate information. Ideally, the information would include a spreadsheet in which calculations are contained within the cells, but alternately, a text document that details the calculations completed would also be adequate. Specific minimum information requirements based on end use is described below.

Lighting Projects

- Quantities of existing fixtures
- Specifications of existing fixtures, including number of bulbs per fixture, and fixture wattage
- Assumed or measured operating hours for the existing fixtures
- Baseline annual energy use and peak demand
- Quantities of replacement fixtures
- Specifications of replacement fixtures, including number of bulbs per fixture, and fixture wattage
- Assumed or measured operating hours for the replacement fixtures

- Proposed annual energy use and peak demand
- Annual energy savings and peak demand reduction
- Model numbers of existing and replacement bulb types would also ideally be included
- Detailed invoice matching the quantities and specifications used in the calculations

HVAC or Motor Projects

- Quantities of existing equipment
- Specifications of existing equipment, including model number, age, capacity, estimated efficiency, and part-loading assumptions
- Assumed or measured operating hours for the existing fixtures, which may include equivalent full load heating or cooling hours, hourly bin data, etc.
- Baseline annual energy use and peak demand
- Quantities of replacement equipment
- Specifications of replacement equipment, including model number, capacity, and estimated efficiency, and part-loading assumptions
- Assumed or measured operating hours for the replacement fixtures
- Proposed annual energy use and peak demand
- Annual energy savings and peak demand reduction
- Detailed invoice matching the quantities and specifications used in the calculations

- **Verify documentation, installation and persistence of measures**

  Currently, there does not appear to be any verification of measure installations, and very limited efforts are made to review or question project documentation. Moreover, contractors are not required to be AmerenUE approved contractors. As this program grows, additional efforts should be made to verify the installation of funded measures and the savings from these measures. Generally, this role is conducted by the program administrator or third party evaluator.

- **Conduct evaluation effort closer to project implementation**

  Several of the respondents to our survey indicated that they could not remember the details of the project, while other project contacts listed in the database were no longer at the company, or could not be tracked down because of outdated contact information. As such, we recommend that future process evaluation efforts be conducted during the program cycle to help gather immediate feedback to guide the program and ensure that all necessary data is collected.

Overall, the current program design documents do not appear to match the overall process for what is occurring. While the pilot was valuable by allowing AmerenUE to gain experience with a commercial program, before rolling out a larger program, AmerenUE should revisit the project design and ensure that all necessary information is being tracked.

VI. Firmographics and Other Detailed Information from Evaluation

Key firm/facility characteristics of the 10 program participants who completed the entire in-depth interview:

- Eight of ten facilities use natural gas as their primary fuel.
- Nine of the ten interviewees have less than 300 employees at the upgraded location; three have less than 50.
- Seven of ten facilities are between 10 and 30 years of age.
- One of ten facilities renovated less than 25,000 square feet of space; four facilities renovated 100,000 square feet or more.

Additional information was not available in the program spreadsheet.

VII. Detailed Impact and Cost-Effectiveness Analyses

This section includes our detailed analyses on seven of the 31 projects completed through AmerenUE's Commercial Energy Audit and Energy Efficiency Improvement Program.

Wal-Mart – Caruthersville, MO

The Wal-Mart in Caruthersville, MO completed a lighting retrofit project in March 2004, primarily involving replacement of eight-foot, two-lamp, T12 fixtures (123 Watts per fixture) with four-foot, two-lamp, high ballast factor T8 fixtures (79 Watts per fixture). The project sponsor was American Light, and engineering calculations were presumably completed by American Light.

Gross Savings Calculation

The calculations were thorough and detailed, listing existing and replacement fixture types by the area of the store. 5,054 annual operating hours were assumed for the light fixtures. This is reasonable given the 7 AM to 10 PM operating hours for the store. Part of the calculation estimated interactive cooling savings resulting from the lower wattage fixtures. This also appears to be reasonable, however no supporting calculations were provided. In order to check the interactive cooling savings claimed, we assumed that 30% of lighting wattage affected the occupied space of the store and a rooftop unit cooling efficiency of 1.2 KW/ton. Approximate cooling hours of 2,620 hours were derived from the savings and peak reduction provided by the contractor, and these appear to be reasonable for a large building in this climate. Total annual savings claimed by the contractor were 148,477 KWh and a peak demand reduction of 29.3 KW, resulting in annual cost savings of $8,949. It is likely that there would be a slight heating penalty because of the reduced wattage of the light fixtures, but this was not factored into the contractor's savings analysis. In order to estimate heating penalty, we assumed that 30% of the lighting wattage affected the space as heat load, a heating efficiency of 90%, and 1,000 hours of heating, assuming that significant internal heat generation is typical in large buildings. As a result, we estimated an additional annual heating requirement of 303 Therms of natural gas as a result of the fixture retrofit. These results are summarized in Section VII Table D-1 below.

Section VII Table D-1: Wal-Mart Caruthersville, MO

Measure type	Peak KW reduction	Annual electric savings (KWh)	Annual gas savings (Therms)	Total annual savings ($)
Claimed Lighting	26.6	141,477	0	$8,523
Claimed interactive cooling	2.7	7,074	0	$ 426
Claimed interactive heating	0	0	0	0
Total claimed savings	29.3	148,551	0	$8,949
Adjusted Lighting	26.6	141,477	0	$8,523
Adjusted interactive cooling	2.7	7,074	0	$ 426
Adjusted interactive heating	0	0	-303	-$ 242
Total adjusted savings	29.3	148,477	-303	$8,707

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 148,477 KWh and -304 Therms of gas, and a peak demand reduction of 29.3 KW.

Cost Effectiveness

Section VII Table D-2 shows the cost effectiveness of the Caruthersville Wal-Mart project. FEMP UPV Discount Factors for commercial electricity and natural gas for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 7.0 years for lighting measures was assumed, so an effective life of 7.0 years was used in determining the appropriate commercial discount factors.

Section VII Table D-2: Caruthersville Wal-Mart Cost Effectiveness

Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
$32,218	$8,707	7.0	$52,378	1.6

Wal-Mart – Owensville, MO

The Wal-Mart in Owensville, MO completed a lighting retrofit project in March 2004, primarily involving replacement of eight-foot, two-lamp, T12 fixtures (123 Watts per fixture) with four-foot, two-lamp, high ballast factor T8 fixtures (79 Watts per fixture). The project sponsor was American Light, and engineering calculations were presumably completed by American Light.

Gross Savings Calculation

The calculations were thorough and detailed, listing existing and replacement fixture types by the area of the store. 5,054 annual operating hours were assumed for the light fixtures. This is reasonable given the 7 AM to 10 PM operating hours for the store. Part of the calculation estimated interactive cooling savings resulting from the lower wattage fixtures. This also appears to be reasonable, however no supporting calculations were provided. In order to check the interactive cooling savings claimed, we assumed that 30% of lighting wattage affected the occupied space of the store and a rooftop unit cooling efficiency of 1.2 KW/ton. Approximate cooling hours of 2,620 hours were derived from the savings and peak reduction provided by the contractor, and these appear to be reasonable for a large building in this climate. Total annual savings claimed by the contractor were 108,354 KWh and a peak demand reduction of 21.6 KW, resulting in annual cost savings of $8,949. It is likely that there would be a slight heating penalty because of the reduced wattage of the light fixtures, but this was not factored into the contractor's savings analysis. In order to estimate heating penalty, we assumed that 30% of the lighting wattage affected the space as heat load, a heating efficiency of 90%, and 1,000 hours of heating, assuming that significant internal heat generation is typical in large buildings. As a result, we estimated an additional annual heating requirement of 246 Therms of natural gas as a result of the fixture retrofit. These results are summarized in Section VII Table D-3 below.

Section VII Table D-3: Wal-Mart Owensville, MO

Measure type	Peak KW reduction	Annual electric savings (KWh)	Annual gas savings (Therms)	Total annual savings ($)
Claimed Lighting	21.6	103,194	0	$6,192
Claimed interactive cooling	2.1	5,160	0	$ 310
Claimed interactive heating	0	0	0	0
Total claimed savings	23.7	108,354	0	$6,502
Adjusted Lighting	21.6	103,194	0	$6,192
Adjusted interactive cooling	2.1	5,160	0	$ 310
Adjusted interactive heating	0	0	-246	-$ 197
Total adjusted savings	23.7	108,354	-246	$6,305

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 108,354 KWh and -246 Therms of gas, and a peak demand reduction of 23.7 KW.

Cost Effectiveness

Section VII Table D-4 shows the cost effectiveness of the Owensville Wal-Mart project. FEMP UPV Discount Factors for commercial electricity and natural gas for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 7.0 years for lighting measures was assumed, so an effective life of 7.0 years was used in determining the appropriate commercial discount factors.

Section VII Table D-4: Owensville Wal-Mart Cost Effectiveness

Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
$23,407	$6,305	7.0	$37,941	1.6

Wal-Mart – Ferguson, MO

The Wal-Mart in Ferguson, MO completed a lighting retrofit project in March 2004, primarily involving replacement of eight-foot, two-lamp, T12 fixtures (123 Watts per fixture) with four-foot, two-lamp, high ballast factor T8 fixtures (79 Watts per fixture). The project sponsor was American Light, and engineering calculations were presumably completed by American Light.

Gross Savings Calculation

The calculations were thorough and detailed, listing existing and replacement fixture types by the area of the store. 5,054 annual operating hours were assumed for the light fixtures. This is reasonable given the 7 AM to 10 PM operating hours for the store. Part of the calculation estimated interactive cooling savings resulting from the lower wattage fixtures. This also appears to be reasonable, however no supporting calculations were provided. In order to check the interactive cooling savings claimed, we assumed that 30% of lighting wattage affected the occupied space of the store and a rooftop unit cooling efficiency of 1.2 KW/ton. Approximate

cooling hours of 2,620 hours were derived from the savings and peak reduction provided by the contractor, and these appear to be reasonable for a large building in this climate. Total annual savings claimed by the contractor were 258,546 KWh and a peak demand reduction of 47.4 KW, resulting in annual cost savings of $15,504. It is likely that there would be a slight heating penalty because of the reduced wattage of the light fixtures, but this was not factored into the contractor's savings analysis. In order to estimate heating penalty, we assumed that 30% of the lighting wattage affected the space as heat load, a heating efficiency of 90%, and 1,000 hours of heating, assuming that significant internal heat generation is typical in large buildings. As a result, we estimated an additional annual heating requirement of 490 Therms of natural gas as a result of the fixture retrofit. These results are summarized in Section VII Table D-5 below.

Section VII Table D-5: Wal-Mart Ferguson, MO

Measure type	Peak KW reduction	Annual electric savings (KWh)	Annual gas savings (Therms)	Total annual savings ($)
Claimed Lighting	43.1	246,234	0	$14,766
Claimed interactive cooling	4.3	12,312	0	$ 738
Claimed interactive heating	0	0	0	0
Total claimed savings	47.4	258,546	0	$15,504
Adjusted Lighting	43.1	246,234	0	$14,766
Adjusted interactive cooling	4.3	12,312	0	$ 738
Adjusted interactive heating	0	0	-490	-$ 392
Total adjusted savings	47.4	258,546	-490	$15,112

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 258,546 KWh and -490 Therms of gas, and a peak demand reduction of 47.4 KW.

Cost Effectiveness

Section VII Table D-6 shows the cost effectiveness of the Ferguson Wal-Mart project. FEMP UPV Discount Factors for commercial electricity and natural gas for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 7.0 years for lighting measures was assumed, so an effective life of 7.0 years was used in determining the appropriate commercial discount factors.

Section VII Table D-6: Ferguson Wal-Mart Cost Effectiveness

Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
$48,063	$15,112	7.0	$90,905	1.9

Clean Uniform Company – O'Fallon, Missouri

Clean Uniform Company in O'Fallon, MO completed a lighting retrofit project in 2006, involving replacement of various fixtures with T8 lighting systems. The project sponsor was Budget Lighting Inc, and engineering calculations were presumably completed by Budget Lighting Inc.

Gross Savings Calculation

The calculations were thorough and detailed, listing existing and replacement fixture types by the area of the store. 3,120 annual operating hours were assumed for the light fixtures. This is reasonable given a ten hour operating time for the store, six days a week. The results are summarized in Section VII Table D-7 below.

Section VII Table D-7: Clean Uniform Co. – O'Fallon, MO

Measure type	Peak KW reduction	Annual electric savings (KWh)	Total annual savings ($)
Claimed Lighting	23.5	73,251	$9,377
Adjusted Lighting	23.5	73,251	$9,377
Total adjusted savings	23.5	73,251	$9,377

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 73,251 KWh and a peak demand reduction of 23.5 KW.

Cost Effectiveness

Section VII Table D-8 shows the cost effectiveness of the Clean Uniform Company project. FEMP UPV Discount Factors for commercial electricity in Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 7.0 years for lighting measures was assumed, so an effective life of 7.0 years was used in determining the appropriate commercial discount factors.

Budget Lighting Inc used a 2% annual increase rate and 20 year life of the lighting to determine the lifetime savings. The higher life of the lights is what caused their lifetime savings values to be considerably high.

Section VII Table D-8: Clean Uniform Company Cost Effectiveness

	Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
Claimed	$16,130	$5,860	20.0	$103,299	N/A
Adjusted	$16,130	$5,860	7.0	$35,161	2.2

Capitol Plaza Hotel – Jefferson City, Missouri

Capitol Plaza Hotel in Jefferson City, MO, completed a kitchen remodeling project and HVAC replacement in February 2006. The HVAC replacement included installing four new Armstrong rooftop units. No information on the chiller refurbishing was provided and there was insufficient data on the kitchen upgrade so no savings calculations could be done by ODC/GDS.

Gross Savings Calculation

Calculations for the Capitol Plaza Hotel energy savings were not available, but an engineering calculation based on estimated efficiencies for the existing and new units and weather data for St. Louis indicated that the savings for the main rooftop unit project were reasonable. The annual cost savings were reported for electric and natural gas savings, only. The results are summarized in Section VII Table D-9 below.

Section VII Table D-9: Capitol Plaza Hotel – Jefferson City, MO

Measure type	Peak KW Reduction	Annual Electric Savings (KWh)	Annual Natural Gas Savings (therms)	Total Annual Savings ($)
Claimed HVAC	N/A	N/A	N/A	$3,500
Adjusted HVAC	24.7	42,192	1,044	$3,576

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 42,192 KWh, 1,044 therms and a peak demand reduction of 24.7 KW.

Cost Effectiveness

Section VII Table D-10 shows the cost effectiveness of the Capitol Plaza Hotel project. FEMP UPV Discount Factors for commercial electricity in Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 15.0 years for the rooftop units was assumed, so an effective life of 15.0 years was used in determining the appropriate commercial discount factors.

Section VII Table D-10: Capitol Plaza Hotel Cost Effectiveness

	Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
Claimed	$57,000	$3,500	N/A	N/A	N/A
Adjusted	$57,000	$3,576	15.0	$20,848	0.4

Missouri Lutheran Synod – St. Louis, MO

The Missouri Lutheran Synod in St. Louis, MO completed an air handling unit upgrade and chiller replacement in July 2006. The air handling unit upgrade consisted of adding a variable frequency drive to the 125 HP motor, while the chiller replacement involved replacement of two older 130 ton units with two high efficiency 130 ton units of IPLV of 13. The project sponsor was Automation Solutions Group, who completed a building simulation for the two different measures.

Gross Savings Calculation

The simulation results were thorough and detailed, listing existing and replacement building energy use for both the VFD project and the chiller replacement, however very little information was provided on the inputs to the building simulation model. In an attempt to verify claimed savings we completed engineering calculations based on reasonable assumptions for equipment efficiencies, operating hours for the air handling unit, average speed of the air handling unit fan motor after retrofit, and weather data for St. Louis. Based on this, we believe the savings generated by the simulation model to be reasonable estimates of project savings. Total annual savings claimed by the contractor were 275,949 KWh and a peak demand reduction of 70 KW, resulting in annual cost savings of $16,557. These results are summarized in Section VII Table D-11 below.

Section VII Table D-11: Missouri Lutheran Synod

Measure type	Peak KW reduction	Annual electric savings (KWh)	Annual gas savings (Therms)	Total annual savings ($)
Claimed VFD savings	10	124,594	0	$ 7,476
Claimed chiller replacement	60	151,355	0	$ 9,081
Total claimed savings	70	275,949	0	$16,557
Adjusted VFD savings	10	124,594	0	$ 7,476
Adjusted chiller replacement	60	151,355	0	$ 9,081
Total adjusted savings	70	275,949	0	$16,557

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 275,949 KWh and a peak demand reduction of 70 KW.

Cost Effectiveness

Section VII Table D-12 shows the cost effectiveness of the Ferguson Wal-Mart project. FEMP UPV Discount Factors for commercial electricity and natural gas for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 20.0 years for lighting measures was assumed, so an effective life of 20.0 years was used in determining the appropriate residential discount factors.

Section VII Table D-12: Cost Effectiveness

Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
$147,412	$16,557	20.0	$238,751	1.6

St. Anthony's – St. Louis, Missouri

Saint Anthony's hospital in St. Louis, MO, completed an outdoor lighting retrofit project in 2005, involving the replacement of four 250 watt mercury vapor lights with one 400 watt metal halide.

Gross Savings Calculation

There were no calculations provided for Saint Anthony's, only initial cost and annual energy cost of the old system and new system. Thirty sets of outdoor lights were assumed to have been replaced. Since there were four mercury vapor lights to every one metal halide lights, a total of 120 mercury vapors were replaced with 30 metal halides. 3,650 annual operating hours were assumed for the light fixtures based on the outside lights running for an average of ten hours each night. These results are summarized in Section VII Table D-13 below.

Section VII Table D-13: St. Anthony's Medical Center St. Louis, MO

Measure type	Peak KW reduction	Annual electric savings (KWh)	Total annual savings ($)
Claimed Lighting	N/A	N/A	$5,008
Adjusted Lighting	20.4	74,460	$4,468

Net Realized Savings

No information on free-ridership or spillover exists for the project, so it is assumed that the project would not have happened with out the program, and net realized savings are therefore assumed to be the same as the adjusted gross savings above: Annual energy impact of 74,460 KWh and a peak demand reduction of 20.4 KW.

Cost Effectiveness

Section VII Table D-14 shows the cost effectiveness of Saint Anthony's outdoor lighting upgrade. FEMP UPV Discount Factors for commercial electricity and natural gas for Census Region 2 (Including Missouri) were used for the benefit/cost analysis. The Department of Energy currently uses a 3% discount rate in determining discount factors. An expected life of 7.0 years for lighting measures was assumed, so an effective life of 7.0 years was used in determining the appropriate commercial discount factors.

Section VII Table D-14: Saint Anthony's Cost Effectiveness

Program Cost	First Year Program Savings	Effective Life of Recommendations	Lifetime Savings	Lifetime Benefit/Cost Ratio
$15,960	$4,468	7.0	$26,806	1.7