# Appendix B
# Comments and Response
# January 20, 2011 Draft Presentation

# Appendix B: Comments and Response – January 20 Presentation of Draft Results

In a letter dated February 18, 2011 the Missouri Public Service Commission provided the following directive, among others, to KEMA:

> 3) Include as Appendix B of the final report, all previously submitted questions/comments and KEMA responses of the draft report (including, but not limited to responses to issues and concerns raised at the January 20, 2011 roundtable; questions and responses related to KEMA's February 7, 2011 memo; subsequent response to Commissioner Jarrett's question identified as Issue Identifier: PSC3; questions and responses related to the email exchange with John Rogers from February 14 through February 18, 2011).

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KEMA

# memo

To: Natelle Dietrich, Missouri PSC; Brenda Wilbers, Missouri DNR
From: Tom Franks, KEMA
Date: February 7, 2011
Copy: Fred Coito, Kristina Kelly, KEMA; Gwen Mizell, GSM
Subject: Response to stakeholder comments – submitted through January 25, 2011

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## Overview

In the following sections we present a summary of the questions and issues raised by stakeholders subsequent to the presentation of the draft results of the Missouri Statewide DSM Potential Study and KEMA's responses. These are grouped by presenting organization, in the following order:

Missouri Public Service Commission

- File name "PSC110120.pdf"
- File name "PSC110120A.pdf"

Missouri Department of Natural Resources

- File name "MDNR110121.pdf"

Ameren Missouri

- File name "Ameren110124.pdf"

Missouri Industrial Electric Consumers

- File name "MIEC110122.pdf"

Renew Missouri

- File name "RenewMO110121.pdf"

We have attached the full text of the comments as received in portable document format for reference purposes, with the file names shown above. Quotation marks signify a direct quote from the submission as received by KEMA.

We request that the Missouri Public Service Commission (PSC) provide responses with reference to the "Issue Identifier" assigned to each question or comment to expedite future revision.

# Missouri Public Service Commission

## *General Issues*

File name "PSC110120.pdf"

*Issue Identifier: PSC1*

Issue: "The final report should include a detailed explanation of the baseline forecast and explain more clearly how it was developed."

KEMA response:

- KEMA will review and revise, as necessary, the sections in the draft report and sections from a previous submission on the baseline development to describe the development process, and incorporate revisions as appropriate in the final report.
- KEMA will also provide language in the final report stating that the baseline used for this study is projected from the overall penetration of efficient measures in a fixed-year and that annual loads are projected based on a fixed increment of growth in energy consuming units, households for residential, square feet for the commercial sector, and base-year usage for the industrial sector.

*Issue Identifier: PSC2*

Issue: "The final report should include a discussion of the Ameren study, with a comparison of approach and result. (I'm not suggesting a line item by line item comparison, but it would be helpful to have a comparison of general methodologies, approaches, and assumptions – to the extent KEMA has completed that analysis or can receive input from Ameren.)"

KEMA response:

- KEMA will provide a high-level discussion comparing the approach and results of the Missouri Statewide DSM Potential Study and the study prepared by Global Energy Partners for Ameren Missouri (" Ameren study") in the final report. Please see draft text of this review, incorporated in this document as Attachment A.

## *Compact Fluorescent Lamps (CFL)*

File Name: "PSC110120A.pdf"

NOTE: This issue was raised by Janet Wheeler, assistant to Commissioner Jarrett, during the presentation. The file referenced contains the comments received by the PSC from Rick Voytas of Ameren in response to a PSC solicitation.

*Issue Identifier: PSC3*

Issue: With regard to the issue, Ameren asserts that due to jurisdictional differences, there are "ample opportunities to install CFLs in optimal locations" to acquire savings in Missouri.

KEMA response:

- The baseline KEMA developed for this study is consistent with this statement.

*Issue Identifier: PSC4*

Issue: Ameren asks for an explanation of "how KEMA developed its base case electric sales forecast in regards to future CFL market saturation" to "eliminate to the extent possible the double counting of energy savings attributable to CFLs"

KEMA response:

- In light of the impending federal lighting standards, KEMA modeled the savings from CFLs as declining to, and discontinued after, the effective date of the standards. Furthermore, KEMA's modeling incorporated the following additional impacts from standards: 1) the phase-out of magnetic ballasts for T12 fluorescent and the phase out of T12 lamps entirely in 2012. We have excluded replace-on-burnout measures for T12 base lighting and reduced the savings from certain measures over time, e.g. high performance lighting remodel; and, 2) modeled the standards for metal halide fixtures as effectively eliminating probe-start fixtures as of 2015. We note that since LEDs did not pass the TRC test, only CFLs are modeled in the achievable analysis, eliminating the possibility of double counting due to this measure as well.
- We have thoroughly reviewed our model inputs and processes and conclusively state that savings are not "double-counted" as both our naturally occurring and program-driven savings are calculated from a fixed-efficiency baseline.

# Missouri Department of Natural Resources

*Issue Identifier: MDNR1*

Issue: "Do the definitions of the "one-year payback" and "three-year payback" scenarios used by KEMA differ from the definitions used by Ameren?"

KEMA response:

- The PSC directed KEMA to "configure the DSM Assyst Model inputs such that the definitions of maximum achievable potential and realistic achievable potential are analogous to the definitions used in the Ameren Missouri DSM Market Potential Study" in letter dated November 16, 2010. These potential scenarios are based on customer payback. While KEMA typically does not define a one-year payback scenario as maximum achievable potential nor a three-year payback scenario as realistic achievable potential, KEMA developed a scenario analogous to Ameren's MAP based on a

one-year payback criteria and a scenario analogous to the Ameren's RAP based on a three-year payback criteria. KEMA met the PSC directive through the following approach, as noted in section 3.3 of the draft report:

- In the one-year payback scenario, base incentive levels are set to a one year payback. Program administration budgets are set at moderately aggressive amounts, roughly corresponding to program support levels. In this case, measures that had a less than one year natural (i.e. without intervention) payback were modeled without incentives.
- In the three-year payback scenario, base incentive levels are set to a three-year payback. Program administration budgets are set at modest amounts, roughly corresponding to minimum program support levels. In this case measures that had a less than three year natural payback modeled without incentives.

- The process KEMA used to meet this directive was to perform a series of calculations on the measure level outputs from the economic potential analysis such that measures that exceed the target payback period received incentives that brought them in line with the target payback, and measures that had payback periods less than the target period received no incentives. The results of these measure level calculations were summed by the model to produce the total incentive amounts, overall and by sector and market.

  From our review of the Ameren report, provided in PDF format, it was not clear what modeling techniques GEP used to set the incentive levels such that the payback targets were met. We did review Ameren's approach and have calculated incentives in a manner we believe to be consistent with the description provide therein. We note that a chart provided by Ameren at the January 20 presentation and incorporated in their subsequent comments , shows the levels of achievable potential for the one- and three-year payback scenarios for both analysis as overlapping.

*Issue Identifier: MDNR1a*

Issue: "If so, please describe the differences, as KEMA understands them."

KEMA response:

- See response to MDNR1.

*Issue Identifier: MDNR1b(i)*

Issue: "If the goal of estimating the "one-year payback" and "three-year payback" scenarios was to provide comparability with the Ameren study, and if the underlying assumptions differ are KEMA's scenarios and Ameren's results fully comparable?"

KEMA response:

- The payback period for a specific measure is only one of many inputs required to model achievable potential. Equivalence in this input alone does not guarantee comparability across the full spectrum of variables used to estimate potential. For example, in its modeling effort, KEMA used avoided costs

selected by the PSC to represent the statewide avoided cost over the analysis horizon. Ameren presumably used its own projected avoided costs. KEMA requested these avoided costs by e-mail on October 6, 2010. The response, from Mr. Dave Costenaro on October 8, 2010, states "Avoided costs are based on market projections which we treat as competition sensitive and highly confidential." Based on this factor alone, we cannot state that the results are fully comparable.

- Based on the information provided by Ameren, we believe that the two models differ significantly in their approaches to modeling measure adoption and the calculation of naturally occurring savings.
- See Attachment A for discussion of the KEMA and Ameren approaches. While we think the scenarios developed by each study attempt to portray similar levels of program effort, the differences in modeling approach limit the ability to do a "full comparison."

*Issue Identifier: MDNR1b(ii)*

Issue: "If they are not fully comparable, what refinements would have been required to develop scenarios that more fully comparable?"

KEMA response:

- In order to be "fully comparable" a wide range of inputs, including but not limited to avoided costs, baseline energy use, projections on future use, and assumptions on customer mix, awareness and behavior would need to either identical or scaled appropriately. If these conditions could be fully met, then the outputs would be directly comparable, and differences would be an artifact of the specific modeling approaches.
- Secondly, the PSCspecified a geographic scope for the KEMA model that was fundamentally different from that modeled by Ameren. Comparison across service territories is only meaningful if the Ameren service territory, and the market conditions and costs facing Ameren, are statistically representative of the state of Missouri as a whole.
- Finally, comparability cannot be achieved by creating new scenarios. Comparison must account for the following differences in model design, to name only a few:
  - How each model defines technical and economic savings;
  - How the models treat naturally occurring efficiency savings: and
  - How the two models calculate incremental measure adoption under each scenario.
- It is important to note that the "comparability" objective was not to achieve the "same answer" but to understand savings potential. In this sense the models are comparable (and relevant to the Commission's goals) in that each presents a perspective of energy potential achievable in the market given the specific inputs provided. KEMA has documented the inputs and assumptions used in our study to enable the Commission to make such comparisons.

*Issue Identifier: MDNR1b(iii)*

Issue: "If they are not fully comparable, what disclaimers should be included in KEMA's report?"

KEMA response:

- KEMA was engaged to estimate the DSM potential for the state of Missouri using its proprietary DSM Assyst model. KEMA has met this obligation and our modeling and report do not require any disclaimers. Indeed, KEMA's analyses have been conducted to the highest standards of independence and objectivity, without any economic or other incentive to achieve a particular outcome. KEMA will include a discussion of statistical limitations inherent in any such modeling in the final report. Please see Attachment A for comparative discussion of the KEMA and Ameren studies, and Attachment C for a broader overview of potential study results.

*Issue Identifier: MDNR1c*

Issue: Please describe the methodology used by KEMA to adjust measure incentive levels to create the "one-year payback" and "three-year payback" scenarios.

KEMA response:

- One set of output files created by DSM Assyst includes information at the measure level for the payback period absent program intervention (natural payback). KEMA utilized this information to filter out all measures that had natural paybacks below the threshold level of the scenario, and then set the incentives for those measures with paybacks greater than the threshold level such that they reach the threshold level.
- See also response to MDNR1 above

*Issue Identifier: MDNR1c(i)*

Issue: "Please provide a table of measures showing the incremental cost relative to the baseline measure along with the incentive level set for the "one-year payback", "three-year payback" and "KEMA 75% Achievable Potential" scenarios."

KEMA response:

- Attachment B lists the incentive level as a percent of incremental cost for each measure under each scenario. Measure costs are available in Appendix E of the draft report.

*Issue Identifier: MDNR2*

Issue: "Please provide a table comparing the results of the KEMA Missouri Demand Side Potential Study to other equivalent state-wide potential studies and to studies that have estimated achievable potential in other jurisdictions using a methodological approach similar to KEMA's "75% of incremental cost" approach. Please include complete references for the comparable studies."

KEMA response:

- Attachment C summarizes the results of various studies that KEMA has access to. In most cases, the various studies employ different methodologies and also employ different definitions for achievable potential scenarios, making a direct comparison of the studies difficult without a careful reading of each report.

*Issue Identifier: MDNR3*

Issue: "Please describe how codes and standards are incorporated in the KEMA ASSYST model. With respect to federal equipment standards please discuss how KEMA treats: a) standards that are in DOE regulations that are due to go into effect in the future, and b) standards which DOE is required by legislation to establish but that DOE has not yet established in specific regulations."

KEMA response:

- As noted in the response to PSC3 above, KEMA modeled the effect of standards for CFLs, T12 fluorescent lamps and ballasts and metal halide fixtures.
- Experience has shown that as the standards shift, the prevalence of higher efficiency equipment increases and the price goes down. The net effective of federal standards and market actions is that a relatively constant differential in efficiency and cost is preserved between baseline equipment and efficient equipment.
- DOE's schedule for updating standards is extremely uncertain. Once the standard-setting process has begun, it can take several years to reach a final ruling, and then there is typically a 3 or more year delay before the standard goes into effect. Adding to that uncertainty, DOE has the option of enacting a "no standard" standard, or retaining existing standards to comply with legislative requirements. Attempting to model yet-to-be-implemented standards would inappropriately add uncertainty without adding accuracy or precision.

*Issue Identifier: MDNR4*

Issue: "In his comments, Fred Coito of KEMA mentioned that KEMA agreed with Ameren's assumption that Missouri residents are less interested in energy efficiency than residents in other states."

KEMA response:

- We have reviewed the transcript of the January 20 presentation and have not found this comment. Please provide a page and line number from the transcript.
- However, for the purposes of this study, KEMA reviewed the direct customer research Ameren had conducted relative to Missouri customer DSM adoption rates. To maintain comparability, KEMA incorporated the Ameren study's conclusion that their customers expressed less interest in DSM investments than the average customer nationally. The results presented by KEMA are inclusive of this Missouri-specific finding.

*Issue Identifier: MDNR4a*

Issue: Please explain how KEMA came to this conclusion.

KEMA response:

- KEMA made a decision to calibrate certain inputs based on the data collected for the Ameren study in the absence of more comprehensive or unchallenged data. We exercised professional experience and judgment during this calibration effort to reflect a reasonable estimate of adoption of efficiency

measures. This is an approach we have used in similar studies that have been performed where limited territory-specific data was available.

*Issue Identifier: MDNR4bi*

Issue: "Did this assumption impact the results of the study? If so, how was this assumption operationalized? Please identify any variable(s) or factor(s) in the model that reflect this assumption."

KEMA response:

- KEMA used a standard technique of adjusting appropriate model penetration curves to reflect somewhat lower measure penetration rates for given level of measure cost effectiveness relative to penetration rates in recent studies KEMA has undertaken in other states. KEMA routinely calibrates its penetration curves in each study undertaken to increase confidence levels that the model results are statistically reflective of the circumstances found in each service territory. In states with more developed programs, this calibration makes use of recorded program accomplishments. For Missiouri, with limited evaluated program data, the calibration utilized results of the Ameren study

*Issue Identifier: MDNR4b(ii)*

Issue: "In the absence of the AmerenUE study, what assumptions about customer participation (or similar factors) would KEMA have used in their modeling?"

KEMA response:

- In the complete absence of localized information, KEMA would have started with a standard set of model inputs based on decades of experience in efficiency program results from across the nation, with greater weight being placed on studies/results from the Midwest area generally.
- It is best practice to utilize available and relevant data points, and our professional preference. In the absence of relevant results from evaluation efforts undertaken to represent Missouri statewide, KEMA used the available data points as reported in the Ameren study.
- While it is not proven how these various input changes would have *specifically* affected the savings levels in this study, our professional judgment would lead us to opine that the alternative inputs would have resulted in a somewhat greater degree of energy efficiency savings at a given incentive level. In this sense, using the Ameren primary research allows for a more conservative assessment of energy savings potential.

*Issue Identifier: MDNR4b(iii)*

Issue: "Please provide a sensitivity analysis on the variable identified in 4).b.i, showing how study results would vary with changes in the assumptions about customer participation (or similar factors). Please compare Ameren's value to the values KEMA has used in other studies for other jurisdictions as the lower and upper values of these factors in any sensitivity analysis."

KEMA response:

- As previously offered, it is standard practice to calibrate the model to local conditions. Had such local data not been available, KEMA would nevertheless have made adjustments to penetration curves, based on other sources, resulting in the alignment of our model with Midwestern utility customer behavior. In Attachment C we provide a comparison of various study results, including the Ameren study and our current study. We believe this comparison provides the most relevant set of values by which to judge relative impacts determined in each study. .

*Issue Identifier: MDNR4b(iv)*

Issue: "Please estimate the impact on the reported participation and savings level such an assumption has on the study results."

KEMA response:

- Please see responses to MDNR 4a, 4b(ii) and 4b(iii) above.

# Ameren Missouri

File Name: "Ameren110124.pdf"

*Issue Identifier: AM1*

Issue: Net or gross – Ameren states that KEMA should present net numbers, that our report has "major inconsistencies" on how it develops net. They also note inconsistencies in some of our presented information and state "KEMA should provide a detailed EXCEL spreadsheet so that the stakeholders can see exactly what the KEMA methodology is" for converting gross to net savings.

KEMA response:

- Within the context of this report, KEMA consistently defines net energy savings as those savings estimated beyond that which is naturally occurring, that is, those which would occur in the absence of any program or new standards.
- KEMA will review, and revise as necessary, all data presented in the draft report to assure quantitative consistency in the final report.
- Appendix H, *Achievable Program Potential Results*, which will be created after the PSC has provided direction as to revisions to the draft report, will provide more detail on gross and net program results, along with program costs and cost effectiveness parameters.

*Issue Identifier: AM2*

Issue: "It is critically important to this study for KEMA to articulate in writing, supported by documentation, exactly how they estimate naturally occurring energy efficiency."

KEMA response:

- Appendix A of the draft report, section A.1.3, discusses the estimation of naturally occurring and program savings potentials. Both the naturally occurring and program savings estimates are the result of variety of factors which are quantified based on evaluation results, research data, or professional experience. These include the availability of the adoption opportunity as a function of capital equipment turnover rates and changes in building stock over time, customer awareness, cost-effectiveness, and market barriers. The model utilizes a multi-stage process to calculate adoption for both program and naturally occurring efficiency measures.

*Issue Identifier: AM3*

Issue: Ameren asserts that KEMA's estimates of technical and economic potential should be closer to the findings of their study; notes that some of the measure level inputs KEMA used are wrong; asserts that KEMA should incorporated known and measureable standards; asserts that KEMA is double counting savings for some measures; asks for clarification on our approach to normalizing for a 20-year measure life; and, asks for verification that "renewed efficiency measures are not allocated to achievable at zero program cost."

KEMA response:

- KEMA notes that different analytic approaches and inputs are likely to produce different results. Each model is subject to a high degree of uncertainty and variability.
- Please see the description of KEMA's approach to standards as described in response to MDNR 3
- KEMA has reviewed the concerns raised by Ameren and agrees to make the following changes to ensure greater comparability between the modeling parameters:
    - Revise the inputs to appliance recycling to show a cost of $125 and a measure life of 5 years
    - Revise the inputs for the OPower measure to a measure life of 1 year
    - Add an adjustment factor to lower the baseline energy use of dehumidifiers to the future standard. Since it is unlikely the specifications for the future EnergyStar dehumidifier will be determined by the completion of this study, KEMA will also lower the incremental savings from the efficient measure to 10% of base energy use as a proxy for the difference between the base equipment and the Energy Star equipment.
    - With regard to LED lamps, as previously noted they did not pass the TRC test and are not included in the achievable analysis.
- Within the technical and economic potential analysis, DSM Assyst models competing measures, such as the two efficiency levels efficiency of room air conditioners, such that all of the savings go to the more cost effective measure. If the least efficient measure is the most cost effective measure, then the higher efficiency measure is modeled as incremental to the first measure, so savings are not double counted. These results are incorporated into the analysis of achievable potential, thus eliminating the potential for double counting of savings.
- With regard to "double counting" please see response to PSC4,
- With regard to normalization methodology, this is contained in Appendix A, section A.1.2.2. In short, KEMA's model utilizes a nominal discount rate to calculate the present value of both costs and benefits over twenty years. For measures with measure lives shorter than 20 years, the measures are re-installed as many times as necessary at no additional cost to the program and without generating additional savings beyond those attributed to the initial installation.

*Issue Identifier: AM4*

Issue: Asks for a description of methodology for developing program costs; comparison of those costs to those currently borne by Missouri utilities; and information on those costs, specifically "levelized cost per unit of energy saved, or a year-by-year cost per first-year-installed kWh or therms."

KEMA response:

- KEMA developed program costs by reviewing the information provided by Missouri utilities on program costs, including marketing/education budgets, relative to base energy usage, in other service territories to set approximate marketing/education budgets for Missouri. The marketing/education budgets are used to increase customer awareness of energy efficiency, and together with incentives define the size of the program. Given the program size, administration budgets are set by looking at typical $ per first year kWh of program savings. We will describe cost development methodology in greater detail in the final report.
- Appendix H to the final report will include information on program costs.

## Missouri Industrial Energy Consumers

*Issue Identifier: MIEC1*

Issue: MEIC states that the amount of time allocated to this project is "insufficient to produce a reliable product," that the "KEMA study uses much broader inputs which do not necessarily correlate to or represent the characteristics of the customers in … Missouri utilities," that KEMA's disaggregation of the industrial sector does not match their understanding, and that the "conclusions drawn from this data would be accurate only by chance."

KEMA response:

- KEMA asserts that the data used as input for this study are consistent with best practices for this type of study and that the time frame provided was sufficient to accomplish the study objectives as originally constituted. While the original project plan approved by the PSC did not initially incorporate a component for stakeholder process, additional time was added to the study to accommodate a robust stakeholder process.
- KEMA used its professional experience in the disaggregation of the industrial sector and provided its assumptions to the PSC in a memo on baseline inputs dated October 4, 2010 which the PSC circulated to stakeholders. The PSC accepted this memo (and the assumptions contained therein) without revisions to the industrial allocation.

*Issue Identifier: MEIC2*

Issue: MEIC notes that the avoided costs used in the study are "MORE THAN DOUBLE" and requests that KEMA be directed to revise avoided costs.

KEMA response:

- KEMA analyzed three avoided cost scenarios for the estimate of economic potential. KEMA submitted a Memorandum dated December 20, 2010 that addressed this point, among others. The PSC subsequently confirmed via email dated December 22, 2010, that KEMA was to bring the "base" avoided costs forward to all scenarios for the achievable potential scenarios . KEMA has fully complied with PSC's instructions and has therefore satisfied its obligations with respect to this issue.

# Renew Missouri

File Name: "RenewMO110121.pdf"

*Issue Identifier: RM1*

Issue: "Are achievable savings for retrofit measures calculated on the basis of incremental costs or on the basis of total cost of replacing operating equipment (inclusive of labor and the total equipment cost)?"

KEMA response:

- For measures described in the question, called "retrofit measures" in our analysis, the KEMA model includes the full cost and full measure life.
- For replace-on-burnout measures, which affect most equipment replacements in our analysis, KEMA utilizes the incremental measure costs, which is the difference between total costs for installation of the energy efficient equipment minus the total cost for the standard equipment.

*Issue Identifier: RM2*
Issue: Asks if the baseline is the existing equipment or the current code.

KEMA response:

- The measure level data will be shown in the appendix for achievable potential to be included in the final report. See AM3, above
- For retrofit measures, the savings are calculated from the existing baseline equipment, which is an average of the efficiency of similar equipment currently installed.
- For replace-on- burnout measures, the savings are calculated based on the existing baseline of new equipment.

*Issue Identifier: RM3*

Issue: "Does your analysis capture the full value of equipment replacements in the retrofit market? Would the use of existing equipment baselines and incentive levels based on full project costs result in a higher estimate of achievable savings?"

KEMA response:

- Our analysis captures the full value of the energy and demand savings attributable to measure installation. It does not include non-energy benefits or costs.
- Measure costs include installation.
- KEMA uses existing equipment as the baseline and full project cost.

*Issue Identifier: RM4*

Issue: Asks whether projections of technological improvements over time are included in this analysis; if the assumption we made for this study is used in other studies; for examples of studies where assumptions differ, and if the PSC or others required such an exclusion.

KEMA response:

- Our analysis did not include forecasts of technological improvements, often called "emerging technologies."
- When specifically directed by a client to do so, KEMA has estimated savings attributable to assumptions of increased efficiency from emerging or yet-to-be-discovered technologies as an external add-on to the general modeling process. At the project kick-off meeting KEMA noted that generally it takes a conservative approach and only includes proven technologies with known costs and benefits in its analysis, and we were proposing to do the same for this study. The PSC accepted this approach
- Assumptions differ across studies, depending on the regulatory environment, the geographic scope, and the client perspective and situation. This makes comparability across studies, as discussed in the responses to MDNR1b et. seq., difficult at best. With this caveat, Attachment C displays the results of a variety of studies for review.

*Issue Identifier: RM5*

Issue: "Does Figure 1-1 estimates of net benefits include the lifetime 20 year benefits of all measures installed through 2020?"

KEMA response:

- The net benefits are the present value of the full lifetime of the measures installed up to and including the program year for which the net benefits are presented.

*Issue Identifier : RM6*

Issue: Notes a discrepancy tables within the report

KEMA response:

- This will be corrected in the final report.

*Issue Identifier: RM7*

Issue: Renew Missouri created a table showing different net-to-gross ratios (NTGR) for the three scenarios, and asked for clarification net about KEMA's approach NTGR and raised questions about free-ridership.

KEMA approach/response:

- For this study KEMA assumed that 100% of naturally occurring (see response to AM2 above) efficiency receives a program incentive, for measures where incentives are assumed to be offered. While it is likely that some naturally occurring savings would occur outside the program, we believe that most customers will utilize an incentive when it is available. Assuming all naturally occurring savings receive program incentives provides a conservative approach in calculating the benefit-cost ratios of programs. To the extent that some customers adopt energy efficiency measures without program incentives, program costs would be lower than estimated and TRC ratios would be higher than estimated.

*Issue Identifier: RM8*

Issue: "Presumably, the higher rebate levels of the 75% scenario would produce a lower level of free-ridership. However, the NTGR ratio for this scenario suggests that free-ridership is higher. Please clarify how the NTGR would be lower for this scenario than the one year payback scenario."

KEMA response:

- The incentive levels in the 75% incentive scenario are not uniformly higher than in the one-year payback scenario. (See measure level incentives in Attachment B)

*Issue Identifier: RM9*

Issue: Renew Missouri asks about installations made absent program incentives, and if this represents "spillover."

KEMA response:

- Installations made absent program incentives (that are above and beyond naturally occurring savings) are assumed to be the result of education and awareness efforts, and thus technically not classified as spillover.
- KEMA did not include a component for spillover in the estimate of achievable potential.

# Attachment A - Comparison of Ameren and KEMA Studies

## Baseline Estimates

The baseline estimates include both a base year energy consumption analysis and a baseline forecast.

**Base-Year Energy Consumption.**

Both the KEMA study and the Ameren study develop base-year energy consumption by sector and end use. The Ameren study relied on customer surveys, prototype energy analysis, and secondary sources for their analysis. The KEMA study relied on all secondary-source data. A comparison of base-year energy results would be of limited value since both studies target different service territories, with a different sectoral/building-type mix.

**Baseline Forecast**

Global's LoadMAP tool was utilized to develop Ameren's baseline forecast. "This forecast embodies assumptions about customer growth, electricity prices, technology trends, and the impacts of codes and standards."[1] The Ameren reports do not provide much detail on how the LoadMAP model works, but a high-level description of the model is provided in Volume 3 of the study.[2]

KEMA's baseline forecast is a frozen efficiency forecast that assumes energy use per consuming unit (such as households for residential and square footage for commercial) and per end use is held constant at base-year levels throughout the forecast horizon. The growth in baseline energy use is a function of customer growth.

The Ameren baseline forecast appears to be an integral part of their study, and the estimates of energy efficiency potential. It is designed to address codes and standards and naturally occurring energy efficiency. The KEMA forecast is much simpler and is mainly used as a benchmark for understanding the relative magnitude of energy efficiency improvements. (KEMA's development of naturally occurring energy efficiency and codes and standards affects are carried out in our achievable potential analysis.)

The following table compares growth rates for the Ameren and KEMA baseline forecasts. Both sets of estimates show very minimal growth in the 2010-2020 timeframe.

[1] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary, Global Energy Partners, LLC, January 2010, page ES-24.

[2] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 3: Analysis of Energy-Efficiency Potential, Global Energy Partners, LLC, January 2010, pages 2-3 through 2-5.

**Table 1. Comparison of Baseline Electricity Usage**

| | 2010 GWh | 2020 GWh | Average Annual Growth |
|---|---|---|---|
| Ameren | 38,847 | 40,248 | 0.35% |
| KEMA | 91,076 | 92,556 | 0.16% |

## Technical and Economic Potential Calculations

Both the KEMA and Ameren studies use a bottom-up approach to estimate technical and economic potential. Both studies utilize measure cost, savings, applicability, feasibility, and measure lifetimes to assess these potentials, using what appear to be similar algorithms. However, KEMA's definition of technical and economic potential differs from Ameren's.

KEMA begins with current energy use and calculates what current energy use would be if all the measures under consideration (for technical) or all the cost-effective measures under consideration (for economic) were instantaneously put into place. The calculation is extended to forecast years by adding customer growth and the potentials associated with new construction energy efficiency. In these calculations, KEMA does not take into consideration stock turnover and that replace-on-burnout measures will only gradually penetrate the market as existing equipment is retired (note that KEMA does take this significant factor into account in estimating achievable potential). KEMA's approach uses current measures with current cost effectiveness in these calculations. Economic potential therefore does not include measures that are not cost effective now but may become cost effective in the future. Both technical and economic potential do include savings that may be achieved through standards or through naturally occurring energy efficiency.

Ameren's approach is different. Ameren's technical and economic potentials are not instantaneous; they take into account stock turnover and a gradual penetration of replace-on-burnout measures. Ameren also models incremental costs for at least some equipment types as falling over time, resulting in some measures not cost effective in 2011 becoming cost effective later in the study's time horizon.

These differences make it difficult to compare KEMA and Ameren's technical and economic potentials. The 2011 estimates differ because KEMA includes the impact of replace-on-burnout measures and Ameren does not, resulting in KEMA having much higher potential. Solving this problem requires looking forward, at 2020 or 2030 numbers, by which time most of the stock of most equipment types has turned over. However, by 2030, Ameren's assumptions about the improved cost effectiveness of some measures makes the Ameren potential significantly higher than KEMA's for some end-uses.

Another difference between the two studies lies in the costs that are utilized for cost effectiveness screening. Both studies utilize the total resource cost (TRC) test for screening, but the Ameren study includes program cost adders in their analysis, while the KEMA study utilizes only incremental measure costs. KEMA later adds in program costs in the achievable potential analysis for calculating program cost effectiveness. KEMA does not allocate program costs to measure in the initial economic screening

because these costs are not generally incurred at the measure level, but rather at the program levels, and assignment of these costs would be arbitrary. Overall, this factor may lead to a somewhat lower estimate of economic potential in the Ameren study (other things being equal), but we expect this difference to be small as it would only affect a handful of measures where TRC ratios are near 1.0.

Finally, it appears that both studies treat the effects of codes and standards differently in the technical and economic potential calculations. The Ameren approach seems to address effects of codes and standards as part of the baseline forecast and excludes savings from technologies affected by codes and standards from the technical and economic potentials. The KEMA study includes in technical and economic potential technologies that get affected by codes and standards, but then factors these effects out as part of the achievable potential analysis.

The following table compares 2020 technical and economic potentials as a percent of base energy usage, although we recognize that this comparison has limited value due to differences in how both baseline and potentials are calculated, as noted above.

**Table 2. Comparison of Electric Technical and Economic Potential as a Percent of Baseline Usage - 2020**

| | Technical | Economic |
|---|---|---|
| Ameren | 28% | 14% |
| KEMA | 35% | 25% |

Note that the KEMA technical and economic potentials for CFL are respectively about 5.7% and 5.2% of baseline usage in 2020. This result may explain a significant portion of the difference between the Ameren and KEMA estimates.

## Achievable Potential Calculations

The KEMA and Ameren studies utilized very different approaches to estimate achievable potential. The KEMA approach estimates naturally occurring and achievable program potential as a function of measure availability (utilizing a stock-adjustment process to determine how much of a measure is available in a given year), customer awareness of the measure, measure economics, and barriers to installing the measure.[3] The model provides estimates of what would happen in the absence of programs, which is defined as naturally occurring energy efficiency. The model also provides estimates of savings attributable to the program efforts, both in terms of marketing/education efforts and financial incentives.

[3] The KEMA approach is described in Section A.1.3 of Appendix A of the current report.

The KEMA model estimates the effects of program marketing expenditures on increased customer awareness of measures, which leads to one level of program savings. In addition the model, through the use of penetration curves that translate measure cost effectiveness ratios into measure penetration rates, provides estimates of increased measure uptake (over naturally occurring measure uptake) that result from payment of financial incentives.

For the 1-year and 3-year payback scenarios, measure-specific incentives were developed to drive measure paybacks to the 1-year and 3-year points. No incentives were assumed for measures that already had payback lower that the 1-year or 3-year payback criteria without an incentive. This approach was taken to estimate, as accurately as possible, what incentive levels and associated program penetration would occur if, in fact, programs were designed to meet the 1-year and 3-year payback criteria.

To be as consistent with the Ameren study as possible for these scenarios, beginning customer awareness of measures was set at 25%, and sufficient marketing/education expenditures were input into the model to increase awareness into the 80% range over a 10-year period. In addition, measure penetration curves were adjusted to take into account stated penetration rates developed as part of the Ameren market research.

In the KEMA model, all savings, incentive levels, and program costs are internally consistent, and program effects flow directly from measure-specific estimates of how customers are likely to behave at given incentive levels. For example, program effects for the 3-year payback incentive are relatively low compared to naturally occurring effects. The reason for this result is that incentive rates are low or zero for many measures in this scenario because the paybacks already approach or are at the 3-year payback cutoff. The low incentives will not be sufficient to induce many new customers to purchase energy efficiency, but will only serve to reward customers who would have done it anyway with a financial bonus.

The Ameren approach for estimating achievable potential appears to be mainly driven by informed assumption.[4] First, measure awareness was assumed to grow from 25% in 2010 to 85% by 2019, but it was not clear from the documentation if or how this increase in awareness was tied to program marketing/education expenditures.

Second, initial program "take rates" were developed from the study's market research and were assumed to grow at 1% per year over the forecast horizon. These take rates reflect the fraction of informed customers that would purchase a measure under the assumed financial circumstances (1-year, 3-year, and 5-year paybacks). Ameren indicates that their savings are "net" savings, but their documentation does not describe how the take rates, which are estimated for the total customer population, are translated into net effects. For example, the market research indicates that 37% of

[4] See AmerenUE Demand Side Management (DSM) Market Potential Study Volume 4: Program Analysis, Global Energy Partners, LLC, January 2010, pages 2-1 through 2-9 for a discussion of the program analysis methodology.

residential customers were likely to purchase energy efficient light bulbs at a three-year payback.[5] However, since payback periods for CFLs are already at 3-years or less for most likely residential installations, there would be no need to provide incentives for this measure and most of the savings would be naturally occurring savings under the 3-year payback scenario. However, it appears that Ameren applies the estimated take rate (37%) for this measure and simply calls it net savings, with the explanation that naturally occurring savings are picked up in the baseline forecast.

Third, it appears that incentive amounts were based on program experience in other regions of the country and were only generally tied to the customer payback criteria that were used to define the various scenarios.

The Ameren report indicates that detailed incentive levels were provided in Appendix A of Volume 4 of their report. Ameren provided this Appendix in PDF format, and as such could not be readily manipulated. It contains incentives as a fixed dollar amount and also displays a field labeled "% of equipment cost covered by Ameren" which also appears to be fixed by measure (33% for residential sector measures, 25% for commercial sector measures with a few exceptions at 33%, and 50% for industrial sector measures). The tables in this file are all labeled "RAP." The data in our possession is not sufficient for us to determine exactly what incentive levels were applied in the scenario they identified as MAP. KEMA requested Ameren's underlying data in a format that could be manipulated, a request Ameren declined to fulfill.

In light of wide variation in incentive levels KEMA developed for the one-year payback and three-year year payback scenarios, incorporated to this response as Attachment B , and the fixed levels presented by Ameren, we cannot determine how Ameren matched the estimated incentive levels to the assumed payback criteria.

Overall, the KEMA and Ameren studies approach achievable potential estimation from different perspectives. KEMA builds up program savings potentials based on penetration curves, measure cost effectiveness, program expenditures, and incentives tied to the measure specific payback criteria that define each scenario. The Ameren approach appears to utilize assumptions, in part supported by their market research, to develop estimates of program savings potentials, and then applies judgment and experience with related programs to develop program costs that are consistent with the level of program savings that have been developed.

Both studies utilize reasonable approaches for estimating achievable program potential. However, we do not think Ameren has provided enough documentation of their take-rate approach to support their claim that their achievable savings estimates represent net savings.

[5] See AmerenUE Demand Side Management (DSM) Market Potential Study Volume 2: Market Research, Global Energy Partners, LLC, January 2010, Chapter 4, page 14.

It appears that the 1-year and 3-year payback scenarios developed under each study attempt to get at similar levels of program effort. However, the differences in approach limit the ability to do a direct comparison.

The following table compares 2020 cumulative net achievable potentials as a percent of base energy usage, although we recognize that this comparison has limited value due to differences in how both baseline and potentials are calculated, as noted above.

**Table 3. Comparison of Electric Net Achievable Potential as a Percent of Baseline Usage - 2020**

| | 1-Year Payback Scenario | 3-Year Payback Scenario |
|---|---|---|
| Ameren | 9.8% | 6.5% |
| KEMA | 7.1% | 4.0% |

The KEMA estimates show a lower savings penetration rate than the Ameren estimates, if in fact the Ameren estimates truly reflect net savings. (See comments above.) Note that KEMA's gross achievable potential estimates are 10% of base usage for the 1-year payback scenario and 7% of base usage for the 3-year payback scenario, which are similar to the Ameren "net" savings.

Table 4, below provides a comparison of total program costs per first year kWh saved. This table shows that Ameren estimates lower costs per net first year kWh saved than does KEMA. We think there are at least three possible reasons for this difference: (1) Ameren's estimates do not incorporate as much free-ridership as KEMA's estimates, and thus the costs don't reflect the need for as much rebate expenditures for customers who wouldn't contribute to net savings; (2) Ameren's incentive rates, by measure, are different that KEMA's, and this could affect the amount of incentive expenditures; and (3) the Ameren estimates may reflect lower expenditures on marketing and administration than the KEMA estimates.

**Table 4. Comparison of Cost per First Year kWh Saved – Cumulative Savings and Costs to 2020**

| | 1-Year Payback Scenario | 3-Year Payback Scenario |
|---|---|---|
| Ameren[6] | $0.22 | $0.16 |
| KEMA | $0.43 | $0.41 |

[6] See AmerenUE Demand Side Management (DSM) Market Potential Study Volume 2: Market Research, Global Energy Partners, LLC, January 2010, Chapter 5, Table 5-7 and Figure 5-5 for data that were used to develop cost per kWh shown in Table 4.

# Attachment B - Incentives by Measure and Scenario

## New Construction Measures – All sectors and fuels.

| Residential New Electric Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | 2011 ENERGY STAR Home | 44% | 81% | 75% |

| Residential New Gas Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | ENERGY STAR Home | 9% | 70% | 75% |

| Commercial New Electric Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | High Performance Building/Int Design - Tier 1 30% | 48% | 75% | 75% |
| 201 | High Performance Building/Int Design - Tier 2 50% | 46% | 74% | 75% |
| 301 | Near Zero Energy (60-75%) | 0% | 58% | 75% |

| Commercial New Gas Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | High Performance Building/Int Design - Tier 1 30% | 46% | 78% | 75% |
| 201 | High Performance Building/Int Design - Tier 2 50% | 47% | 79% | 75% |

Note: For the purposes of this analysis, no new industrial construction was assumed.

| Residential Existing Electric Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | 15 SEER Split-System Air Conditioner | 80% | 94% | 75% |
| 103 | Programmable Thermostat | 67% | 89% | 75% |
| 105 | Whole House Fans | 72% | 91% | 75% |
| 106 | Attic Venting | 55% | 85% | 75% |
| 107 | Proper Refrigerant Charging and Air Flow | 29% | 75% | 75% |
| 108 | Duct Repair | 82% | 93% | 75% |
| 109 | Duct Insulation | 81% | 94% | 75% |
| 111 | Single Pane Windows to Double Pane with Gas | 50% | 86% | 75% |
| 112 | Double Pane with Glazing to Energy Star | 76% | 91% | 75% |
| 114 | Ceiling R-0 to R-38 Insulation | 69% | 89% | 75% |
| 116 | Ceiling R-0 to R-49 Insulation | 72% | 90% | 75% |
| 120 | Self Install Weatherization | 0% | 7% | 75% |
| 121 | Infiltration Reduction | 9% | 59% | 75% |
| 131 | 15 SEER Split-System AC Early Replacement | 53% | 84% | 75% |
| 142 | HE Room Air Conditioner - CEE Tier 1 EER 11.3 | 7% | 69% | 75% |
| 144 | Whole House Fans | 60% | 87% | 75% |
| 145 | Single Pane Windows to Double Pane with Gas | 45% | 81% | 75% |
| 146 | Double Pane with Glazing to Energy Star | 67% | 86% | 75% |
| 147 | Ceiling R-0 to R-38 Insulation | 68% | 87% | 75% |
| 150 | Ceiling R-0 to R-49 Insulation | 72% | 89% | 75% |
| 154 | Self Install Weatherization | 0% | 23% | 75% |
| 155 | Infiltration Reduction | 39% | 80% | 75% |
| 156 | Ductless Split Heat Pump | 13% | 67% | 75% |
| 161 | EER 8.5 AC Early Replacement, CEE Tier 1 EER 11.3 | 0% | 66% | 75% |
| 171 | Energy Star Dehumidifier (ROB) | 0% | 0% | 75% |
| 181 | Variable speed furnace fans (RET) | 38% | 79% | 75% |
| 201 | Single Pane Windows to Double Pane with Gas | 0% | 0% | 75% |
| 202 | Double Pane with Glazing to Energy Star | 19% | 69% | 75% |
| 205 | Ceiling R-0 to R-38 Insulation | 11% | 63% | 75% |
| 206 | Ceiling R-11 to R-38 Insulaton | 44% | 81% | 75% |
| 208 | Ceiling R-0 to R-49 Insulation | 16% | 68% | 75% |
| 211 | Wall Blow-in R-0 to R-13 Insulation | 40% | 77% | 75% |
| 213 | Basement Insulation | 0% | 21% | 75% |
| 214 | Programmable Thermostat | 0% | 12% | 75% |
| 215 | Infiltration Reduction | 0% | 27% | 75% |
| 216 | Self Install Weatherization | 0% | 0% | 75% |
| 217 | Ductless Split Heat Pump | 51% | 84% | 75% |
| 221 | Single Pane Windows to Double Pane with Gas | 0% | 0% | 75% |
| 222 | Double Pane with Glazing to Energy Star | 11% | 62% | 75% |
| 225 | Ceiling R-0 to R-38 Insulation | 7% | 61% | 75% |
| 228 | Ceiling R-0 to R-49 Insulation | 5% | 57% | 75% |
| 231 | Wall Blow-in R-0 to R-13 Insulation | 44% | 81% | 75% |
| 233 | Basement Insulation | 0% | 38% | 75% |
| 234 | Programmable Thermostat | 0% | 33% | 75% |
| 235 | Infiltration Reduction | 9% | 57% | 75% |
| 236 | Self Install Weatherization | 0% | 0% | 75% |
| 251 | CFL (15-Watt integral ballast), 1.8 hr/day | 0% | 0% | 75% |
| 266 | LEDs w/ Halogen Baseline | 56% | 68% | 75% |
| 301 | HE Refrigerator - Energy Star | 51% | 84% | 75% |
| 341 | Second Refrigerator Recycling | 0% | 0% | 75% |
| 501 | Heat Pump Water Heater (EF=2.5) | 49% | 83% | 75% |
| 502 | HE Water Heater (EF=0.93) | 19% | 72% | 75% |
| 503 | Low Flow Showerhead | 0% | 39% | 75% |
| 504 | Pipe Wrap | 0% | 0% | 75% |
| 505 | Faucet Aerators | 0% | 54% | 75% |
| 551 | Early Replacement Water Heating to Heat Pump Water Heater | 40% | 80% | 75% |
| 911 | Energy Star Plasma Screen TV | 0% | 0% | 75% |
| 921 | Energy Star LCD TV | 0% | 0% | 75% |
| 931 | Energy Star LCD TV | 0% | 0% | 75% |
| 941 | Energy Star Laptop Computer | 0% | 0% | 75% |
| 946 | Energy Star Desktop Computer | 0% | 0% | 75% |
| 971 | Indirect Feedback | 0% | 0% | 75% |

| Residential Existing Gas Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | Basement insula ion R-13 (Furnace) | 16% | 58% | 75% |
| 102 | Ceiling R-0 to R-38 Insulation | 16% | 46% | 75% |
| 103 | Ceiling R-0 to R-49 Insulation | 12% | 42% | 75% |
| 104 | Ceiling R-11 to R-38 Insulaton | 17% | 72% | 75% |
| 105 | Ceiling R-11 to R-49 Insulation | 0% | 42% | 75% |
| 108 | Comprehensive Shell Air Sealing - Inf. Reduction | 0% | 58% | 75% |
| 110 | Crawlspace insula ion | 0% | 63% | 75% |
| 112 | Duct Repair and Sealing | 39% | 80% | 75% |
| 113 | ENERGY STAR Programmable Thermostat | 0% | 35% | 75% |
| 118 | Furnace Diagnostic Tes ing, Repair and Maintenance | 0% | 34% | 75% |
| 121 | Self Install Wea heriza ion | 0% | 0% | 75% |
| 122 | Slab insulation R-0 to R-5 (4 ft) | 21% | 74% | 75% |
| 126 | Single Pane to Double Pane with Gas | 0% | 6% | 75% |
| 127 | Windows - Double-Glazed to Energy Star | 0% | 60% | 75% |
| 201 | Basement insulation R-13 (Boiler) | 0% | 52% | 75% |
| 202 | Boiler controls | 16% | 72% | 75% |
| 203 | Boiler Diagnostic Testing, Repair and Maintenance | 0% | 21% | 75% |
| 204 | Ceiling R-0 to R-38 Insulation | 1% | 43% | 75% |
| 205 | Ceiling R-0 to R-49 Insulation | 3% | 50% | 75% |
| 206 | Ceiling R-11 to R-38 Insulaton | 29% | 76% | 75% |
| 207 | Ceiling R-11 to R-49 Insulation | 13% | 62% | 75% |
| 210 | Comprehensive Shell Air Sealing - Inf. Reduction | 0% | 45% | 75% |
| 211 | Crawlspace insula ion | 16% | 72% | 75% |
| 212 | ENERGY STAR Programmable Thermostat | 0% | 21% | 75% |
| 220 | Self Install Wea heriza ion | 0% | 0% | 75% |
| 221 | Slab insulation R-0 to R-5 (4 ft) | 27% | 75% | 75% |
| 226 | Single Pane to Double Pane with Gas | 0% | 0% | 75% |
| 227 | Windows - Double-Glazed to Energy Star | 0% | 60% | 75% |
| 301 | Basement insulation R-13 (Room Heater) | 25% | 75% | 75% |
| 302 | Ceiling R-0 to R-38 Insulation | 19% | 73% | 75% |
| 303 | Ceiling R-0 to R-49 Insulation | 30% | 77% | 75% |
| 305 | Ceiling R-11 to R-49 Insulation | 47% | 82% | 75% |
| 308 | Comprehensive Shell Air Sealing - Inf. Reduction | 0% | 61% | 75% |
| 310 | ENERGY STAR Programmable Thermostat | 0% | 34% | 75% |
| 314 | Heater Diagnostic Testing, Repair and Maintenance | 8% | 43% | 75% |
| 315 | High efficiency gas room heater | 0% | 33% | 75% |
| 316 | Radiant Barrier | 1% | 42% | 75% |
| 318 | Self Install Wea heriza ion | 0% | 0% | 75% |
| 323 | Single Pane to Double Pane with Gas | 0% | 9% | 75% |
| 401 | Commercial Clotheswasher (MEF = 2.0) | 0% | 0% | 75% |
| 403 | Drain Water Heat Recovery (GFX) | 43% | 81% | 75% |
| 408 | Energy Star Water Heater (EF = .67) | 8% | 63% | 75% |
| 409 | Faucent Aerators | 0% | 10% | 75% |
| 411 | Pipe Wrap | 0% | 18% | 75% |
| 501 | Efficient Clo hes Dryer (EF = 2.67) | 18% | 64% | 75% |
| 801 | Conservation- Opower | 0% | 0% | 75% |

| Commercial Existing Electric Measure Incentives (Pt 1) | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 102 | RET 2L4' Premium T8, 1EB, Reflector, base 4L4'T12 | 30% | 76% | 75% |
| 104 | Occupancy Sensor, 4L4' Fluorescent Fixtures - Base 4L4'T12 | 14% | 68% | 75% |
| 106 | Lighting Control Tuneup | 0% | 33% | 75% |
| 107 | High Performance Lighting Remod/Renov - 25% Savings - Base 4L4'T12 | 22% | 72% | 75% |
| 122 | RET 1L4' Premium T8, 1EB, Reflector OEM - Base 2L4'T12 | 56% | 85% | 75% |
| 124 | Occupancy Sensor, 8L4' Fluorescent Fixtures - Base 2L4'T12 | 14% | 63% | 75% |
| 125 | Continuous Dimming, 10L4' Fluorescent Fixtures - Base 2L4'T12 | 31% | 77% | 75% |
| 126 | Lighting Control Tuneup - Base 2L4'T12 | 0% | 32% | 75% |
| 127 | High Performance Lighting Remod/Renov - 25% Savings - Base 2L4'T12 | 14% | 64% | 75% |
| 132 | RET 2 - 1L4' Premium T8, 1EB, Reflector OEM - Base 2L8'T12 | 52% | 84% | 75% |
| 134 | Occupancy Sensor, 4L8' Fluorescent Fixtures - Base 2L8'T12 | 11% | 57% | 75% |
| 135 | Continuous Dimming, 5L8' Fluorescent Fixtures - Base 2L8'T12 | 25% | 75% | 75% |
| 136 | High Performance Lighting Remod/Renov - 25% Savings - Base 2L8'T12 | 13% | 62% | 75% |
| 141 | CFL Screw-in 18W | 0% | 0% | 75% |
| 142 | Cold Cathode Lamps | 15% | 71% | 75% |
| 143 | Screw-in LED--Base Incandescent | 66% | 89% | 75% |
| 151 | CFL Hardwired, Modular 18W | 9% | 63% | 75% |
| 153 | Hardwired LED fixture--Base Incandescent | 62% | 87% | 75% |
| 161 | High Bay T5 - Base Std MH | 14% | 65% | 75% |
| 164 | Occupancy Sensor, High Bay T5 - Base Std MH | 21% | 72% | 75% |
| 165 | High Performance Lighting Remod/Renov - 25% Savings - Base High Bay PSMH | 34% | 77% | 75% |
| 181 | ROB 4L4' Premium T8 1EB - Base 4L4'T8 | 8% | 58% | 75% |
| 182 | Occupancy Sensor, 4L4' Fluorescent Fixtures - Base 4L4'T8 | 16% | 67% | 75% |
| 183 | Lighting Control Tuneup - Base 4L4'T8 | 3% | 56% | 75% |
| 185 | High Performance Lighting Remod/Renov - 25% Savings - Base 4L4'T8 | 41% | 80% | 75% |
| 191 | ROB 2L4' Premium T8, 1EB - Base 2L4'T8 | 12% | 65% | 75% |
| 192 | Occupancy Sensor, 8L4' Fluorescent Fixtures - Base 2L4'T8 | 14% | 63% | 75% |
| 193 | Lighting Control Tuneup - Base 2L4'T8 | 3% | 49% | 75% |
| 196 | High Performance Lighting Remod/Renov - 25% Savings - Base 2L4'T8 | 37% | 77% | 75% |
| 201 | LED Exit Sign | 55% | 85% | 75% |
| 211 | High Pressure Sodium 250W Lamp | 42% | 81% | 75% |
| 212 | LED Outdoor Area Lighting | 56% | 85% | 75% |
| 214 | Outdoor Lighting Controls (Photocell/Timeclock) | 4% | 19% | 75% |
| 302 | Window Film (Standard) | 34% | 67% | 75% |
| 303 | EMS - Chiller | 67% | 89% | 75% |
| 304 | Cool Roof - Chiller | 47% | 82% | 75% |
| 305 | Chiller Tune Up/Diagnostics | 57% | 86% | 75% |
| 306 | VSD for Chiller Pumps and Towers | 53% | 84% | 75% |
| 307 | EMS Optimization | 19% | 67% | 75% |
| 311 | High Efficiency Chiller Motors | 61% | 87% | 75% |
| 351 | DX Tune Up/ Advanced Diagnostics | 52% | 84% | 75% |
| 353 | DX Packaged System, EER=11.5, 10 tons | 67% | 89% | 75% |
| 357 | Window Film (Standard) | 49% | 71% | 75% |
| 358 | Prog. Thermostat - DX | 25% | 71% | 75% |
| 359 | Cool Roof - DX | 51% | 84% | 75% |
| 360 | Optimize Controls | 8% | 59% | 75% |
| 361 | Economizer | 68% | 89% | 75% |
| 362 | Aerosol Duct Sealing - DX | 15% | 52% | 75% |
| 363 | Ceiling/roof Insulation - DX | 23% | 62% | 75% |
| 365 | DX Coil Cleaning | 5% | 38% | 75% |
| 401 | Fan Motor, 5hp, 1800rpm, 89.5% | 46% | 81% | 75% |
| 402 | Variable Speed Drive Control, 5 HP | 30% | 58% | 75% |
| 403 | Demand Controlled Ventilation | 13% | 64% | 75% |
| 411 | Fan Motor, 15hp, 1800rpm, 92.4% | 29% | 70% | 75% |
| 412 | Variable Speed Drive Control, 15 HP | 16% | 39% | 75% |
| 413 | Air Handler Optimization 15 HP | 0% | 46% | 75% |
| 415 | Electronically Commutated Motors (ECM) on an air handler unit | 45% | 82% | 75% |
| 416 | Separate Makeup Air/Exhaust Hoods AC | 0% | 0% | 75% |
| 417 | Demand Controlled Ventilation | 51% | 84% | 75% |
| 422 | Variable Speed Drive Control 40 HP | 46% | 82% | 75% |
| 423 | Air Handler Optimization, 40 HP | 36% | 79% | 75% |
| 521 | High-efficiency fan motors | 62% | 87% | 75% |
| 522 | Strip curtains for walk-ins | 0% | 18% | 75% |
| 523 | Night covers for display cases | 0% | 27% | 75% |
| 525 | Efficient compressor motor | 7% | 28% | 75% |
| 526 | Compressor VSD retrofit | 54% | 85% | 75% |
| 527 | Floating head pressure controls | 0% | 46% | 75% |
| 528 | Refrigeration Commissioning | 0% | 45% | 75% |
| 529 | Demand Hot Gas Defrost | 7% | 24% | 75% |
| 530 | Demand Defrost Electric | 0% | 13% | 75% |
| 531 | Anti-sweat (humidistat) controls | 13% | 62% | 75% |
| 533 | Freezer-Cooler Replacement Gaskets | 0% | 14% | 75% |
| 534 | High R-Value Glass Doors | 38% | 79% | 75% |
| 536 | Oversized Air-Cooled Condenser | 37% | 79% | 75% |
| 538 | Fiber Optic Display Lighting | 2% | 21% | 75% |
| 539 | Beverage Merchandisers | 12% | 54% | 75% |
| 540 | Reach-In Refrigerators | 2% | 36% | 75% |
| 611 | Energy Star or Better PC | 0% | 4% | 75% |
| 613 | PC Network Power Management Enabling | 0% | 0% | 75% |
| 621 | Energy Star or Better Monitor - CRT | 0% | 0% | 75% |
| 622 | Monitor Power Management Enabling - CRT | 0% | 8% | 75% |
| 631 | Energy Star or Better Monitor - LCD | 0% | 52% | 75% |
| 632 | Monitor Power Management Enabling - LCD | 0% | 31% | 75% |
| 641 | Energy Star or Better Copier | 0% | 0% | 75% |
| 642 | Copier Power Management Enabling | 0% | 28% | 75% |
| 651 | Printer Power Management Enabling | 0% | 16% | 75% |
| 661 | Data Center Improved Operations | 0% | 0% | 75% |
| 662 | Data Center Best Practices | 0% | 0% | 75% |
| 663 | Data Center State of the Art practices | 0% | 3% | 75% |

| Commercial Existing Electric Measure Incentives (Pt 2) | | | | |
|---|---|---|---|---|
| 701 | Demand controlled circulating systems | 20% | 49% | 75% |
| 702 | High Efficiency Water Heater (electric) | 12% | 46% | 75% |
| 704 | Hot Water Pipe Insulation | 22% | 73% | 75% |
| 706 | Heat Recovery Unit | 9% | 42% | 75% |
| 707 | Heat Trap | 5% | 19% | 75% |
| 708 | Tankless Water Heater | 28% | 66% | 75% |
| 709 | Solar Water Heater | 18% | 62% | 75% |
| 801 | Vending Misers (cooled machines only) | 11% | 43% | 75% |
| 901 | Convection Oven | 11% | 62% | 75% |
| 906 | Efficient Fryer | 3% | 25% | 75% |
| 911 | Efficient Steamer | 7% | 24% | 75% |
| 916 | Energy Star Hot Food Holding Cabinets | 2% | 34% | 75% |

| Commercial Existing Gas Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | Energy Star Fryer | 31% | 77% | 75% |
| 201 | High Performance Building/Int Design - Tier 2 50% | 46% | 74% | 75% |
| 121 | High-Efficiency Convection Oven | 47% | 82% | 75% |
| 141 | High-Efficiency Range | 34% | 78% | 75% |
| 201 | High Efficiency Windows (Multiple Glazed Low Emissivity) | 50% | 83% | 75% |
| 202 | Insulation (ceiling) | 26% | 59% | 75% |
| 203 | Insulation (wall) | 22% | 47% | 75% |
| 207 | Duct Insulation | 58% | 86% | 75% |
| 212 | Boiler Tune-Up | 0% | 6% | 75% |
| 216 | Clock / Programmable Thermostat | 17% | 64% | 75% |
| 218 | Installation of Energy Management Systems (EMS) | 35% | 78% | 75% |
| 228 | High Efficiency (Power Burner/ Premium) Boiler 95% efficiency (in situ base=82%) | 41% | 80% | 75% |
| 229 | Stack Heat Exchanger | 20% | 63% | 75% |
| 230 | Condensing unit heaters | 0% | 13% | 75% |
| 231 | Radiant heater | 0% | 0% | 75% |
| 232 | Hot water temperature reset | 0% | 1% | 75% |
| 233 | Demand controlled ventilation (DCV) | 13% | 63% | 75% |
| 235 | Retrocommissioning | 0% | 59% | 75% |
| 401 | Hot Water Pipe Insulation | 28% | 75% | 75% |
| 402 | Demand controlled circulating systems | 9% | 31% | 75% |
| 403 | Tankless Water Heater | 5% | 41% | 75% |
| 501 | Hot Water Pipe Insulation | 23% | 74% | 75% |
| 502 | Demand controlled circulating systems | 4% | 15% | 75% |
| 503 | Condensing Water Heater (gas, 95% thermal efficiency) | 0% | 21% | 75% |

| Industrial Existing Electric Measure Incentives (Pt 1) | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | Compressed Air-O&M | 0% | 0% | 75% |
| 102 | Compressed Air - Controls | 0% | 65% | 75% |
| 103 | Compressed Air - System Optimization | 0% | 28% | 75% |
| 104 | Compressed Air- Sizing | 0% | 0% | 75% |
| 107 | Comp Air - Motor practices-1 (1-5 HP) | 71% | 90% | 75% |
| 109 | Comp Air - ASD (6-100 hp) | 0% | 2% | 75% |
| 110 | Comp Air - Motor practices-1 (6-100 HP) | 41% | 80% | 75% |
| 111 | Comp Air - Replace 100+ HP motor | 54% | 85% | 75% |
| 112 | Comp Air - ASD (100+ hp) | 0% | 57% | 75% |
| 113 | Comp Air - Motor practices-1 (100+ HP) | 10% | 70% | 75% |
| 114 | Power recovery | 57% | 86% | 75% |
| 201 | Fans - O&M | 0% | 0% | 75% |
| 202 | Fans - Controls | 38% | 79% | 75% |
| 203 | Fans - System Optimization | 51% | 84% | 75% |
| 204 | Fans- Improve components | 0% | 42% | 75% |
| 207 | Fans - Motor practices-1 (1-5 HP) | 69% | 90% | 75% |
| 209 | Fans - ASD (6-100 hp) | 0% | 29% | 75% |
| 210 | Fans - Motor practices-1 (6-100 HP) | 25% | 75% | 75% |
| 211 | Fans - Replace 100+ HP motor | 49% | 83% | 75% |
| 212 | Fans - ASD (100+ hp) | 0% | 55% | 75% |
| 213 | Fans - Motor practices-1 (100+ HP) | 40% | 80% | 75% |
| 214 | Optimize drying process | 36% | 79% | 75% |
| 215 | Power recovery | 57% | 86% | 75% |
| 301 | Pumps - O&M | 0% | 0% | 75% |
| 302 | Pumps - Controls | 0% | 19% | 75% |
| 303 | Pumps - System Optimization | 10% | 69% | 75% |
| 304 | Pumps - Sizing | 0% | 39% | 75% |
| 307 | Pumps - Motor practices-1 (1-5 HP) | 71% | 90% | 75% |
| 309 | Pumps - ASD (6-100 hp) | 0% | 1% | 75% |
| 310 | Pumps - Motor practices-1 (6-100 HP) | 44% | 81% | 75% |
| 311 | Pumps - Replace 100+ HP motor | 55% | 85% | 75% |
| 312 | Pumps - ASD (100+ hp) | 1% | 59% | 75% |
| 313 | Pumps - Motor practices-1 (100+ HP) | 14% | 71% | 75% |
| 314 | Power recovery | 55% | 85% | 75% |
| 401 | Bakery - Process (Mixing) - O&M | 0% | 0% | 75% |
| 402 | O&M/drives spinning machines | 4% | 68% | 75% |
| 403 | Air conveying systems | 0% | 23% | 75% |
| 404 | Replace V-Belts | 0% | 42% | 75% |
| 405 | Drives - EE motor | 3% | 66% | 75% |
| 406 | Gap Forming papermachine | 0% | 38% | 75% |
| 407 | High Consistency forming | 0% | 38% | 75% |
| 408 | Optimization control PM | 31% | 77% | 75% |
| 409 | Efficient practices printing press | 0% | 39% | 75% |
| 410 | Efficient Printing press (fewer cylinders) | 36% | 79% | 75% |
| 412 | Efficient drives | 0% | 65% | 75% |
| 413 | Clean Room - Controls | 25% | 75% | 75% |
| 414 | Clean Room - New Designs | 51% | 84% | 75% |
| 415 | Drives - Process Controls (batch + site) | 53% | 84% | 75% |
| 416 | Process Drives - ASD | 46% | 82% | 75% |
| 417 | O&M - Extruders/Injection Moulding | 0% | 0% | 75% |
| 418 | Extruders/injection Moulding-multipump | 47% | 82% | 75% |
| 420 | Injection Moulding - Impulse Cooling | 62% | 87% | 75% |
| 423 | Process control | 0% | 41% | 75% |
| 424 | Process optimization | 39% | 80% | 75% |
| 425 | Drives - Process Control | 42% | 81% | 75% |
| 426 | Efficient drives - rolling | 0% | 63% | 75% |
| 427 | Drives - Optimization process (M&T) | 0% | 24% | 75% |
| 428 | Drives - Scheduling | 19% | 73% | 75% |
| 429 | Machinery | 1% | 67% | 75% |
| 430 | Efficient Machinery | 1% | 67% | 75% |
| 501 | Bakery - Process | 0% | 48% | 75% |
| 502 | Drying (UV/IR) | 39% | 80% | 75% |
| 503 | Heat Pumps - Drying | 74% | 91% | 75% |
| 504 | Top-heating (glass) | 0% | 42% | 75% |
| 505 | Efficient electric melting | 48% | 83% | 75% |
| 507 | Near Net Shape Casting | 0% | 37% | 75% |
| 508 | Heating - Process Control | 46% | 82% | 75% |
| 509 | Efficient Curing ovens | 50% | 83% | 75% |
| 510 | Heating - Optimization process (M&T) | 0% | 24% | 75% |
| 511 | Heating - Scheduling | 20% | 73% | 75% |
| 551 | Efficient Refrigeration - Operations | 0% | 2% | 75% |
| 552 | Optimization Refrigeration | 62% | 87% | 75% |

| Industrial Existing Electric Measure Incentives (Pt 2) | | | | |
|---|---|---|---|---|
| 601 | Other Process Controls (batch + site) | 40% | 80% | 75% |
| 602 | Efficient desalter | 4% | 68% | 75% |
| 603 | New transformers welding | 1% | 67% | 75% |
| 604 | Efficient processes (welding, etc.) | 1% | 67% | 75% |
| 606 | Power recovery | 47% | 82% | 75% |
| 701 | Centrifugal Chiller, 0.51 kW/ton, 500 tons | 33% | 78% | 75% |
| 702 | Window Film - Chiller | 71% | 90% | 75% |
| 705 | Chiller Tune Up/Diagnostics | 77% | 92% | 75% |
| 712 | DX Packaged System, EER=10.9, 10 tons | 80% | 93% | 75% |
| 713 | Window Film - DX | 44% | 81% | 75% |
| 715 | Prog. Thermostat - DX | 0% | 1% | 75% |
| 716 | Cool Roof - DX | 83% | 94% | 75% |
| 801 | RET 2L4' Premium T8, 1EB | 45% | 82% | 75% |
| 802 | CFL Hardwired, Modular 36W | 0% | 64% | 75% |
| 804 | Occupancy Sensor, 4L4' Fluorescent Fixtures | 46% | 82% | 75% |
| 901 | Replace V-belts | 0% | 65% | 75% |
| 902 | Membranes for wastewater | 46% | 82% | 75% |

| Industrial Existing Gas Measure Incentives | | | | |
|---|---|---|---|---|
| **Measure Number** | **Measure** | **% Incentive for 3 YR Payback** | **% Incentive for 1 YR Payback** | **75% Incentive** |
| 101 | Improved process control | 0% | 0% | 75% |
| 102 | Maintain boilers | 0% | 0% | 75% |
| 103 | Flue gas heat recovery/economizer | 8% | 69% | 75% |
| 104 | Blowdown steam heat recovery | 37% | 79% | 75% |
| 105 | Upgrade burner efficiency | 7% | 69% | 75% |
| 106 | Water treatment | 0% | 31% | 75% |
| 107 | Load control | 0% | 0% | 75% |
| 108 | Improved insulation | 0% | 26% | 75% |
| 109 | Steam trap maintenance | 0% | 0% | 75% |
| 110 | Automatic steam trap monitoring | 0% | 10% | 75% |
| 111 | Leak repair | 0% | 0% | 75% |
| 112 | Condensate return | 0% | 41% | 75% |
| 113 | Thermally activated heat pump/chiller | 0% | 60% | 75% |
| 201 | Improve ceiling insulation | 37% | 79% | 75% |
| 202 | Install high efficiency (95%) condensing furnace/boiler | 0% | 63% | 75% |
| 203 | Stack heat exchanger | 41% | 80% | 75% |
| 204 | Duct insulation | 0% | 56% | 75% |
| 205 | EMS install | 30% | 77% | 75% |
| 206 | EMS optimiza ion | 0% | 1% | 75% |
| 501 | Process Controls & Management | 0% | 28% | 75% |
| 502 | Heat Recovery | 41% | 80% | 75% |
| 503 | Efficient burners | 0% | 30% | 75% |
| 504 | Process integration | 52% | 84% | 75% |
| 505 | Efficient drying | 44% | 81% | 75% |
| 507 | Extended nip press | 58% | 86% | 75% |
| 508 | Improved separation processes | 7% | 69% | 75% |
| 509 | Thermal oxidizers | 2% | 67% | 75% |
| 510 | Flare gas controls and recovery | 0% | 48% | 75% |
| 511 | Fouling control | 0% | 0% | 75% |
| 512 | Efficient furnaces | 4% | 68% | 75% |
| 513 | Oxyfuel | 27% | 76% | 75% |
| 514 | Batch cullet preheating | 0% | 59% | 75% |
| 515 | Preventative maintenance | 0% | 0% | 75% |
| 516 | Combustion controls | 0% | 35% | 75% |
| 517 | Optimize furnace operations | 0% | 47% | 75% |

**Attachment C - Comparison of Achievable Potential Results from Various Electric Studies**

The following table provides achievable potential results for various studies conducted over the past decade. The results are normalized to base energy consumption. For each study, we provide a reference to the report the numbers were pulled from. Due to the heterogeneous nature of these studies, a direct comparison of results is not possible, but rather these results provide a range that can be used to judge the reasonableness of Missouri potential estimates.

In addition, we have attached a copy of a recent summary study: *A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest*, (file name "Midwest studies 247-1.pdf") prepared by the Energy Center of Wisconsin and ACEEE, and published in August 2009. In addition to a comparison of studies, this report provides a discussion of various methodologies used and some qualifiers to note in comparing results.

In most cases, KEMA has copies of the studies cited in the table, and could provide them upon request.

## Table 1. Achievable Potential Savings as a Percent of Base Load – Various Electric Potential Studies

| Area | Study Year | Number of Years | Scenario | Achievable Savings as a percent of Base Load | % Saving / Years | Source |
|---|---|---|---|---|---|---|
| Ameren | 2010 | 12 | Realistic Achievable | 6.5% | 0.5% | AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary, Global Energy Partners, January 2010 |
| Ameren | 2010 | 12 | Maximum Achievable | 9.8% | 0.8% | AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary, Global Energy Partners, January 2010 |
| Ameren | 2010 | 12 | Business as Usual | 5.4% | 0.5% | AmerenUE Demand Side Management (DSM) Market Potential Study Volume 1: Executive Summary, Global Energy Partners, January 2010 |
| Missouri | 2011 | 10 | 3-Year Payback – Net | 3.8% | 0.4% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Missouri | 2011 | 10 | 1-Year Payback – Net | 6.8% | 0.7% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Missouri | 2011 | 10 | 75% Incentives – Net | 9.5% | 1.0% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Missouri | 2011 | 10 | 3-Year Payback - Gross | 7.1% | 0.7% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Missouri | 2011 | 10 | 1-Year Payback - Gross | 10.1% | 1.0% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Missouri | 2011 | 10 | 75% Incentives – Gross | 12.9% | 1.3% | Missouri Statewide DSM Market Potential Study - DRAFT, KEMA, Inc. January 15, 2011 |
| Wisconsin | 2009 | 11 | | | 1.6% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Kansas | 2008 | 21 | | | 1.1% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Florida | 2007 | 15 | | | 1.3% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Texas | 2007 | 15 | | | 1.2% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Utah | 2007 | 15 | | | 1.7% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |

| Area | Study Year | Number of Years | Scenario | Achievable Savings as a percent of Base Load | % Saving / Years | Source |
|---|---|---|---|---|---|---|
| Vermont | 2007 | 10 | | | 1.9% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| California | 2006 | 13 | | | 0.6% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| North Carolina | 2006 | 10 | | | 1.4% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Georgia | 2005 | 10 | | | 0.9% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| New England | 2005 | 10 | | | 2.3% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Northwest | 2005 | 20 | | | 0.6% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Ontario | 2005 | 20 | | | 0.7% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Wisconsin | 2005 | 10 | | | 0.8% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| New Jersey | 2004 | 16 | | | 7.0% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| Quebec | 2004 | 8 | | | 4.0% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| U.S. | 2001 | 20 | | | 1.2% | A Review and Analysis of Existing Studies of the Energy Efficiency Resource Potential in the Midwest, Energy Center of Wisconsin and ACEEE, August 2009, includes annotated bibliography |
| US (EPRI) | 2009 | 12 | Realistic Achievable | 4.3% | 0.4% | Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S., EPRI with Global Energy Partners and The Brattle Group, January 2009 |

| Area | Study Year | Number of Years | Scenario | Achievable Savings as a percent of Base Load | % Saving / Years | Source |
|---|---|---|---|---|---|---|
| US (EPRI) | 2009 | 12 | Maximum Achievable | 10.1% | 0.8% | Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S., EPRI with Global Energy Partners and The Brattle Group, January 2009 |
| Northwest | 2007 | 20 | | 9.2% | 0.5% | Assessment of Long-Term, System-Wide Potential for Demand-Side and Other Supplemental Resources, Quantec with Summit Blue and Nexant, July 11, 2007 |
| British Columbia | 2007 | 10 | Upper | 11.7% | 1.2% | BC Hydro 2007 Conservation Potential Review: the Potential for Electricity Savings, 2006-2016, Marbek Resource Consultants, Ltd., November 20, 2007 |
| British Columbia | 2007 | 10 | Lower | 6.0% | 0.6% | BC Hydro 2007 Conservation Potential Review: the Potential for Electricity Savings, 2006-2016, Marbek Resource Consultants, Ltd., November 20, 2007 |
| Colorado | 2010 | 11 | 100% Incentives | 14.9% | 1.4% | Colorado DSM Market Potential Assessment, KEMA, March 12, 2010 |
| Colorado | 2010 | 11 | 75% Incentives | 8.6% | 0.8% | Colorado DSM Market Potential Assessment, KEMA, March 12, 2010 |
| Colorado | 2010 | 11 | 50% Incentives | 5.5% | 0.5% | Colorado DSM Market Potential Assessment, KEMA, March 12, 2010 |
| Iowa | 2009 | 9 | Moderate | 11.0% | 1.2% | Energy Efficiency and Demand Response Potential for Iowa Municipal Utilities, Energy Center of Wisconsin, June 2009 |
| ConEd - New York | 2010 | 9 | Maximum Achievable | 15.0% | 1.7% | Energy Efficiency Potential Study for Consolidated Edison Company of New York, Inc. Volume 1: Executive Summary; Global Energy Partners, June 2010 |
| ConEd - New York | 2010 | 9 | Realistic Achievable – High | 10.0% | 1.1% | Energy Efficiency Potential Study for Consolidated Edison Company of New York, Inc. Volume 1: Executive Summary; Global Energy Partners, June 2010 |
| ConEd - New York | 2010 | 9 | Realistic Achievable - Mid | 9.0% | 1.0% | Energy Efficiency Potential Study for Consolidated Edison Company of New York, Inc. Volume 1: Executive Summary; Global Energy Partners, June 2010 |
| ConEd - New York | 2010 | 9 | Realistic Achievable – Low | 8.0% | 0.9% | Energy Efficiency Potential Study for Consolidated Edison Company of New York, Inc. Volume 1: Executive Summary; Global Energy Partners, June 2010 |
| Minnesota | 2010 | 20 | Base | 12.3% | 0.6% | Minnesota Statewide Electricity Efficiency Potential Study DSM Potentials Report, Summit Blue Consulting, April 30, 2010 |
| Minnesota | 2010 | 20 | High | 13.9% | 0.7% | Minnesota Statewide Electricity Efficiency Potential Study DSM Potentials Report, Summit Blue Consulting, April 30, 2010 |
| Minnesota | 2010 | 20 | Low | 11.7% | 0.6% | Minnesota Statewide Electricity Efficiency Potential Study DSM Potentials Report, Summit Blue Consulting, April 30, 2010 |
| California | 2003 | 10 | Most aggressive scenario | 10.0% | 1.0% | Nadel, Steve, Shipley, A., and Elliott, R. N., Technical, Economic, and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies, 2004 ACEEE Summer Study, Includes references to specific studies |
| Puget Power | 2003 | 20 | Most aggressive scenario | 11.0% | 0.6% | Nadel, Steve, Shipley, A., and Elliott, R. N., Technical, Economic, and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies, 2004 ACEEE Summer Study, Includes references to specific studies |

| Area | Study Year | Number of Years | Scenario | Achievable Savings as a percent of Base Load | % Saving / Years | Source |
|---|---|---|---|---|---|---|
| U.S. | 2003 | 20 | Most aggressive scenario | 24.0% | 1.2% | Nadel, Steve, Shipley, A., and Elliott, R. N., Technical, Economic, and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies, 2004 ACEEE Summer Study, Includes references to specific studies |
| Vermont | 2003 | 10 | Most aggressive scenario | 31.0% | 3.1% | Nadel, Steve, Shipley, A., and Elliott, R. N., Technical, Economic, and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies, 2004 ACEEE Summer Study, Includes references to specific studies |
| Southwest | 2002 | 17 | Most aggressive scenario | 33.0% | 1.9% | Nadel, Steve, Shipley, A., and Elliott, R. N., Technical, Economic, and Achievable Potential for Energy-Efficiency in the U.S. - A Meta-Analysis of Recent Studies, 2004 ACEEE Summer Study, Includes references to specific studies |
| Connecticut | 2009 | 10 | Base | 10.0% | 1.0% | Potential for Energy Efficiency in Connecticut, KEMA, May 1, 2009 |
| Connecticut | 2009 | 10 | Current | 11.0% | 1.1% | Potential for Energy Efficiency in Connecticut, KEMA, May 1, 2009 |
| Connecticut | 2009 | 10 | Accelerated | 20.0% | 2.0% | Potential for Energy Efficiency in Connecticut, KEMA, May 1, 2009 |
| New Mexico | 2006 | 10 | Base | 3.4% | 0.3% | Public Service New Mexico Electric Energy Efficiency Potential Study, Itron, Inc. with assistance from KEMA, Inc., September 20, 2006 |
| New Mexico | 2006 | 10 | Advanced | 6.1% | 0.6% | Public Service New Mexico Electric Energy Efficiency Potential Study, Itron, Inc. with assistance from KEMA, Inc., September 20, 2006 |
| New Mexico | 2006 | 10 | Maximum Achievable | 8.2% | 0.8% | Public Service New Mexico Electric Energy Efficiency Potential Study, Itron, Inc. with assistance from KEMA, Inc., September 20, 2006 |

NOTE: Commissioner Jarrett requested a more detailed response to PSC3. KEMA provided the response below on February 16, 2011.

The issues raised by Janet Wheeler at the January 20th meeting in regard to CFLs are based on an article about the California market. The California market for CFLs is much more mature than the Missouri market. California has been promoting CFLs for many years and its residents have installed a large number of CFLs per home and per business, as compared to Missouri residents. Hence, CFLs are nearing saturation of the optimal lighting sockets in California. A high percentage of new CFLs in California are placed in less optimal location where the operating hours are lower and the equipment is frequently cycled on and off. These factors reduce both equipment life and the savings per load period relative to the baseline. Both factors significantly reduce the average savings from CFL installation and the net benefits of the average installation. In light of the differences between the California and Missouri markets, we agree with Ameren's observation that there are still significant opportunities to install CFLs in optimal locations in Missouri.

The baseline for the Missouri Statewide DSM Potential Study was developed for both electricity and natural gas usage across the residential, commercial and industrial sectors by the methodology detailed in the preliminary memorandum on the baseline energy use submitted on October 4, 2010 and in the draft report, Section 4, submitted on January 15, 2011. The question indentified as PSC3 specifically addresses compact fluorescent lamps (CFLs). To develop the statewide baseline for Missouri with regard to CFLs, KEMA assembled data from secondary sources, calibrated to the extent justified by available Missouri-specific data including:

- Total count of energy-consuming units (floor space of commercial buildings, number of residential dwellings, and the base kWh consumption of industrial facilities);
- Annual energy consumption for lighting (both in terms of total consumption in GWh and normalized for intensity on a per-unit basis (e.g., kWh/ft2);
- The saturation of electric lighting (e.g, for the commercial sector the fraction of total commercial floor space illuminated and for the residential sector the average number of fixtures per household);
- Market share for each energy-efficiency measure in scope (for example, the fraction of total commercial floor space already served by CFLs or the fraction of residential fixtures containing CFLs).

Based on these and other inputs, we quantified the potential for savings that exists in Missouri from the installation of CFLs in appropriate locations up to the effective date of the new federal standards for lighting.

From: Rogers, John [mailto:John.Rogers@psc.mo.gov]

Sent: Tuesday, February 15, 2011 6:03 PM

To: Franks, Thomas G.; Dietrich, Natelle*

Cc: Noller, John; Bickford, Adam; Wilbers, Brenda

Subject: RE: Questions on potential

Tom:

You have it captured correctly below. I did add one clarifying question in 2).

Thanks

John

From: Franks, Thomas G. [mailto:Thomas.Franks@kema.com]

Sent: Tuesday, February 15, 2011 4:46 PM

To: Rogers, John; Dietrich, Natelle*

Cc: Noller, John; Bickford, Adam; Wilbers, Brenda

Subject: Questions on potential

Hi John,

I offer the notes below, based on our telephone conversation today, to confirm my understanding of the issues raised:

1) You request that KEMA to present the achievable potential results as a percentage of an adjusted baseline using the following formula: B – N = the adjusted baseline.

Where:

- Potential% = The achievable potential as percentage of the adjusted baseline
- PotentialU = The achievable potential in units (e.g GWh) as determined by DSM Assyst
- B= The baseline as used within DSM Assyst
- N= The amount of naturally occurring savings as determined by DSM Assyst
- B – N = the adjusted baseline.

2) We will check the baseline energy use for the first year as presented in Table 1 of Attachment A to the February 7 submission. How does the 91,076 GWh in Table 1 of Attachment A to the 2/7/2011 memo reconcile with 84,358 GWh in Table 4-1, page 4-9 of the 1/15/2010 draft report (where 84,358 = 35,390 + 48,968 in Table 4-1)?

3) We will provide an answer to the following questions: For those measures that receive no incentive under the two payback scenarios developed:

a. Why are the savings from these measures not treated as naturally occurring?

b. What is the quantity of savings attributable to measures for which no incentive is paid?

Please confirm or correct as appropriate.

Thank you,

Tom Franks

Hi John,

Now that we have confirmed the questions, below are our answers or proposed disposition in *italics*.

1) You request that KEMA to present the achievable potential results as a percentage of an adjusted baseline using the following formula:

$$Potential_{\%} = \frac{Potential_U}{B - N}$$

Where:

- $Potential_{\%}$ = The achievable potential as percentage of the adjusted baseline
- $Potential_U$ = The achievable potential in units (e.g GWh) as determined by DSM Assyst
- B= The baseline as used within DSM Assyst
- N= The amount of naturally occurring savings as determined by DSM Assyst
- B – N = the adjusted baseline.

*KEMA: We will incorporate this approach in the final report if so directed by the Commission. We anticipate that we will be directed to re-run the model to incorporate several input changes that developed from comments after the January 20th stakeholder presentation. The model does not provide outputs for all the factors necessary for this approach so additional programming and analysis will be necessary to derive them, a significant investment of time. Performing this task on a set of data that has a high probability of changing would not produce accurate results nor be efficient.*

*We respectfully request that if it is the Commission's intent to apply this approach only in the presentation of achievable potential as a ratio, then this be clearly stated in the direction it provides on February 21st.*

2) We will check the baseline energy use for the first year as presented in Table 1 of Attachment A to the February 7 submission.

*KEMA: After receipt of the Commission's February 21st communication, we will revise the inputs and incorporate methodological changes as directed and prepare and confirm a final baseline energy use to be consistently presented in the final report.*

3) We will provide an answer to the following questions: For those measures that receive no incentive under the two payback scenarios developed:

    a. Why are the savings from these measures not treated as naturally occurring?

*The model takes into account two key factors in measure adoption. The most obvious is cost effectiveness: the more cost effective a measure is, the more customers will purchase it. Incentives increase the customer's benefit cost ratio, which causes more customers to purchase the measure.*

*However, customers will only adopt a measure if they are aware of the measure and its benefits. You can have the most cost-effective energy saving widget in the world, but if no one knows what it is, how it works and why they should get one, they will not buy it. Measures with high cost effectiveness but less than 100 percent awareness may be assigned zero incentives in the model, but still be included in the program's marketing efforts. These efforts might include information provided through bill inserts, website information, in-store marketing etc.*

*In the structure of the model, marketing budgets affect a parameter called Awareness, which is used to determine the pool of customer who are available to adopt a measure in a particular year (for example, the pool of customers who are replacing a water heater in that year AND know about the existence and benefits of heat pump water heaters). Marketing budgets increase the pool of aware customers and therefore increase measure adoption as compared to adoption absent program effects. The incremental savings due to the increased marketing are not "Naturally Occurring;" the savings would not have accrued in the absence of the program.*

b. What is the quantity of savings attributable to measures for which no incentive is paid?

*KEMA: Developing the answer to this question will require an effort comparable to the process outlined for question 1 above. If directed by the Commission, KEMA will provide this information in the final report.*

Thank you,

Tom Franks

**Franks, Thomas G.**

**From:** Dietrich, Natelle* [natelle.dietrich@psc.mo.gov]
**Sent:** Thursday, January 20, 2011 5:42 PM
**To:** Franks, Thomas G.
**Cc:** Wilbers, Brenda; Dietrich, Natelle*
**Subject:** FW: Draft KEMA Report

Tom,
Some initial direction based on my discussions with Commissioners. I wanted to get these to you as soon as possible. Let me know if you have questions or need further direction. Natelle

**The final report should include a detailed explanation of the baseline forecast and explain more clearly how it was developed.**

**The final report should include a discussion of the Ameren study, with a comparison of approach and result. (I'm not suggesting a line item by line item comparison, but it would be helpful to have a comparison of general methodologies, approaches, and assumptions – to the extent KEMA has completed that analysis or can receive input from Ameren.)**

**Franks, Thomas G.**

**From:** Dietrich, Natelle* [natelle.dietrich@psc.mo.gov]
**Sent:** Thursday, January 20, 2011 5:59 PM
**To:** Franks, Thomas G.
**Subject:** FW: Follow-up to MoPSC DSM Potential Study Roundtable Discussion

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**From:** Voytas, Rick A [mailto:RVoytas@ameren.com]
**Sent:** Thursday, January 20, 2011 2:55 PM
**To:** Dietrich, Natelle*; Rogers, John; Adam Bickford; Arora, Ajay K; 'Alden Hathaway'; 'Allen Dennis'; Meyer, Andrew M; 'Barry Dicker'; 'Barry Matchett'; 'Barry Warren'; Beck, Dan; 'Beth Burka'; 'Beth Soholt'; Barbieri, William J; Davis, Bill R; 'Bill Loesch'; 'Bill Roush'; 'Bill Roush'; Mark Drazen; Billie Sue. LaConte; 'Blake Mertens'; 'Bob Gardner'; Miller, Richard A; 'Brad Klein'; 'Brad Lutz'; 'Brent Ross'; 'Brent Stewart'; 'Brett McLean'; 'Burton Crawford'; 'Cara Schaefer'; 'Carl Lumley'; Carlson, Bob; 'Carol Sivils'; 'Charles Peoples'; 'Chris Burnette'; 'D. J. Linton'; Laurent, Dan G; 'Dane Glueck'; 'Dave Kreimer'; 'David Weisman'; 'David Overfelt'; 'David Woodsmall'; 'Dianna M. Vuylsteke'; Donald Johnstone; Douglas Healy; 'Duane Highley'; 'Ed Downey'; Pappas, Charles; Parish, Dana; Voss, Cherlyn; Wilbers, Brenda; 'Ed Hedges'; 'Ed Matthews'; 'Eric Gunning'; 'Eric Swillinger'; 'Eric Thumma'; 'Erin Noble'; 'Ezra Hausman'; 'Frank Lewon'; Suggett, Gaye L; 'Greg Geller'; 'Greg Meyer'; 'Hank Stelzer'; 'Hans Detweiler'; 'Heather Starnes'; 'Henry Rentz'; Henry Robertson; Hughes, Mark; 'Jay Hasheider'; 'Jayna Long'; 'Jeff Lewis'; 'Jeff Reinkemeyer'; Mendl, Jerry; 'Jesse Bermel'; 'Jim Fischer'; 'Jim Okenfuss'; 'John Coffman'; 'John Ervin'; 'John Grimwade'; 'Josh Harden'; 'Joyce Davidson'; 'Juan Gutierrez'; 'Judd Moritz'; 'Kari Decker'; 'Karl Zobrist'; 'Kathleen Henry'; 'Kathleen Logan Smith'; 'Keith Beall'; 'Kelly Walters'; 'Kevin Bryant'; 'Khristine Heisinger'; 'Lars Kvale'; Lisa Langeneckert; 'Lois Liechti'; 'LuAnn Madsen'; Mantle, Lena; 'Marc Lopata'; 'Mark Lawlor'; 'Marvin Rollison'; Michels, Matt R; 'Matthew Brown'; Maurice Brubaker; 'Michelle Harris'; Mills, Lewis; Noller, John; Oligschlaeger, Mark*; VanEschen, John; Wheeler, Janet; Thompson, Kevin; 'Kim McCloud'; 'Margo McNeil'; 'Marsha Troy'; 'Mary Ann Young'; 'Michael McCabe'; 'Michelle McConnell'; 'Mike Bollenbach'; 'Mike Carella'; 'Mike Revak'; Whitmore, Michael F; Couch, Myron; 'Nathan Jones'; Williams, Nathan; 'P. J. Wilson'; 'Patrick McNamara'; 'Paula Haskin'; 'Pete Curtice'; 'Phil Wright'; 'Puja Deverakonda'; 'Randy Hughes'; Jenkins, Rex W; 'Moore, Richard'; Wright, Richard A; 'Rob Freeman'; 'Rob Land'; Willen, Robert E; 'Roger Clark'; 'Roger Steiner'; 'Ron McLinden'; 'Ron Stimmel'; 'Russ Mitten'; Trippensee, Russ; Kind, Ryan; 'Sandeep Menon'; 'Scott Miller'; Woods, Shelley; 'Sherry McCormack'; 'Sierra Club Missouri Chapter'; Kidwell, Steve M; 'Steve Capanna'; Dottheim, Steve; 'Steve Gaw'; 'Stuart Conrad'; 'Susan Brown'; Sundermeyer, Susan; 'Terry Hilgedick'; 'Tim Michels'; 'Tim Rush'; 'Tim Wilson'; 'Todd Tarter'; 'Todd Wheeler'; 'Tom Rutigliano'; 'Tony Robyn'; 'Travis Creswell'; 'Troid Edwards'; 'Vaughn Prost'; 'Veronica Thomason'; Miller, Wade A; 'Warren Wood'; Li, Wenbin; Tatro, Wendy K; Cooper, Wil L; 'Yuri Horwitz'; 'Zeina El-Azzi'; 'Zeke Fairbank'; Barnes, Matthew; Bender, Leon; Eaves, Dana; Gross, Randy; Kang, Hojong; Roos, David; Wankum, Martha; 'Cara Shaefer'; Eichelberger, Pam; Eiken, Shelley; Elliott, David; 'George McCollister'; Gregory, Sheryl; Harden, Joshua; Hernandez, Jennifer; 'Jill Cornett'; 'Joseph O'Donnell'; 'Laura Becker'; Neuner, Joyce; 'Rick D. Chamberlain'; 'Angela Beehler'; 'B. Maire Pieniazek'; 'Bruce Campbell'; 'Damon E. Xenopoulos'; 'David Ellis'; 'John Orr'; 'Ken Baker'; 'Kenneth Schisler'; Mckinnie, Adam; 'Paul Peterson'; 'Paul Tyno'; Rebecca Stanfield; 'Tim Carter'; 'ewest@communityaction.org'; Imhoff, Tom; Cox, Kim; Stahlman, Michael; 'FGILZOW@MPUA.org'; 'mcline@lacledegas.com'; 'Mike Perdergast (mpendergast@lacledegas.com)'; 'mike.noack@sug.com'; 'tjohnston@summitutilitiesinc.com'; 'kjames@smng.biz'; 'jlong@empiredistric.com'; 'mark.martin@atmosenergy.com'; 'leonard.matheny@atmosenergy.com'; 'lwdority@sprintmail.com'; 'jmassman@ameren.com'; Hurt, Erica; 'Aditya JayamPrabhakar'; Jenkins, Lesa*; 'fisleib@nexant.com'
**Subject:** RE: Follow-up to MoPSC DSM Potential Study Roundtable Discussion

Input provided by Rick Voytas – Ameren Services

The major issue cited in the Wall Street Journal article regarding CFLs is that the latest actual evaluation, measure and verification reports from California show that CFLs appear to be lasting only about 6.3 years on average rather than the 9.4 years that were used in California's program planning/design process. Consequently lifetime energy savings attributed to CFLs have been reduced accordingly in California.

A CFL's life can be shortened when it is turned off and on more frequently – situations that may occur when the CFLs are used in less than optimal locations like closets or automatic garage door openers.

A state like California with a long history of CFL promotions may have to address this issue because most of the optimal light sockets such as room reading lights or room ceiling lights are already saturated with the installation of CFLs. By necessity more CFLs are going into less optimum locations in California.

Missouri is in a different place right now with regard to CFL installations in residential homes. There appear to be ample opportunities to install CFLs in optimal locations. Consequently, the persistence issue, i.e. assume a life of 9.4 years or 6.3 years, is not currently a pressing issue.

Our view is that a more pressing issue with the consideration of CFLs in the Missouri statewide DSM potential study is to understand how KEMA developed its base case electric sales forecast in regards to future CFL market saturation in light of the legislative mandates on incandescent light bulbs in the Energy Independence and Security Act of 2007 versus the inclusion of CFLs in the estimates of technical, economic and achievable potential. The issue is to eliminate to the extent possible the double counting of energy savings attributable to CFLs in the Missouri statewide DSM potential study.

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**From:** Dietrich, Natelle* [mailto:natelle.dietrich@psc.mo.gov]
**Sent:** Thursday, January 20, 2011 2:32 PM
**To:** John Rogers; Adam Bickford; Arora, Ajay K; 'Alden Hathaway'; 'Allen Dennis'; Meyer, Andrew M; 'Barry Dicker'; 'Barry Matchett'; 'Barry Warren'; Dan Beck; 'Beth Burka'; 'Beth Soholt'; Barbieri, William J; Davis, Bill R; 'Bill Loesch'; 'Bill Roush'; 'Bill Roush'; Mark Drazen; Billie Sue. LaConte; 'Blake Mertens'; 'Bob Gardner'; Miller, Richard A; 'Brad Klein'; 'Brad Lutz'; 'Brent Ross'; 'Brent Stewart'; 'Brett McLean'; 'Burton Crawford'; 'Cara Schaefer'; 'Carl Lumley'; Carlson, Bob; 'Carol Sivils'; 'Charles Peoples'; 'Chris Burnette'; 'D. J. Linton'; Laurent, Dan G; 'Dane Glueck'; 'Dave Kreimer'; 'David Weisman'; 'David Overfelt'; 'David Woodsmall'; 'Dianna M. Vuylsteke'; Donald Johnstone; Douglas Healy; 'Duane Highley'; 'Ed Downey'; Pappas, Charles; Parish, Dana; Voss, Cherlyn; Brenda Wilbers; 'Ed Hedges'; 'Ed Matthews'; 'Eric Gunning'; 'Eric Swillinger'; 'Eric Thumma'; 'Erin Noble'; 'Ezra Hausman'; 'Frank Lewon'; Suggett, Gaye L; 'Greg Geller'; 'Greg Meyer'; 'Hank Stelzer'; 'Hans Detweiler'; 'Heather Starnes'; 'Henry Rentz'; Henry Robertson; Hughes, Mark; 'Jay Hasheider'; 'Jayna Long'; 'Jeff Lewis'; 'Jeff Reinkemeyer'; Mendl, Jerry; 'Jesse Bermel'; 'Jim Fischer'; 'Jim Okenfuss'; 'John Coffman'; 'John Ervin'; 'John Grimwade'; 'Josh Harden'; 'Joyce Davidson'; 'Juan Gutierrez'; 'Judd Moritz'; 'Kari Decker'; 'Karl Zobrist'; 'Kathleen Henry'; 'Kathleen Logan Smith'; 'Keith Beall'; 'Kelly Walters'; 'Kevin Bryant'; 'Khristine Heisinger'; 'Lars Kvale'; Lisa Langeneckert; 'Lois Liechti'; 'LuAnn Madsen'; Lena Mantle; 'Marc Lopata'; 'Mark Lawlor'; 'Marvin Rollison'; Michels, Matt R; 'Matthew Brown'; Maurice Brubaker; 'Michelle Harris'; Lewis Mills; John Noller; Oligschlaeger, Mark*; VanEschen, John; Wheeler, Janet; Thompson, Kevin; 'Kim McCloud'; 'Margo McNeil'; 'Marsha Troy'; 'Mary Ann Young'; 'Michael McCabe'; 'Michelle McConnell'; 'Mike Bollenbach'; 'Mike Carella'; 'Mike Revak'; Whitmore, Michael F; Couch, Myron; 'Nathan Jones'; Nathan Williams; 'P. J. Wilson'; 'Patrick McNamara'; 'Paula Haskin'; 'Pete Curtice'; 'Phil Wright'; 'Puja Deverakonda'; 'Randy Hughes'; Jenkins, Rex W; Moore, Richard; Voytas, Rick A; Wright, Richard A; 'Rob Freeman'; 'Rob Land'; Willen, Robert E; 'Roger Clark'; 'Roger Steiner'; 'Ron McLinden'; 'Ron Stimmel'; 'Russ Mitten'; Trippensee, Russ; Ryan Kind; 'Sandeep Menon'; 'Scott Miller'; Shelley Woods; 'Sherry McCormack'; 'Sierra Club Missouri Chapter'; Kidwell, Steve M; 'Steve Capanna'; Steve Dottheim; 'Steve Gaw'; 'Stuart Conrad'; 'Susan Brown'; Sundermeyer, Susan; 'Terry Hilgedick'; 'Tim Michels'; 'Tim Rush'; 'Tim Wilson'; 'Todd Tarter'; 'Todd Wheeler'; 'Tom Rutigliano'; 'Tony Robyn'; 'Travis Creswell'; 'Troid Edwards'; 'Vaughn Prost'; 'Veronica Thomason'; Miller, Wade A; 'Warren Wood'; Li, Wenbin; Tatro, Wendy K; Cooper, Wil L; 'Yuri Horwitz'; 'Zeina El-Azzi'; 'Zeke Fairbank'; Matthew Barnes; Leon Bender; Dana Eaves; Gross, Randy; Hojong Kang; David Roos; Wankum, Martha; 'Cara Shaefer'; Eichelberger, Pam; Eiken, Shelley; Elliott, David; 'George McCollister'; Gregory, Sheryl; Harden, Joshua; Hernandez, Jennifer; 'Jill Cornett'; 'Joseph O'Donnell'; 'Laura Becker'; Neuner, Joyce; 'Rick D. Chamberlain'; 'Angela Beehler'; 'B. Maire Pieniazek'; 'Bruce Campbell'; 'Damon E. Xenopoulos'; 'David Ellis'; 'John Orr'; 'Ken Baker'; 'Kenneth Schisler'; Mckinnie, Adam; 'Paul Peterson'; 'Paul Tyno'; Rebecca Stanfield; 'Tim Carter'; 'ewest@communityaction.org'; Imhoff, Tom; Cox, Kim; Stahlman, Michael; 'FGILZOW@MPUA.org'; 'mcline@lacledegas.com'; 'Mike Perdergast (mpendergast@lacledegas.com)'; 'mike.noack@sug.com'; 'tjohnston@summitutilitiesinc.com'; 'kjames@smng.biz'; 'jlong@empiredistric.com'; 'mark.martin@atmosenergy.com'; 'leonard.matheny@atmosenergy.com'; 'lwdority@sprintmail.com'; 'jmassman@ameren.com'; Hurt, Erica; 'Aditya JayamPrabhakar'; Jenkins, Lesa*; 'fisleib@nexant.com'
**Cc:** Dietrich, Natelle*
**Subject:** Follow-up to MoPSC DSM Potential Study Roundtable Discussion

In the Roundtable this morning, Janet Wheeler posed some questions on behalf of Commissioner Jarrett. I indicated I would follow-up the discussion with an email seeking input from all interested stakeholders. I will place the article and all responses in the working docket. Natelle

http://online.wsj.com/article/SB10001424052748704259704576033890595565026.html

According to the attached article, California has learned, that "it is hard to accurately predict and tricky to measure energy savings" when reviewing evaluation reports and field studies related to the use of CFLs. The article goes on to say, " Staff of the state utilities commission said utilities missed their overall-energy savings targets, partly because of disappointing results from light bulbs."

Do you have any comments or observations about these statements?

Should the MoPSC DSM Potential Study be adjusted to acknowledge these statements?

MDNR Questions for KEMA Draft Missouri Demand Side Potential Study
January 21, 2011

1) Do the definitions of the “one-year payback” and “three-year payback” scenarios used by KEMA differ from the definitions used by Ameren?
    a. If so, please describe the differences, as KEMA understands them.
    b. If the goal of estimating the “one-year payback” and “three-year payback” scenarios was to provide comparability with the Ameren study, and if the underlying assumptions differ:
        1. Are KEMA's scenarios and Ameren's results fully comparable?
        2. If they are not fully comparable, what refinements would have been required to develop scenarios that more fully comparable?
        3. If they are not fully comparable, what disclaimers should be included in KEMA's report?
    c. Please describe the methodology used by KEMA to adjust measure incentive levels to create the “one-year payback” and “three-year payback” scenarios.
        i. Please provide a table of measures showing the incremental cost relative to the baseline measure along with the incentive level set for the “one-year payback”, “three-year payback” and “KEMA 75% Achievable Potential” scenarios.
2) Please provide a table comparing the results of the KEMA Missouri Demand Side Potential Study to other equivalent state-wide potential studies and to studies that have estimated achievable potential in other jurisdictions using a methodological approach similar to KEMA's "75% of incremental cost" approach. . Please include complete references for the comparable studies.
3) Please describe how codes and standards are incorporated in the KEMA ASSYST model. With respect to federal equipment standards please discuss how KEMA treats
    a. standards that are in DOE regulations that are due to go into effect in the future, and
    b. standards which DOE is required by legislation to establish but that DOE has not yet established in specific regulations.
4) In his comments, Fred Coito of KEMA mentioned that KEMA agreed with Ameren’s assumption that Missouri residents are less interested in energy efficiency than residents in other states.
    a. Please explain how KEMA came to this conclusion.
    b. Did this assumption impact the results of the study?
        i. If so, how was this assumption operationalized? Please identify any variable(s) or factor(s) in the model that reflect this assumption.
        ii. In the absence of the AmerenUE study, what assumptions about customer participation (or similar factors) would KEMA have used in their modeling?

iii. Please provide a sensitivity analysis on the variable identified in 4).b.i, showing how study results would vary with changes in the assumptions about customer participation (or similar factors). Please compare Ameren's value to the values KEMA has used in other studies for other jurisdictions as the lower and upper values of these factors in any sensitivity analysis.
iv. Please estimate the impact on the reported participation and savings level such an assumption has on the study results.

January 24, 2011

**RE**: **Missouri Statewide DSM Potential Study Draft Report Dated 1-15-2011**
**Docket Number – EW-2011-0136**

From: Rick Voytas, Manager Energy Efficiency and Demand Response – on Behalf of Ameren Missouri

Ameren Missouri appreciates this opportunity to share our comments regarding our concerns with the KEMA DSM Study and hopes this information will be helpful to the Missouri Public Service Commission.

The purpose of this memo is to follow-up on the most substantive comments that the Ameren Missouri energy efficiency team made at the January 20, 2011 MPSC DSM Potential Study Roundtable.

Our comments are necessarily abbreviated because there is simply not enough time to file thorough comments on the voluminous draft report and associated Appendices A-G by 8:00 a.m. on Monday January 24, 2011 as requested by Staff – especially with the Roundtable meeting adjourning at noon on Thursday, January 20th. Similarly, there was insufficient time to review 100% of the 145-page KEMA Statewide draft study and the thousands of numbers in Appendices A-G that were delivered to stakeholders late Saturday evening January 15th in the midst of the Martin Luther King, Jr. holiday weekend. Only portions of January 18th and 19th were left to sift through all the information required to prepare for the January 20th Roundtable. To further complicate matters, the KEMA draft report and Appendices were sent in PDF format which made it difficult to understand or interrogate the numbers cited in the report. These concerns are further stated by the short timeframe of only 120 days being allowed for the study.

## ISSUE #1: Net or Gross?

KEMA has issued three draft reports on the various types of DSM potential. The reports were delivered on December 15, 2010, January 5, 2011 and January 15, 2011. There have been significant changes in the various types of DSM potential from report to report. KEMA, however, has not provided either a discussion of the changes or a red-lined version of the draft documents that highlight changes. Stakeholders have been left on their own to discern the underlying causes for the changes. Such a process is time consuming and inefficient.

With that background, between KEMA's January 5th and January 15th draft reports, they substantially increased their estimates of realistic achievable potential "RAP" in 2020 (from 5% to 7%) and maximum achievable potential "MAP" (from 6% to 10%). KEMA also added for the first time in this project a totally new scenario "theoretical maximum" potential of 13% in 2020.

KEMA attributed the substantial increases in their estimates of achievable potential to converting potential estimates of electric energy efficiency savings from a net basis to a gross basis.

KEMA should be presenting net numbers as net numbers represent what utility sponsored programs can truly achieve. Unfortunately, the KEMA draft report has major inconsistencies on how it develops net numbers.

Table 1.1 in the Executive Summary of the draft report shows the following levels of achievable potential.

| **From KEMA Table 1.1** | **RAP/3-year payback** | **MAP/1-year payback** | **75% INCENTIVE ACHIEVABLE POTENTIAL** |
|---|---|---|---|
| GWh savings in 2020 | 6,601 | 9,394 | 11,942 |
| % Reduction in 2020 | 7.1% | 10.1% | 12.9% |

However, the main body of the KEMA report has Table 1.5 that shows substantially different levels of achievable potential.

| **From KEMA Table 1.5** | **RAP/3-year payback** | **MAP/1-year payback** | **75% INCENTIVE ACHIEVABLE POTENTIAL** |
|---|---|---|---|
| Net GWh savings in 2020 | 3,281 | 6,571 | 7,561 |
| % Net Reduction in 2020 | 3.5% | 7.1% | 8.2% |
| Gross GWh savings in 2020 | 6,406 | 9,696 | 10,185 |
| % Gross Reduction in 2020 | 6.9% | 10.5% | 11.0% |

What are the real gross GWh savings in 2020 – the numbers in Table 1.1 or in Table 1.5? Furthermore, what are the corresponding net numbers? Perhaps most importantly, what is the KEMA methodology for converting from gross to net? What are the net numbers which should ultimately be included in this report? This is one of many examples where KEMA should provide a detailed EXCEL spreadsheet so that stakeholders can see exactly what the KEMA methodology is.

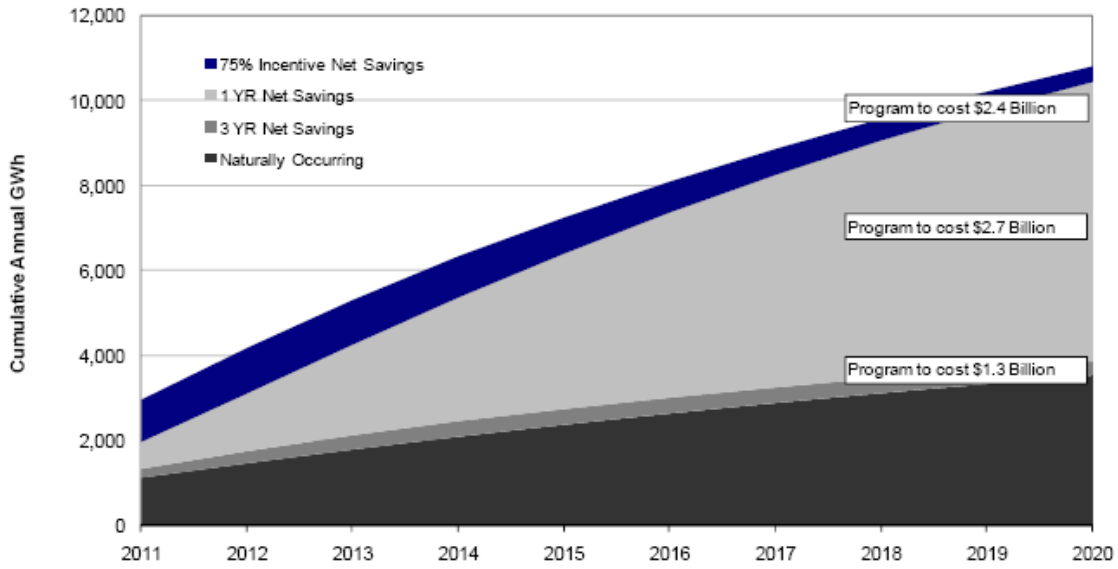
**Issue #2: Naturally Occurring Energy Efficiency**

Naturally occurring energy efficiency represents the amount of energy efficiency that customers will do on a going forward basis without the benefit of utility sponsored energy efficiency programs. It is a critical component in the development of a base case from which to measure the impact of utility sponsored energy efficiency programs.

The estimation of naturally occurring energy efficiency can be addressed in at least two ways. First, it can be addressed by reducing the base case sales forecast to account for naturally occurring energy efficiency. This is how the Ameren Missouri DSM Potential Study addressed it. Alternatively, it can be addressed by excluding naturally occurring efficiency from the base forecast, in effect "freezing" efficiency penetration at 1st year levels and then adjusting for the effects later in the analysis. KEMA stated that this is the approach that they used, applying the naturally occurring effects at the level of achievable savings.

According to Figure 5-22, the impact of naturally occurring energy efficiency estimated by KEMA is significant – very significant.

**Figure 5-22**
**Achievable Electric Energy-Savings: All Sectors**




It is in the 25% to 50% range of total energy efficiency savings depending upon the scenario under consideration.

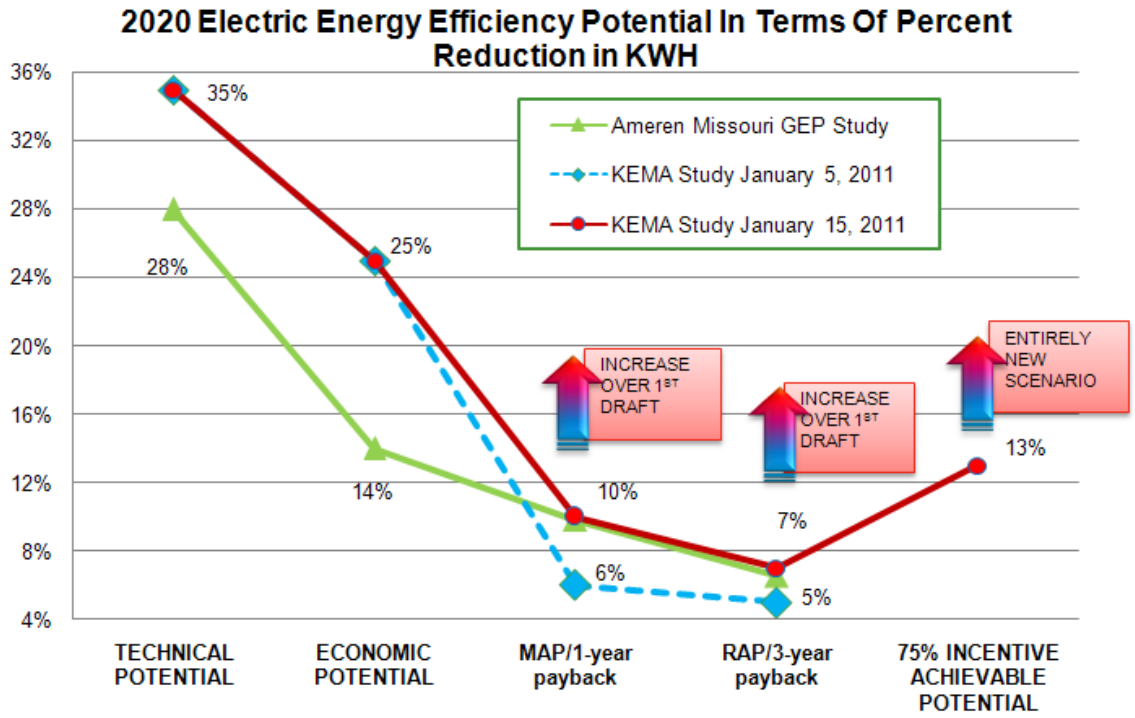
When asked to explain how KEMA estimated naturally occurring energy efficiency – the response was that naturally occurring energy efficiency is an output of the KEMA model. It is critically important to this study for KEMA to articulate in writing, supported by documentation, exactly how they estimate naturally occurring energy efficiency. The implications are significant. First, understanding the process by which KEMA estimates

naturally occurring energy efficiency and how KEMA then uses the output to adjust energy efficiency measure level and program level estimates of achievable potential are the essence of the KEMA study. We need to know how naturally occurring energy efficiency is applied to every measure or program in the KEMA study. Residential lighting, specifically CFLs, is a prime example because the Energy Independence and Security Act of 2007 effectively legislates that incandescent light bulbs can no longer be manufactured after 2014. It is important to see and understand the bulb count, gross kWh savings and net (program-driven) kWh savings that KEMA ascribed to CFLs for every year of the study.

Figure 5-22 and the level of naturally occurring energy efficiency should raise a multitude of energy efficiency policy issues with the Commission – if the KEMA estimates of naturally occuring energy efficiency are truly indicative of where the energy efficiency market is. If naturally occurring energy efficiency represents 25% to 50% of all achievable energy efficiency potential, that indicates that the market for energy efficiency products and services is significantly, albeit not completely, transformed. According to Figure 5-22, it appears that utility sponsored DSM programs that KEMA projects to cost $1.3 billion over ten years will only add a miniscule increment to the overall levels of energy efficiency savings in the state.

**Issue #3: Technical and Economic Potential Estimates**

The following graph illustrates the significant differences in estimates of both technical and economic potential between the Ameren Missouri electric DSM potental study and the KEMA statewide electric portion of the DSM potential study. The differences are problemmatic because there are succint, quantitative methods to estimate technical and economic potential. Two studies completed within 12 months of each other in the same state should produce much closer estimates. Estimating achievable potential, in contrast, involves a high degree of subjectivity if estimates are not based on primary market research. The achievable estimates derived by KEMA, based on penetration/adoption curves, have not been described or documented in detail at the measure level in any way other than a general listing of illustrative curves in Appendix A.




The ultimate type of DSM potential that the KEMA study estimates is achievable potential. Achievable potential is a function of economic potential which is a function of technical potential. Errors in the estimation of technical and economic potential necessarily impact the estimate of achievable potential. The graph illustrates the magnitude of the differences in technical potential (35% vs. 28% - a 25% difference) and in economic potential (25% vs. 14% - a 79% difference).

Staff made the point that the schedule to complete the final KEMA study is fixed, which precludes time to do a thorough gap analysis between the Ameren Missouri and KEMA statewide studies in order to understand those signficant differences.

One possible reason for the large discrepancy between the KEMA and Ameren Missouri technical and economic potentials would be the aforementioned issue of naturally occuring energy efficiency. Ameren Missouri's estimates build naturally occuring efficiency into the baseline forecast, and exclude those kWh from all subsequently analyzed potentials. KEMA, on the other hand, makes their adjustment at the achievable potential level, thus leaving a large amount of naturally occuring energy efficiency built into the technical and economic potential, as they precede the achievable analysis.

Additionally, Ameren Missouri did a cursory review of several key energy efficiency measure benefit/cost assumptions in the KEMA study. The results indicated that the economic potential ascribed to many individual energy efficiency measures in the KEMA study appear inconsistent with measure level savings, useful lifetimes, and cost assumptions confirmed by evaluation, measurement and verification of actual field installations. Correcting these inconsistencies would bring the KEMA estimates of economic potential closer to the Ameren Missouri DSM potential study estimates.

Ameren Missouri has questions regarding the KEMA assumptions for at least the following specific measures:

1. **Refrigerator recycling** – KEMA ascribes a benefit/cost ratio to this measure of 26.42 based in part on an assumption of an incremental cost of $25. The incremental measure cost to recycle a refrigerator (pick-up, recycle the plastics, glass and refrigerant) is closer to $100. Additionally, the measure life used by KEMA is much longer than that researched and used by Ameren Missouri (19 years vs 6 years).
2. **Energy Star Dehumidifier** – KEMA ascribes a benefit/cost ratio to this program of 36.11. The Energy Independence and Security Act of 2007 (see citation below) mandates that all dehumidifiers meet Energy Star standards effective October 2012. Consequently, efficiency programs should move away from incentivizing dehumidifiers.

**SEC. 311. ENERGY STANDARDS FOR HOME APPLIANCES.**

(a) APPLIANCES.—

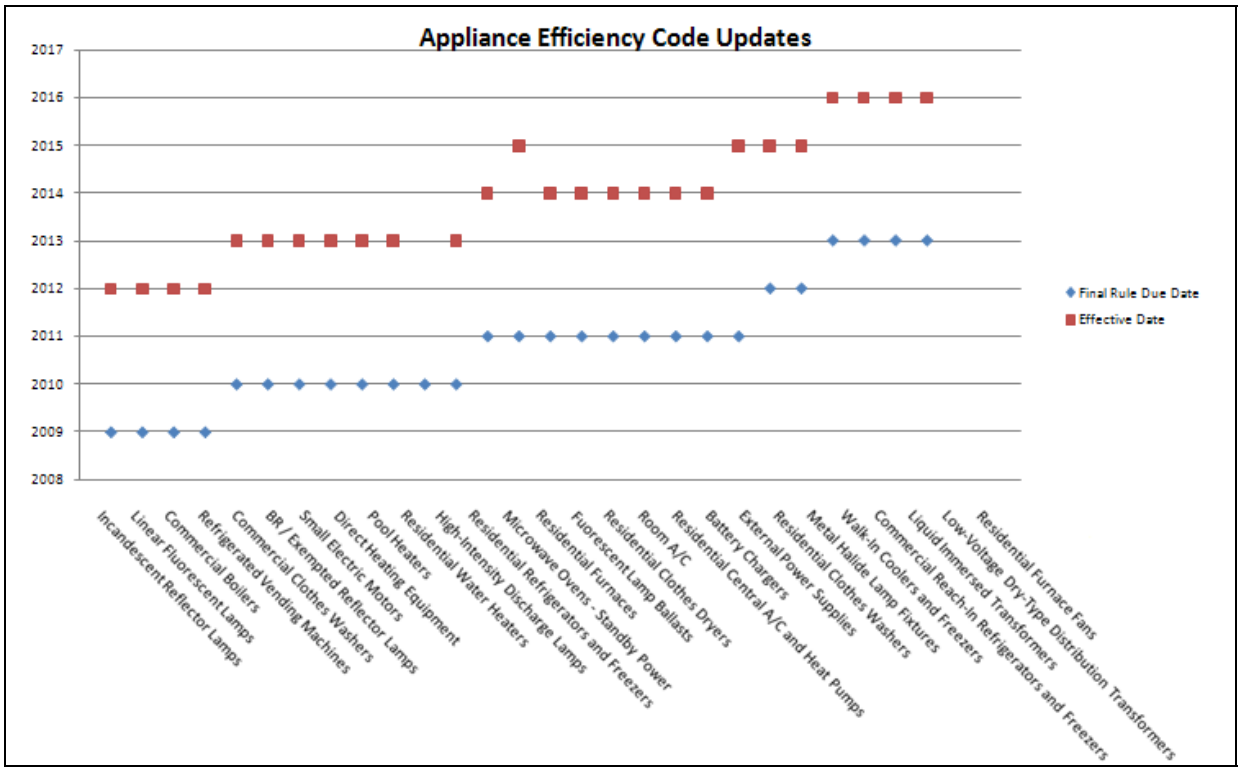
(1) DEHUMIDIFIERS.—Section 325(cc) of the Energy Policy and Conservation Act (42 U.S.C. 6295(cc)) is amended by striking paragraph (2) and inserting the following:

''(2) DEHUMIDIFIERS MANUFACTURED ON OR AFTER OCTOBER 1, 2012.—Dehumidifiers manufactured on or after October 1, 2012, shall have an Energy Factor that meets or exceeds the following values:

**''Product Capacity (pints/day): Minimum Energy Factor (liters/ kWh)**

Up to 35.00 ..... 1.35 35.01–45.00 ..... 1.50 45.01–54.00 ..... 1.60 54.01–75.00 ..... 1.70 Greater than 75.00 ...2.5.''.

3. **Appliances in general** – similar to dehumidifiers, there are a multitude of appliances for which federal rulemaking and associated increased efficiency standards are known and measureable. A baseline forecast should include the associated reduction in electric sales. Regardless, a potential study's cost effectiveness screening should be based on known and measureable standards. A partial list of the new standards is shown below:




4. **LED lighting** - There are a number of LED measures in the KEMA study that replace an incandescent bulb. After 2014, EISA will be the baseline, so an incandescent baseline is incorrect and overstates the incremental savings.
5. **Duplicative measures** – In the industrial measures, there appear to be many overlapping fan and pump measures presumably being applied to the same system. The possible issue is double counting of the same savings multiple times for duplicative measures like: replace motor, correct motor sizing, motor practices, install controls, system optimization.
6. **CFLs** – it is unclear in the KEMA study as to the percent of energy savings in each year of the study attributable to CFLs after applying the appropriate net-to-gross ratios. On Page 5-1, KEMA states that their technical potential and economic potential estimates include all CFLs through 2020, even though federal legislation will move the market naturally. Because of EISA 2007, the Ameren Missouri study includes the effects of those CFLs in the base sales forecast, not the potential estimates. It appears that KEMA may be in essence double counting the effects of CFLs.
7. **Behavior modification** – Behavior modification or indirect feedback, which is the term used by KEMA in its study, is listed in the top 20 KEMA cost-effective measures. Behavior modification programs are similar to recently introduced pilot scale customer energy consumption feedback reports that have been piloted by a handful of utilities nationally. Evaluation, measurement and verification reports of the handful of studies completed to date indicate that there is a persistence issue with this program. Studies show that customers can reduce their annual energy consumption by as much as 2% if they receive reports on a bi-monthly basis. However, once the reports stop, the customers revert to their prior

energy consumption patterns. This means that the program has a persistence or expected useful life of 1-year. Yet, the global assumption in the KEMA study appears to use a 20-year normalized life for all measures. The assumption is that measures are re-installed as many times as necessary by the customer at the customer's sole expense at no cost to the utility - if the measure life is less than 20-years. If our understanding is correct, such an assumption will have a tremendous impact on improving the economics of an indirect feedback program.

8. **20-year Normalized Measure Life** – It goes without saying that a global energy efficiency measure life assumption of 20-years will also have an influence on increasing the estimate of energy efficiency potential and decreasing the estimate of associated costs of achieving energy efficiency potential across a large percentage of cost effective energy efficiency measures with expected useful lives of less than 20-years. Ameren Missouri would like clarification on how this concept is applied, and would like to verify that renewed efficiency measures are not allocated to the achievable potentials at zero program cost. The workpapers received to date have not made this observation possible.

**Issue #4: DSM Program and Portfolio Cost Estimation**

As important as the process for estimating energy savings attributable to utility sponsored energy efficiency programs is, so too is the process for estimating the associated costs of implementing programs to install cost effective energy efficiency measures.

The KEMA draft report provides scant, if any, information on cost allocation.

Table 1-5 in the KEMA report shows the following cost allocations for electric energy efficiency programs:

| Result - Programs | 3 YR Payback | 1 YR Payback | 75% Incentive |
|---|---|---|---|
| **Gross Energy Savings - GWh** | 6,406 | 9,696 | 10,185 |
| **Gross Peak Demand Savings - MW** | 1,175 | 2,259 | 2,169 |
| **Net Energy Savings - GWh** | 3,281 | 6,571 | 7,561 |
| **Net Peak Demand Savings - MW** | 779 | 1,863 | 1,801 |
| **Program Costs - Real, $ Million** | | | |
| **Administration** | $193 | $246 | $317 |
| **Marketing** | $223 | $223 | $221 |
| **Incentives** | $597 | $2,148 | $1,723 |
| **Total** | $1,013 | $2,617 | $2,260 |
| **PV Avoided Costs** | $2,797 | $6,196 | $6,771 |
| **PV Annual Program Costs (Adm/Mkt)** | $334 | $377 | $433 |
| **PV Net Measure Costs** | $927 | $2,331 | $1,977 |
| **Net Benefits** | $1,536 | $3,488 | $4,361 |
| **TRC Ratio** | 2.22 | 2.29 | 2.81 |

Ameren Missouri cannot find documentation describing the methodology by which KEMA estimated program level costs. Nor can we discern how KEMA accounted for portfolio level costs for critical components such as evaluation, measurement and verification, portfolio level customer information and education, portfolio level marketing etc. It would also be useful to understand the process by which KEMA benchmarked its cost estimates to actual costs that Missouri investor owned utilities have incurred to implement its programs. Helpful metrics would be levelized cost per unit of energy saved, or a year-by-year cost per first-year-installed kWh or therms.

In addition, we need to understand the cost components that KEMA ascribes to achieving maximum levels of energy efficiency potential. The definition of maximum achievable potential (" MAP") is generally along the lines of the maximum penetration of cost effective energy efficiency measures that would be adopted given unlimited funding, and assuming a concerted, sustained campaign involving highly aggressive programs and market intervention.

MAP presumes no impediments to the effective implementation and delivery of programs. For example, the regulatory framework to encourage energy efficiency is in place. Customers, legislators, regulators and utilities are on the same page as to the prioritization of energy efficiency opportunities. State run programs are aligned and leveraged with IOU programs. In essence, MAP assumes the regulatory/legislative/state-utility cooperation model described in EPACT 2005 is in place. The pertinent section of EPACT 2005 is attached.

**Concluding Observations**

The project management over the KEMA statewide DSM potential study has and continues to increase our levels of concern with the reasonable accuracy and usefulness of the statewide report. Of the many project management issues, perhaps the lack of transparency in the development of information contained in the KEMA draft report is the predominant issue. As we've stated, KEMA has not provided a roadmap or description of changes it has made to its analysis from draft report to draft report. When information is given to Missouri stakeholders, the information is in PDF format or another format that does not show the formulas and logic used to develop numbers in the report. Ameren Missouri has spent significant man-hours, but in very short condensed spurts to comply with unreasonable turnaround times, in reviewing the KEMA draft reports. Our reviews led to questions for which we have not received answers.

The project review and quality control process employed by KEMA has been limited by budget and schedule considerations. The truth is that there has been little review and quality control over the draft reports that have been sent to Missouri stakeholders. The issues described in this memo hopefully illustrate that point effectively. KEMA themselves admitted the 120 day timeline limited their ability to provide in-depth review over product sent to stakeholders.

There are a myriad of issues in doing a Missouri statewide DSM potential study using secondary and tertiary data sources and relying on data based on metrics in such states as Rhode Island, Connecticut, and Colorado. Even more troublesome is the possibility that KEMA may be using a non-applicable or outdated dataset of energy efficiency measure energy savings and costs.

Finally, there appears to be a rush to the finish line to complete the study no later than the date listed in the Missouri and KEMA contract. If so, the issue is quality versus schedule compliance; but the two are incongruent. It appears that schedule will rule. The KEMA study will do little, if anything, to move the optimal implementation of energy efficiency forward in Missouri. It may do the opposite.

Energy efficiency and rulemakings around it are enormously important issues for Missouri. Ameren Missouri is concerned unachievable targets and goals will be established using inaccurate data from KEMA's report, and Missouri consumers will ultimately have the burdened to pay for these mistakes.

Ameren Missouri appreciates the opportunity to provide input toward this very important issue, and remains dedicated to being helpful in any way we can to make studies like this accurate and useful for further policy development. There were several times during this process, Ameren Missouri compared data from KEMA's study to the Ameren Missouri DSM study. If further comparison is beneficial, the Company will be more than happy to provide any detail required.

**January 22, 2011**

**Comments of the Missouri Industrial Energy Consumers*
on the January 15, 2011 Draft
"Missouri Statewide DSM Market Potential Study"**

MIEC has reviewed the January 15, 2011 draft report, and participated in the January 20, 2011 PSC sponsored roundtable. Based on our review of the material provided, plus the question and answer exchanges during the roundtable, MIEC is forced to conclude that this study is not a realistic or reliable indicator of the potential for DSM in Missouri.

## Customer Issues

It was obvious from the questions asked, and the responses given by KEMA, that the amount of time allowed to complete this study was insufficient to produce a reliable product. There appear to be many unexplained discrepancies or differences between the Ameren Missouri service territory specific DSM potential study and the KEMA statewide study. Whereas the Ameren Missouri study was based on Ameren Missouri's primary (service territory specific) data, the KEMA study uses much broader inputs which do not necessarily correlate to or represent the characteristics of the customers in the Ameren Missouri service territory, or in the service territory of any of the other Missouri utilities for that matter.

Perhaps because of the shortness of the timeframe, there apparently was little interaction between KEMA and the individual electric utilities – interaction that could have been very helpful in making realistic adjustments to general data in an attempt to make that data more representative of Missouri service territories. This is a fundamental problem with study.

If such a study is to be of <u>any value</u>, it must have realistic, representative impacts and customer characterizations. At this point, the draft study does not meet that requirement. At the

*MIEC consists of Anheuser-Busch, Bayer, BioKyowa, Doe Run, Enbridge, Ford, General Motors, GKN, Hussmann, JW Aluminum, MEMC, Monsanto, National Starch, Nestlé Purina, Noranda, Precoat Metals, Procter & Gamble, St. Gobain, and U.S. Silica.

very minimum, time should be taken to allow for further interaction between KEMA and the Missouri electric utilities to make sure that KEMA is proceeding with an accurate data set, an appreciation for the work that has already been done by the Missouri utilities, and can explain the differences in data and approach that remain after this further interaction has occurred.

In addition to the issues raised during the roundtable, our review has revealed a large potential problem with the baseline assumptions for the industrial sector. This subject is discussed in the KEMA study beginning on page 4-32. KEMA notes that it did not have available very detailed data on energy use by type of industry. KEMA decided to break out 16 different industries even though it did not have the data from the Missouri utilities. In order to develop the break out, KEMA says as follows:

> "We adopted an approach based on employment data by industry. The Bureau of the Census' 2007 Economic Census provides state-level employment by NAICS code, which we combined with energy use per employee by industry from the Department of Energy's Manufacturing Energy Consumption Survey to estimate distributions of electricity and gas use by industry for Missouri. These were then normalized to the consumption estimates developed above."

Page 4-33 of the KEMA study sets out the resulting breakdown. According to this break out that forms the basis for the industrial baseline profile, 4,162 GWh (or 23%) of the total is from the chemical industry, and 3,173 GWh (or 18%) is from the paper industry. Only 2,860 GWh is identified as being associated with primary metals. Based on our knowledge of industry in Missouri, the proportions attributable to the chemical and the paper industry are grossly overstated. At the same time, the GWh for the primary metals industry are at least 1,200 GWh (or 30%) low.

How these misspecifications would affect the outcome of the study is unknown – but what is known is that this characterization of the industrial sector in Missouri is seriously in error, so conclusions drawn form this data would be accurate only by chance.

## Avoided Costs

A major component to the determination of whether or not particular energy efficiency measures are cost-effective is the utility's avoided cost. This information appears in Appendix C. For 2011, the avoided cost is stated to be $113 per kW of summer on-peak demand plus avoided energy costs by time period. The summer on-peak energy avoided cost used in the study for 2011 is 10.22¢/kWh. This value is MORE THAN DOUBLE the current forward prices for on-peak summer energy for 2011 at the Cinergy hub. The KEMA values in other time periods are similarly much higher than market values. The 2011 avoided cost in Appendix C is approximately 5.1¢/kWh on an annual (8,760 hour) average basis. The current Cinergy 2011 forward prices on an around-the-clock basis are approximately 3¢/kWh. Accordingly, the avoided cost used in the study (energy alone before considering any demand component) appear to be 70%-100% greater than current market prices. Other participants in the roundtable indicated that similar relationships existed with respect to the Southwest Power Pool ("SPP") prices.

It was acknowledge during the roundtable that these inputs were directed by PSC Staff and that they were derived from the 2008 vintage integrated resource plan filings of the utilities. Those values were estimated at a time when natural gas prices, oil prices and electric wholesale market prices were at their peak. Subsequently, as is well known, the prices for all of these products have dropped materially, as evidenced by the electricity forward market prices referenced above. In addition, avoided cost calculations recently provided by at least some of the Missouri utilities suggest avoided costs that are much closer to the SPP and Cinergy forward market prices than to the exaggerated values used in the draft DSM potential study.

KEMA presented some sensitivity results around avoided cost values. However, as noted at page 5-10 of the draft report, the sensitivities range from a high value of 50% greater than the base number, to a low value of only 20% lower than the base number. This non-symmetrical bandwidth is not explained and certainly is not adequate in light of information

available at the time that the report was prepared. The statements by KEMA during the roundtable seemed to suggest that avoided cost numbers do not matter a whole lot, at least within this particular range. That, of course, is counter intuitive, and even if true in that range, actually may not hold true if avoided costs are examined at 50% of their baseline value.

As a quick example, if the avoided costs are reduced by 50%, the total resource cost ("TRC") value for the three-year payback scenario presented on page 1-9 of the draft report would drop from 2.2 to 1.1. Similarly, at the 75% incentive scenario, TRC would drop from 2.8 to about 1.4. Particularly given the other issues with the report, these are quite small margins above threshold cost effectiveness levels and should cause the reader to be very skeptical of the conclusions. At the very least, KEMA should be directed to revise the avoided costs, and other inputs that may be related to them, and re-run the studies.

MISSOURI INDUSTRIAL ENERGY CONSUMERS

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# MEMORANDUM

To: Natelle Dietrich, Missouri Public Service Commission
From: Chris Burnette, Regulatory Affairs Coordinator, Renew Missouri
Date: January 21st, 2011
RE: Additional Comments related to the 2011 Missouri DSM Potential Study Draft Workshop

## INTRODUCTION

Renew Missouri, a project of the Missouri Coalition for the Environment, would first like to thank the PSC Staff for coordinating yesterday's workshop concerning the Missouri DSM Potential Study. We acknowledge the difficult position the Staff is in when dealing with the Commission, an outside consultant and multiple interested stakeholders. As such, we would also like to thank you for your diligence, concern, and attention to detail and publicly support your efforts. We would also like to thank the KEMA representatives for coming to answer questions about their work thus far.

## GENERAL COMMENTS

Renew Missouri and the Missouri Coalition for the Environment are generally supportive of the Missouri DSM Potential Study. We would like to start by pointing out some of the reasons for this stance.

A. Throughout the process, both KEMA and the PSC have been open and transparent. When questions or concerns have arisen, whether it be about inputs or assumptions made by KEMA, either the PSC or KEMA have attempted to address them to the best of their ability. We applaud this transparent process and think that the steps taken by the PSC to ensure this type of open government are not only commendable but serve to make our State a better place for all its residents.

B. We feel that this Study is an accurate, although conservative, representation of the energy efficiency potential in our great State. As with any study, there is a margin of error, but we agree with KEMA that this Study is a conservative estimation of the achievable potential in Missouri. This achievable potential could be higher, as the saturation rate does not look at behavior, or other reasons beyond purely economic ones, for a ratepayer to take part in an energy efficiency program. We believe that, as the residents of the state become more educated about energy efficiency, this penetration rate will increase and the utilities will discover many more program opportunities. When residents see that pursuing energy efficiency is in there own economic self-interest, coupled with the myriad of other social, environmental and health related reasons for energy-efficiency, utilities will see a much higher penetration rate in their programs.

C. A study conducted outside the control and influence of an affected utility is a much more credible and legitimate product than one that is. Because of the transparent nature of the process and the outside expertise by a disinterested party such as KEMA, this study should be seen as beyond reproach. We applaud the PSC's decision to conduct a study in this way and believe that the final results will help Missouri reach its statutory goal of all cost-effective demand side savings. This Study, coupled with other studies provided by utilities, will help the PSC make better decisions regarding energy efficiency in the State of Missouri.

# QUESTIONS

Renew Missouri has identified the following as issues we would like to see clarified. We ask that these issues, questions and concerns be forwarded to KEMA for consideration and clarification.

1- Retrofit Measures , 1 Your achievability analysis is largely based on the incremental costs between standard and high efficiency technologies. This seems appropriate for scenarios which involve new construction or replacing failed equipment. However, I am not sure about how this would apply to savings associated the replacement of operating low efficiency equipment. Are the achievable savings for "retrofit" measures calculated on the basis of incremental costs or on the basis of the total cost of replacing operating equipment (inclusive of labor and the total equipment cost)? Such a scenario might entail, for example, the incremental costs for a 200 horsepower air compressor might be $10,000 but the entire costs of replacing the existing operating compressor might be $50,000.

2- Retrofit Measures , 2 For the above air compressor retrofit scenario what costs would be used in your analysis ($50K or $10K)? What would the 75% scenario rebate be? What baseline would be used for the calculation of savings – energy code or the efficiency of the existing chiller?

3- Retrofit Measures , 3: Does your analysis capture the full value of equipment replacements in the retrofit market? Would the use of existing equipment baselines and incentive levels based on full project costs result in a higher estimate of achievable savings?

4- Technological Improvements: Page 1-3 stated "technological improvements" to existing technologies were excluded from the analysis. Is it correct that this assumes that no progress will be made in improving the energy efficiency (or reducing the costs) of equipment during 2010-2020 period despite the fact that dramatic improvements have been made during the prior 10 years (eg increases in lumens per Watt etc)? Does KEMA always make this exclusion in other DSM potential analyses? If not, can you point to a specific potential study in which these elements were included, perhaps by extrapolating past trends in improved equipment efficiency? Did the PSC or other parties request such an exclusion?

5- Does Figure 1-1 estimates of net benefits include the lifetime 20 year benefits of all measures installed through 2020? For example, measures installed in 2020 would have benefit streams through 2040; are these post 2020 benefits included?

6- There is an apparent discrepancy in gross energy savings between Table 1-5 and Table 1-1. For example, Table 1-5 shows 6,406 GWh savings for the three year payback scenario while Table1-1 shows 6.601 GWh. Why the discrepancy?

7- Net and Gross Savings, 1: Table 1-5, listing net and gross savings, suggests very different implicit net to gross ratios for the three scenarios as follows:

| 3 year payback NTGR | 1 year payback NTGR | 75% Incentive NTGR |
|---|---|---|
| 50% | 70% | 63% |

Can you clarify what the net savings represent; does this signify the effects of free-ridership? Does this imply, for example, that the 75% scenario has an overall free-ridership rate of 37%?

8- Net and Gross Savings, 2: Presumably, the higher rebate levels of the 75% scenario would produce a lower level of free-ridership. However, the NTGR ratio for this scenario suggests that free-ridership is higher. Please clarify how the NTGR would be lower for this scenario than the one year payback scenario.

9- Spillover: The report suggests that some customers installing measures will not receive a rebate because the payback is less than a prescribed threshold and that such customers are presumed to make the installation unaided by the programs. However, the report also indicates that some of these customers will be motivated by the education and "awareness" produced by the EE programs.

Doesn't this represent "spillover" that should be included in the net savings attributed to the program since these specific savings would not have occurred without the promotional effects of the programs? However, aren't you counting these as gross, not net savings? Has the PSC or KEMA explicitly decided not to include program spillover effects in this analysis?

Again, we at Renew Missouri and the Missouri Coalition for the Environment would like to thank the PSC Staff for their diligence, dedication and attention to detail. With your guidance and support, we have confidence that the final study will be a work product that will positively impact energy efficiency, aid in the policy discussions within the State of Missouri, and help the PSC reach its goal of all cost effective demand side savings. Please feel free to contact me if you have any questions or concerns.

Sincerely,

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