222

Exhibit No.:
Issues: DSM Cost Recovery
Witness: John A. Rogers
Sponsoring Party: MO PSC Staff
Type of Exhibit: Surrebuttal Testimony
File No.: ER-2011-0028
Date Testimony Prepared: April 15, 2011

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

SURREBUTTAL TESTIMONY

OF

JOHN A. ROGERS

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

FILE NO. ER-2011-0028

Jefferson City, Missouri
April 2011

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE's Tariff to Increase its Annual Revenues for Electric Service	)))	File No. ER-2011-0028

AFFIDAVIT OF JOHN A. ROGERS

STATE OF MISSOURI)
) **ss**
COUNTY OF COLE)

John A. Rogers, of lawful age, on his oath states: that he has participated in the preparation of the following Surrebuttal Testimony in question and answer form, consisting of 22 pages of Surrebuttal Testimony to be presented in the above case, that the answers in the following Surrebuttal Testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

John A. Rogers

Subscribed and sworn to before me this 13th day of April, 2011.

SUSAN L. SUNDERMEYER
Notary Public - Notary Seal
State of Missouri
Commissioned for Callaway County
My Commission Expires: October 03, 2014
Commission Number: 10942086

Notary Public

Table of Contents

SURREBUTTAL TESTIMONY

OF

JOHN A. ROGERS

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

FILE NO. ER-2011-0028

SURREBUTTAL TESTIMONY

OF

JOHN A. ROGERS

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

FILE NO. ER-2011-0028

Q. Please state your name and business address.

A. My name is John A. Rogers, and my business address is Missouri Public Service Commission, P. O. Box 360, Jefferson City, Missouri 65102.

Q. What is your present position at the Missouri Public Service Commission?

A. I am a Utility Regulatory Manager in the Energy Department of the Utility Operations Division.

Q. Are you the same John A. Rogers that contributed to Staff's Revenue Requirement Cost of Service Report (COS Report) filed on February 4, 2011 and that filed rebuttal testimony in this case on March 25, 2011?

A. Yes, I am.

Q. Would you please summarize the purpose of your surrebuttal testimony?

A. I address certain rebuttal testimony of Union Electric Company d/b/a Ameren Missouri (Ameren Missouri or Company) witnesses Richard J. Mark, Daniel G. Laurent and/or William R. Davis related to: a) aligning customer and utility interests through compliance with the Missouri Energy Efficiency Investment Act of 2009 (MEEIA), Section 393.1075, RSMo, Supp. 2009; b) Ameren Missouri's level of compliance with MEEIA in this case; c) Ameren Missouri's experience with and plans for its demand-side management

(DSM) programs; d) the appropriate DSM cost recovery treatment in this case; and e) the prudence of the Company's Residential Lighting and Appliance program (L&A). I provide Staff's recommended strategy for Ameren Missouri to align its financial incentives with helping its customers use energy more efficiently through compliance with MEEIA. Finally, I provide Staff's view of the important role that the utility-stakeholder process will play during the transition to and following the implementation of MEEIA rules. On these issues, Staff makes the following recommendations in this case:

1. That the Commission not change Ameren Missouri's current DSM cost recovery mechanism from its current six year amortization to a three year amortization, because approval of Ameren Missouri's request will not create the necessary financial incentives for the Company to comply with the MEEIA;

2. That the Commission not approve either of the mechanisms for recovery of lost revenue proposed by Ameren Missouri in the direct and rebuttal testimony of Mr. Davis, because: a) these mechanisms proposed by Ameren Missouri are lost revenue recovery mechanisms, which are inconsistent with the provisions for a utility lost revenue component of a demand-side programs investment mechanism (DSIM) included within the Commission's recently-approved MEEIA rules; b) approval of either mechanism will not create the necessary financial incentives for Ameren Missouri to comply with MEEIA; c) neither mechanism removes the Company's throughput incentive; and d) the Company has not requested Commission approval of its demand-side programs under MEEIA, a statutory condition for receiving a Commission-approved DSIM;

3. That the Commission encourage Ameren Missouri to pursue a comprehensive strategy consistent with the Commission's MEEIA rules that aligns the Company's financial incentives with helping its customers use energy more efficiently. The Company should focus its attention on working with its stakeholders to achieve by January 1, 2012, the filing of applications for approval of its realistic achievable potential (RAP) demand-side programs (described in Ameren Missouri's recently filed Chapter 22 Electric Utility Resource Planning compliance filing in File No. EO-2011-0271(Chapter 22 compliance filing)[1]) and for approval of a DSIM under the soon-to-be-effective MEEIA rules or, should MEEIA rules[2] not be effective, under 393.1075, RSMo, Supp. 2009; and

4. That all costs for the Ameren Missouri L&A program incurred through the February 28, 2011 true-up cut-off date be included in rate base and amortized over a six year period, consistent with Staff's recommended rate treatment for other prudently incurred DSM costs.

Aligning customer and utility interests through MEEIA

Q. Does Ameren Missouri mention the need for a constructive solution to align customer and utility interests as contemplated by MEEIA?

A. Yes. Mr. Mark's rebuttal testimony on page 6, lines 3 through 14 make this very clear:

> The Company is seeking a way to align the interests of the utility with that of its customers so that they can use energy efficiently, a goal

[1] Staff references Ameren Missouri's Chapter 22 Electric Utility Resource Planning compliance filing in File No. EO-2011-0271 in this surrebuttal testimony. The Staff reserves the right to finish its review of the Company's resource plan within that filing and the discussion of the filing herein shall not be taken as a waiver by the Staff to contest any and all information within that filing after further review.

[2] Commission's final rules for 4 CSR 240-3.163, 4 CSR 240-3.164, 4 CSR 240-20.093 and 4 CSR 240-20.094 in File No. EX-2010-0368 were sent to the Administrative Rules Division on April 14, 2011, for publication in the Missouri Register.

> which is specifically set forth in MEEIA. All parties must recognize the financial impact of energy efficiency programs upon the Company. The issue is the essence of utility regulation – balancing a utility's obligation to provide reliable service at a reasonable cost and providing utilities the opportunity to earn reasonable returns. Ameren Missouri's management has a legal obligation to its shareholders to protect their interest. Ameren Missouri is not asking the Commission to place Company shareholder interests *above* those of our customers; rather we are asking the Commission to work with us to find a constructive solution to *align* customer and Company interests, as contemplated by MEEIA. In other words, there must be a solution that provides an equitable balance between, and an alignment of, the interest of the utility shareholders and utility customers.

Q. Do the Commission's MEEIA rules and MEEIA itself provide a regulatory framework that balances a utility's obligation to provide reliable service at a reasonable cost and the opportunity to earn reasonable returns on the utility's demand-side investments?

A. Yes. With the enactment of MEEIA, the State of Missouri has declared and directed the following:

> 3. It shall be the policy of the state to value demand-side investments equal to traditional investments in supply and delivery infrastructure and allow recovery of all reasonable and prudent costs of delivering cost-effective demand-side programs. In support of this policy, the commission shall:
> (1) Provide timely cost recovery for utilities;
> (2) Ensure that utility financial incentives are aligned with helping customers use energy more efficiently and in a manner that sustains or enhances utility customers' incentives to use energy more efficiently; and
> (3) Provide timely earnings opportunities associated with cost-effective measurable and verifiable efficiency savings.
> 4. The commission shall permit electric corporations to implement commission-approved demand-side programs proposed pursuant to this section with a goal of achieving all cost-effective demand-side savings. Recovery for such programs shall not be permitted unless the programs are approved by the commission, result in energy or demand savings and are beneficial to all customers in the customer class in which the programs are proposed, regardless of whether the programs are utilized by all customers. The commission shall consider the total resource cost test a preferred cost-effectiveness test. Programs targeted to low-income customers or general education campaigns do not need to meet

> a cost-effectiveness test, so long as the commission determines that the program or campaign is in the public interest. Nothing herein shall preclude the approval of demand-side programs that do not meet the test if the costs of the program above the level determined to be cost-effective are funded by the customers participating in the program or through tax or other governmental credits or incentives specifically designed for that purpose.

The Commission promulgated MEEIA rules pursuant to the authority granted within MEEIA.

Q. Does the Commission believe that utilities must comply with MEEIA and that MEEIA is the appropriate framework for utility regulation of demand-side investments?

A. Yes. The Commission expressed its view on this issue when it stated the following on page 88 in its April 12, 2011 Report and Order in File No. ER-2010-0355 regarding its Conclusions of Law – Demand-Side Management:

> Utilities within the Commission's jurisdiction must comply with The Missouri Energy Efficiency Investment Act (MEEIA) regardless of whether or not proposed rules under the law are effective. The language of MEEIA allows KCP&L and GMO to propose a different method of recovery regardless of whether specific Commission rules are in place or not[3].

Ameren Missouri's compliance with MEEIA in this case

Q. Does Ameren Missouri's request for cost recovery and for "adjusting billing units" in this case comply with MEEIA?

A. No.

Q. Why not?

A. The MEEIA and the MEEIA rules require that a utility receive Commission approval of its demand-side programs as a condition for receiving a recovery mechanism, respectively below:

[3] Case No. ER-2010-0355, *Report and Order*, p. 88, para. 26 (April 12, 2011).

> 4. The commission shall permit electric corporations to implement commission-approved demand-side programs proposed pursuant to this section with a goal of achieving all cost-effective demand-side savings. *Recovery for such programs shall not be permitted unless the programs are approved by the commission*, result in energy or demand savings and are beneficial to all customers in the customer class in which the programs are proposed, regardless of whether the programs are utilized by all customers[4]

and

> (3) Applications for Approval of Electric Utility Demand-Side Programs or Program Plans. Pursuant to the provisions of this rule, 4 CSR 240-2.060, and section 393.1075, RSMo, an electric utility may file an application with the commission for approval of demand-side programs or program plans by filing information and documentation required by 4 CSR 240-3.164(2). *Any existing demand-side program with tariff sheets in effect prior to the effective date of this rule shall be included in the initial application for approval of demand-side programs if the utility intends for unrecovered and/or new costs related to the existing demand-side program be included in the DSIM cost recovery revenue requirement, and/or if the utility intends to establish a utility lost revenue component of a DSIM or a utility incentive component of a DSIM for the existing demand-side program.* The commission shall approve, approve with modification acceptable to the electric utility, or reject such applications for approval of demand-side program plans within one hundred twenty (120) days of the filing of an application under this section only after providing the opportunity for a hearing. In the case of a utility filing an application for approval of an individual demand-side program, the commission shall approve, approve with modification acceptable to the electric utility, or reject applications within sixty (60) days of the filing of an application under this section only after providing the opportunity for a hearing[5].

(emphasis added).

Ameren Missouri has not filed an application for approval of its demand-side programs under MEEIA or under the MEEIA rules as a part of this case. Therefore, the Commission cannot approve demand-side programs or a demand-side programs investment mechanism which comply with MEEIA in this case.

[4] Section 393.1075.4, RSMo (Supp. 2009).
[5] Commission's final version of 4 CSR 240-20.094(3).

Ameren Missouri's experience with and plans for its DSM programs

Q. Has Ameren Missouri been successful in implementing DSM programs?

A. Yes. The Staff COS Report[6] provides a summary of Ameren Missouri's demand-side programs' spending levels, estimated energy savings and estimated demand savings levels. The Staff COS Report also contains the following summary of Ameren Missouri's spending levels for its DSM programs:

> Ameren Missouri has a total budget of $85 million for its business Energy Efficiency tariff and its Residential Energy Efficiency tariff through September 30, 2011 (the end of Program Year 3) and has spent a total of $38 million through December 31, 2010. Assuming a spending rate of $2.5 million per month (the average monthly spending for October through December 2010 total spending level in Schedule JAR-2) for the period January through September 2011, Ameren Missouri will spend a total of $60 million through September 30, 2011 which is $25 million less than the $85 million total budget for its Business Energy Efficiency and Residential Energy Efficiency tariffs. Such "under spending" is not unusual during the early years of demand-side programs' implementation as the utility climbs the learning curve and as its customers become familiar with newly offered demand-side programs and decide to take actions necessary to participate in demand-side programs.

The Company's DSM programs spending level in 2010 was $23 million[7]. However, the $2.5 million average monthly spending rate for the last four months of 2010 equates to an annualized spending level of $30 million.

Q. What DSM spending level does the Company plan to have in the coming years?

A. There is uncertainty on what the Company plans to spend on DSM in the coming years. The testimony of Mr. Mark and Mr. Davis states that the Company plans to spend $25 million per year on its DSM programs as long as the Company receives approval of

[6] *Staff COS Report*, p. 35, l. 20 - p. 38, l. 8.
[7] Ameren Missouri's response to Staff data request MPSC 0352 in File No. ER-2011-0028.

its request for cost recovery and for "adjusting billing units.[8]" However, Mr. Mark's rebuttal testimony at page 8, lines 4 through 19 makes it clear **that the Company will likely reduce its level of DSM spending** should the Commission not approve the Company's request for DSM cost recovery and for "adjusting billing units":

> Q. What if the Commission does not grant Ameren Missouri the treatment you are requesting?
> A. I certainly hope the Commission will grant us the treatment we are requesting. However, *if the Company is not given full and timely cost recovery, it will be unable to sustain its energy efficiency funding at the level it has in the past few years. I do not know exactly what level of energy efficiency funding Ameren Missouri will provide, but I do know that the Company will have no choice but to significantly reduce its expenditures on energy efficiency programs.*
> ...
> A commission decision that achieves the MEEIA goal of providing timely cost recovery and alignment of utility incentives with helping customers use energy more efficiently is necessary if Ameren Missouri is to continue making substantial investment in energy efficiency.

(emphasis added).

Q. What are the demand-side resources in the Company's preferred resource plan?

A. Ameren Missouri filed its Chapter 22 compliance filing on February 23, 2011, in File No. EO-2011-0271. Staff is reviewing the compliance filing and will file its report to include any alleged filing deficiencies by June 23, 2011. Schedule JAR-1 to this surrebuttal testimony is the Executive Summary in the Company's Chapter 22 compliance filing. On page eight (8) of the Executive Summary are two charts which clearly illustrate the relative levels of DSM annual spending and relative levels of estimated annual cumulative energy savings from DSM programs for four cases: maximum achievable potential (MAP), RAP, Low Risk DSM, and business as usual. The business as usual case represents the demand-

[8] Rebuttal testimony of Mr. Mark at page 8, lines 1 through 4.

side resources in the Company's previous Chapter 22 compliance filing in File No. EO-2007-0409. The Staff COS Report on pages 40 through 42 also provides information on MAP, RAP and business as usual DSM based on the Ameren Missouri DSM Market Potential Study.[9]

According to Ameren Missouri's Chapter 22 compliance filing, Low Risk DSM represents the demand-side resources in the Company's preferred resource plan under existing regulatory treatment of DSM cost recovery ordered in the Company's last rate case in File No. ER-2010-0036 (approved DSM regulatory asset to include allowance for funds used during construction (AFUDC), rate base treatment of prudent DSM costs and six year amortization period). The preferred resource plan includes Low Risk DSM at an annual spending of approximately $20 million in 2012 and in 2013, a decrease of approximately $3 million from 2010 spending levels. The RAP alternative resource plan has the lowest utility cost (net present value of revenue requirements) and RAP demand-side resources have a lower levelized cost of energy (4 cents per kWh)[10] compared to supply-side resources (existing generation at 5 cents per kWh, nuclear at 10 cents per kWh, wind at 11 cents per kWh, combined cycle natural gas at 12 cents per kWh, simple cycle natural gas at 17 cents per kWh, and solar at 37 cents per kWh) over the planning horizon. The Company did not choose the RAP alternative resource plan for its preferred resource plan due to its expected impact on Company earnings under existing DSM cost recovery treatment. The Chapter 22 compliance filing summarizes the Company's strategy for DSM as: "Ameren Missouri will continue to advocate for better alignment of utility financial incentives to ultimately support the state's goal of achieving all cost-effective DSM. Ameren Missouri will continue pursuing a modest

[9] Vol. 1, *Executive Summary of the Market Potential Study*, is included in the Staff COS Report as Appendix 3, Schedule JAR-3.
[10] File No. EO-2011-0271, *Executive Summary*, p. 8 (February 23, 2011).

energy efficiency portfolio, which helps to preserve the option to switch to a more aggressive path.[11]"

Q. Please summarize Staff's understanding of the Company's planned DSM annual spending levels in the next few years.

A. Staff is uncertain what the Company's DSM annual spending levels will be. Ameren Missouri gives different amounts as demonstrated in this section of my surrebuttal testimony and summarized below:

1. $25 million represents the maximum level if the Company receives approval of its request in rebuttal testimony for DSM cost recovery and "adjusting billing units"[12];

2. $20 million in the Company's preferred resource plan under current regulatory treatment ; and

3. "Significantly less" [than $25 million] if the Company does not receive approval of its request in rebuttal testimony for DSM cost recovery and "adjusting billing units.[13]"

Appropriate DSM cost recovery treatment in this case

Q. What DSM cost recovery treatment does the Company request in this case?

A. In its direct case the Company requested: a) DSM costs and interest accrued at the Company's AFUDC rate be included in rate base and amortized over three years, and b) a fixed cost recovery mechanism (FCRM). However, in its rebuttal testimony, the Company changed its request to include: a) DSM costs and interest accrued at the Company's AFUDC rate be included in rate base and amortized over three years, and b) "adjusting billing units" in

[11] File No. EO-2011-0271, *Executive Summary* , p. 22 (February 23, 2011).
[12] Rebuttal Testimony of William R. Davis, p. 7, ll. 1-5.
[13] Rebuttal Testimony of Richard J. Mark, p. 8, ll. 9-12.

this case to provide recovery of lost revenue due to energy and demand savings from the Company's planned DSM programs.

Q. Did Staff provide rebuttal testimony on the Company's DSM cost recovery request in its direct case?

A. Yes. Staff made the following recommendations concerning the Company's DSM cost recovery [14]request in its rebuttal testimony:

> 1. That the Commission not change Ameren Missouri's current DSM cost recovery mechanism from its current six year amortization to a three year amortization, because approval of Ameren Missouri's request will not create the necessary financial incentives for the Company to comply with the Missouri Energy Efficiency Investment Act of 2009 ("MEEIA"), Section 393.1075, RSMo, Supp. 2009;
> 2. That the Commission not approve the FCRM proposed by Ameren Missouri, because a) the FCRM proposed by Ameren Missouri is a lost revenue recovery mechanism, which is inconsistent with the provisions for a utility lost revenue component of a demand-side programs investment mechanism ("DSIM") included within the Commission's recently-approved MEEIA rules; b) approval of the proposed FCRM will not create the necessary financial incentives for Ameren Missouri to comply with MEEIA; c) the proposed FCRM does not remove the Company's throughput incentive; and d) the Company has not requested Commission approval of its demand-side programs under MEEIA, a condition for receiving a Commission-approved DSIM;

Q. Why is the Company requesting "adjusting billing units" in this case?

A. Mr. Mark discusses how additional DSM expenditures and the resulting reduction in energy sales result in a "throughput disincentive" under current DSM cost recovery regulatory treatment and how "[t]he Company has already lost approximately $15 million because of its investment in energy efficiency since 2009. If the Company spends $25

[14] Rebuttal Testimony of John A. Rogers, p. 2, 11. 5-19.

million per year on energy efficiency programs going forward, it expects to experience $53.6 million in lost revenues over the next two years.[15]"

Further, Mr. Mark testifies that the Company does not believe the Commission's MEEIA rules provide the proper regulatory treatment to remove the "throughput disincentive." In his rebuttal testimony, Mr. Mark describes how:

> "[t]he Company's inability to recover lost revenues is a significant concern and, until this issue is addressed, serves as a major disincentive for the Company to make large investments in energy efficiency and is inconsistent with the intent of MEEIA. While the legislature recognized this in MEEIA, the rules recently approved by the Commission define lost revenue in a manner that fails to resolve this problem, primarily because the definition [of lost revenues] requires the utility to offset revenues due to energy efficiency against natural customer load growth. ... [T]he Company already relies upon this natural load growth to offset the additional cost associated with putting new customers on our system as well as to offset other increasing cost it must absorb due to regulatory lag.[16]"

Q. Please describe the Company's request for "adjusting billing units."

A. Mr. Davis provides a detailed discussion of the proposal for "adjusting billing units" in his rebuttal testimony at page 6, line 12 through page 7 line 21:

> I am proposing an adjustment to the test year sales used to set rates after all other rate design has been completed. This is advantageous because it allows the revenue requirement to be set and the rate design process to be followed as normal. Once that process is complete I would simply *reduce the sales used to set rates based on expected savings* from Ameren Missouri's energy efficiency programs.
>
> ...
>
> Based on continued expenditures of $25 million annually, I propose the residential sales be reduced by 250,951 MWh. For the Small General Service, Large General Service, Small Primary Service, and Large Primary Service classes, I propose a total reduction of 227,678 MWh to be allocated based on the 2010 energy savings estimates. For classes

[15] Rebuttal Testimony of Richard J.Mark, p. 3, ll. 18-21.

[16] Rebuttal Testimony of Richard J. Mark, p. 3, l. 21 – p. 4, l. 11.

> with demand-related charges I propose those demand units be reduced by the same percentage as the energy.
>
> ...
>
> As with any cost or revenue element impacting the setting of rates, a difference in the actual level of that element from the amount used to set rates can produce over- or under-collection during the period when rates are in effect, all other things being equal. However, because my proposal seeks to use forward-looking information and also is a new concept for the Commission, the Company is willing to commit to building in a mechanism to prevent such an over-collection for occurring.
>
> ...
>
> The Company would, in its next rate case, compare the adjustment to the final MWh savings result using its DSM evaluation for the time period that those rates are in effect. The Company would then make an adjustment to correct for any over collection related to this billing adjustment in order to keep customers whole if Ameren Missouri's energy efficiency programs don't obtain the level of MWh savings which is anticipated.

(emphasis added).

Q. Does Staff support approval of "adjusting billing units" in this case?

A. No.

Q. Why not?

A. Staff opposes approval of the Company's proposal for "adjusting billing units" for the following reasons:

1. After careful consideration of the lost revenue issue in its MEEIA rulemaking case, the Commission established its policy concerning recovery of lost revenue in its MEEIA rules to allow recovery of lost revenue only to the extent the Company has not recovered its fixed costs through sales growth and only on a retrospective basis as a result of energy savings measured and verified by a third party

evaluation, measurement and verification contractor, whose analysis and report is then subject to audit by a Commission-selected independent auditor[17].

2. Staff believes approval of "adjusting billing units" could result in the Company recovering lost revenue amounts in the future, which are in excess of what is allowed under the Commission's MEEIA rules.

3. The "adjusting billing units" mechanism does nothing to remove the "throughput incentive," since the Company will continue to benefit from increases in energy sales at the same time it will benefit from having "guaranteed" recovery of all lost revenue resulting from its DSM programs. This fact is acknowledged by Mr. Davis.[18]

4. The "adjusting billing units" discussion in Mr. Davis's rebuttal testimony applies to all costs, both fixed and variable costs. If "adjusting billing units" is approved by the Commission, the amount of the adjustment to billing units should be reduced to account for the fact that variable costs should not be recovered through such a mechanism.

5. The "adjusting billing units" amounts of 250,951 MWh for residential and 227,678 MWh for other rate classes proposed by Mr. Davis are cumulative energy savings from the time the programs started (mostly in 2009). Thus, the "adjusting billing units" amounts are double accounting for energy savings which have already been recognized in the setting of rates in the last rate case.

[17] 4 CSR 240-20.093(1)(Y) and 4 CSR 240-20.093(2)(G).
[18] Direct Testimony of William R. Davis, p. 10, ll. Davis direct testimony at page, 10 lines 14 through 14.

6. The "adjusting billing units" amounts are not annualized and would result in a collection of all the revenue lost from 2009 through 2013 each year until rates go into effect in the next rate case.

Q. What is Staff's recommendation concerning the Company's request for DSM cost recovery and "adjusting billing units"?

A. Staff recommends that the Commission not change the DSM cost recovery treatment approved in its Report and Order in Ameren Missouri's last rate case. The Company's proposal for "adjusting billing units" should not be approved by the Commission, because it will not remove the "throughput incentive" and may contribute to the Company over earning as a result of the concerns expressed in the previous answer. But most importantly, this mechanism is inconsistent with the Commission's final MEEIA rules.

Strategy for Ameren Missouri to align its financial incentives with helping its customers use energy more efficiently through its compliance with MEEIA

Q. Did you previously recommend a strategy for Ameren Missouri to align its financial incentives with helping its customers use energy more efficiently through its compliance with MEEIA?

A. In the Staff COS Report on page 43, lines 6 through 12:

> Staff recommends that the Commission not change the current Ameren Missouri DSM cost recovery mechanism and not approve a fixed cost recovery mechanism for Ameren Missouri in this case. Staff recommends that Ameren Missouri instead focus its attention on working with its stakeholders during the upcoming Chapter 22 compliance filing review to reach alignment on the strategy for the Company's demand-side resources. Such alignment in the Chapter 22 compliance case is possible by June 2011, the same month in which the MEEIA rules are expected to become effective. As discussed earlier in this section of Staff's COS Report, Ameren Missouri could have approved DSM programs and an approved DSIM under the MEEIA rules by the end of October 2011.

Q. How did the Company respond to this recommendation?

A. Other than continuing to express the Company's concerns for the MEEIA rules, Mr. Davis expressed that Staff's proposed schedule for the Company to file applications under the MEEIA in June 2011 was overly optimistic.

Q. Do you agree with Mr. Davis?

A. Upon reflection, I do agree. I now feel that the Company should take more time to prepare its MEEIA filings, and I believe a more reasonable date for the Company making its MEEIA filings is January 1, 2012.

Prudence of L&A

Q. Has Staff completed its review of the Cadmus Group's evaluation, measurement and verification report for the L&A (L&A EMV Report)?

A. The L&A EMV Report was received by Staff on March 24, 2011. Staff has had time to complete only an initial review of the L&A EMV Report which totals 131 pages and is included in this testimony as Schedule JAR-2. Staff has also had the opportunity to receive clarification of some information in the report through its productive and open conversations with the Company and with members of the Cadmus Group project team.

Q. Is the L&A different from other DSM programs being delivered by Missouri investor-owned electric utilities?

A. The compact florescent light (CFL) portion of the L&A is the only market transformation program and has a delivery strategy which uses product promotions with retail partners and a "buy-down" and/or "mark-down" strategy to reduce the wholesale price of program products for retailers and/or to reduce the retail price for consumers. Through this market transformation strategy the objectives[19] are to:

[19] Cadmus Group Lighting and Appliance Evaluation PY2, March 2011 at page 1

1. Increase the supply of qualifying products through program partnerships with retailers, manufacturers, and distributors;

2. Create demand through consumer awareness and understanding of the ENERGY STAR label and through consumer education about energy efficiency benefits; and

3. Create a lasting retailer preference for stocking and selling ENERGY STAR products, as well as a lasting consumer preference for purchasing these items.

Q. Is there any other feature which distinguishes market transformation programs from other types of DSM programs which are based on direct customer incentives?

A. Yes. It is very difficult to measure the impact of energy and demand savings due to market transformation programs. The benefits from the "spillover" due to changes in program participants attitudes and behaviors as a result of market transformation programs cannot be measured directly.

Q. How much energy (MWh) and demand (MW) does the L&A EMV Report estimate the L&A saved and how were these estimates of energy and demand savings obtained?

A. Table ES2 on page 3 of the L&A EMV Report indicates that the estimate of net energy savings is 69,759 MWh and the estimated net demand savings is 12,238 MW for the program year 2. The largest components of energy and demand savings are from the sale of ENERGY STAR CFL bulbs with much smaller levels of energy and demand savings from CFL fixtures, room air conditioners, dehumidifiers and freezers. To estimate the impact of the L&A, Cadmus Group recently developed a multistate model using demand-side program, econometric and demographic data for 11 areas of the country (including Ameren Missouri's

service territory) with CFL programs similar to that of Ameren Missouri and 4 areas of the country without any history of such programs. Five of the other CFL program areas are also utility clients of Cadmus Group. The resulting zero-inflated negative binomial regression (ZINB) model is used to estimate the "lift" that the L&A has on increasing the total number of CFL bulbs (total of L&A CFLs and non-L&A CFLs) sold in the Ameren Missouri service territory. To estimate the impact of L&A fixture and appliance sales, Cadmus Group used a more traditional approach of using retailer interviews and in store customer intercepts to determine: a) whether L&A products were being purchased by Ameren Missouri customers or by customers of another utility (leakage), and b) whether customers purchased the L&A products due to the L&A promotions and prices or whether customers were not influenced by the L&A promotions and prices, i. e., customers would have made the purchases without the L&A promotions and prices (free riders).

Q. Does Staff have concerns regarding the estimated net energy savings of 69,759 MWh and the estimated net demand savings of 12,238 MW for the program year 2?

A. Yes. Staff is primarily concerned over the estimated impacts of the CFL bulbs, since Staff has not gained a full understanding of the ZINB which estimates the net-to-gross (NTG) ratio for program CFL bulbs to be 0.96. The L&A EMV Report includes several references to also using the more traditional retailer interview (and sales data) and customer store intercept data to estimate NTG for program CFL bulbs. However, this approach is not used even though the information to make such an estimate of NTG is available in the L&A EMV Report. Cadmus Group could not provide Staff with an adequate explanation for not using the more traditional retailer interview (and sales data) and customer store intercept data to estimate NTG for program CFL bulbs (as promised in the L&A EMV Report), other than to

say it feels the retailer interviews data is biased and employees being interviewed were not well informed.

Q. Does Staff accept this explanation of Cadmus Group?

A. No. If traditional estimating procedures can be used for room air conditioners (NTG = 0.62), dehumidifiers (NTG = 0.52) and freezers (NTG = 0.58), staff sees no reason this procedure cannot be relied upon as an alternative piece of information to understand and to estimate the impact of the program on transforming the market.

Q. Has Staff performed its own estimate of NTG for program CFL bulbs?

A. Yes. Staff uses the information from the retailer interviews on page 56 of the L&A EMV Report which suggests that "CFL sales would be 35 percent lower in absence of the program" along with the program "leakage" rate of 8.7 percent (3.4 percent for St. Louis metro and 40.3 percent for rural areas) to estimate NTG of 0.32 (= 0.35 x (1 – 0.087)).

Q. Can the Cadmus Group's NTG of 0.96 be compared directly to the Staff's NTG of 0.32?

A. Not entirely. Staff's approach accounts for "leakage" and "free riders" but does not account for "spillover" (in this case, purchase of non-L&A CFL bulbs as a result of the L&A's influence on transforming customers attitudes and behaviors concerning CFL bulbs). The ZINB was developed by Cadmus Group with the objective of capturing the "spillover" in the estimation of NTG. However, the ZINB has the disadvantage of not being able to identify the amount of "free riders" and the amount of "spillover" in the model of the market.

Q. Does Staff feel that there will be much "spillover" from the L&A CFL program?

A. Staff has reason to believe that there will not be much spillover, since 78 percent of customers intercepted indicated that they had an initial intention of buying CFLs when they entered the store and Staff feels that the CFL market has experienced significant naturally occurring market transformation as a result of the ENERGY STAR retailer program and brand which have been in existence since 1992[20].

Q. Are there total resource cost (TRC) test calculations available for the L&A using the Cadmus Group's NTG of 0.96 for the CFL program and the Staff's NTG of 0.32 for the CFL program?

A. Yes. Ameren has run the DSMore software model to estimate a TRC of 2.65 for the NTG of 0.96 and a TRC of 1.79 for the NTG of 0.32.

Q. What does Staff conclude from its review of the L&A EMV Report and from its independent calculation of NTG and TRC for the L&A?

A. Staff concludes that the L&A has an estimated TRC of at least 1.79 and, therefore, all costs for the L&A in the DSM regulatory asset at the end of the true-up test year period should be included for recovery through rates in this case.

Q. What else has Staff learned as a result of its review of the L&A EMV Report?

A. Staff continues to have concerns for the ability of an EMV process to accurately estimate the energy savings and demand savings from market transformation programs such as the L&A. This concern is heightened by the expectations that such a process may soon be used in the determination of the utility lost revenue requirement and utility incentive revenue requirement for approved demand-side programs investment mechanisms under the Commission's MEEIA rules. For example, the L&A's estimated avoided cost of production and capacity is $24.3 million if the L&A's estimated NTG is 0.96

[20] http://www.energystar.gov/index.cfm?c=join.join_index

(TRC = 2.65), but the L&A's avoided cost of production and capacity is only $8.5 million if the L&A's NTG is 0.32 (TRC = 1.79). The difference of $15.8 million in this example points out the importance of having good methodologies to measure the impact of DSM programs, especially DSM market transformation programs.

Q. Is Ameren Missouri in full compliance with the conditions included in the Commission's May 21, 2009 Order Approving Tariff for the L&A[21]?

A. Two conditions do not apply until after the end of the initial term of the program since they require that Ameren Missouri share the final EMV report for the L&A with all electric utilities in Missouri and then invite all other Missouri utilities to participate in the L&A should Ameren Missouri choose to continue the program beyond September 30, 2011. Ameren Missouri is in compliance with the condition that it provide program data to interested stakeholders quarterly. One condition states: "Program EM&V (evaluation, measurement and verification) and reporting shall be done separately for the St. Louis metro area, rural areas, and for the program in total." This was not done in the L&A EMV Report which includes only the estimations of "leakage" for St. Louis metro area, rural areas, and for the program in total. All other elements of the L&A EMV Report are analyzed and reported on a total program basis. Staff recommends that Ameren Missouri assure that the final EMV report following completion of the three year term of the L&A complies with the Commission's condition or else explain in detail in a filing to the Commission why this cannot be done.

[21] File No. ET-2009-0404.

Role of utility-stakeholder process during transition to and following implementation of MEEIA

Q. Please comment on Staff's view of the utility-stakeholder process during the transition to and following implementation of MEEIA.

A. Staff encourages each electric utility and its DSM stakeholders to work in a cooperative way to make MEEIA successful. DSM is clearly Missouri's least cost resource. At the same time, the transition to new regulatory treatment for DSM investments through MEEIA will be challenging and will require some acceptance of disappointing outcomes and some give and take along the way as we learn together. MEEIA may be the pathway to "a solution that provides an equitable balance between, and an alignment of, the interest of the utility shareholders and utility customers.[22]"

Q. Does this conclude your surrebuttal testimony at this time?

A. Yes, it does.

[22] Mr. Mark rebuttal testimony page 6 lines 12 through 14.

1. Executive Summary

Highlights

- *Ameren Missouri has conducted a thorough evaluation of options to meet future customer demand in a safe and reliable manner at a reasonable cost*
- *Future environmental regulation is expected to be a significant driver of the need for new resources*
- *There are several potentially viable paths that Ameren Missouri could pursue, each of which presents unique opportunities and challenges*
- *Ameren Missouri has developed a complete decision roadmap to detail the Preferred Resource Plan and its relationship to several contingency options.*

Ameren Missouri's Integrated Resource Plan (IRP) serves as the basis for the utility's resource acquisition strategy over the next three years and the overall direction of resource procurements for the remainder of the 20-year planning horizon. The IRP provides a snapshot of the Company's resources and loads, and provides guidance regarding resource needs and acquisitions. Since the filing of Ameren Missouri's 2008 IRP there have been several key changes that have impacted Ameren Missouri's long-term planning. Those changes include adoption of a state Renewable Energy Standard (RES), the passage of the Missouri Energy Efficiency Investment Act (MEEIA), the prospect for more stringent environmental regulations, and a severe recession. The current Missouri resource planning rules make it clear that regulators are to evaluate the *process* Ameren Missouri follows to arrive at its Preferred Resource Plan. However, Ameren Missouri believes the importance of resource planning rises above simple rule compliance and includes the need to discuss the *plan*. It is clear based on the analysis included in this IRP that Ameren Missouri and the entire state will be facing some serious challenges in the planning horizon.

The immediate challenges are largely driven by emerging environmental policies. Although activity has recently cooled with respect to greenhouse gas legislation, general activity around more stringent environmental regulations affecting coal plants has increased substantially. New regulations governing air emissions, use of water, and disposal of coal ash are likely to require significant investment in control equipment for coal-fired plants. Given Ameren Missouri's strong reliance on coal (75% today), there could be a substantial impact to Ameren Missouri customers. Ameren Missouri's Preferred Resource Plan balances low cost, reliable service at reasonable rates by including a mix of renewable resources, demand-side resources, upgrades at existing facilities, and new gas-fired generation. This plan is optimal for our customers should existing environmental regulations remain largely unchanged over our planning horizon.

Should environmental regulations become more stringent, which we expect to be the case, Ameren Missouri has developed a robust set of contingency options to consider.

Stakeholder Involvement

Throughout the IRP planning process Ameren Missouri has hosted several meetings of key stakeholders with the purpose of providing a status update and an opportunity to provide feedback at a time when the feedback is most useful. The discussions ranged from conceptual to technical depending on the stage of the analysis. In limited cases offline discussions were held to answer questions. Ameren Missouri also posted meeting materials, transcripts, and supporting studies online to facilitate information sharing. Below is a list of the meetings with a summary of the topics that were discussed.

- January 9th, 2009 – Renewables study conducted by Black & Veatch
- April 2nd, 2009 – Waivers requested by Ameren Missouri for certain requirements of the IRP rules
- August 26th, 2009 – Renewables Follow-up, Coal and Gas Resource Options study conducted by Black & Veatch
- November 20th, 2009 – 2008 IRP Implementation Plan update, Overview of Planning Process
- January 26th, 2010 – Conference Call on Financing Analysis Plan
- March 8th, 2010 – Scenarios, Uncertain Factors, Load Analysis and Forecasting, EPRI End-to-End Efficiency Study, Initial Supply-Side Screening Results
- April 16th, 2010 – Conference Call on Financing Analysis Plan
- May 25th, 2010 – Forecasting Results, DSM Analysis, Alternative Resource Plan Development, Scenario Modeling Results
- September 14th, 2010 – Integration Analysis, Sensitivity Analysis, Critical Independent Uncertain Factors, Decision Framework
- February 22nd, 2011 – Risk Analysis, Environmental Scenarios and Strategy Selection

Drivers of Resource Needs

In determining our future resource needs we must first understand what the future demand for electricity is likely to be. Then, we must consider factors that may impact the ability of our existing power plants to meet those needs. Here are some of the critical drivers we analyze:

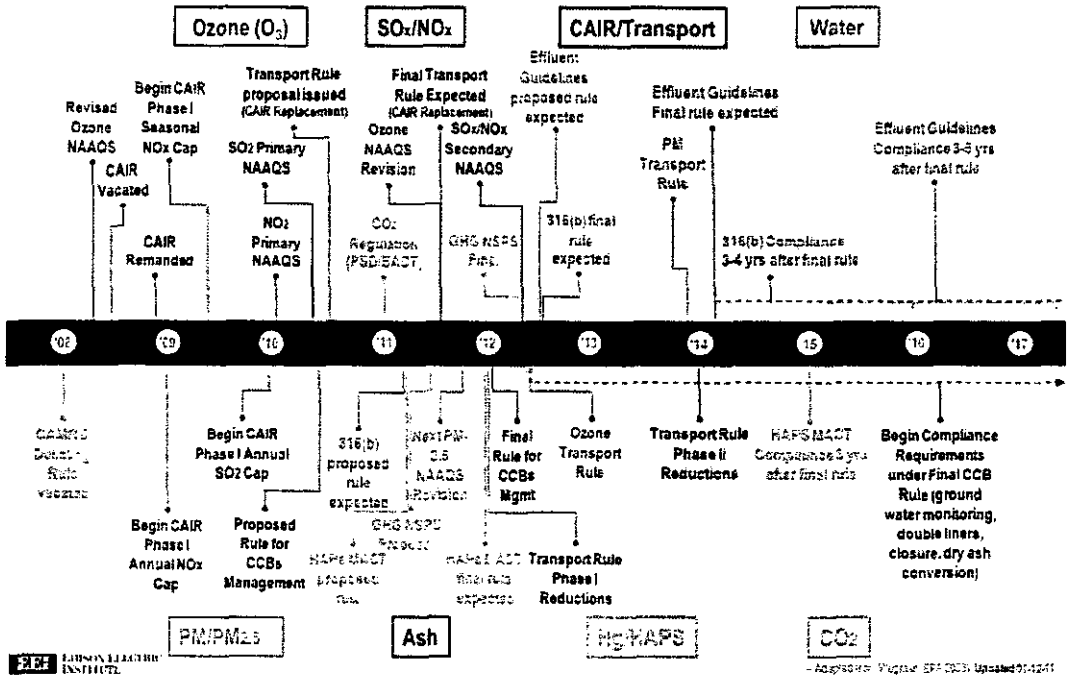
Customer Demand: Missouri's population has grown about 7 percent in the last decade, and this growth has also contributed to the rising demand for power. In the last 20 years, demand for electricity increased by 50% among Ameren Missouri customers.

In the next 20 years, our forecasts show demand for power rising almost another 20% in the Ameren Missouri service area alone.

Customer Expectations: Customers increasingly expect to have near-perfect service reliability. Customers believe that our product provides essential comfort and convenience and is critical to providing health care, personal security, recreation and many other services, so our customers expect us to have an abundant supply of electricity available when they want it.

Environmental Regulations: An area that has received a great deal of focus and attention over the last several years has been environmental regulations. In particular, the U.S. Environmental Protection Agency (EPA) is expected to issue new environmental regulations in the next 12 to 24 months related to air emissions, ash waste and water. Figure 1.1 highlights some of the regulations under consideration.

Figure 1.1 Potential Environmental Regulations



Source: Edison Electric Institute

These new regulations will likely require the installation of expensive environmental control equipment on our coal-fired plants over the next several years. The cost to comply with these regulations will be in the billions of dollars for Ameren Missouri and billions more for the rest of Missouri and the Midwest. These environmental regulations, along with potential legislation limiting the emission of greenhouse gases, will have a significant impact on electric rates and on our state's energy future because coal currently accounts for about 80% of the energy supplied in Missouri. As a result, we are

diligently working with legislators, regulators and other key stakeholders to find solutions that balance the need to address environmental concerns with the need to protect our state's economy, energy security and our customers' costs.

Aging Infrastructure: Across the nation and our region, large coal-fired plants that provide most of our power are growing older. The average age of Missouri's large plants is 40 years, and that's at least middle age for a power plant. These plants will not operate forever. In addition, the need to install billions of dollars of environmental controls may not be prudent on some of the older, less efficient plants and may force Ameren Missouri and other generators across the region, state and nation to shutter such plants. Not only does this have economic consequences, but the closing of some of these plants could impact the reliability of our power grid.

These plants won't be quickly or easily replaced. Planning for new generation must be done years in advance. That's why we need clear state and federal energy policies and regulation, as well as a reasonable transition period to implement these regulations so that we can plan effectively for the need to meet our customers' future energy needs in the most prudent and affordable fashion.

Future Resource Options

Meeting existing power demand requires a vast network of different types of power plants, big and small, connected by a network of power lines. For a sense of scale, we can consider how many power plants of a given type would be required to generate the same amount of electricity. One single-unit nuclear power plant or two coal-fired units, for example, produce enough electricity to meet the annual needs of one million households. To meet the needs of the same number of consumers, it could take 1.6 million solar energy panels, 2,000 wind turbines, or three natural gas-fired plants. As the U.S. and other countries seek to ramp up renewable energy production, land use is becoming a more contentious issue; wind and solar energy farms may require 70 – 80 times more land than what is typically needed for traditional energy sources.

Clearly, it takes a combination of resources to reliably supply electricity. What we strive for is a number of power generation options working together within and across regions—so we aren't dependent on any single generation source. Each technology has distinct advantages and disadvantages.

Coal-fired power plants have been our state's energy workhorses for decades and are important energy resources for our state. Today they generate large quantities of low-cost electricity around the clock, but they emit greenhouse gases and other pollutants and release coal combustion byproducts that present waste disposal issues. Due to the potential new environmental regulations discussed previously, future coal plants will likely have to meet more stringent environmental standards in the future. New

technologies are under development to meet these standards, including those to capture and sequester carbon dioxide (CO_2). These offer promise as long-term solutions to climate change, but they are still mostly experimental.

Nuclear energy is by far the world's largest source of carbon-free generation. The U.S. is the largest nuclear energy producer with 104 nuclear plants in 31 states, generating about 20% of the nation's electricity. For Ameren Missouri, nuclear energy accounts for approximately 20% of our total generating capacity. U.S. energy providers recently began exploring development of new nuclear plants after decades with no new nuclear units constructed in the nation. Building a new nuclear plant can be a boost to local and regional economies—adding jobs in the tens of thousands during construction and hundreds of permanent jobs. Since 2001, nuclear power plants have achieved the lowest production costs when compared to plants fired with coal, natural gas and oil. However, due to their complexity and the significant regulation controlling nuclear energy, nuclear power plants can be more challenging to build, finance and operate than plants fueled by other sources.

Natural gas-fired generation is generally simpler to build and produces lower greenhouse gas emissions (about half the CO_2 emissions of a coal-fired power plant), but it too presents price uncertainty because natural gas costs have historically been very volatile. However, new uses of existing technologies have opened new domestic sources of natural gas, driving down prices. The current low prices for natural gas have encouraged some electric generators to substitute gas for coal. Environmental concerns about the use of these technologies have surfaced recently and could impact natural gas prices in the future.

Renewable power – solar and wind energy resources don't produce harmful greenhouse gases that contribute to climate change. However, the wind does not always blow, and the sun does not always shine, so you can't depend on these resources for predictable electricity production. Renewable energy also requires development of additional transmission lines to move wind and solar energy to the urban areas where it is needed from windy rural areas, or sunny environments, where it is often generated. That said, the cost of installing wind and solar energy systems has dropped with improvements in renewable technology, attracting customer interest in renewable energy.

To help our customers evaluate various solar power systems, we recently installed five solar power systems at our downtown headquarters building. The project will provide customers with practical information on the effectiveness of solar energy in our area. In the spring of 2011, we will open a viewing area and classroom where visitors will be able to see the rooftop solar systems along with monitors showing how much energy the units are generating.

Hydroelectric generation is environmentally friendly, but it relies on available water supplies and is very time-consuming to permit and costly to build. Largely financed through insurance proceeds, Ameren Missouri's newly rebuilt 440-megawatt Taum Sauk Hydroelectric Plant, which returned to service in 2010, is proving to be a valuable hydroelectric storage resource that can be quickly started during times of high demand for electricity. Taum Sauk Plant stores energy in the form of water, pumped from a lower elevation reservoir to a higher elevation. Low-cost off-peak electric power is used to run the pumps. During periods of high electrical demand, the stored water is released through turbines to create electricity.

Biomass – Common examples of biomass include food crops, crops for energy (e.g., switchgrass or prairie perennials), crop residues, wood waste and byproducts, and animal manure. Biomass can be burned directly in boilers to provide heat or in high-pressure boilers to generate electricity and then provide heat. Biomass can be used to generate electricity 24 hours a day. Coal-fired plants can be modified to burn biomass with coal, a process called "co-firing." Nationwide, biomass fuels less than 1% of the nation's electricity. Power generated from biomass is classified as "renewable" by the current Missouri Renewable Energy Standard, and may qualify as a renewable resource in potential federal legislation. However, biomass has seen limited use as an energy source thus far because it is not readily available as a year-round feedstock, can be expensive to transport and requires costly technology to convert to energy. Ameren Missouri is supporting research on biomass fuel resources, feed systems, storage facilities, and transportation options.

Landfill gas-to-energy projects can generate enough energy to power thousands of homes every day, reducing emissions of greenhouse gases in the process. The Ameren Missouri Methane to Megawatts project, slated to be up and running in 2012, will be the largest landfill gas-electric facility in the state and among the largest in the nation. It will generate enough electricity to meet the demands of about 10,000 homes. But this energy option requires the right kind of landfill and the right kind of technology to be installed, as well as lots of land to obtain meaningful scale.

Energy efficiency – Using energy more efficiently can defer the need for new generation resources. The following section discusses Ameren Missouri's experience to date and the potential for additional energy saving opportunities.

Demand-Side Resources

Demand-Side Management ("DSM") entails actions by the utility that influence the quantity or patterns of energy consumption. DSM can further be divided into energy efficiency and demand response programs. Energy efficiency programs are designed to reduce overall consumption of electricity; whereas, demand response programs are designed to reduce electricity consumption during the few periods of highest demand.

Ameren Missouri has been implementing full-scale energy efficiency programs since 2009 and has several programs for both residential and business customers. Below is a brief description of the existing energy efficiency programs, all of which are scheduled to end September 2011. The future level of investment in these programs is highly dependent on the regulatory framework applied to DSM.

Residential Programs

- Lighting and Appliance Program – Provides an instant rebate or manufacturer buy-downs on Compact Fluorescent Lights (CFLs) and mail-in rebates on new ENERGY STAR®-qualified appliances.
- Social Marketing Distribution Program – Reduces energy use in residential lighting by leveraging the distribution and education capabilities of organizations to distribute CFLs and educational material at no charge to their residential constituents.
- Multi-Family Income Qualified Program – Partners with multi-family building owners and managers to remove energy inefficient lighting and appliances and install program-specified energy efficiency measures (EEMs) in income qualified building units.
- Refrigerator Recycling Program – Prevents the continued use of inefficient, working refrigerators and freezers by taking the units out of homes and recycling them in an environmentally safe manner.
- HVAC CheckMe!® Program – Encourages residential customers to have existing cooling systems evaluated and if feasible, brought back to factory specifications (re-commissioned), or replace less efficient, working central cooling systems with high efficiency central cooling systems.

Business Programs

- Standard Incentive Program – Provides pre-set incentives for energy efficient products that are readily available in the marketplace and will target measures for which energy savings can be reliably deemed, or calculated using simple threshold criteria. Incentives are available for lighting, motor, heating, ventilation and air conditioning (HVAC) and refrigeration projects.
- Custom Incentive Program – The Custom Incentive Program is for projects that save electricity, but are not on the Standard Incentive list. The incentive is $.05 per kWh saved during the first year of operation, with program incentives not to exceed 50 percent of the overall energy efficiency measure costs.
- New Construction Program – Provides financial incentives and technical assistance for energy efficient building design and construction. Eligible facilities include new facilities built from the ground up, additions to existing facilities, or major renovation of existing facilities requiring significant mechanical and/or electrical equipment alteration.

- Retro-Commissioning Program – Provides incentives for energy and demand reduction opportunities achievable through optimizing building control systems.

In January 2010, Ameren Missouri published the results of a major research study aimed at understanding the potential for energy efficiency improvements on the customer side of the meter. To understand customer energy efficiency plans and future needs, a third-party vendor surveyed more than 4,000 residential and commercial customers using both online and onsite surveys. Ultimately the customer research was integrated with cost and performance data of end uses to estimate potential demand and energy savings. Ameren Missouri also developed several portfolios that represent a wide range of energy savings and cost. Figure 1.2 shows the annual energy efficiency budgets for the portfolios while Figure 1.3 shows the potential annual savings.

Figure 1.2 Annual Budgets

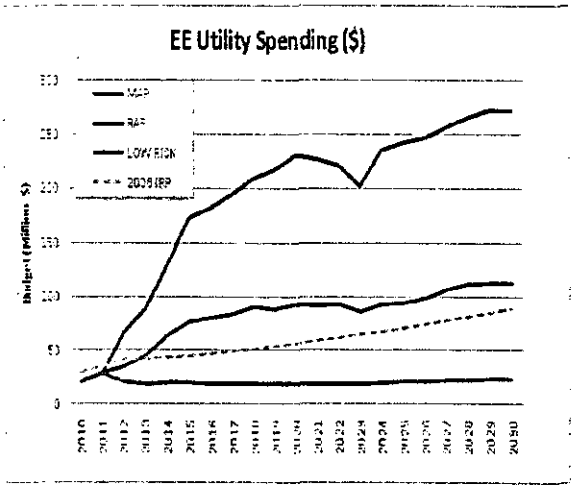
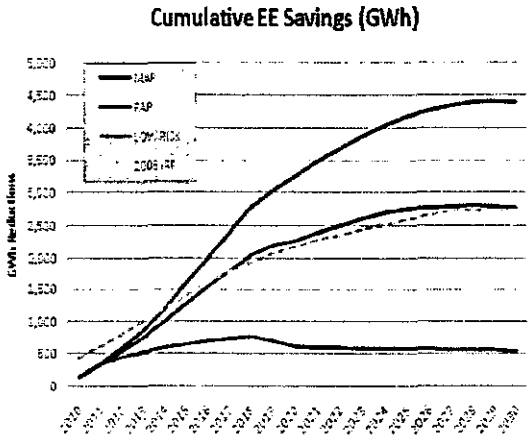


Figure 1.3 Annual Savings



*RAP-Realistic Achievable Potential, MAP-Maximum Achievable Potential

A DSM portfolio is initially measured by its cost-effectiveness. The Total Resource Cost (TRC) test, which measures benefits and costs from the perspective of the utility's customers and society as a whole, is a commonly used measure of cost-effectiveness. In short, if the benefits outweigh the costs then the ratio will be greater than one. It should be noted that the TRC is a screening-level assessment that does not reflect risk and that the results of integration and risk analysis determine cost-effectiveness on a risk-adjusted basis. With a levelized cost of energy near 4 cents/kwh, energy efficiency is less expensive than the supply-side alternatives. Ameren Missouri's analysis has also quantified some of the unique risks associated with implementing demand-side programs.

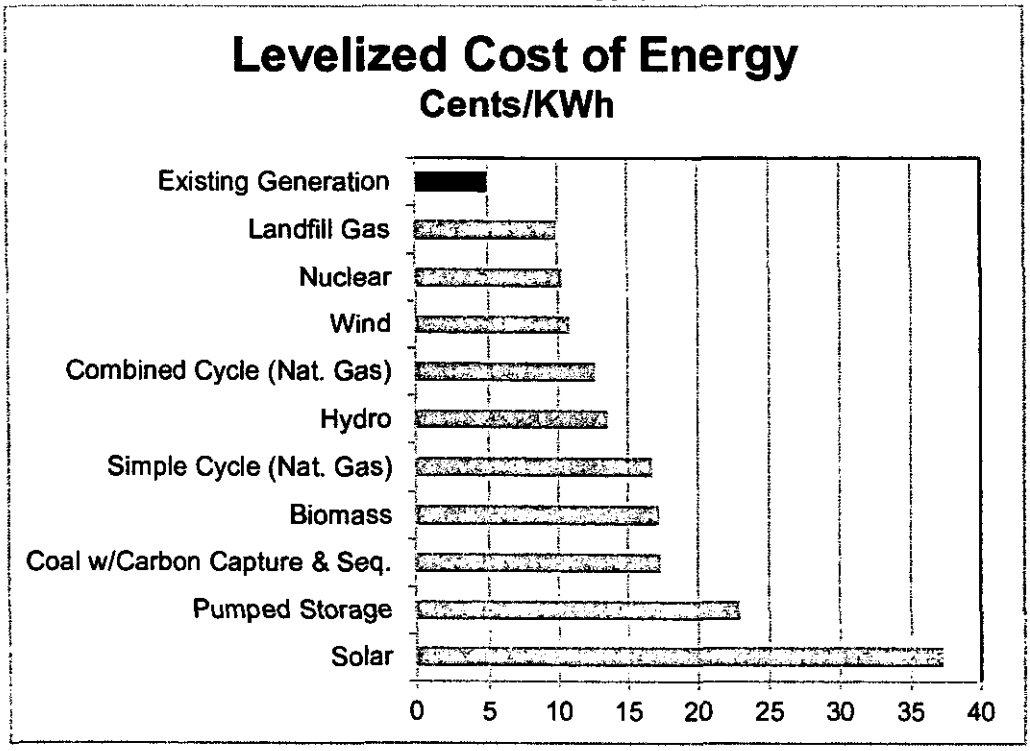
Relative Costs of Future Resource Options

Some generation technologies cost a lot more to construct and then have much lower operating costs. Others cost a lot less to construct but have higher operating costs. The

expected lifetime of generation assets also varies by technology. One way to compare the relative costs of different generation technologies is to calculate a levelized cost of energy. To do this, we calculate the total costs of production - construction and operating costs, including environmental and fuel costs - over the expected life of the plant. Then we divide that by the amount of energy the plant produces over its lifetime. Coal traditionally has been an economically attractive fuel for generating power because it is so abundant.

As shown in Figure 1.4, the levelized cost of energy produced by Ameren Missouri's existing generation fleet (mainly electricity generated by coal and nuclear facilities) is much lower than any new generation resource we might add in future years to meet our customers' rising need for power.

Figure 1.4 Levelized Cost of Energy (Without Incentives)



With potential mandates requiring the reduction of CO_2 and other air emissions and potentially more stringent environmental regulations on water quality and ash disposal, coal becomes more expensive as a future generation source unless technological advances drive these costs down.

Natural gas is also a strong choice, particularly with efficient, smaller gas-fired facilities that are less expensive to build than coal or nuclear plants. But fuel costs for natural gas are about double the price of coal right now, and natural gas prices have traditionally been volatile, meaning that they can change rapidly.

Since 2001, nuclear power plants have achieved the lowest production costs when compared to plants fired with coal, natural gas and oil. In addition, nuclear power produces virtually no air emissions and is a great choice to address future environmental regulations. However, due to their large scale and the significant regulation controlling nuclear energy, nuclear power plants can be more challenging to build, finance and operate than plants fueled by other sources.

It is clear that all new supply-side options are more expensive than Ameren Missouri's existing resources and thus would likely result in increased rates when implemented. This is not unexpected given the age of existing units, some of which were constructed in the 1950's, and the less stringent environmental regulations at the time they were built. It is also why Ameren Missouri has and will continue to evaluate options to extend the life of its existing fleet and increase the production capabilities of existing plants.

Finally, energy efficiency might seem to be a good choice. While not typically considered a traditional generation option, an energy efficiency program that is significantly embraced by customers could be the cheapest choice (that is, similar to our existing generation costs) to meet our customers' future energy needs. However, there are meaningful expenses related to offering customer rebates and discounts on energy efficient appliances, providing weatherization services and energy audits, installing energy efficient equipment, and promoting the efficient use of electricity. In addition, proper incentives and customer acceptance are key drivers.

Key Factors Influencing Resource Choices

Costs alone do not dictate which energy resources offer the greatest development potential. In our planning process, we looked at a range of factors in analyzing possible resources. They include:

Portfolio Diversity: Consistent with other electric energy providers in our state, Ameren Missouri's generation portfolio is heavily weighted toward coal. We must thoughtfully transition our portfolio of generation to other sources, including potentially cleaner coal.

Environmental Regulation: We must assess the current and potential long-term impacts of expected environmental regulations on our power plants.

Costs to Customers: We must be mindful of the impact that our future energy choices will have on our customers' rates and future energy bills.

Ability to Finance Future Energy Sources: In determining the right energy resource, we analyze our ability to finance its construction and the long-term costs to our customers.

Economic Development Impact: We evaluate the economic impact of any decision to add new energy resource projects – the number of jobs, tax revenues, and other

economic benefits a project is expected to bring can be very important to the communities we serve and the entire state of Missouri.

Regulatory and Legislative Matters: We need to assess how well the current or future regulatory and legislative frameworks enable our ability to move forward on certain energy resource options. In particular, those frameworks need to provide timely recovery of, and fair returns on, these significant investments, as well as provide appropriate safeguards for our customers.

One example in this arena is the mechanism (or lack thereof) to finance a large new generating plant during construction. Under current Missouri law, costs associated with building a new generating plant cannot be reimbursed through customer rates until construction is completed and the plant is serving customers. Projects of this magnitude take several years to plan and complete and cost hundreds of millions of dollars and in some cases several billion dollars. This framework creates significant challenges to finance and move large scale projects forward and will be a factor in choosing energy resource options in the future.

Another example is the issue of utility incentives for promoting energy efficiency. Because the existing regulatory framework provides an incentive for utilities to maximize sales of electricity, shifting utility incentives in favor of energy efficiency require the use of alternative ratemaking approaches. Rate treatment related to utility energy efficiency programs can be separated into three categories – program cost recovery, lost revenue, and performance incentives. Of these, lost revenue represents the greatest hurdle which must be overcome to align utility incentives with promotion of energy efficiency. The reason for this, simply put, is that for each kwh of reduced sales the utility loses revenue for that kwh until it is reflected in the development of rates in the utility's next general rate case. Until this significant disincentive is addressed, utilities will be reluctant to pursue aggressive energy efficiency goals.

In order to support a more transparent discussion of the trade-offs between cost and other factors, Ameren Missouri used a scorecard approach to screen alternative resource plans and ultimately select its Preferred Resource Plan. Table 1.1 shows the six major categories that represent Ameren Missouri's policy objectives and the various measures used to evaluate plans in each category, reflecting our

Table 1.1 Policy Objectives

Policy Objective Category(ies)	Measure(s)
Environmental & Resource Diversity	Resource Diversity, Carbon Emissions, SO2 Emissions, NOx Emissions
Energy Efficiency	Energy Savings
Financial/Regulatory	ROE, ROIC, EPS, Free Cash Flow, Stranded Cost Risk, Transaction Risk, Recovery
Customer Satisfaction	Average Rates Single-Year Rate Increase
Economic Development	Primary Job Growth (FTE-years)
Cost	PV Revenue Requirement

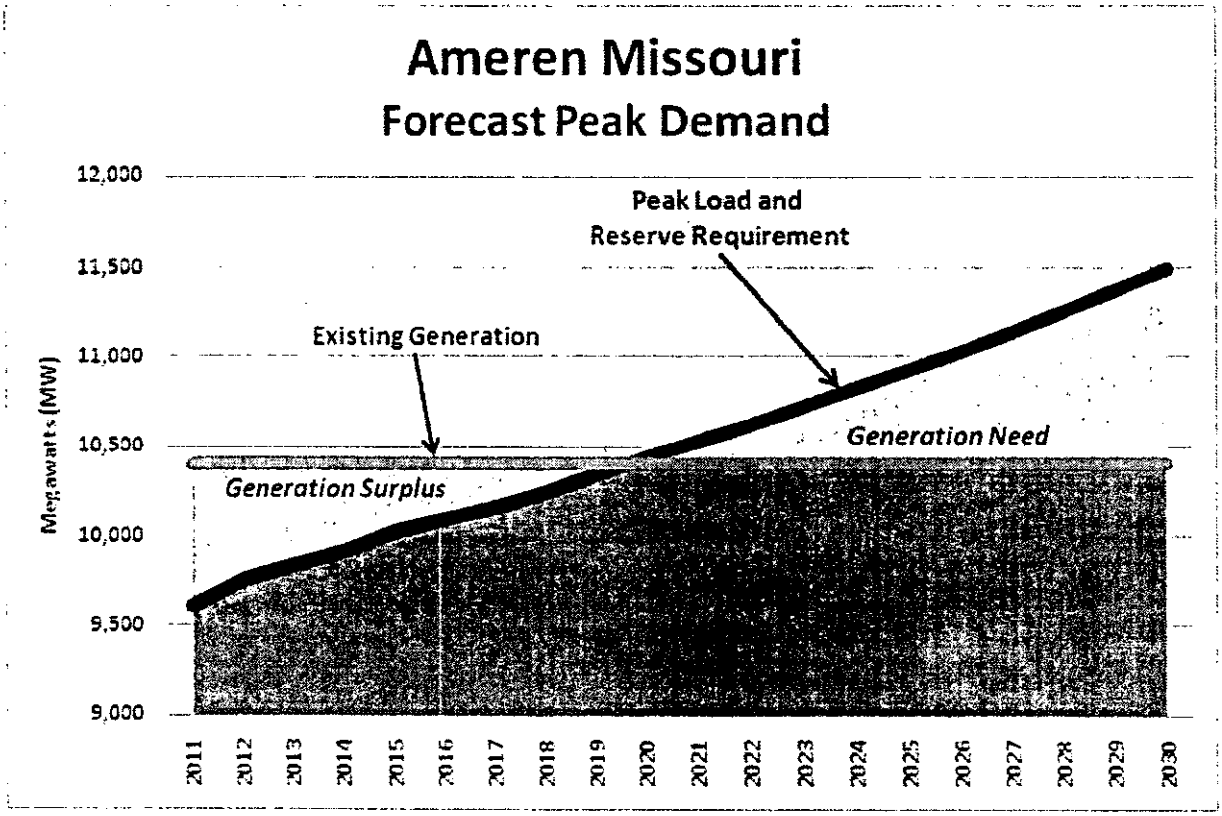
consideration of the factors listed above. Initially, as described in Chapter 9, the 216 alternative resource plans were all screened using this scorecard. At that time only one measure was used per category since there were so many plans being analyzed. Once there were only a few plans remaining, more measures (including qualitative measures) were included to support a richer discussion and differentiation of each plan. While cost remained the primary driver, the other factors weighed heavily into the decision making.

Resource Needs

As stated earlier, we believe the demand for power will continue to grow—in fact, we forecast demand will increase about 20% in our service territory over the next two decades.

As shown in the chart in Figure 1.5, Ameren Missouri currently has about 10,400 megawatts of electric generation capability. The chart also indicates that by 2020, with expected load growth and existing environmental regulations, Ameren Missouri will need additional resources to meet expected customer demand and reliability reserve requirements.

Figure 1.5 Ameren Missouri Resource Position

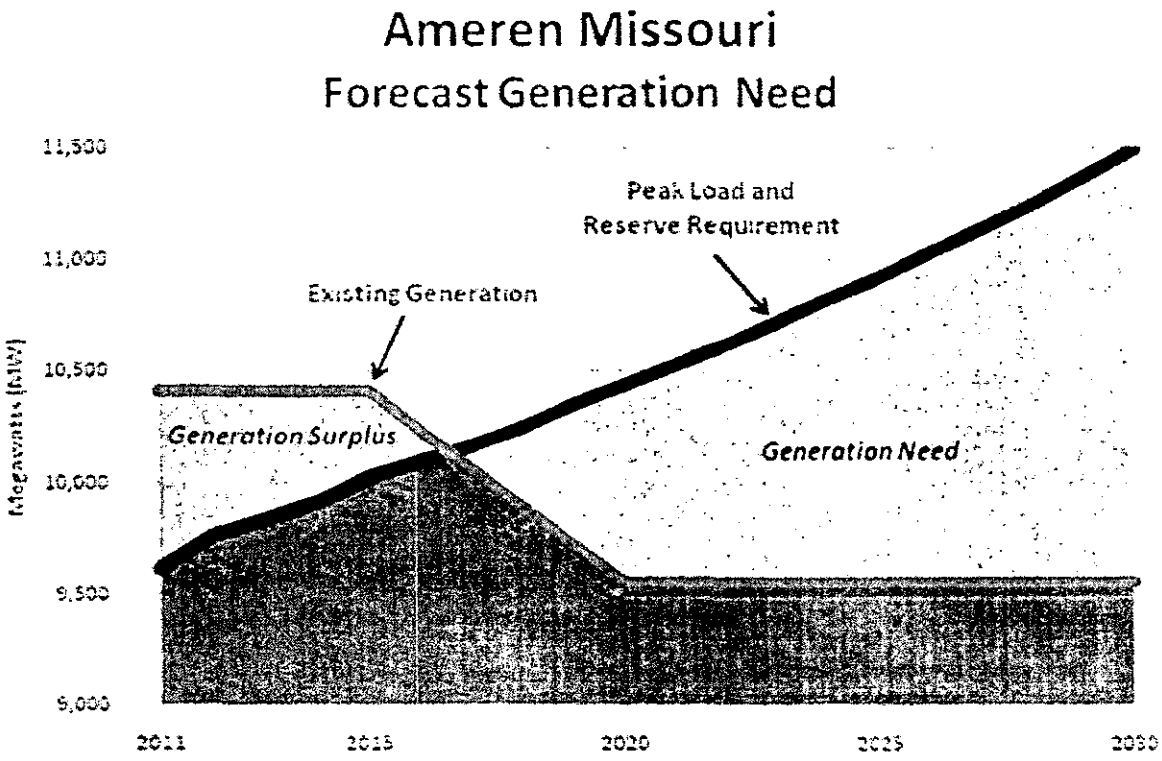


The previous chart identifies a need for more generation by 2030 should no new environmental regulation be mandated. As stated previously, while there is a great deal of uncertainty in the area of environmental regulation, we do believe that more stringent

regulations on air emissions, water and waste will be in place between 2015 and 2020. The costs to meet those regulations are expected to be significant, will drive up energy costs, and are likely to cause older, less efficient coal-fired plants to shut down, including our Meramec Power Plant.

Rising customer demand, when coupled with the shutdown of Meramec Plant, will result in a meaningful shortfall of generation available to meet our customers' needs – about 1000 megawatts by 2020. That shortfall continues to grow through 2030. The chart in Figure 1.6 illustrates the need for resources under such circumstances. The chart presents the resource position in five-year steps to recognize the uncertain nature of the timing of new environmental rules and the potential need for retirement of Meramec.

Figure 1.6 Ameren Missouri Resource Position with Meramec Retired



The adoption by Missouri voters of a state Renewable Electricity Standard ("RES") in 2008 has introduced a new layer into the planning process. Not only does Ameren Missouri need to meet future capacity needs but it also needs to do so while meeting the RES requirements. The state RES has both a solar and non-solar requirement. Ameren Missouri recently installed solar panels at its St. Louis General Office Building, but must acquire additional solar resources to comply in 2011. Table 1.2 shows

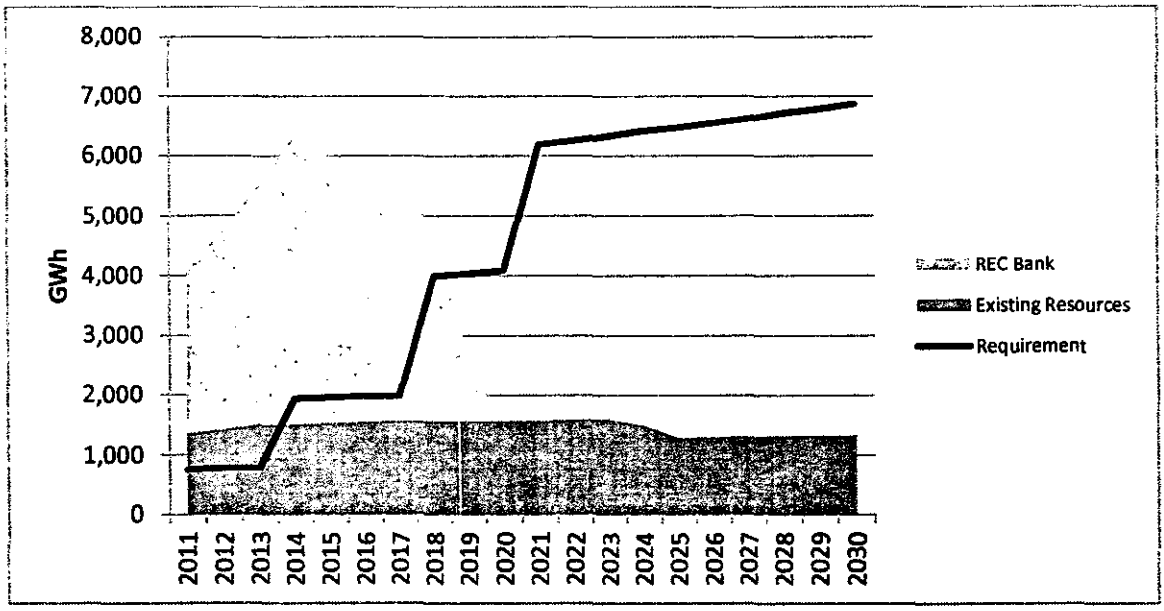
Table 1.2
Solar Energy Needs (MWh)

Year	Solar Requirement
2011	15,049
2012	15,312
2013	15,387
2014	38,718

the megawatt-hour solar requirements over the next several years while Figure 1.7 depicts how Ameren Missouri's existing renewables resource compare to the non-solar RES requirements once banking of credits is considered. It is evident that no additional non-solar resources are needed until 2019.

With the resource needs outlined above in mind, Ameren Missouri has evaluated a range of options to meet these needs. Both supply side options, such as power plants, and demand side options, such as energy efficiency programs, were considered.

Figure 1.7 Ameren Missouri Renewable Position



Alternative Resource Plans

Developing alternative resource plans includes the combination of various demand-side and supply-side resources to meet future capacity needs. However, there are other factors that could cause dramatic changes in the capacity position that need to be considered when developing plans. Figure 1.8 includes the five dimensions considered during the development of resource plans. The permutations of these five dimensions would create 416 plans. However, some combinations may create duplicate resource plans or plans that do not make sense. For example, the Meramec combined cycle option is contingent on Meramec's retirement so the interaction of Meramec continuing and the Meramec combined cycle option would produce an infeasible plan. Ultimately there were 216 plans to be analyzed.

Figure 1.8 Five Attributes of Alternative Resource Plans

Supply-Side Types
- Coal with Carbon Capture
- Combined Cycle (Greenfield)
- Combined Cycle (Meramec)
- Combined Cycle (Venice)
- Simple Cycle (Greenfield)
- Pumped Storage
- Nuke 30% (Partial Ownership)
- Nuke 50% (Partial Ownership)
- Wind with Simple Cycle

Renewable Portfolios
- Federal
- Missouri

Demand-Side Portfolios
- Maximum Achievable Potential
- Realistic Achievable Potential
- Low Risk
- None

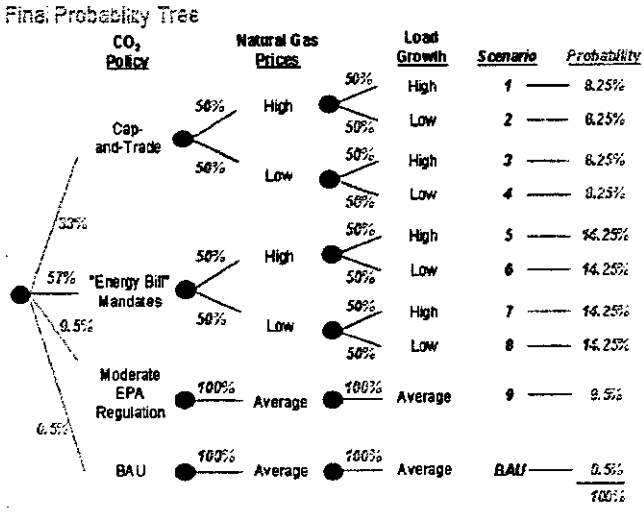
Meramec Status
- Meramec Retired 2015
- Meramec Retired 2022
- Meramec Continues As-Is

Noranda Status
-Noranda Continues
-Noranda Contract Expires 2020

Planning Scenarios

There are various uncertainties that can influence future resource decisions. Some of these uncertainties are highly interactive. That is, a change in one variable may cause a substantial change in another. For this reason it is useful to develop internally consistent scenarios of these uncertain variables. To develop its scenarios Ameren Missouri concluded the three factors with the largest influence on future resource decisions are carbon policy, natural gas prices, and economy-wide load growth. A third party interviewed Ameren Missouri experts to determine the likelihood of different future outcomes of each of those important factors. Figure 1.9 represents the end result those interviews, which culminated in the creation of 10 unique scenarios and associated probabilities. Each scenario is internally consistent with respect to the range of uncertain variables analyzed. This was achieved by using a model that simulates interactions in fuel and energy markets, electricity generation system operation, non-electricity sector outcomes, macroeconomic activity levels, and sector-specific responses to emissions limits. These scenarios and probabilities together comprise a probability tree and allow Ameren Missouri to test potential resource plans under a range of potential futures.

Figure 1.9 Scenario Probability Tree



Environmental Regulation

Coal-fired and other fossil-fired generating resources are subject to an ever-increasing range of environmental regulation. In particular, efforts by the U.S. Environmental Protection Agency in recent years indicate the desire to further limit power plant emissions and environmental impacts. Considering the gamut of potential environmental regulation, Ameren Missouri developed two scenarios, Moderate and Aggressive, to describe combinations of more stringent regulations and then translated those into expected requirements for equipment retrofits for its existing coal fleet. Table 1.3 contains the retrofit timing by scenario and power plant for each category of regulation.

Table 1.3
Plant Retrofit Timing by Scenario

Plant/Unit	Scenario	FGD (Scrubber)	SCR (Catalyst)	Mercury	Ash Landfill	Cooling Tower	Water Intake
Labadie 1&2	Moderate	2020	2015	2017			
	Aggressive	2016	2015		2017	2017	2017
Labadie 3&4	Moderate	2024	2015	2017			
	Aggressive	2016	2015		2017	2017	2017
Meramec 1-4	Moderate		2015	2017			
	Aggressive	2016	2015	2017	2017		2017
Rush Island 1&2	Moderate	2016	2015	2017			
	Aggressive	2016	2015	2017	2017		2017
Sioux 1&2	Moderate	*2010*	2015	2017			
	Aggressive	*2010*	2015	2017	2017		2017

The characterization of environmental scenarios was used in the Meramec retirement analysis which considered the retirement of Meramec versus adding environmental controls or converting to a natural gas boiler. The comparisons ultimately indicated, under aggressive environmental regulations, it would be better to retire Meramec.

Financial Analysis

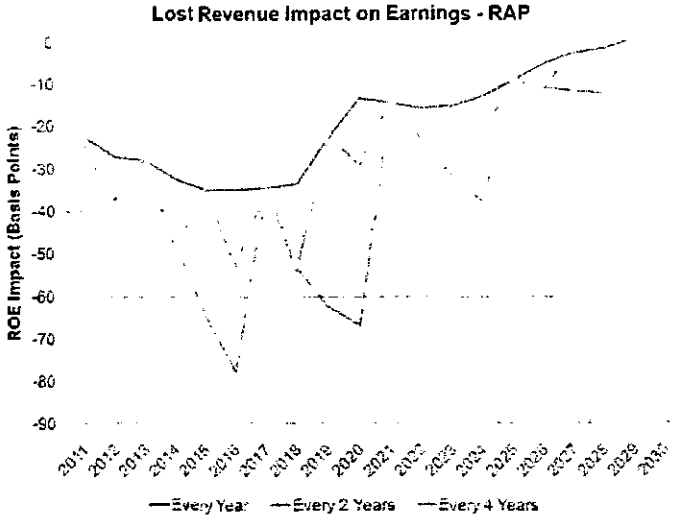
In a perfect world resources and plans can be evaluated assuming perfect ratemaking, unlimited access to capital markets, and perfect knowledge of the future. To accommodate the imperfections of forecasting and general market conditions Ameren Missouri has expanded its analysis to include a more realistic representation of the ratemaking environment and the realities of financial markets. Assuming a rate case every other year and a 6-month lag between the cost period on which rates are set and when they go into effect helps better emulate the financial effects of implementing aggressive energy efficiency programs and large plant capital investments.

The large investment financial analysis indicated compliance with more stringent environmental regulations or construction of large baseload generation assets could strain Ameren Missouri's ability to finance such investments at reasonable rates. It was evident that non-traditional ratemaking treatment may be needed to preserve Ameren Missouri's access to low-cost sources of capital.

The DSM financing analysis highlighted the substantial negative financial impacts to the Company from the implementation of energy efficiency under traditional Missouri regulation. The issue of "Lost Revenue" presents the greatest potential financial impact.

Lost Revenue is revenue the utility is not able to collect, because of reduced sales from energy efficiency gains, between the time energy savings begin to occur and the time customer rates reflect the reduction in sales. Figure 1.10 shows the impact to utility earnings due to lost revenue associated with implementation of the RAP DSM portfolio under varying assumptions for rate case frequency. It will be imperative to Ameren Missouri's DSM expansion plans to properly align utility financial incentives with efforts to help customers use energy more efficiently.

Figure 1.10 Lost Revenue Impact on ROE



Resource Acquisition Strategy – Preferred Plan and Contingency Options

Considering all the factors that we discussed earlier in this report, a few alternatives rise to the top—from business as usual, to relying heavily on natural gas-fired power, to a combination of natural gas and nuclear energy to a heavy reliance on energy efficiency. Under each of these options, we believe our customers' future energy rates could rise meaningfully from current levels. Here is a summary of our options:

The Preferred Resource Plan

Among the top alternatives, the lowest cost resource plan for our customers under Missouri's current regulatory framework would occur should the environmental regulations for air, ash and water that are in place today remain largely unchanged for the next 20 years. Under this scenario, our current generation portfolio would not change significantly until 2030, when we would add combined cycle natural gas generation to our portfolio. At that time, coal would drop to 66% from its current level of 75%; natural gas would grow to 7% from 1% currently; renewable energy would grow to 5% in compliance with the renewable energy standard in Missouri; and nuclear would remain at about 20%. We would employ a modest program offering incentives to customers to use energy efficiently. Figure 1.11 shows the generation mix for the Preferred Resource Plan.

Figure 1.11 Generation Mix – Preferred Resource Plan

While this is the lowest cost resource plan, it is not likely to be sufficient in light of expected new regulations to be issued by the EPA. As stated previously, we expect those new regulations could be significant and will drive us to consider other resource options in the future. Each of these options will drive customer rates higher to address these new environmental regulations and to meet future customer energy needs. We currently believe the following three options are the best to consider for the future.

The Natural Gas / Nuclear Plan

Under this plan, new environmental regulations in the 2015 to 2020 time frame would cause us to replace Meramec with a combined cycle natural gas plant. As demand continues to grow in the future, those needs would be met with new nuclear generation. With this plan, by 2030 coal's percentage of the total portfolio would drop to 58% with the closing of our oldest coal-fired power plant. Our use of nuclear energy would rise from a current level of 18% to 28%. With the addition of combined cycle units in the 2016 to 2020 timeframe, natural gas-fired generation would grow to around 7%. Figure 1.12 shows the generation mix for the Natural Gas / Nuclear Plan.

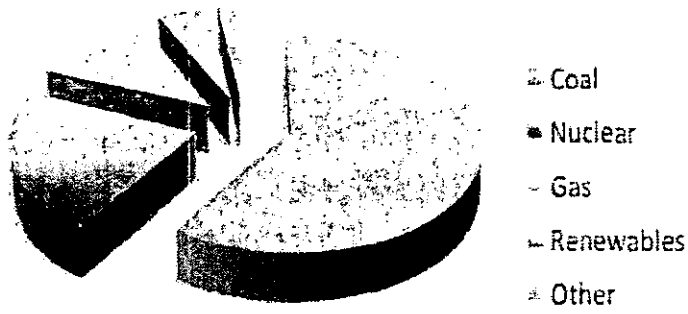
Figure 1.12 Generation Mix – Natural Gas / Nuclear Plan

This approach to meeting our future energy needs has several important advantages. First, it would allow us to effectively comply with tougher environmental regulations on a timely basis and better position our future generation portfolio to address more stringent environmental regulations down the road. Second, building a new nuclear plant would create significant jobs and strong economic development opportunities for the state. However, moving forward on a nuclear plant presents construction, financing and operating challenges.

The Natural Gas Only Plan

This plan calls for natural gas to meet the vast majority of our new energy needs. This plan would result in natural gas growing to 12% of the total portfolio, twelve times its current level, while coal-fired generation would drop to 60%. Meramec would be closed between 2016 and 2020, while highly efficient natural gas-fired units were built. The percentage produced by nuclear energy rises slightly to 22% as a result of dispatch changes due to expected future market conditions. Figure 1.13 shows the generation mix for the Natural Gas Only Plan.

Figure 1.13 Generation Mix – Natural Gas Only Plan



This plan helps us reduce carbon emissions, but natural gas fired plants would still emit half the carbon dioxide of coal-fired units. In addition, as mentioned earlier, natural gas prices have historically been very volatile. Not as many jobs would be created with this option, but construction and operating risks would be lower.

The Energy Efficiency Plan

Under this plan, our future energy needs would be met solely through greater energy efficiency. With this plan, we would aggressively expand our portfolio of energy efficiency programs, with the hope that customers would embrace these programs and realize energy savings. Our oldest coal-fired plant would be retired in the 2016 to 2020 timeframe. This plan calls for nuclear energy's percentage of the total to rise slightly to 24% as a result of dispatch changes due to expected future market conditions. Figure 1.14 shows the generation mix for the Energy Efficiency Plan.

Figure 1.14 Generation Mix – Energy Efficiency Plan

This plan helps us reduce overall emissions with less total generation required. Some jobs would be created as well, through energy efficiency projects completed by our customers at their homes and businesses. The success of this approach depends on a state regulatory framework that encourages utility investment in energy efficiency programs and the willingness of customers to embrace energy efficiency programs and work with us to save energy.

Resource Acquisition Strategy – Decision Roadmap

Each of these plans represents a viable approach that meets our customers' future energy needs and creates different opportunities for our state. Each also has its share of challenges, including cost, construction and financing risks.

The IRP analysis indicated that retiring Meramec is preferred if future environmental regulations require significant capital investment. Until we have an accurate picture of new regulations and the implications to our existing fleet, Meramec will continue operating without the addition of expensive environmental controls. While both nuclear and aggressive DSM plans are potentially viable alternatives to the natural gas combined cycle plan, both face significant regulatory and financial barriers.

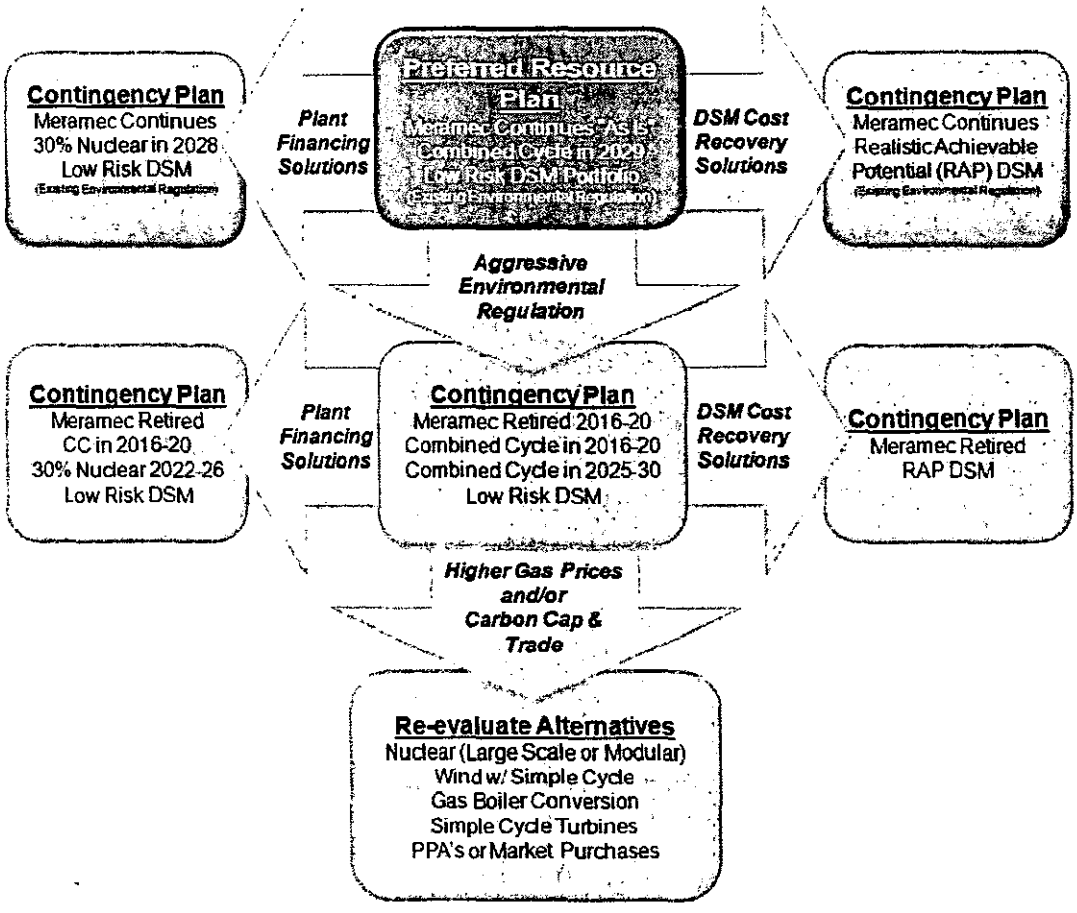
The IRP analysis showed aggressive DSM plans are likely to result in the lowest cost to customers over the planning horizon, so if regulatory barriers to implementation are removed the aggressive DSM plan could become the preferred plan. Although the MAP portfolio was more cost-effective from a TRC perspective, once the additional risk of portfolio energy savings and cost was considered RAP emerged as the dominant DSM portfolio. The significant uncertainty around achieving targeted energy savings levels necessitates that Ameren Missouri preserve viable supply-side resource options and pursue ratemaking options that enable them.

The IRP analysis showed that significant investment in new resources could necessitate the use of alternative ratemaking or financing methods to ensure access to low-cost

sources of capital. If alternative ratemaking structures are enabled, then the financial hurdles for those options could be easier to overcome

Figure 1.15 shows Ameren Missouri's Preferred Plan as well as a robust set of contingency options that reflect the alternative paths described above, both with existing environmental regulation and more aggressive environmental regulation. This "Decision Roadmap" highlights the paths that could be taken should regulation change to a degree that causes Ameren Missouri's management to select a different course of action from that represented in the Preferred Plan. Such changes represent seismic shifts in the resource planning landscape that go beyond the capabilities of analyzing uncertainty with ranges and probabilities. However, by considering such important decision factors we can better prepare ourselves to change course when appropriate.

Figure 1.15 Decision Roadmap



Resource Acquisition Strategy - Implementation Plan

Over the next three years Ameren Missouri will be engaging in several activities to implement the Preferred Resource Plan and to keep contingency options open. Although the Preferred Resource Plan does not show the need for a supply-side resource until the latter portion of the planning horizon, the contingency options call for

a combined cycle plant as early as 2016 if more stringent environmental regulations result in the retirement of Meramec. Ameren Missouri will start investigating viable sites for combined cycle generation and begin engineering studies in the case environmental regulations become more aggressive and accelerate the need for new resources.

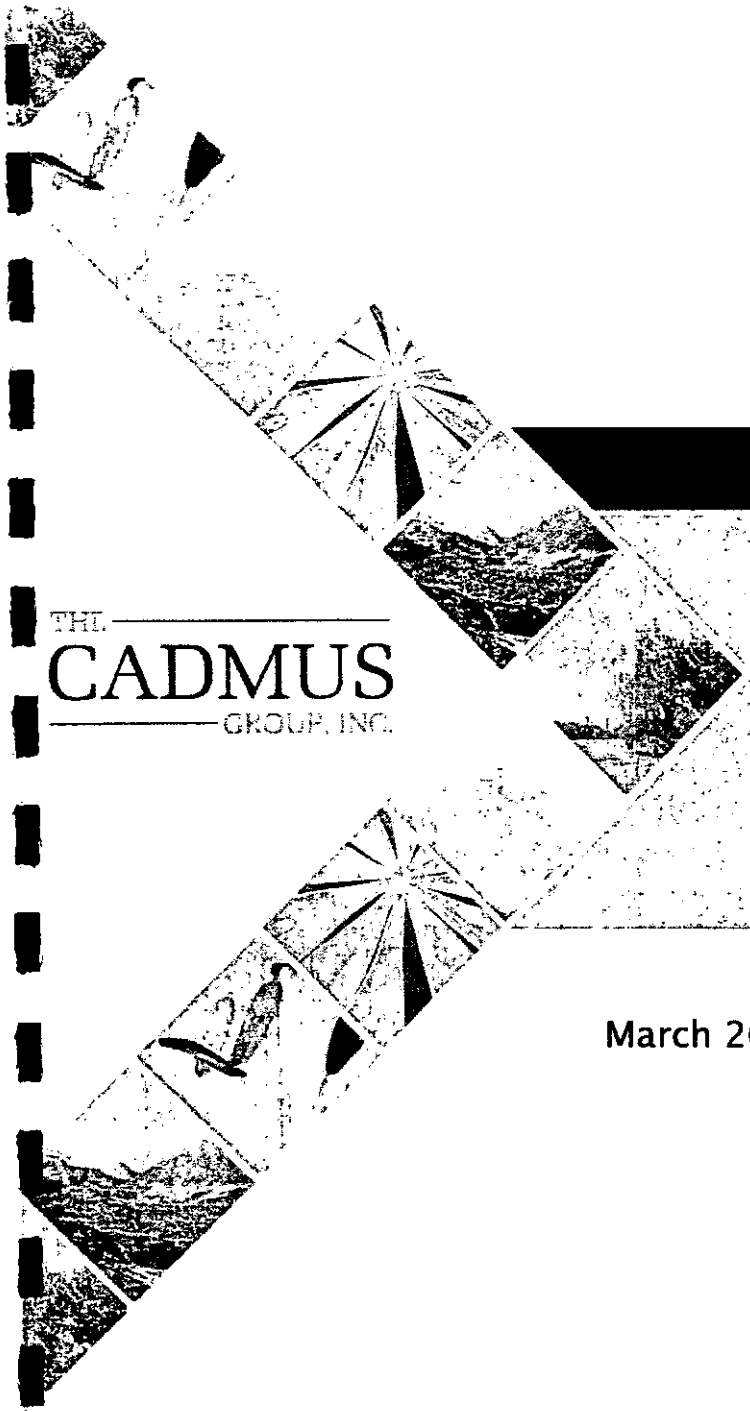
To preserve the nuclear option, Ameren Missouri and a coalition of other utilities will be seeking an Early Site Permit for a second nuclear unit at Ameren Missouri's Callaway site, should appropriate legislation be passed. Furthermore, the cost to continue operations at a plant of Meramec's vintage will impact that retirement decision, so Ameren Missouri will continue to study the ongoing costs to keep Meramec operating safely and reliably.

Ameren Missouri will continue to advocate for better alignment of utility financial incentives to ultimately support the state's goal of achieving all cost-effective DSM. Ameren Missouri will continue pursuing a modest energy efficiency portfolio, which helps to preserve the option to switch to a more aggressive path. To comply with renewable energy mandates in the short term, Ameren Missouri is purchasing solar renewable energy credits to supplement the production from its recently installed solar panels at its St. Louis Headquarters. Some additional solar support will come from Ameren Missouri's existing tariff to procure solar credits through customer-owned generation.

Because the consideration of uncertainty and risk is an important aspect of the IRP process, Ameren Missouri will continue to monitor those factors that may cause it to consider pursuing a different plan than the Preferred Plan. Ameren Missouri considered 22 uncertain factors and concluded several are critical to future resource decisions. Below is a list of factors Ameren Missouri will be watching closely to determine whether changes to its plan are necessary.

- Carbon Policy
- Natural Gas Prices
- Project Costs
- Environmental Regulations
- DSM Impacts and Costs
- Load Growth
- Interest Rates and Financial Metrics

While Ameren Missouri believes it has conducted a thorough analysis of resource needs, options and uncertainties, it is important to note that this IRP represents a snapshot of the Company's expected resources and loads, and provides guidance regarding potential resource needs and acquisitions. Ameren Missouri is continuously planning and adapting to market conditions. In doing so, there will be opportunities for interested parties to engage in discussions on every topic analyzed in this IRP. For that reason the value of the IRP transcends simple compliance with PSC rules and serves as an analytical backdrop to discussions that can shape constructive Missouri energy policies.



THE CADMUS GROUP, INC.

Lighting and Appliance Evaluation PY2

March 2011

Prepared by:

The Cadmus Group Inc. / Energy Services
720 SW Washington Street, Suite 400
Portland, OR 97205

503.228.2992

Prepared for:

Ameren Missouri

Prepared by:
Jane Colby
Katie Ryder
Kathryn Albee
Noah Lieb
Brian Shepherd
Kate Swayne
Kate Bushman
Doug Bruchs
M. Sami Khawaja

March 2011
The Cadmus Group Inc.

Corporate Headquarters:
57 Water Street
Watertown, MA 02472
Tel: 617.673.7000
Fax: 617.673.7001

An Employee-Owned Company
www.cadmusgroup.com

720 SW Washington St.
Suite 400
Portland, OR 97205
Tel: 503.228.2992
Fax: 503.228.3696

Table of Contents

1. Executive Summary

The Lighting and Appliance Program (L&A program, or the program) has the greatest expected savings of the efficiency programs implemented in 2010 as part of Ameren Missouri's residential demand-side management portfolio. The program, implemented by Applied Proactive Technologies (APT), sought to deliver energy savings of 43,319 MWh in Program Year 2 (PY2) through higher sales of residential, energy-efficient, ENERGY STAR® products, including compact fluorescent lamps (CFLs) and ENERGY STAR labeled appliances.

The L&A program is a market transformation program, based on an assumption that consumer education and use of market forces, combined with the recognizable and trusted ENERGY STAR label, will provide long-term, permanent changes in consumer purchasing and retailer stocking patterns. To achieve its market transformation goal, the program has developed a delivery strategy based on a three-tiered approach:

1. Increase the supply of qualifying products through program partnerships with retailers, manufacturers, and distributors;
2. Create demand through consumer awareness and understanding of the ENERGY STAR label, and through consumer education about energy-efficiency benefits; and
3. Create a lasting retailer preference for stocking and selling ENERGY STAR products, as well as a lasting consumer preference for purchasing these items.

The program focuses on subsidizing retailer markdowns by working directly with manufacturers and has expanded the program into additional retail chains from PY1, in particular large big-box stores. The following is a summary of the eligible ENERGY STAR products in PY2.

Retail Markdown Products:

- ENERGY STAR CFLs
- ENERGY STAR Lighting Fixtures

Customer Mail-in Rebate Products:

- ENERGY STAR Room Air Conditioners
- ENERGY STAR Freezers
- ENERGY STAR Dehumidifiers

In addition to retail markdowns and mail-in rebates, a new program component was introduced in PY2: an online store selling marked-down lighting products. A Social Marketing Distribution (SMD) program also began in PY2, which distributed free CFLs to customers, with some marketing targeted toward hard-to-reach segments (low-income, disabled, and elderly customers).

The research activities that informed this evaluation are summarized in Table ES1 below.

Table ES1. Summary of Evaluation Approach (PY2)

Action	Impact	Process	Details
CFL User Survey	✓	✓	Lighting: Estimate CFL awareness, sales, and saturation. (n=451)
Site Visits	✓		Lighting: Assess CFL purchase, saturations, and installation rates.(n=87)
Participant Retail Store Sales Analysis	✓		Lighting and Appliances: Obtain an unbiased assessment of program sales from database tracking. (n=census)
Store Intercepts	✓		Lighting: Assess CFL leakage rates. (n=611)
Metering	✓		Lighting: Estimate hours-of-use. (n=44)
Retailer Interviews	✓	✓	Lighting: Obtain supplier self-reported estimates of NTG and review of program approach and opportunities for improvement. (n=75)
Multistate Analysis	✓		Lighting: Analyze NTG and benchmarking.
Social Marketing Distribution Survey	✓	✓	Lighting: Obtain installation rate for social marketing distribution CFLs. (n=70)
Engineering Estimates of Appliance Savings	✓		Appliances: Obtain information based on rebate applications and secondary research.
Appliance Participant Survey	✓	✓	Appliances: Analyze NTG and process results for appliance rebates.(n=150)
Program Document Review		✓	Lighting and Appliances: Understand program approach and identify opportunities for improvement, ensure all data necessary for evaluation are available,
Stakeholder Interviews		✓	Lighting and Appliances: Understand program approach and identify opportunities for improvement.(n=5)

Findings

Key findings are listed below:

- Based on metering in 44 homes over a period of 6 months, we estimated average hours of CFL usage per day to be 2.91.
- Per unit energy savings are estimated to be 48.4 kWh per bulb
- Our intercept study estimated that overall average leakage rates (discounted CFL purchases by non-Ameren retail customers) were 8.7 percent, driven by higher rates (40.3 percent) in rural areas compared to 3.4 percent in the greater St. Louis area. This estimate does not include "leakage-in," where Ameren Missouri customers may be purchasing discounted CFLs in outside areas.
- Upstream lighting net-to-gross (NTG), as estimated by the multistate regression analysis, was 0.96. This NTG ratio includes CFL freeridership and spillover, but does not consider possible spillover that may occur when consumers implement additional energy efficiency measures not promoted by the program (other efficient appliances or weatherization).
- Appliance free-ridership estimates were 0.48, 0.42, and 0.38 for dehumidifiers, freezers, and room air conditioners, respectively.

The program's evaluated results exceeded its goals for CFL sales and energy savings during PY2; Table ES2 and Table ES3 show overall participation and gross and net savings as well as the results compared to Ameren Missouri's goals.

Table ES2. PY2 Evaluated Participation, Gross and Net Savings

Product	Total Program Sales	*Ex Post* Energy Savings (MWh)	*Ex Post* Demand Savings (kW)	NTG Ratio*	Net Energy Savings (MWh)	Net Demand Saving* (kW)
Upstream CFLs	1,547,459	72,097	12,435	0.96	69,214	11,938
Fixtures	591	73.3	8.3	1	73.3	8.3
Room Air Conditioner	3,853	443.1	231.18	0.62	274.7	143.3
Dehumidifier	3,545	347	283.6	0.52	180.4	147.5
Freezers	490	29.9	2.0	0.58	17.3	1.1
Total-PY2	**1,555,938**	**72,991**	**12,960**	**0.96**	**69,759**	**12,238**

* Appliance NTG estimates are based on free-ridership only.

Table ES3. PY2 Sales and Participation Targets and Results

ENERGY STAR Lighting or Appliance Type	Program Targets	Results
Upstream CFLs	1,177,537	1,547,459
Dehumidifiers	1,500	3,545
Freezers	2,600	490
Room Air Conditioner	8,000	3,853
CFL Fixtures	2,500	591
Total Net Energy Saving (MWh)	**64,928**	**69,759**
Total Net Peak Demand Savings (kW)	**5,600**	**12,238**

As shown in Table ES5, the SMD program distributed 114, 690 bulbs saving a total of 5,789 MWh and 898 kW.

Table ES5. SMD Results

	Total Bulbs Distributed	*Ex Post* Total Gross Energy Savings (MWh)	*Ex Post* Gross Demand Savings CFL (kW)	NTG Ratio	Net Energy Savings (MWh)	Net Demand Savings (kW)
Social Marketing Distribution CFLs	114,690	5,789	898	1.0	5,789	898

Combining the totals from the upstream lighting and appliance programs (Table ES2) with the SMD CFL program (Table ES5) yields an overall portfolio PY2 savings of 78,780 gross MWh and 13,858 gross kW. Net savings are slightly lower with 75,549 net MWh and 13,136 net kW. These savings do not include possible additional spillover which may occur when program participants purchase and install additional types of energy efficient measures outside of the

program. This type of spillover is difficult to verify and quantify without detailed surveys and site verifications to identify additional measures installed.

The evaluation found evidence that market transformation is occurring, as the multistate site visits indicated that Ameren Missouri's CFL market penetration (number of homes with at least one CFL is 93 percent, which is higher than all the non-program areas, the newer program areas, and even the average of all long-running program areas. This may be evidence that Ameren's unique SMD program is broadening the reach of CFLs. A high market penetration indicates the program is wide-reaching; however, Ameren Missouri's low average saturation compared to long-running programs (16.3 percent vs. 23 percent, respectively) indicates significant opportunities for increased CFL purchases within customers' homes.

Ameren Missouri's program and incentive costs were lower than most other participating program areas in the multistate study, yet CFL sales (both program bulbs and non-program bulbs) were higher, perhaps indicating an effective program delivery strategy.

Program stakeholders reported being pleased with the program, and plan to continue adding more retail outlets in the coming year. An additional two appliance types have been added for PY3.

As reported by retailers, the program has been successful in increasing the supply of energy-efficient CFLs and appliances in the market, and most retailers report significant increases in their sales due to the program. Program staff also reported success in product placement in end-caps and other visible store locations, which were likely to induce more sales.

Recommendations

Based on the findings of this evaluation, Cadmus offers the following recommendations for Ameren Missouri's consideration:

- ***Continue focusing on consumer education.*** As reported by APT, store events and trainings were effective in increasing consumer awareness and knowledge of CFLs. The high level of market penetration is indicative of this effort. Cadmus recommends incorporating education regarding proper disposal of CFLs and proper application of specialty CFLs in specialty fixtures.
- ***Consider switching to the coupon approach in stores vulnerable to leakage.*** Evidence of leakage rates as high as 49 percent was found in one rural big-box store. The coupon approach, which requires customers to complete an instant rebate form and ensures bulbs are purchased by Ameren Missouri customers, could alleviate this problem without eliminating the rural stores from the program.
- ***Update appliance savings estimates in the tracking database.*** Cadmus independently calculated the estimated savings for freezers, dehumidifiers, and room air conditioners. The *ex ante* estimates for freezers, in particular, were higher than our estimates, which occurred because the original planning assumption considered freezer savings from early replacement rather than replacement at burnout. New savings estimates for freezers were approximately 25 percent of *ex ante* savings. *Ex ante* and *ex post* savings estimates for dehumidifiers and room air conditioners were close and are dependent on particular sizes installed.

- ***Incorporate evaluation requirements into corporate retailer/manufacturer MOUs:*** Retailers are not always cooperative in responding to interview requests, allowing store intercepts, providing opinions on program processes, and providing information on their CFL sales levels; information that is needed to perform an evaluation. In some cases during PY2, Cadmus was unable to collect data from all the retailers in our planned sample. The current memorandum of understanding (MOU) does not require specific cooperation with interviews or in-store customer surveys. Cadmus recommends modifying retailer and manufacturer MOU's to require cooperation with evaluation approaches.
- ***Perform additional mass marketing***: Based on a small level of dissatisfaction by retailers and the fact that many intercepted customers were unaware of Ameren Missouri's program, Cadmus recommends Ameren Missouri perform broader program marketing or advertising. General advertising can increase program spillover and hasten the market transformation as consumers will think more about their choices wherever they shop. Participating retailers will also feel they are benefitting more from the program.
- ***Perform general marketing regarding appliance rebates***: While appliance rebate freeridership was not unnecessarily high, Ameren Missouri may be able to achieve greater savings by broadly marketing the program. The current approach attempts to convert customers already shopping for appliances from purchasing standard efficiency to higher efficiency products. Adding general marketing could encourage some customers to replace older, inefficient appliances early, which would result in greater energy savings and fewer free riders.

2. Introduction

Program Description

The Lighting and Appliance Program (L&A program, or the program) has the greatest expected savings of the efficiency programs implemented in 2010 as part of Ameren Missouri's residential demand-side management portfolio. The program, implemented by Applied Proactive Technologies (APT), sought to deliver energy savings of 43,319MWh through PY2 via higher sales of residential, energy-efficient, ENERGY STAR® products, including compact fluorescent lamps (CFLs) and ENERGY STAR labeled appliances.

While major changes in implementation occurred in PY2, the underlying logic remained very similar to PY1. L&A remains a market transformation program, based on an assumption that consumer education and use of market forces, combined with the recognizable and trusted ENERGY STAR label, will provide long-term, permanent changes in consumer purchasing and retailer stocking patterns. To achieve its market transformation goal, the program has developed a delivery strategy based on a three-tiered approach:

1. Increase the supply of qualifying products through program partnerships with retailers, manufacturers, and distributors;
2. Create demand through consumer awareness and understanding of the ENERGY STAR label, and through consumer education about energy-efficiency benefits; and
3. Create a lasting retailer preference for stocking and selling ENERGY STAR products, as well as lasting consumer preferences for purchasing these items.

Program Implementation

Ameren Missouri's PY1 L&A program focused mainly on lighting, and offered retail markdowns, manufacturer buy downs, and cooperative advertising incentives to encourage CFL sales. In PY2, Ameren Missouri changed its approach and subcontracted implementation to Applied Proactive Technologies (APT). APT has implemented upstream lighting programs in a number of areas and has ongoing relationships with many national retail chains. APT's approach focuses on retailer markdowns through manufacturers and expanding the program into additional retail chains, in particular large big-box stores. The appliance component of the program introduced mail-in customer rebates for three measures. Ameren Missouri also continued to provide branded point-of-purchase (POP) materials.

APT's responsibilities included program design and fieldwork, which entailed:

- Initiating relationships with retailers through field representatives;
- Negotiating Memoranda of Understanding (MOUs) with manufacturers and retailers;
- Developing and maintaining the program tracking database;
- Training program staff;
- Training retail store employees;

- Developing point-of-puchase (POP) materials and ensuring proper placement in retail stores;
- Responding to retailer requests to develop cooperative advertising and promotion materials;
- Conducting lighting clinics for retail store customers; and

APT hired a subcontractor, Energy Federation Incorporated (EFI), to process rebates and administer the online store.

Program Offerings

Using retail markdowns and mail-in rebates as the two primary vehicles for market transformation, the program sought to promote the following eligible ENERGY STAR products in PY2.

Retail Markdown Products:

- ENERGY STAR CFLs
- ENERGY STAR Lighting Fixtures

Customer Mail-in Rebate Products:

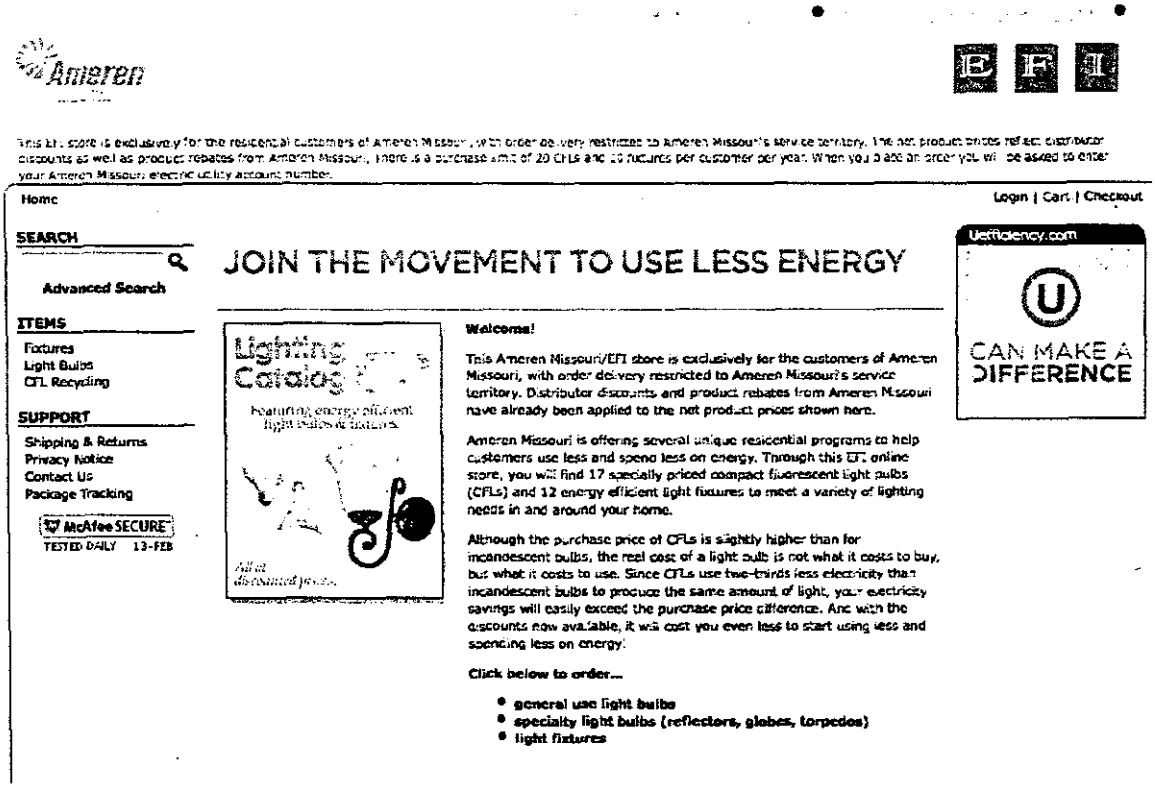
- ENERGY STAR Room Air Conditioners
- ENERGY STAR Freezers
- ENERGY STAR Dehumidifiers

In addition to retail markdowns and mail-in rebates, a new program component was introduced in PY2: an online store selling marked-down lighting products.

Customers can reach the store, administered by EFI and shown in Figure 1, via Ameren Missouri's website.

The Social Marketing Distribution (SMD) Program, which also launched during PY2, operates separately from the L&A program, and is discussed in Section 6 of this report.

Figure 1. Ameren Missouri Online Store



Program Goals

Ameren Missouri set annual performance goals for the program over its planned three-year implementation period as part of its integrated resource planning (IRP). To meet its PY2 cumulative savings goals of 64,928 MWh of energy and 5.6 MW of demand, the target sales levels for each L&A program measure were set as shown in Table 1.

Table 1. PY2 Sales and Participation Targets

ENERGY STAR Lighting or Appliance Type	Program Targets
CFLs	1,177,537
Dehumidifiers	1,500
Freezers	2,600
Room Air Conditioners	8,000
CFL Fixtures	2,500

A variety of lights are discounted through the program, with an average incentive of $1.09 per bulb and $15 for CFL fixtures. The appliance portion of the program is incented through mail-in rebates in the amounts listed in Table 2.

Table 2. Appliance Rebate Amounts

Appliance Type	Rebate
Freezers	$50
Dehumidifier	$25
Room Air Conditioner	$50

Evaluation Questions

Cadmus' evaluation of the PY2 L&A program sought to answer the following key questions:

Impact Questions

1. What are the program's gross energy and demand savings?
2. What are the program's net energy and demand savings?
3. What are the market effects associated with program activities?
4. What percent of program bulbs were purchased by non-Ameren Missouri customers?
5. How many hours, on average, are program CFL used each day?
6. What are the appropriate per-unit savings for each lighting and appliance measure?

Process Questions

1. How has the program design changed from PY1?
2. How effective were program implementation, design and processes, and marketing efforts?
3. What are retailer and manufacturer experiences and satisfaction with the program?
4. What were program staff experiences and satisfaction with the program?
5. What were customers' perceptions of CFLs and what issues did they report with CFL use?

Report Organization

The remainder of this report is organized as follows:

- Section 3. Evaluation Methods
- Section 4. Impact Results
- Section 5.Process Results
- Section 6.Social Marketing Distribution
- Section 7.Conclusions and Recommendations
- The appendices of this report contain more detail on methodologies and results from the various research efforts.
- Appendix A contains analysis of responses from the CFL User Survey.

- Appendix B contains an analysis of the Site Visits.
- Appendix C contains additional detailed analysis from the Store Intercept Surveys.
- Appendix D contains additional detail regarding data preparation from the Metering Study.
- Appendix E contains comparative statistics from all 15 areas surveyed as part of the Multistate Study.
- Appendix F contains the survey instruments used for data collection.

3. Evaluation Methods

Analytical Methods

The research activities that informed this evaluation are summarized in Table 3. This chapter describes each major task and data source.

Table 3. Summary of Evaluation Approach (PY2)

Action	Impact	Process	Details
CFL User Survey	✓	✓	Lighting: Estimate CFL awareness, sales, and saturation. (n=451)
Site Visits	✓		Lighting: Assess CFL purchase, saturations, and installation rates.(n=87)
Participant Retail Store Sales Analysis	✓		Lighting and Appliances: Obtain an unbiased assessment of program sales from database tracking. (n=census)
Store Intercepts	✓		Lighting: Assess CFL leakage rates. (n=611)
Metering	✓		Lighting: Estimate hours-of-use. (n=44)
Retailer Interviews	✓	✓	Lighting: Obtain supplier self-reported estimates of NTG and review of program approach and opportunities for improvement. (n=75)
Multistate Analysis	✓		Lighting: Analyze NTG and benchmarking.
Engineering Estimates of Appliance Savings	✓		Appliances: Obtain information based on rebate applications and secondary research.
Appliance Participant Survey	✓	✓	Appliances: Analyze NTG and process results for appliance rebates.(n=150)
Program Document Review		✓	Lighting and Appliances: Understand program approach and identify opportunities for improvement, ensure all data necessary for evaluation are available,
Stakeholder Interviews		✓	Lighting and Appliances: Understand program approach and identify opportunities for improvement.(n=5)

CFL User Survey and Site Visits

The primary purpose of the CFL User Survey was to recruit participants for the site visits to be used as part of the multistate CFL analysis. However, the survey also estimated a number of important program indicators, including:

- ***CFL Awareness.*** These questions gathered data on the respondents awareness and familiarity with both standard and specialty CFL bulbs.
- ***CFL Satisfaction.*** This section asked about participants' satisfaction with CFLs, including reasons for dissatisfaction.
- ***CFL Purchasing.*** These questions focused on whether customers had purchased CFLs in the last six months and how many of those were installed, where they typically purchase CFLs and other lights, and how many CFLs are currently installed in their home.
- ***Concerns and Removal Rates of CFLs.*** Questions in this section gathered information on customer concerns about CFL bulbs and what they did with bulbs no longer in use.

- ***Demographics***. This section captured household and respondent characteristics, including income, age, home type, home square-footage, and energy expenditures.

A total of 451 surveys and 87 site visits were performed yielding precisions of 3.9 percent and 8.8 percent with a confidence of 90 percent for each study respectively. The CFL User Survey Results are included in Appendix A. Site Visit Results are included in Appendix B.

Participant Store Retail Sales Analysis

APT tracks retail sales of incented CFLs and data from rebate applications for appliances in a database. These files tie payment requests to identified transactions and track:

- Program activity by product or product type;
- Program activity on an aggregated basis of products rebated and dollars spent;
- Program activity by various identified components (e.g., by product, by store chain, by manufacturer, by month); and
- Ameren Missouri's estimated energy and demand savings.

Cadmus reviewed the energy and demand savings assumptions in the database, and summarized and analyzed the transactions to compute relevant totals for PY2.

Store Intercepts

Cadmus and its subcontractor, ICC/Decision Services, interviewed 611 consumers as they purchased lighting products in 24 different stores. The purpose was to determine the percentage of CFLs purchased by customers outside of Ameren Missouri territory and whether the CFLs were to be installed in a home or business. Store Intercept results are discussed in the Impact Results section with additional details provided in Appendix C.

Metering

Cadmus installed up to five light logger meters per home in a random sample of 44 Ameren Missouri homes with at least one CFL installed (22 from December 2009 through June 2010, and another 22 from June 2010 through December 2011). Through metering, we gathered information on lighting use patterns and developed estimates of overall hours-of-use (HOU) and average HOU for each room type. On a total home basis, the sample precision was ± 12.4 percent at the 90 percent confidence level; on a socket basis, sample precision was ±6.1 percent at the 90 percent confidence level. Metering results are discussed in the Impact Results section with additional details provided in Appendix D.

Retailer Interviews

Interviews of lighting retailers form the basis for one estimate of net-to-gross (NTG) for PY2. Interview questions regarding estimated changes in CFL sales due to the program, the share of CFLs sold through the program, and the total overall CFL sales are used to estimate NTG. In addition, the 60 lighting retailers and 15 appliance retailers were asked about changes in customer awareness, stocking, and sales trends for CFLs compared to one year ago.

Multistate Analysis

The multistate analysis is conducted via a non-linear statistical regression tool used to calculate NTG results by predicting the program's effect on net sales. After capturing CFL purchases and installations through the CFL User Survey and follow-up site visits from Ameren Missouri and 13 other program and non-program areas of the United States, we developed a regression model to predict CFL purchases while controlling for factors impacting CFL sales, such as income, education, home ownership, size of home, electricity rates, and the presence of big-box stores. The regression model isolates the program's effect on sales and establishes a modeled baseline of CFL purchases in the program's absence. The "lift" in purchases, as indicated by the program variable, is the effect attributable to program activities. This evaluation approach required the coordination of nine other utility groups to ensure consistent data collection and coordinated site visits. The final output also includes a benchmark comparison of the 10 different utility programs involved. This benchmarking, or comparative statistics are provided in Appendix E.

Engineering Estimate of Appliance Savings

Cadmus independently developed engineering estimates of appliance savings for use in determining program impacts. We used the ENERGY STAR calculator to estimate savings using St. Louis, Missouri as the reference location.

Appliance Participant Survey

An appliance survey of 70 rebate program participants was conducted so that Cadmus could assess self reported estimates of freeridership and determine how the program processes worked from the viewpoint of the participating consumer. The sample size was designed to produce a sampling error of ±10 percent at the 90 percent confidence level.

Stakeholder Interviews

To assess the program's effectiveness and implementation, Cadmus conducted interviews with four stakeholders intimately familiar with the program. The four stakeholders came from Ameren Missouri and APT. Details regarding interviewed stakeholders are provided in Table 4.

Table 4. Stakeholder Interviewees

Title	Organization
Residential Program Manager	Ameren Missouri
Senior Program Manager	Ameren Missouri
Regional Director of Operations	APT
Program Manager	APT

Cadmus conducted stakeholder interviews utilizing interview guides aimed at discussing the program's design, implementation and delivery, marketing efforts, implementation barriers, and communication.

We used information obtained from stakeholders to inform the following evaluation elements:

- Determination of program progress;
- Identification of changes during implementation; and

- Assessment of program marketing.

Program Document Review

Cadmus reviewed program documents consisting of rebate applications and marketing materials. We also reviewed APT's data tracking reports, which provided an ongoing understanding of marketing and training events as well as progress in signing up participating retailers.

Data Sources

The following data sources informed the impact and process evaluation:

- Final PY2 program database;
- Information gathered through the CFL User Survey;
- Information gathered through stakeholder interviews;
- Information gathered through retailer interviews;
- ENERGY STAR Savings Calculator for Room Air Conditioners, Freezers, and Dehumidifiers;[1]
- Marketing and informational materials (provided by Ameren Missouri);
- Progress reports (provided by APT);
- Metered data gathered through the lighting logger study; and
- Information gathered through store intercept surveys.

[1] http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorConsumerRoomAC.xls.

4. Impact Results

Impact evaluation findings are presented in the following five subsections, with each covering lighting, fixtures, and appliances separately:

1. Per unit savings
2. Summary of program sales
3. Determination of gross savings
4. Determination of net savings
5. Impact evaluation summary

Per Unit Savings

Lighting - Upstream

To calculate lighting per unit savings for the upstream portion of the program, the analysis required the following inputs:

- An estimate of the wattage displaced by program-discounted products (delta watts);
- An estimate of the average daily HOU;
- An estimate of the coincident CFL use at the time of Ameren Missouri's system peak; and
- An estimate of bulbs installed in non-residential applications and the associated HOU.

Delta Watts

Using Ameren Missouri's tracking database, we determined the weighted average wattage of all CFLs sold through the Ameren Missouri program in 2010 was 15.2 watts (W). **Error! Reference source not found.** shows the theoretical lumen-equivalent wattages associated with the CFLs sold by Ameren Missouri, with a calculated average of 66. Using the 66 lumen-equivalent incandescent wattage, the estimated average incandescent to CFL ratio is 4.3.

Table 5. CFL Wattage and Amount Sold

CFL Wattage	Total Number Sold*	Lumen-Equivalent Incandescent Wattage
7	13,098	40
9	50,300	40
10	42,638	40
11	23,995	40
12	3	40
13	526,807	60
14	493,452	60
15	70,730	60
16	265	60
17	3,531	75
18	37,254	75
19	17,079	75
20	30,468	75
22	543	100
23	138,085	100
25	334	100
26	88,434	100
27	5,677	100
28	449	150
29	1,650	150
30	67	150
33	21	150
39	665	150
40	370	150
42	1,314	150
Total	1,547,229	
Weighted Average	15.2	66

* Includes coupons and on-line sales, does not include SMD bulbs

Cadmus does not recommend using the theoretical lumen-equivalent incandescent wattage ratio directly as calculated, because consumers sometimes replace incandescent light bulbs with higher lumen CFLs to overcome perceived CFL "dimness". Manufacturers recommend an approximate 4:1 ratio for incandescent-to-CFL wattage and incandescent packaging typically recommends the lumen-equivalent wattage as shown in Figure 2, below; however, a number of websites suggest that a 3:1 ratio might provide higher consumer satisfaction with the quantity of light.[2] Further, brightness was listed as a concern by some Ameren Missouri survey participants reporting dissatisfaction with CFLs in the CFL User Survey.

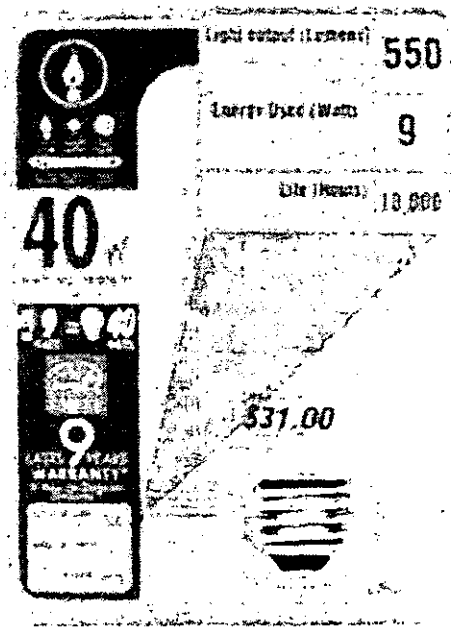
When considering the appropriate incandescent-to-CFL wattage ratio, Cadmus also reviewed other primary research regarding the estimation of replaced incandescent wattage:

[2] See recent websites for both Consumer Reports (http://www.consumerreports.org/cro/magazine-archive/october-2009/home-garden/compact-fluorescents/how-to-choose/compact-fluorescents-how-to-choose.htm) and Flex Your Power (http://www.fypower.org/res/tools/products_results.html?id=100195).

1. The most recent 2006-2008 California Upstream Lighting Evaluation[3] conducted lighting inventories at approximately 1,200 homes and found that the average incandescent wattage of 61.7 was being replaced by average CFL program wattage of 17.2 (incandescent-to-CFL ratio of 3.6). In this study, technicians completed a full inventory of lighting wattages in the home and assumed the replaced wattage was equal to the corresponding wattage used in a similar room with similar lamp type bulbs that were not replaced.
2. A 2010 study for Duke Energy[4] used program participant's self-reported information for both replacement and purchased wattages, and found that the average incandescent wattage of 66.7 was replaced by average CFL program wattage of 15.7, resulting in an incandescent-to-CFL ratio of 4.25. This study also formed the basis for Ohio's Technical Reference manual.

The average Ameren Missouri program CFL wattage is lower than in California (15.2 vs. 17.2) and slightly lower than in Ohio (15.2 vs. 15.7). Based on these different studies and the other information discussed above, Cadmus recommends discounting the lumen-equivalent incandescent-to-CFL wattage ratio from 4.3 calculated in Table 5, to 4.0 by accounting for the above mentioned human factor (where some customers replace incandescent bulbs with higher lumen CFLs). Cadmus calculated the *ex post* energy savings for this evaluation using a 4.0 incandescent-to-CFL wattage ratio.

Figure 2. Example of CFL Packaging with Equivalent Incandescent



[3] KEMA, Inc., The Cadmus Group Inc., Itron, Inc., PA Consulting Group, and Jai J. Mitchell Analytics. Draft Evaluation Report: Upstream Lighting Program. Prepared for the California Public Utilities Commission, Energy Division, December 10, 2009.

[4] TekMarketWorks. Draft Report:Ohio Residential Smart Saver CFL. Prepared for Duke Energy, June 2010.

Average Daily HOU

Cadmus performed a metering study to estimate HOU specific to Ameren Missouri customers. Cadmus conducted two waves of CFL metering for the PY2 evaluation. The first wave coincided with residential lighting audits in December 2009. Cadmus field technicians installed 98 light loggers in 22 households with electricity service provided by Ameren Missouri. The first wave of metering ended in June 2010 when Cadmus field technicians removed the loggers and then installed 82 light loggers in 22 additional households to begin the second wave of metering. The sample error is ±12.4 percent on a per household basis and ±6.1 percent on a logger basis, at the 90 percent confidence level. The second wave of metering ended in December 2010. Each wave collected lighting usage data for a period of six months, resulting in a full year of lighting usage data.

Wave 1 participants were recruited through an on-line survey conducted in June 2009. As part of this effort, 478 respondents agreed to participate in a six month light logger study. From this sample, Cadmus randomly recruited 22 respondents who indicated at least one CFL was installed in their home for the Wave 1 metering effort.

The CFL User Survey, conducted by Tetra Tech for information and recruitment to the multistate study was also used to recruit 22 participants for Wave 2 metering in the same fashion described for Wave 1. The two waves were designed to capture the seasonal differences of lighting use and allow for additional participant samples. As a result, we have lighting use data covering an entire year. Table 6 summarizes the data collection and metering schedule.

Table 6. Data Collection and Metering Schedule

Metering Wave	Data Collection Task	Sample Size	Date Completed
Wave 1	Ameren Online Survey	478	6/2009
	Cadmus Audit/Metering Recruitment	22	11/2009
	Meter Installation and Lighting Audits	22	12/09/2009 – 12/12/2009
	Meter Removal and Onsite Survey	22	6/21/2010 – 6/24/2010
Wave 2	Tetra Tech Phone Survey	451	6/2010
	Cadmus Audit/Metering Recruitment	22	6/2010
	Meter Installation and Lighting Audits	22	6/28/2010 – 7/2/2010
	Meter Removal and Onsite Survey	22	12/6/2010 – 12/9/2010

Logger Sampling Methodology. For homes with five or fewer CFL fixture groups identified, field technicians installed a logger on each CFL fixture. For homes with more than five CFL fixture groups, field technicians used the random selection method described below and shown in Table 7 to determine which five fixtures to meter.

Each household was assigned a random start number, used as the fixture number from which to begin the random count, based on possible ranges of CFL fixture groups. After determining the

number of CFL fixture groups from the audit, field technicians identified the range (the number of CFL fixtures) and the corresponding random start number (the first and second columns of Table 7). Field technicians then counted a predetermined number of fixture groups from the random start number, and installed a logger on every n^{th} CFL fixture group from the random start number. Field technicians adhered to this protocol to install up to five loggers per household.

Table 7. CFL Fixture Random Selection Protocol

Range of CFL Fixture Groups	Random CFL Fixture Group Start Number	Meter Every n^{th} CFL
1-5	4	1st
6-10	2	2nd
11-15	12	3rd
16-20	9	4th
21-25	18	5th
26-30	5	6th
More than 30	24	7th

Cadmus field technicians installed up to five light loggers per household on both interior and exterior CFL fixtures. Light loggers record the time and date of each on and off event on the metered fixture. These data enable analysts to estimate average HOU per day per CFL fixture, as well as average HOU per household and room. Additionally, light logger data can provide a clear understanding of lighting usage during peak and off-peak hours. Details on data cleaning and preparation are described in Appendix J.

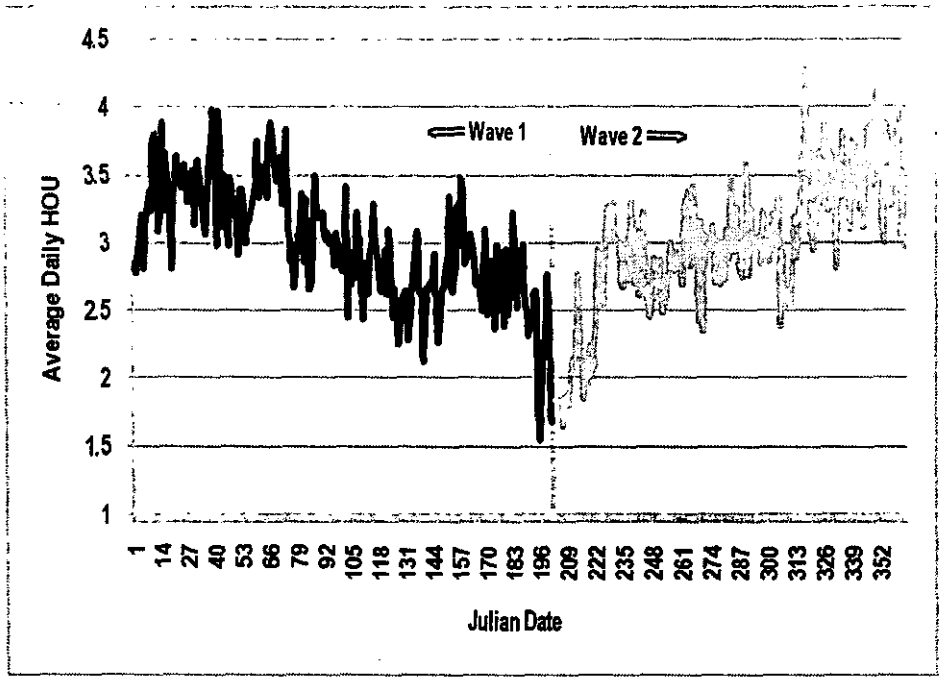
To calculate HOU estimates we determine the total time "on" for each individual light logger per day. We used the following guidelines to assign "on" intervals to each light logger:

- If a light logger did not record any light for an entire day, that day's HOU was 0.
- If a light logger registered that a light was turned on at 8:30 p.m. on Monday, and registered the light being turned off at 1:30 a.m. on Tuesday morning, 3.5 were added to Monday's HOU, and 1.5 hours were added to Tuesday's HOU.

We calculated the average daily HOU as the average time "on" across the entire metering period (daily from 12:00:00 a.m. to 11:59:59 p.m.) across all light loggers. The average HOU is the average of all HOU estimated for each logger across all days. The primary un-weighted mean HOU estimate across all loggers was 3.01.

Figure 3 shows that average daily HOU for each wave are almost symmetrical; with HOU decreasing from winter to summer and then increasing from summer to winter. Figure 3 demonstrates how lighting usage varies inversely with daylight hours over the course of a year, confirming our expectation that lighting use is highly correlated with hours of daylight.

Figure 3. Average Daily Unweighted HOU – Wave 1 and Wave 2



After calculating the average HOU for the raw metered data, analysts weighted the data based on responses to an on-site survey that took place during logger removals for wave 1 and a phone survey that took place prior to logger installations for wave 2. These weights were determined by participant educational attainment, home ownership status (i.e., home owner or renter) to approximate population demographics along with the total number of CFLs associated with the fixture for all light loggers and the room-based number of CFLs per fixture. In weighting for CFLs per fixture, if a logger was installed on a fixture with only one associated CFL, it would have half the weight of a logger installed on a fixture with two CFLs. Even though a logger collected lighting data from a single lamp, all other CFL lamps in common with that fixture were assumed to have the same HOU. The weighting logic by room type is shown in the third column of Table 8. The initial weight for each room type is representative of the percent of all CFLs associated with each room type by the total CFL lamps across all metered households. We calculated this weight as the percent of the sum of all CFLs associated with each room by all CFLs found in the total audit population (i.e., the total CFLs found in all audited households). We then adjusted each room's HOU by this population-based CFL saturation. Table 8 shows the sample distribution and the final population distribution. Based on our weighted findings, we estimate HOU to be 2.91.

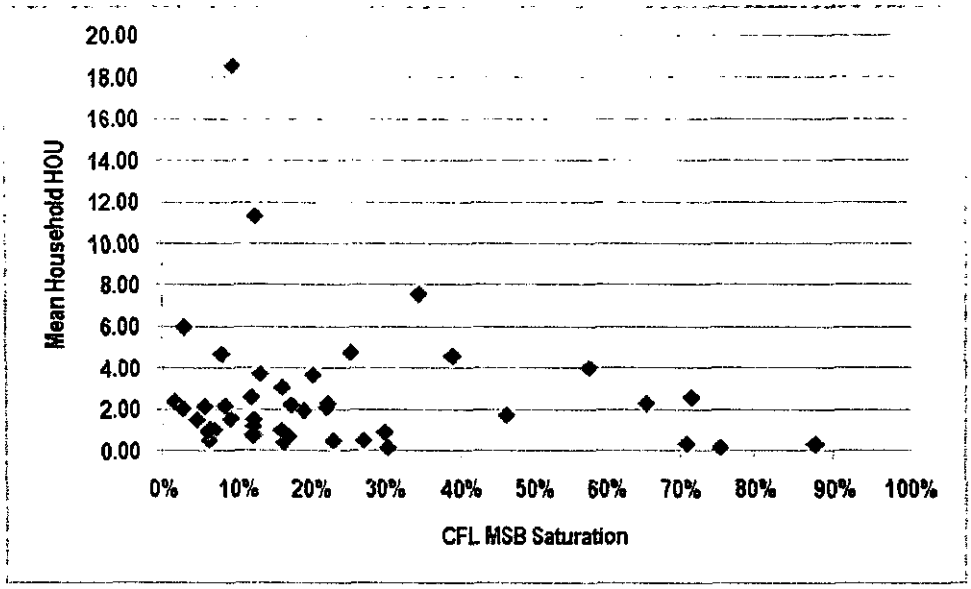
Table 8. Weighted HOU Estimates (n = 164)

Room Type	Demographic Weighted HOU	Sample Population BPF Weight	Audit Population BPF Weight
Basement	5.76	5.3%	8.1%
Bathroom	1.68	7.8%	11.5%
Bedroom	1.32	25.6%	20.8%
Closet	0.80	2.5%	1.4%
Dining	1.21	3.2%	3.6%
Foyer	1.39	2.1%	2.2%
Garage	2.06	3.9%	3.6%
Hallway	1.32	2.1%	3.2%
Kitchen	4.32	15.3%	13.1%
Living Space	4.37	23.1%	20.1%
Office/Den	2.76	3.9%	2.4%
Other	0.32	0.4%	0.4%
Outdoor	3.20	3.2%	7.9%
Utility	0.47	1.4%	1.6%
Mean HOU	**3.01**	**2.87**	**2.91**

As a final step for the HOU analysis, analysts tested the relationship between CFL saturation at a household level and the mean-weighted household HOU. The general assumption is that CFL saturation and HOU have an inverse relationship; as CFL saturation increases, mean HOU decreases. The logic around this assumption is that as people purchase CFLs, they tend to install them in high-use areas first (such as kitchens or living spaces or where lamps typically burn out first). As households saturate high-use sockets, they will eventually begin to install CFLs in secondary low-traffic rooms such as closets, garages, guest bedrooms, and offices. The low-use associated with these secondary low-traffic rooms will decrease the average HOU. Therefore, the overall average HOU is assumed to decrease as CFL saturation increases.

Cadmus did not find evidence of a strong statistical relationship between CFL saturation of medium screw-base sockets and mean-weighted household HOU across the two metering waves. Figure 4 presents these findings. A visual inspection of the data scatter plot is convincing that there is little to no statistical relationship between saturation and HOU. The Pearson correlation coefficient of -0.15 indicates that there is a weak negative correlation, but largely confirms that there is no statistical relationship between CFL saturation and mean-weighted household HOU.

Figure 4. CFL MSB Saturation and HOU (n = 44)



Cadmus constructed a two-tailed 90 percent confidence interval around the un-weighted mean HOU as shown in Table 9. Some variance around the mean HOU is expected, as Cadmus field technicians randomly selected fixtures to meter. As discussed above, lighting usage depends on daylight hours, room type, and frequency of room usage. For example, high-traffic areas such as kitchens and living rooms typically have higher lighting usage. Low-traffic areas such as closets and guest rooms typically have lower lighting usage.

Table 9. Confidence Intervals for Mean HOU – Two-Tailed at 90 Percent

Loggers	Unweighted Mean HOU	Standard Error	Standard Deviation	Margin of Error +/-	Coefficient of Variation	Two-Tailed Confidence Interval
164	3.01	0.36	4.56	45.83%	1.52	1.63 – 4.39

Coincident Peak Demand Savings

Analysts also calculated peak coincidence factors for metered CFL fixtures. The peak period is defined as non-holiday weekdays from 4:00 p.m. to5:00 p.m., beginning on August1, 2010 and ending August 31 2010. This peak period coincided with the wave 2 metering period. The mean peak coincidence factor is 12.2 percent; indicating that during the 60-minute peak period, metered CFLs were on for an average of 12.2 percent of the time, or roughly 7.3 minutes.

Per Unit Energy Savings and Demand Reduction

Table 10 compares Cadmus' estimates of per-unit energy savings to Ameren Missouri's estimates. Cadmus used the following formula:

$$\frac{CFL\ Watts\ X\ Watt\ Ratio - CFL\ Watts\ X\ HOU\ X\ 365}{1000}$$

$$\frac{CFL\ Watts\ X\ 4 - CFL\ Watts\ X\ 2.91\ hours\ X\ 365\ days}{1000} = 48.4\ \text{kWh}$$

As shown in Table 10, per unit CFL energy savings determined by this evaluation is higher than the program's *ex ante* per unit value because the *ex ante* estimates assumed a lower HOU of 2.34 hours per day and an incandescent-to-CFL wattage ratio of 3.8.

Table 10. Per Unit Lighting Energy Savings Comparison

Ex Ante Per Unit Energy Savings* (kWh/Year)	Ex Post Per Unit Energy Savings (kWh/Year)
36.49	48.4

* Weighted average energy savings from lighting program tracking database.

As part of the metering study discussed later in this report, Cadmus calculated that 12.2 percent of metered CFLs were in operation at the time of Ameren Missouri's system peak. Using this information, Cadmus calculated the peak coincident demand savings per bulb shown in Table 11 using the following formula:

$$CFL\ Watts\ X\ Watt\ Ratio\ X\ .122 = 15.2\ X\ 4\ X\ .122 = .0075\ \text{kW/bulb}$$

Table 11. Per Unit Lighting Fixture Demand Savings Comparison

Ex Ante Per Unit Demand Savings (kW)*	Ex Post Per Unit Demand Savings(kW)
.0031	.0075

* Based on IRP goals

Bulbs Installed in Non-Residential Locations

Based on store intercept surveys (summarized later in this report), three percent of the purchased CFLswere intended to be installed in non-residential facilities in Ameren Missouri territory. For those CFLs, we used 10 HOU and 0.86 coincident peak demand/kW of bulb wattage,[5] and computed the average per-unit energy savings and per-unit coincident peak demand using the same formula as above. Table 12 shows the per-unit, non-residential energy and demand savings.

[5] Energy Efficiency/Demand Response Plan Year 2 Evaluation Residential Energy Star Lighting, Commonwealth Edison. Company, September 1, 2010: "non-residential HOU and CF parameter estimates were taken from the ex-post findings from the PY1 Small C&I Intro kit final report (HOU = 10.0 per day and CF = 0.86)."

Table 12. Per-Unit, Non-Residential Lighting Energy and Demand Savings

Realized Per Unit Energy Savings kWh per bulb	Realized Per Unit Demand Savings kW per bulb
166.4	0.054

Fixtures

We determined gross per-unit energy savings for ENERGY STAR® fixtures through an engineering analysis. Since the savings of ENERGY STAR fixtures come from the CFLs bulbs that fit (incandescent bulbs do not fit ENERGY STAR fixtures), we calculated per-bulb unit savings as described in the upstream lighting section above. Weighted average CFL wattages from the tracking database are 39 W per fixture, and applying a similar 4.0 ratio results in kW savings of 117 W per fixture (incandescent wattage = 156). HOU is 2.91 and peak demand savings are 0.122 peak kw/fixture wattage savings multiplied by the kW savings of 117. Applying these calculations, our estimated energy and peak demand savings are shown in Table 13.

Table 13. Unit Energy Savings for ENERGY STAR Fixtures

Ex Ante Per Unit Energy Savings (kWh/Year)	Ex Post Per Unit Energy Savings (kWh/Year)	Ex Ante Per Unit Coincident Demand Savings (kW)	Ex Post Coincident Demand Savings (kW)
88	124	.007	.014

Appliances

Cadmus independently estimated per unit energy savings for each type of appliance also using an engineering analysis. Given that appliances were planned to be a small percentage of overall program results, the majority of evaluation resources in 2010 were focused on lighting. Should the appliances portion of the program grow over time, we would recommend more rigorous evaluation approaches. Our specific assumptions and estimations for each appliance are detailed in the following paragraphs.

Air Conditioner Savings

Cadmus determined gross per-unit energy savings for ENERGY STAR room air conditioners through an engineering analysis based on the ENERGY STAR savings calculator.[6] Using Saint Louis, Missouri as a reference city, energy savings were assumed to be equivalent to a full year of energy consumption with 1,215 full load cooling hours. The calculator used the average purchased EER value from the program of 10.7, replacing the federal standard efficiency of 9.7 EER (these values were the average reported). Cadmus determined the efficiencies using the ENERGY STAR list of qualified units that contains both ENERGY STAR and federal standard

[6] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=AC

efficiency levels by matching brand and models from the Ameren database. We used a 9,761 BTU/hr unit to determine the energy savings estimates (the average of reported purchases).

We based peak demand savings on load shapes developed for another Midwest utility[7] (0.05kWx115kWh/95.7kWh = 0.08 kW). The energy and peak demand savings are shown in Table 14.

Table 14. Per-Unit Gross Savings for Room Air Conditioners

Appliance	*Ex Ante* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Coincident Demand Savings (kW)
Room Air Conditioner	95.7	115	.06

Dehumidifier Savings

Cadmus determined gross per-unit energy savings for ENERGY STAR dehumidifiers through an engineering analysis based on the ENERGY STARs avings calculator.[8]We assumed savings are equal to a full year of energy consumption with 1,620 operating hours. The calculator assumed an ENERGY STAR dehumidifier was replacing a standard dehumidifier. The ENERGY STAR savings calculator evaluates multiple different sizes of dehumidifiers, ranging from 1-24 pints per day to 75-185 pints per day. We calculated an energy savings result for each specific size, and used weights to determine one gross savings estimate. This involved converting liters/day to pints/day using a factor of approximately 2.11. The per-unit gross energy savings and weights based on actual program purchases are shown in Table 15.

Table 15. Per-Unit Gross Energy Savings and Weights by Size for Dehumidifier

Size	1-24 Pints/Day	25-34 Pints/Day	35-44 Pints/Day	45-54 Pints/Day	55-74 Pints/Day	75-185 Pints/Day
Energy Savings	54	117	213	297	185*	374
Weights	0%	30%	5%	42%	23%	0%

*This value is a computation based on the difference between the federal standard efficiency and ENERGY STAR standard efficiency, which has a lower spread than other dehumidifier sizes.

We based peak demand savings on the original default value.[9] We adjusted the demand savings using a ratio of updated energy savings divided by the originally proposed energy savings (0.099 kW x 213 kWh / 270 kWh = 0.08 kW). The energy and peak demand savings are shown in Table 16.

---

7 From Ameren Illinois (Ameren EE DR Plan Appendices 11.15.07).From Ameren Missouri (Attachment B - APT-EFI_TRC_2009-11-03 (2)).

8 http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DE

9 From Ameren Missouri, Attachment B - APT-EFI_TRC_2009-11-03 (2).

Table 16. Per-Unit Gross Savings for Dehumidifiers

Appliance	*Ex Ante* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Coincident Demand Savings (kW)
Dehumidifier	249.8	213	0.08

Freezer Savings

Cadmus determined gross per-unit energy savings for ENERGY STAR freezers through an engineering analysis based on the ENERGY STAR qualified unit list.[10] This list includes the average consumption for both a federal standard unit and the specific ENERGY STAR freezer. All units included in the database contained a matching unit in the ENERGY STAR qualified unit list for freezers. We determined the total federal consumption and ENERGY STAR consumption for all of the participating units and then divided by the total number of participating units to determine an average energy savings. As shown in Table 17 the ex ante and ex post estimates differ significantly. In reviewing the Ameren Missouri estimation approach, it appears the savings assumptions were based on early replacement rather than replacement at burnout or new purchases.

We based peak demand savings on the original default peak demand savings.[11] We then adjusted the demand savings using a ratio of updated energy savings divided by the originally proposed energy savings (0.016 kW x 61 kWh / 247.1 kWh = 0.004 kW). The energy and peak demand savings are shown Table 17.

Table 17. Per-Unit Gross Savings for Freezers

Appliance	*Ex Ante* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Energy Savings (kWh/Year)	*Ex Post* Gross Coincident Demand Savings (kW)
Freezer	247.1	61	0.004

Summary of Program Sales

Lighting

Total upstream program sales amounted to 1,547,459 CFLs: 861 through the online stores, 5,069 through coupon efforts, and 1,546,007 through retailers. Program sales took place through 185 different retailers throughout Ameren Missouri's service territory.

Table 18 summarizes the number of CFLs sold and incentives paid through the different retail channels.

[10] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=FRZ

[11] From Ameren Missouri, Attachment B - APT-EFI_TRC_2009-11-03 (2).

Table 18. CFLs Sold and Incentives Paid by Retail Channel

Store	Qty Sold	Incentives $
Big Box	192,902	$194,729
DIY Big Box	622,809	$656,906
Dollar Stores	8,711	$10,453
Hardware Stores	5,069	$4,436
Farm Supply	47	$64
Grocery Store	29,315	$30,410
On-Line	861	$1,542
Warehouse	687,745	$749,066
Total	1,547,459	$1,643,170

Of the many types of CFLs sold through the program, the three top selling models from December 2009 through September 2010 were TCP's 14W, mini-spiral four packs (351,596 bulbs, or 87,899 packs sold); GE's 13W eight packs (257,904 bulbs, or 32,238 packs sold); and Feit's 13W, mini twist four packs (154,652 bulbs, or 38,663 packs sold). See Figure 5.

Figure 5. Top Ten Selling Program Bulbs

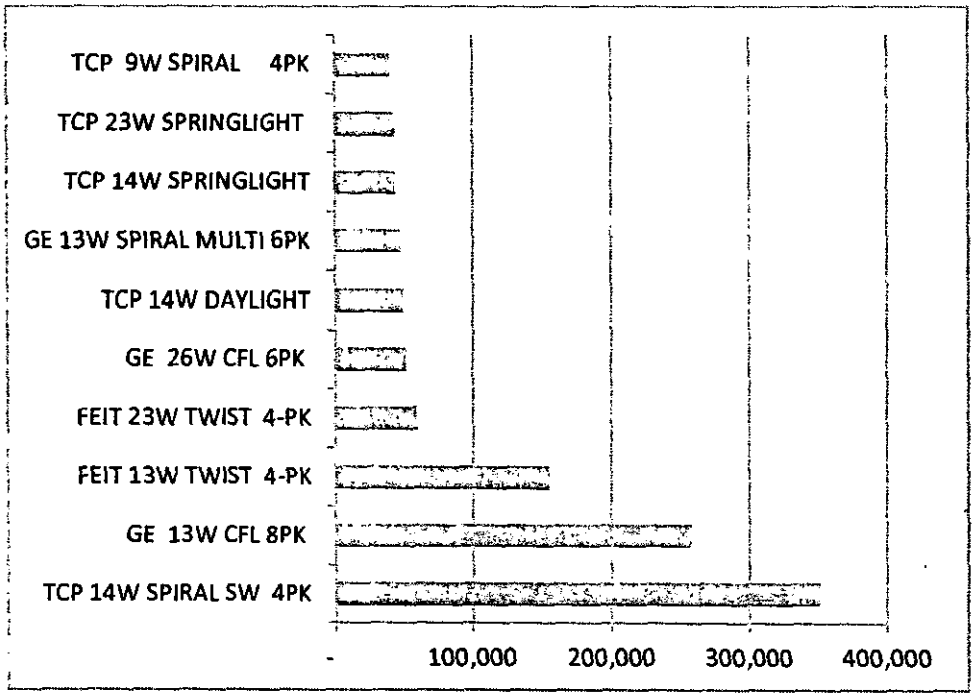
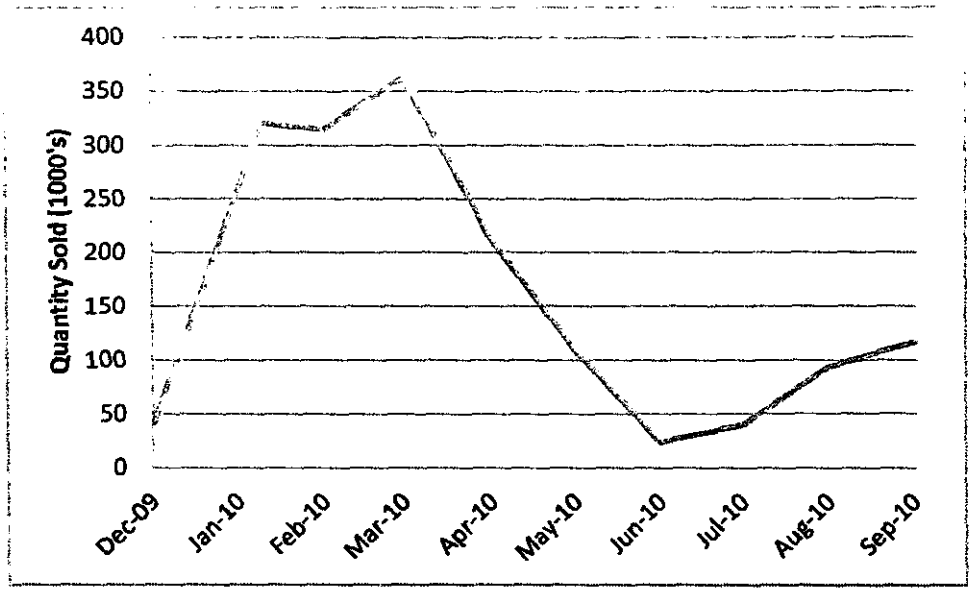


Figure 6 shows program CFL sales by month. Sales significantly increased from the end of 2009 into the beginning of 2010. Sales then began to drop after February 2010 through July, with a positive trend beginning again after July 2010. This trend is somewhat consistent with general lighting sales trends which dip during the summer; however, Ameren Missouri also removed incentives for standard spiral CFLs from May through August to maintain its overall program budget.

Figure 6. CFL Sales by Program Month



As shown in Table 19, the majority of bulbs sold though the upstream program through markdown retailers were standard spiral bulbs, with a total of 1,547,459 sold, accounting for approximately 88 percent of total bulb sales during the PY2 program year. Specialty bulbs accounted for approximately 12 percent of bulb sales for the program year, but represented a larger portion of total incentives, 18 percent.

Table 19. Standard and Specialty Bulb Sales Through Markdown Retailers and Online

Bulb Type	Qty Sold*	Incentives $	Incentives $/Bulb
Specialty Bulbs	192,365	$293,114	$1.52
Standard Bulbs	1,355,094	$1,354,491	$1.00
Grand Total	1,547,459	$1,647,606	$1.06

Since the specialty bulb category encompasses a wide variety of bulb types, it is interesting to note the proportions within the specialty bulb grouping. Flood lights and spotlights account for almost 60 percent of total specialty bulb sales. Globe-shaped bulbs represent the second largest category, accounting for approximately 16.1 percent of specialty bulb sales, and A-lamp bulbs represented approximately 13 percent of sales. The remaining bulb types collectively represent 12 percent of sales. The incentive percentages by bulb type are proportionately very similar to the bulb quantity percentages, see Table 20.

Table 20. Specialty Bulb Sales by Bulb Type

Specialty Bulb Type	Qty Sold	% of Total Bulbs	Incentives $	% of Total Incentives
3-Way Bulbs*	2,732	1.42%	$3,347.25	1.14%
A-Lamp Bulbs	24,401	12.68%	$37,745.59	12.88%
Candelabra Bulbs	13,154	6.84%	$19,728.00	6.73%
Night Lights	186	0.10%	$372.00	0.13%
Dimmable Bulbs	1,203	0.63%	$1,895.50	0.65%
Fan Bulbs	4,043	2.10%	$5,401.50	1.84%
Globe Bulbs	31,429	16.34%	$47,311.25	16.14%
Flood and Spotlights	115,217	59.89%	$177,313.33	60.49%
Grand Total	192,365	100%	$293,114.42	100%

* We calculated energy savings from 3-way bulbs based on the highest of the three wattage levels.

Fixtures

A total of 591 lighting fixtures were sold in PY2. All of them were designed to hold three 13 W CFLs.

Appliances

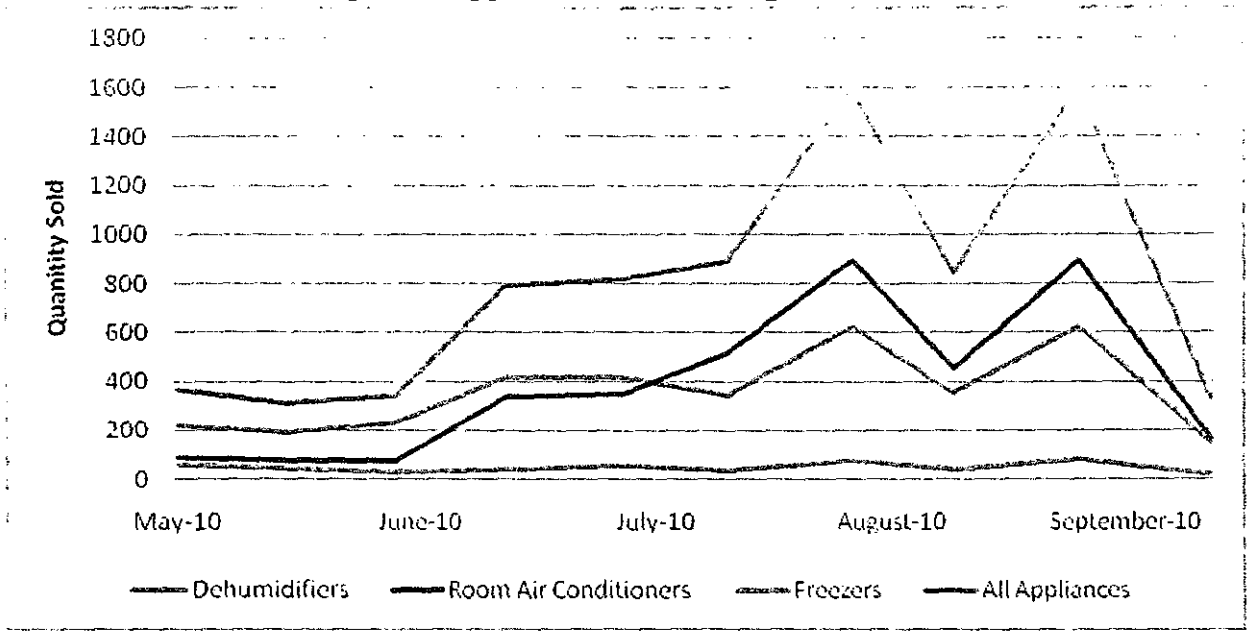
A total of 7,889 program appliances were sold in PY2. Table 21 summarizes the number of appliances sold and the amount of incentives paid by appliance type. Room air conditioners were the highest selling appliance.

Table 21. Appliances Sold and Incentives Paid

Appliance	Incentive Amount	Qty Sold	Total Incentives Paid $
Dehumidifiers	$25.00	3,545	$88,625.00
Freezers	$50.00	490	$24,500.00
Room Air Conditioners	$50.00	3,853	$192,650.00
Grand Total		**7,888**	**$305,795.00**

Figure 7 shows appliance sales by program month.

Figure 7. Appliance Sales by Program Month



Overall, sales increased from June through July 2010. In August, sales noticeably decreased for all appliances, then peaked again at the beginning of September and declined again quickly. These sales patterns follow expectations, as sales of these appliances are largely weather-driven.

Determination of Gross Savings

Lighting – Upstream Program

We determined gross savings for lighting based on the following inputs:

- Average per-unit energy and demand savings;
- Number of product sales;
- Installation rate; and
- Leakage.

Installation Rate

Per-unit energy and demand savings, as well as product sales, were discussed in the previous two sections. Theoretically, installation rates should also be applied to the results. However, carrying over program sales from previous year's evaluation into future years requires continuous tracking and follow-up, which can be challenging if regulatory requirements and policies change over time. Therefore, Cadmus developed an installation rate adjustment to account for the difference in the present value of savings over the assumed approximate nine-year life of a CFL. We developed the installation rate adjustment based on specific site visit data over a three year

period in California,[12] which showed that within three years, 98 percent of CFLs are installed, and the remaining 2 percent do not get installed. Cadmus applied this same logic to Ameren Missouri's results by developing an algorithm to apply the rate at which installation occurs based on the initial year one installation rates.

According to this algorithm, 55 percent of CFLs that were put into storage in year one are installed in year two, and 41 percent of CFLs that were put into storage from year one are installed in year three. Applying this algorithm to Ameren Missouri, where the installation rate was 82 percent in PY2, 55 percent of 278,543 are installed in year two, and 41 percent of 278,543 are installed in year three. Table 22 and Table 23 illustrate this approach and compare the net present value (NPV) of the CFLs savings (simplified by assuming that savings equals the number of CFLs) over a nine year period. As shown, the difference is 2.7 percent. Therefore, Cadmus applied a 2.7 percent installation rate adjustment to gross savings.

Table 22. Expected CFL Installations from PY2 Program Bulbs

	Installation Rate	Total Bulbs
PY2 Bulbs Sold		**1,547,459**
PY2 Installation	82% of Bulbs Sold	1,268,916
Remaining Bulbs After PY2		278,543
PY3 Installation	55% of Remaining Bulbs After PY2	153,198
Remaining Bulbs After PY3		125,344
PY4 Installation	41% of Remaining Bulbs After PY2	114,202
Bulbs Never Installed		81,826
Total Installed	**0.99**	**1,536,317**

[12] KEMA, Inc., The Cadmus Group Inc., Itron, Inc., PA Consulting Group, and Jai J. Mitchell Analytics. Draft Evaluation Report: Upstream Lighting Program. Prepared for the California Public Utilities Commission, Energy Division, December 10, 2009.

Table 23. Comparison of Actual Installation Impacts to Assumed First Year Installation

	Scenario 1, Installation Over Three Years				Scenario 2, Installation Assumed in Year One	Difference
	Year 1	Year 2	Year 3	Total		
NPV				9,026,368	9,277,399	2.71%
1	1,268,916			1,268,916	1,547,459	
2	1,268,916	153,198		1,422,115	1,547,459	
3	1,268,916	153,198	114,202	1,536,317	1,547,459	
4	1,268,916	153,198	114,202	1,536,317	1,547,459	
5	1,268,916	153,198	114,202	1,536,317	1,547,459	
6	1,268,916	153,198	114,202	1,536,317	1,547,459	
7	1,268,916	153,198	114,202	1,536,317	1,547,459	
8	1,268,916	153,198	114,202	1,536,317	1,547,459	
9	1,268,916	153,198	114,202	1,536,317	1,547,459	
10		153,198	114,202	267,401	0	
11			114,202	114,202	0	

*Calculated at 9% discount rate.

Leakage

Leakage is defined as CFLs sold to non-Ameren Missouri customers purchasing CFLs at program stores. To calculate program leakage, Cadmus and its subcontractor ICC/Decision Services conducted 611 customer intercept surveys in 24 stores across seven distribution channels in the Ameren Missouri territory. Customers were intercepted in participating stores after they had selected at least one light bulb to purchase (either a program or non-program bulb). As an incentive for participating, each intercept customer was offered a $5 gift card to the store where the intercepts took place, and the study consisted of taking a three to five minute survey in the store. Retail markdown stores were stratified and sampled to allow higher precision on stores assumed to be most vulnerable. Results were then weighted to calculate overall leakage.

Sampling Plan. To create the intercept sampling plan, we started with a list of retailers participating in the markdown program and not the coupon program. The coupon program requires customers to identify their zip code and utility which minimizes leakage. Cadmus stratified the list of 289 participating markdown retailers by the following strata:

- Urban vs. rural –urban in the St. Louis metropolitan area and rural outside of St. Louis.
- Vulnerable vs. non-vulnerable –using Ameren Missouri customer meter accounts compared to census population estimates, we allocated stores in areas with 50 percent or less of the household population in the area being in the Ameren Missouri service territory to the vulnerable category, as well as specific locations identified by Ameren Missouri staff as being located close to other utility areas.
- Targeted vs. non-targeted – targeted stores were identified by APT as potential high CFL sellers.

- Store distribution channel – warehouse, mass merchandise, home improvement, grocery, hardware, and bargain.

Table 24 shows the number of intercepted stores according to the sample stratifications listed above. Due to the limited number of rural retail stores in the sample and challenges of retail stores allowing the intercept visits, Cadmus was only able to complete intercepts in three rural stores, all of which were Wal-Marts.

Table 24. Stores Visited By Stratification (n = 24)

Leakage Vulnerability	Rural Sample Size		Urban Sample Size	
	Targeted	Non-Targeted	Targeted	Non-Targeted
Non-Vulnerable	0	0	7	1
Vulnerable	3	0	5	8

Table 25 presents the sample plan and completed surveys by store distribution channel, while

Table 26 shows the actual number of completed intercepts by store name. The team conducted the most intercepts at home improvement stores (with over 200 intercepts at Home Depot stores), grocery stores (with 180 surveys at Schnuck's and Dierberg's combined), and mass merchandise stores (with 131 surveys at Wal-Mart stores).

Table 25. Stores Visited by Distribution Channel and Completed Surveys

Distribution Channel	Stores Visited	Surveys Completed
Home Improvement	8	207
Grocery	5	180
Mass Merch or Discount Store	5	131
Bargain	4	39
Hardware	1	30
Warehouse	1	24
Total	**24**	**611**

Table 26. Stores Visited and Completed Surveys by Store Name (n = 611)

Store Name	Stores Visited	Surveys Completed By Store
Wal-Mart	5	131
Home Depot	8	207
Family Dollar Store	3	23
Dierberg's	2	90
Schnuck's	3	90
Sam's Club	1	24
Ace Hardware	1	30
Dollar Tree Store	1	16
Total	**24**	**611**

Table 27 presents the distribution of stores with and without Ameren Missouri program lighting demonstrations that occurred at the same time as the intercepts. As noted, due to difficulty in

gaining store approval for the surveys when demonstrations are not happening, we conducted the majority of the intercepts when demonstrations were taking place.

Table 27. Demonstration Stores by Distribution Channel (n = 24)

Distribution Channel	Demo Store	Non-Demo Store
Mass Merch or Discount Store	5	0
Home Improvement	6	2
Bargain Store	0	4
Grocery	5	0
Warehouse	1	0
Hardware	1	0
Total	**18**	**6**

Weighting. After cleaning and preparing the raw survey data, Cadmus analysts weighted the program bulb data based on store population proportions relative to store sample proportions by distribution channel, targeted/non-targeted and vulnerability status. Walmart stores received an additional weight to account for location. The sample included three rural locations (all of which are Walmart stores) which is not an accurate representation of all rural stores in the population. To mitigate the possibility of overstating leakage from these rural Walmart stores, Cadmus analysts calculated separate urban and rural Wal-Mart weights to represent the store population. Table 28 illustrates the proportions used and the calculated weights for each store type. The population included 289 stores across seven retail distribution channels. Cadmus and ICC conducted intercepts in 24 stores across all distribution channels except specialty lighting stores. The specialty lighting stores were not included because they represent only a small proportion of program bulb sales. Since our rural sample contained only Wal-Mart stores, we only weight those types of stores by the urban and rural designation.

Table 28. Design Weight Inputs and Calculations

		Store Population (n = 289)		Store Sample (n = 24)		
Weighting Variable	Observation	Population Stores	Population Distribution	Sample Stores	Sample Distribution	Weight*
Leakage Risk	Non-Vulnerable	130	45%	8	33%	134.95%
	Vulnerable	159	55%	16	67%	82.53%
Wal-Mart	Rural	12	36	3	60%	60.61%
	Urban	21	64	2	40%	159.09%
Distribution Channel	Bargain	70	25%	4	17%	150.00%
	Grocery	75	27%	5	21%	128.57%
	Hardware	35	12%	1	4%	300.00%
	Home Improvement	53	19%	8	33%	56.79%
	Mass Merch / Discount Store	36	13%	5	21%	61.71%
	Warehouse	11	3.9%	1	4.2%	94.29%
	Specialty Lighting**	9	3%	-		-

* We calculated each weight as the population proportion divided by the sample proportion.

** The intercept store sample did not include specialty lighting stores. To account for specialty lighting store population distribution, analysts redistributed the specialty lighting store weight to the other distribution channels.

We applied all weights applicable to a specific store; for instance, a program CFL purchased in a vulnerable, urban grocery store received a weight of 0.8253 x 1[13] x 1.2857 = 1.0588.

Results. CFL leakage in mass merchandise rural store locations is expected to be higher than in urban locations because rural store locations typically serve larger geographic areas. There are usually fewer store locations in rural areas, and these stores may attract customers from other cities, states, and utility service areas. In urban areas, however; stores like Wal-Mart are more prevalent and may primarily serve small neighborhoods or other housing developments. In many cases, urban customers may not have to travel very far to shop at these types of stores. In rural locations, there may only be one or two big-box retailers within a given area. Fewer big-box retailers may attract customers from various locations and longer distances.

CFL leakage at vulnerable stores is also expected to be higher than at non-vulnerable stores. By definition, analysts suspect higher program bulb leakage since these stores may be closer to state lines, bridge crossings to other states, or within zip codes with higher percentages of non-Ameren Missouri electric meters (households).

CFL leakage at implementer demonstration stores may be higher than leakage at non-demonstration stores, because these atypical in-store events naturally pique customer interest and may potentially influence purchasing decisions.

During the intercept surveys, the interviewers first asked customers what types of lighting products they intended to purchase when entering the store. Table 29 shows that 40 percent of lighting customers intended to purchase incandescent light bulbs. Thirty-six percent intended to purchase CFLs only, and four percent intended to purchase a combination of CFLs and non-CFLs. The remaining customers intended to purchase halogens and other non-CFLs. Eight percent did not decide what types of lighting products they intended to buy prior to visiting the store. The customers who intended to purchase only CFLs purchased roughly 66 percent of the 1,303 Ameren Missouri program bulbs identified during the intercepts. We do not believe this estimate suggests evidence of freeridership since there is not enough information to know whether the customers' intention to purchase CFLs was due to earlier program exposure.

Table 29. Customer Intent to Purchase Lighting Products (n = 611)

Intent to Purchase	Customers	Percent of Total Customers
CFLs only	223	36%
CFLs + other bulbs	23	4%
Incandescent	247	40%
Halogens	29	5%
Other non-CFL	39	6%
None	4	1%
Don't Know	46	8%
Total	**611**	**100%**

[13] All non-Wal-Mart stores received a weight of 1 for the Wal-Mart rural/urban weight. This was used as a placeholder when calculating the final weight but multiplying by 1 has no effect on the final weight.

As can be seen in Table 30, 29 percent of customers who initially intended to purchase only non-CFLs ultimately purchased 27 percent of weighted program CFLs. A number of factors may explain this conversion to CFLs from non-CFLs, including the influence of the Ameren Missouri program, the incentive to participate in the intercept surveys, or the in-store implementer demonstrations. Customers who intended to purchase either CFLs only or CFLs and other bulbs purchased 78 percent of the weighted program CFLs.

Table 30. Actual Program CFL Purchases by Initial Intent

Purchase Category	Initial Intent to Purchase	Percent of Customers	Weighted Percent of Program CFLs Purchased	Weighted Percent of Bulbs by Purchase Category
CFLs	CFLs Only	65%	70%	78%
	CFLs and other bulbs	7%	8%	
Non-CFLs	Incandescent bulbs	9%	7%	27%
	Halogen bulbs	2%	1%	
	Other Non-CFLs	6%	5%	
	None/Don't Know	12%	14%	
	Totals	**308**	**1,103.63**	

When asked about program knowledge, the majority of survey respondents did not have prior knowledge of Ameren Missouri's CFL program. Since a significant portion of program marketing occurs at the point of purchase through signs advertising the discounts, it is expected that most consumers do not have prior knowledge of the program. Also, customers influenced by the program may not recall the program being sponsored by Ameren Missouri. See Figures 10 through 12 for pictures of the promotional displays at the stores. The 8 percent (48 respondents) who did have prior knowledge of the program included 47 Ameren Missouri customers and one customer from Kansas City Power & Light (shown in Table 31). These customers purchased 10.5 percent of weighted program CFLs.

Table 31. Customer Awareness of Ameren Missouri CFL Program (n = 611)

Actual Purchases	Customers	Percent of Total Customers
Customers Aware of Program	48	8%
Customers Not Aware of Program	563	92%
Total	**611**	**100%**

The team reviewed lighting products in each survey respondents' shopping cart to determine actual lighting purchases. Just under half of respondents purchased CFLs only, 44 percent purchased non-CFLs only, and nine percent purchased both CFLs and non-CFLs. Customers purchasing only CFLs accounted for 86 percent of the weighted program CFLs.

The team also asked respondents to indicate where they intended to install the CFLs they purchased. Customers planned to install 97 percent of weighted program CFLs in residential applications, the remaining three percent were to be installed in non-residential locations within Ameren Missouri territory. Of the residential purchases, 91.3 percent were intended to be installed in homes serviced by Ameren Missouri and the remaining 8.7 percent outside the area.

On a total program CFL-based level, weighted[14] CFL leakage is 8.7 percent. We used the following equation to calculate program CFL leakage:

$$Leakage = \left[1 - \left(\frac{\sum Program\ CFLs\ Sold\ to\ Ameren\ Missouri\ Customers}{\sum Program\ CFLs\ Sold}\right)\right] \times 100$$

Table 32 shows the inputs we used in this calculation.

Table 32. Weighted Bulb-Based CFL Leakage Inputs and Calculations

Weighted Program CFLs Purchased By AUE Customers [A]	Weighted Total Program CFLs Sold [B]	Leakage [1 – (A/B)]
1,007.72	1,103.63	8.7%

Analysts also estimated leakage based on general store location, vulnerability, and program demonstrations coinciding with intercept surveys. These results are included in Appendix C.

Total Gross Energy Savings

We calculated total realized gross energy savings using the following formula:

Per unit energy savings x bulbs sold x (1 – *leakage rate*)x (1 – *installation rate adjustment*).

As discussed above, approximately 8.7 percent of program bulbs sold were installed outside of Ameren Missouri's service territory, and all of these were intended to be installed in residential homes. Further, the intercept surveys indicated that approximately three percent of the program purchased upstream markdown CFLs were installed in non-residential facilities. Our installation rate adjustment accounting for bulbs initially put in storage is 2.71 percent. Demand savings were similarly calculated.

Table 33 shows the results for the upstream program. Leakage rates for bulbs purchased using coupons are assumed to be zero, since purchasers are required to provide their zip code and the name of their utility.

Table 33. PY2 Upstream Gross *Ex Ante* and *Ex Post* CFL Savings

Type	Number Sold**	*Ex Post* Per Unit Gross Energy Savings	*Ex Post* Per Unit Gross Demand Reduction	*Ex Ante* Gross Program Energy Savings (MWh)	*Ex Post* Gross Program Energy Saving(MWh)*	*Ex Post* Gross Program Demand Reduction (kW)	Realization Rate
Residential	1,496,118	48.4	0.0075	54,593	64,366	9,967	1.18
Non-Residential	46,272	166.4	0.054	1,688	7,493	2,431	4.44
Coupons	5,069	48.4	0.0075	185.0	239	36.99	1.29
Total	**1,547,459**			**56,467**	**72,097**	**12,435**	**1.28**

* Ex Post Gross Savings= Number Sold X Ex Post Per Unit Energy Savings X (1-leakage) X (installation rate)

** On-line purchases are assumed to be allocated among residential and non-residential similar to the store markdowns

[14] All leakage calculations are weighted by the design weights shown in Table 28.

Table 34 shows the results for the upstream program split by rural and urban areas of Ameren Missouri service territory.

Table 34. Upstream Program Results by Rural and Urban Areas

Product	Total Program Sales*	*Installation Rate*	*Leakage Rate*	*Total Ex Post Gross Energy Savings (MWh)*	*Total Ex Post Gross Demand Savings (kW)*	NTG Ratio	Net Energy Savings* (MWh)	Net Demand Savings* (kW)
Urban	1,402,367	0.9729	0.034	63,868	9,890	0.96	61,313	9,494
Rural	144,231	0.9729	0.403	4,057	628	0.96	3,895	603
Total-PY2	**1,546,598**	**0.9729**	**0.087**	**67,925**	**10,518**		**68,998**	**10,097**

*** Excludes on-line and SMD bulbs.**

Fixtures

We determined gross savings for lighting fixtures based on the following inputs:

- Average per-unit energy and demand savings, and
- Number of product sales.

Cadmus assumed the installation rate to be 100 percent, leakage to be zero, and that all fixtures are installed in residential homes. Table 35 shows *ex ante* and *ex post* savings for lighting fixtures.

Table 35. PY2 Gross *Ex Ante* and *Ex Post* Lighting Fixture Savings

Number Sold	*E x Post* Gross Per Unit Energy Savings (kWh)	*Ex Post* Gross Per Unit Demand Savings (kW)	*Ex Ante* Gross Energy Saved (MWh)	Ex Post Gross Energy Saved (MWh)	Ex Post Gross Demand Saved (kW)	Realization Rate
591	124	.014	52.9	73.3	8.3	1.385

Appliances

We determined gross savings for appliances based on the following inputs:

- Average per-unit energy and demand savings, and
- Number of product sales.

Table 36 illustrates the results for each of the appliances.

Table 36. Gross Energy and Demand Savings for Appliances

Appliance	Number Sold	*Ex Ante* Gross Per Unit Energy Savings (kWh)	*Ex Ante* Gross Energy Saved (MWh)	Realized Gross Per Unit Energy Savings (kWh)	Gross Per Unit Demand Savings (kW)	*Ex Post* Gross Energy Saved (MWh)	*Ex Post* Gross Demand Saved (kW)	Realization Rate
Freezers	490	247.1	121.1	61	0.004	29.9	1.96	0.25
Room AC	3,853	95.7	368.7	115	0.06	443.1	231.18	1.20
Dehumidifier	3,545	249.8	885.5	213	0.08	755	283.6	0.85
Total	**7,888**		**1,375**			**1,228**	**516.74**	**0.89**

Determination of Net Savings

Lighting - Upstream

Cadmus' lighting NTG analysis utilizes a multistate regression model. The multistate modeling effort relies on data from telephone and on-site surveys, conducted in areas with longstanding compact fluorescent lamp (CFL) programs, newer or smaller programs, and no CFL programs, through June 2010. Site visit data were collected from1,533 households across 15 different areas. The primary purpose of the effort was to produce NTG ratios for the ten CFL programs taking part in the effort.

The evaluation team of The NMR Group Inc. (NMR) and The Cadmus Group (Cadmus) chose a zero-inflated negative binomial (ZINB) model for predicting CFL purchases.

Appendix E provides more detail about the model and a discussion of three alternative scenarios; however, numerous models, testing a large number of plausible independent variables, were analyzed for goodness of fit. The final base case predicts that:

1) Households with higher education levels have a greater probability of purchasing any CFLs.
2) Households who received a previous on-site survey (in New York and Houston) were also more likely to purchase CFLs.
3) Households with a greater CFL saturation at the beginning of 2010 were less likely to buy any CFLs.
4) Those who do like to experiment with new technology were more likely to buy at least one CFL.

Other factors influencing the number of CFLs purchased included:

1) Whether or not participants own their own homes (with owners showing propensity to purchase a greater number of CFLs in 2010).
2) The larger the participant's home the more CFLs he or she purchased in 2010.

3) Even though they were less likely to have zero purchases overall, participants who responded that they do like to experiment with the latest technology (measured on a four-point scale ranging from strongly agree to strongly disagree) purchased fewer CFLs in 2010 than those who responded that they do not seek the latest technology.

4) Households with a higher saturation of CFLs at the beginning of 2010 also were likely to buy fewer CFLs.

5) Those in areas with longer running programs were less likely to buy more CFLs.

6) Households who purchased CFLs at big box stores were more likely to buy more CFLs.

7) Finally, households visited in both 2009 and 2010 purchased fewer CFLs in 2010 than households visited only in 2010. Also, those areas where site inspectors did not require residents to guess their purchase period when they responded "don't know" to the question of "was the bulb purchased in the first half of 2010, the last half of 2009, first half of 2009, or 2008 and earlier" were likely to have lower CFL purchases. This could be because those asked to "guess" when bulbs were purchased, tended to guess more recently (a common memory bias); those allowed to "not know" were eliminated from the model if greater than 25 percent were unknown, and set to zero for unknown bulbs if the unknowns were less than 25 percent.

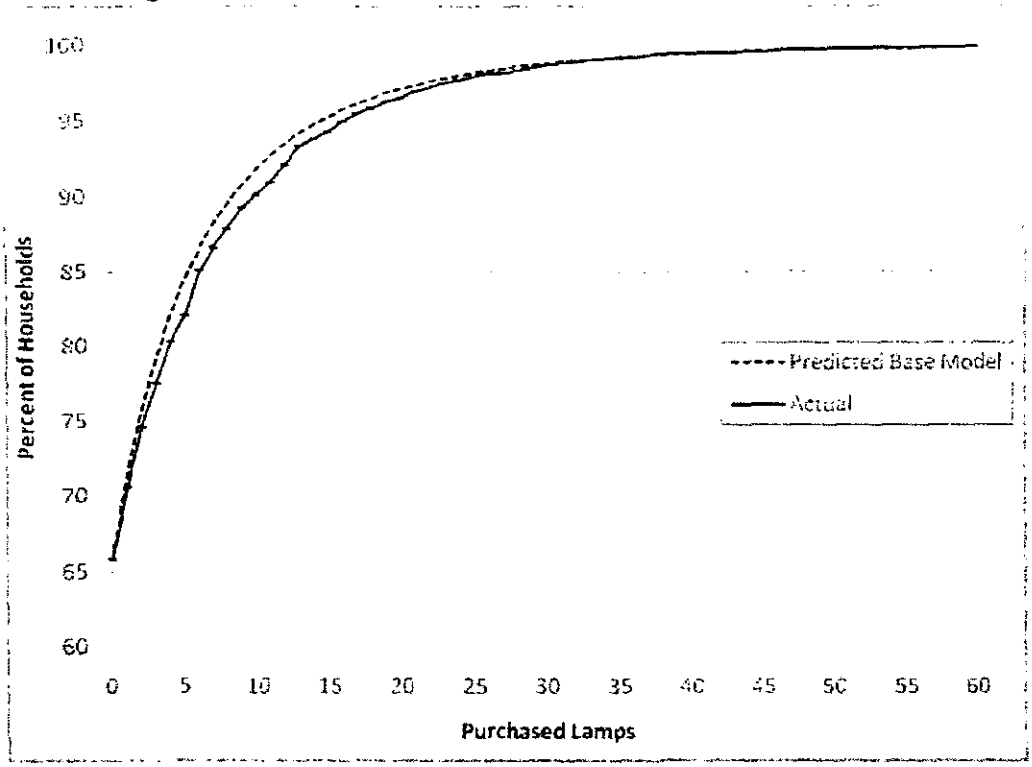
Various model specifications were tested, and quality of fit was evaluated through a variety of techniques:

- Maximum likelihood R^2 of the model;[15]
- Predicted compared to actual values for purchases (P/A) in the program scenario; and
- The probability of significance test for each variable.

We also looked at the coefficient sign and variables to make sure they made logical sense. Figure 8 compares the CFL purchase distributions from the predicted base model to actual reported site visit results; these represent the distribution of purchases across all 15 areas.

[15] Because the ZINB is a nonlinear model, the maximum likelihood R^2 is not directly comparable with those reported for ordinary least squares—regular—regression models. It is normal to have lower R^2 for nonlinear models.

Figure 8. Predicted vs. Actual CFL Purchase Distributions



The following equation was used to estimate the NTG ratios for each program service territory. The model *predicted* each Ameren Missouri household purchased an average 2.54 CFLs in the first half of 2010. The model also predicted that these households would have purchased 2.045 CFLs had the program not existed. Subtracting the without-program estimates from the predicted program scenario yields an estimated "lift" in CFL purchases of 0.499 CFLs per household. Dividing the net program purchase estimates by the 0.52 incented CFLs[16] per household yields a NTG of 0.96.

$$NTG = \frac{Predicted\ CFL\ Purchased\ with\ Pgm - Predicted\ CFL\ Purchased\ without\ Pgm}{Average\ Number\ of\ Incented\ CFL\ per\ Household}$$

$$Ameren\ Missouri\ NTG = \frac{2.544 - 2.045}{0.52} = 0.96$$

Fixtures

As ENERGY STAR lighting fixtures are newer to market and even with the program promotion tend to have low market shares,[17] an NTG of 1.0 is assumed for this measure.

---

16 Calculated from the program tracking database.

17 New York ENERGY STAR® Products and Marketing Program, Market Characterization, Market Assessment, and Market Causality Evaluation, Final Report for New York State Energy Research and Development Authority. Quantec LLC and Summit Blue Consulting, May 2006.

Appliances

Cadmus used self-reported freeridership information from the participant survey to estimate measure-specific NTG ratios. This method of estimating net savings, while inappropriate for the lighting component of the program(due to the fact that lighting participants may be unaware of a program), is the industry standard for appliance rebate programs. The self-reported method does not, however, account for any market effects the program may have, as it does not quantify spillover or consider that the program influences retail store stocking to include more energy efficient appliances in retail stores. In order to account for the market transformation activities that this program includes, Cadmus created a customized analysis matrix to score each participant's freeridership.

The survey asked participants a battery of five questions to assess freeridership:

- F2. Before you knew about the rebate, were you already planning to purchase a new [MEASURE NAME]?
- F3. If the rebate had not been available, would you still have purchased the exact same make and model of [MEASURE NAME] for your home?
- F4. Without the rebate, would the [MEASURE NAME] have had the same level of efficiency, be more efficient, or less efficient?
- F5. And without the rebate, would you have purchased the [MEASURE NAME] at the same time, later [specify when], or not at all?

While these questions imply that anyone responding "yes" to all of these questions is a "free-rider", it doesn't account for the influence of the rebate advertising, prominently displayed on the store's display shelves and influence of the program in the mix of products stocked by retailers.

Additional adjustments were made based on participant responses to the open-ended question:

- C3. Please think back to the time when you were deciding to buy the energy saving [MEASURE NAME]. What factors motivated you to purchase the [MEASURE NAME]?

The freeridership scoring analysis began with development of a score for each participating customer based on his or her individual responses to the specific battery of FR questions.[18]. Each participant's freerider score was derived by translating responses into a matrix value and then using a rules-based calculation to obtain the value. The complete set of participant responses rarely reflect each potential matrix combination but tend to group around a subset of common patterns. The freeridership decision tree shown in **Error! Reference source not found.** epresents the rules-based approach used in the Ameren Missouri appliance freeridership scoring matrix.

[18] Khawaja, S. The NAPEE Handbook on DSM Evaluation, 2007 edition, page 5-10

Figure 9. PY2 Appliance Rebate Freeridership Decision Tree

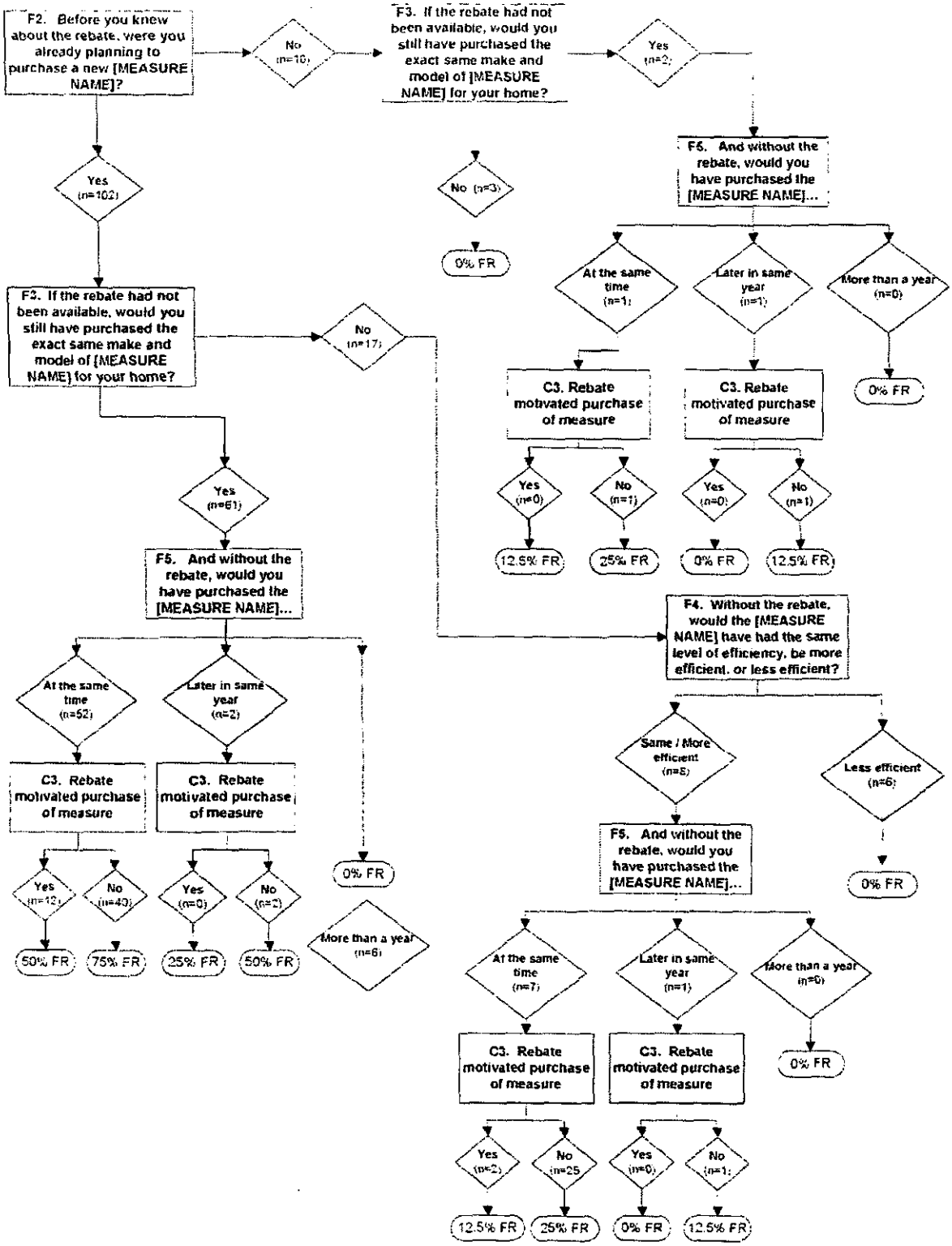


Table 37. PY2 Appliance Freeridership

Stream	FR	N	Precision
Dehumidifier	0.48	34	± .170 @ 90% C.I.
Freezer	0.42	41	± .167 @ 90% C.I.
Room AC	0.38	38	± .224 @ 90% C.I.
Total-PY2	**0.42**	**113**	**± .107 @ 90% C.I.**

One key permutation influencing the freeridership calculations significantly was the group of 41 respondents that answered *"Yes"* to *F2*, *"Yes"* to F3, skipped for F4, and *"At the Same"* time for *F5*. These respondents were initially scored as 75 percent freeriders. Essentially these respondents said that without the Ameren Missouri rebate, they would have installed the same equipment to the same level of efficiency and at the same time. Rather than score these respondents as 100 percent freeriders, Cadmus allowed for the fact that the program has influenced stocking and the POP materials were in view as they were shopping for products.

The additional open-ended question asking about influential factors counterbalanced the freeridership indicated by the responses to the questions above. As shown in the decision tree, freeridership scores were adjusted downward for participants who directly stated that the rebate motivated them to purchase the energy-efficient appliance.

Table 38. PY2 Appliance Overall Freeridership Distribution

Freeridership %	0%	12.5%	25%	50%	75%	Total
# of Respondents	21	10	18	23	41	113

This analysis shows levels of freeridership consistent with data compiled by D&R International that tracks regional ENERGY STAR market shares. According to D&R International, ENERGY STAR room air conditioners account for approximately 38 percent of all room air conditioners sold in Missouri in 2009, which is the same as the freeridership estimated by the survey.[19] This study did not examine the regional values for freezers or dehumidifiers.

Impact Evaluation Summary

A summary of PY2 per-unit gross energy savings, along with program participation and total program gross and net energy (kWh) and demand (kW)savings, is provided in Table 39.

[19] http://www.energystar.gov/ia/partners/manuf_res/2009FinalSalesData.xls

Table 39. PY2 Evaluated Participation, Gross and Net Savings

Product	Total Program Sales	*Ex Post* Energy Savings (MWh)	*Ex Post* Demand Savings (kW)	NTG Ratio*	Net Energy Savings (MWh)	Net Demand Saving* (kW)
Upstream CFLs	1,547,459	72,097	12,435	0.96	69,214	11,938
Fixtures	591	73.3	8.3	1	73.3	8.3
Room Air Conditioner	3,853	443.1	231.18	0.62	274.7	143.3
Dehumidifier	3,545	347	283.6	0.52	180.4	147.5
Freezers	490	29.9	2.0	0.58	17.3	1.1
Total-PY2		**72,991**	**12,960**	**0.96**	**69,759**	**12,238**

* Appliance NTG estimates are based on free-ridership only.

Table 40 compares overall results to program goals for the year. Ameren Missouri is ahead of its cumulative PY2 savings goals, compensating for lower than planned results in PY1.

Table 40. PY2 Sales and Participation Targets and Results

ENERGY STAR Lighting or Appliance Type	Program Targets	Results
CFLs	1,177,537	1,547,459
Dehumidifiers	1,500	3,545
Freezers	2,600	490
Room Air Conditioner	8,000	3,853
CFL Fixtures	2,500	591
Total Net Energy Saving (kWh)	**64,928**	**69,759**
Total Net Peak Demand Savings (kW)	**5,600**	**12,238**

5. Process Evaluation

Informing the process evaluation are the stakeholder interviews, retailer interviews, appliance participant surveys, and the social distribution surveys.

Stakeholder Interview Findings

The stakeholder interviews revealed detailed information about program processes and progress. Stakeholders reported that they were pleased with the program's second year, and that PY2 ran very smoothly. This section reports the findings from all stakeholder interviews.

Program Design and Administration

APT's program design for PY2 shifted the focus away from marketing and manufacturer buy downs, and instead focused on markdown relationships with manufacturers and retailers. APT leveraged existing corporate relationships to expand retailer participation—in particular to large big-box chain stores such as Home Depot and Costco, and scaled up field activity in participating stores. Additionally, the online store was put in place.

The appliance component also expanded in PY2. Again, the focus was shifted away from cooperative advertising, and mail-in rebates were put in place for customers. APT also performed retailer education, placed rebate forms and in-store advertisements, and initiated relationships with appliance retailers.

Program administration also changed: Ameren Missouri addeda new program manager of residential energy efficiency at the same time it transitioned to the new program design. The new program manager was involved in hiring and contracting with APT and the existing program manager stayed involved at a higher level. This level of early involvement likely contributed to the smooth transition from one implementer to the other.

Implementation and Delivery

Ameren Missouri staff perceived APT's approach to program implementation and delivery more favorably than the PY1 implementation strategy. Program staff expressed high satisfaction with all aspects of APT's implementation, including recordkeeping and data management, interactions with participant retailers, budgeting and invoicing, and the quality of in-store POP materials, and all stakeholders felt the program design was executed according to plan. APT focused its field representatives on helping PY1 participating retailers transition from receiving manufacturer buydowns (where bulbs were reserved and purchased in advance)to the simpler mark down approach, where manufacturers receive the incentives and offer lower upfront prices on lighting products to retailers.

Lighting

The retail markdown component is the program's largest generator of energy savings. During PY2, APT expanded the program into many large retailers including big-box stores, which greatly increased program sales. Program staff reported that this expansion was largely attributable to APT's existing corporate relationships with many of the large retailers. Because APT has administered similar CFL programs for a number of utilities around the country, they

were able to leverage their relationships with national chain retailers for the Ameren Missouri program.

Another improvement that aided in expanding the program was the introduction of three-party Memoranda of Understandings (MOUs) with retailers. These agreements laid out the terms of the program and the processes for participation, and reportedly made it easier for retailers to participate. Improved tracking, invoicing, and payment processes, as well as increased presence in retail stores, also contributed to creating an easy participation experience for retailers. Ameren Missouri staff noted that the new systems have reduced the amount of paperwork required of participant retailers.

Retailers with electronic POS data collection are able to use this capability to report program sales to APT. However, a coupon system is also available for smaller retailers without POS data collection capabilities. Small retailers have coupons in the store, which Ameren Missouri customers can use to receive an instant discount on CFLs. The coupons are then returned to the implementer with an invoice for the associated markdown rebate. This system was introduced in PY1, but stakeholders reported that APT streamlined the process, making it simpler for retailers to participate using coupons.

Appliances

While some cooperative advertising was conducted in PY1 to promote ENERGY STAR appliances, only 114 appliances were sold as a result of the program. PY2 saw the introduction of customer incentives in the form of mail-in rebates, and this drove an increase in sales volume. This component is also implemented through relationships with retailers. The APT field representatives went to retail stores and hung rebate forms on appliances, and also conducted training of store personnel. This interactive method aims to promote market transformation at the retail level by encouraging retailers to stock and promote efficient appliances. Appliance rebates are processed and paid by EFI.

Products

The range of products offered through the program is limited by the original tariff filed during PY1. The tariff listed eligible measures, some of which are no longer being promoted through the program. Ameren Missouri staff reported that although they considered filing a revised tariff to allow for additional measures, some staff members felt that this would be too time-consuming to be worthwhile given the short implementation period.

Instead, program staff picked the measures from the tariff that were most cost-effective and made the most sense for the Ameren Missouri market, and focused the program on those measures. For example, the tariff lists dishwashers as an eligible measure, but dishwasher rebates do not tend to be cost-effective, so Ameren Missouri opted not to include them in their rebate offerings. The same applies to lighting products – although fixtures and ceiling fans are included in the tariff, they comprise only a small portion of the program because they are not as prevalent in the market as other lighting products.

Despite the limitations of the tariff, Ameren Missouri staff reported satisfaction with the range of products offered. Expansions to the rebated appliances are planned for PY3, and additional lighting products may be included in future program years. Given the cost-effective appliance opportunities, program stakeholders believe that PY2 offerings were sufficient. Two additional

measures have been added for PY3, water coolers and air purifiers. As noted by one stakeholder, "*having five products on top of lighting is a nice suite of measures to offer.*"

General Marketing

The lighting and appliance program made major gains in saturation during PY2. Rather than focusing on media advertising, Ameren's PY2 approach focused on in-store advertising, with an emphasis on eye-catching POP materials, and product placement in prominent locations such as end-caps. Program staff remarked that a customer "*can't walk into a store without seeing program materials*," and that expansion into more retail channels also increased awareness among area retailers. Examples of POP marketing are shown below**Error! Reference source ot found.**. Ameren Missouri also sponsored store education events where APT field staff set up a table in the store and talked directly to customers about CFLs.

Figure 10. Example of In-Store CFL Signage

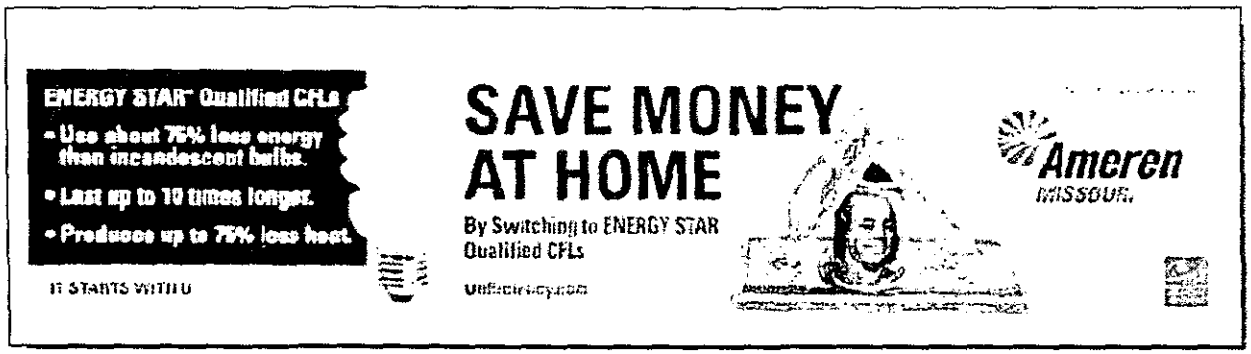


Figure 11. Example of POP Appliance Rebate Marketing