# 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.

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[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.

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[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.