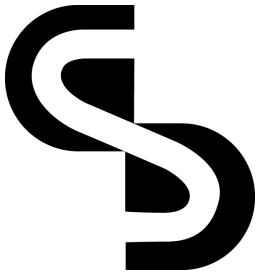

GDS Associates, Inc.
Engineers and Consultants

FINAL REPORT

Review of Ameren Missouri's 2011 Utility Resource Filing Pursuant to 4 CSR 240 – Chapter 22

(Case No. EO-2011-0271)

For the Missouri Department of Natural Resources

June 21, 2011

GDS Associates, Inc.
1850 Parkway Place
Suite 800
Marietta, GA 30067
770.425.8100
770.426.0303 (Fax)
www.gdsassociates.com

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SUMMARY OF DEFICIENCES 3

3.0 LOAD ANALYSIS AND FORECASTING 8

4.0 THERMAL RESOURCES 20

5.0 RENEWABLE & STORAGE RESOURCES 23

6.0 DEMAND SIDE RESOURCES 32

LIST OF TABLES

Table 6-1: Incremental Annual DSM Savings as a Percent of 2009 Retail Sales for Investor Owned Utilities – Top 20 Performers 35

Table 6-2: Market Penetration Estimates from DG Market Penetration Assessment 45

Table 6-3: Transmission Avoided Cost Calculation from Ameren Missouri Work Papers 47

LIST OF FIGURES

Figure 3-1: GDP Growth in Ameren Missouri's Service Territory 9

Figure 3-2: Employment Growth in Ameren Missouri's Service Territory 10

Figure 3-3: Ameren Missouri's Forecast of the Number of Residential Customers and Households 12

Figure 3-4: Moody's Outlook for Growth in Manufacturing Output and Employment, Ameren Missouri, 2009-2030 14

Figure 3-5: Residential Summer Peak Demand by Region and End-Use 17

Figure 3-6: End-Use Contributions to Commercial Peak Demand 19

Figure 6-1: CHP Technical Potential From DG Market Penetration Assessment 43

1.0 INTRODUCTION

On February 23, 2011, pursuant to Chapter 22 of the Missouri Public Service Commission's Rules (4 CSR 240-22), Union Electric Company, d/b/a Ameren Missouri filed information in compliance with the Commission's Electric Utility Resource Planning report requirements. Through an order dated June 30, 2010 in Case No. EE-2010-0243, the Commission granted certain waiver requests made by Ameren Missouri related to certain requirements of the Commission's Integrated Resource Planning Rule, 4 CSR 240-22. Based upon Ameren Missouri's application, Staff's Recommendation, Ameren Missouri's agreement to adopt some waiver language proposed by Office of the Public Counsel ("OPC"), and on the Joint Statement filed by the Missouri Department of Natural Resources ("MDNR") and Ameren Missouri, the Commission found good cause to grant Ameren Missouri its requested waivers, except for Ameren Missouri's request to waive 4 CSR 240-22.040(1)(K).

In turn, the MDNR contracted with GDS Associates, Inc. ("GDS") to identify whether Ameren Missouri has complied with the provisions of the Electric Utility Resource Planning rules (as modified by waivers) in the following areas:

- Load Analysis & Forecasting
- Thermal Resources
- Renewable & Storage Resources
- Demand Side Resources
- Risk Analysis & Strategy Selection

In addition, GDS has assisted MDNR with the issuance of extensive requests for data and reviewed Ameren Missouri's responses to these data requests.

This report provides MDNR with GDS's comments on Ameren Missouri's compliance filing in Case EO-2011-0271. In the report, we identify and discuss in detail the deficiencies in Ameren Missouri's filing and recommend remedies to those deficiencies.

This report references the following Ameren Missouri sources:

- The primary narrative volumes and appendices included in Ameren Missouri's February 23, 2011 Integrated Resource Plan (IRP) filing, referenced by the Chapter or Appendix numbers assigned by Ameren Missouri;
- Accompanying work papers distributed to MDNR by Ameren Missouri as part of its February 23 IRP filing, referenced by the file name assigned by Ameren Missouri;
- Ameren Missouri's responses to MDNR data requests, referenced by data request number
- Waivers granted in Case EO-2011-0271, referenced by the relevant section of 4 CSR 240-22 and a note this is approved waiver language.
- Joint Filing and Partial Stipulation and Agreement in Case EO-2007-0409, referenced by case number and relevant section of 4 CSR 240-22.

All other industry sources used by GDS in the preparation of this report are referenced in the report footnotes.

2.0 SUMMARY OF DEFICIENCES

After reviewing the Load Forecasting, Thermal Resources, Renewable & Storage Resources, Demand Side Resources and Risk Analysis & Strategy Selection sections of Ameren Missouri's 2011 IRP filing, including supporting documentation, information provided in the discovery process and the requirements of 4 CSR 240-22, GDS wishes to bring the following deficiencies to the attention of the MDNR. Following the description of each listed deficiency is an identification of the relevant section of 4 CSR 240-22, applicable waivers and/or agreements to which the deficiency applies. A discussion of each deficiency and a proposed remedy can be found in Sections 3– 6 of this report.

GDS commends Ameren Missouri for the impressive job it has done developing and implementing a complex risk assessment methodology that complies with 4 CSR 240-22 rules and related stipulations and agreements. However GDS is concerned that the complexity of the approach might imply a much greater level of reliability in the results than is actually the case, due to the reliance on subjective weighting factors and probability estimates used in its decision tree analysis. Another issue with the decision tree analysis in general is that the potential size of complete decision trees that identify all uncertain factors typically limits the number of uncertainty factors that can be analyzed, forcing the analyst to choose, what they believe are the most critical uncertain factors. This is in fact what Ameren appropriately did in its analysis. However, this can potentially lead to oversights and less than optimal decisions if certain critical uncertain factors are omitted. Conversely, expanding decision trees to cover more uncertain factors with many branches can be very time consuming. Moreover, such large decision trees can be unwieldy, difficult to present to company management, stakeholders and regulators and to effectively assess. Care should be taken in future IRP filings to find the right level of complexity in the decision tree analysis that is employed and to eliminate potential bias in the development of subjective probability estimates.

DEFICIENCY #1 – AMEREN MISSOURI'S CHOICE OF LOAD FORECAST DRIVERS IS SUSPECT

Ameren Missouri is deficient in that it did not update or reinterpret its load forecast to take into account new economic forecast data that became available from Moody's Analytics. Further, Ameren Missouri's Integrated Resource Plan did not discuss the possible effect of the Moody's more recent economic projections on its load forecast. In addition, Ameren Missouri's industrial sales forecast may be overstated due to the Company's choice of an economic driver that proposes stronger growth than would be expected based upon Moody's manufacturing employment growth forecast. Also the Company's household forecast is of concern, because both income per household and average household size are key factors influencing residential kWh sales per customer. If Ameren Missouri had used its own forecast of the number of residential customers, rather than Moody's forecast of households, in its equation to predict kWh usage per customer, the resulting residential sales forecast would be lower. (4 CSR 240-22.030(2)(A))

DEFICIENCY #2 – AMEREN MISSOURI'S ESTIMATES OF THE END-USE CONTRIBUTION TO PEAK DEMAND ARE DUBIOUS

Ameren Missouri is deficient in that it has not provided convincing evidence that the end-use load profiles it uses are appropriate for its service territory. While Ameren Missouri has attempted to calibrate Itron's end-use load profiles to available utility load research data, the resulting end-use peak load relationships are suspect. For example, the Company appears to have overstated its residential cooling load and understated the contribution of other end-uses to summer peak load. In turn, these end-use estimates could have important implications for Ameren Missouri's demand-side resource analysis. (4 CSR 240-22.030(3)(B)(2))

DEFICIENCY #3 – AMEREN MISSOURI DID NOT ADEQUATELY DEFEND ITS DISMISSAL OF PURCHASED POWER OPTIONS FROM CONSIDERATION IN THE IRP

In its written discussion of the review of supply-side resources, Ameren Missouri dismissed the evaluation of purchased power options. This dismissal was based on internal discussion with its Asset Management and Trading organization. A quantitative approach to assessing the availability of purchased power options would be more appropriate for demonstrating whether or not purchases from other entities should be included in the IRP process. (4 CSR 240-22.040(1), 4 CSR 240-22.040(5))

DEFICIENCY #4 – AMEREN MISSOURI DID NOT PRESENT ANY DISCUSSION OF THE HISTORIC FORECAST ACCURACY OF PREVIOUS FUEL PRICE FORECASTS PRODUCED BY CHARLES RIVER ASSOCIATE'S MRN-NEEM MODEL

Ameren Missouri used CRA's MRN-NEEM model to produce integrated, nationally defined projections of inputs for its IRP evaluations. The model is discussed in detail in Chapter 2 of the IRP document; the discussion includes references to reviews of the model performed by other entities and the positive ratings that resulted from those reviews. There is no discussion, however, of the accuracy of previous forecasts produced by the MRL-NEEM model, or whether or not Ameren Missouri considered previous forecast accuracy in the decision process that was employed to select the provider of fuel price forecasts. (4 CSR 240-22.040(8)(A)(2))

DEFICIENCY #5 – AMEREN MISSOURI DID NOT ADEQUATELY CONSIDER THE FACTORS THAT MAY CAUSE UNCERTAINTY ASSOCIATED WITH SUPPLY-SIDE CAPITAL AND O&M COSTS

Ameren Missouri provides uncertainty distributions for power plant: (1) capital cost, (2) project schedule, (3) fixed O&M, (4) variable O&M, and (5) forced outage in Chapter 4 of the IRP, Table 4.12. However, there is no identification of the critical uncertain factors that may cause the capital and O&M cost variations to vary significantly as required in 4 CSR 240-22. (4 CSR 240-22.040(8)(B)(2), 4 CSR 240-22.040(8)(C)(2))

DEFICIENCY #6 – AMEREN MISSOURI FAILED TO ADDRESS SEVERAL CRITICAL WIND ENERGY FACTORS

For the consideration of wind energy options in its 2011 IRP, Ameren Missouri did not: (1) consider capacity factors for the *best* commercially available wind sites; (2) adequately document its assumptions regarding the timing of transmission capacity upgrades as it relates to potential wind energy resources; (3) identify multi-county regions with a characterization of the wind resources available to each, or the transmission upgrades required to access those resources; and (4) address a purchase power agreement and/or ownership arrangement. (Stipulation Agreement EO-2007-0437)

DEFICIENCY #7 – AMEREN MISSOURI DID NOT CONSIDER RENEWABLE ENERGY RESOURCES THAT COULD BE DEVELOPED BY INDEPENDENT POWER PRODUCERS

In its 2011 Integrated Resource Plan, Ameren Missouri considers a variety of renewable resource options, but does not consider the option of independent power producers with smaller generating capacities that are not "utility scale." Furthermore, the analysis of costs in the IRP assumes full costs would be allocated to capital expenditures, which may or may not be relevant for all technologies considered in the IRP, or the market conditions under which those technologies are developed. (4 CSR 240-22.040(1))

DEFICIENCY #8 - AMEREN MISSOURI HAS NOT CONSIDERED DSM ON AN EQUIVALENT BASIS WITH SUPPLY-SIDE ALTERNATIVES

Ameren Missouri is deficient in that its Integrated Resource Plan (IRP) fails to consider demand-side management resources ("DSM") on an equivalent basis with supply-side alternatives due in part to the constraints that it places on the amount of DSM spending. Ameren Missouri has selected as its preferred demand side resource option a budget constrained plan which it calls a "Low Risk" portfolio and readily admits that it would increase its spending on energy efficiency if it had better cost recovery treatment. What results is a less than optimal resource acquisition strategy that delays the implementation of significant energy efficiency resources at the expense of Ameren Missouri's customers. Moreover, in selecting candidate resource plans from the alternative resource plans that were analyzed, Ameren Missouri applied only a 25% weight to the Present Value of Revenue Requirements (PVRR). It is highly questionable that this satisfies the requirement that a utility use the present worth of long-run utility costs as a "primary selection criteria." This results in less favorable treatment of DSM plans. Finally there is a secondary "equivalence" issue regarding the use of a load forecast to develop demand-side potential estimates that is different than the load forecast that was used in development of the IRP.

DEFICIENCY #9 - AMEREN MISSOURI'S CONCLUSIONS REGARDING THEIR CUSTOMER'S INTEREST IN DSM IGNORE A CRITICAL MARKET RESEARCH FINDING REGARDING THE POTENTIAL CONNECTION BETWEEN LOW CUSTOMER SATISFACTION AND DSM PROGRAM PARTICIPATION RATES

While Ameren Missouri should be commended for conducting comprehensive market research to support the design and delivery of DSM programs, it is deficient in that it chose to ignore a critical finding of that research when it concluded that its customers are different than others in the nation with regard to their level of interest in DSM. It is clear from the research that Ameren Missouri has a problem with how some customer groups view the company and that lower levels of customer satisfaction among these groups appears to be a key factor in their decision to participate in DSM programs. This may help explain why the overall realistic take rates for Ameren Missouri's programs are lower than those for many other U.S. utilities. GDS is concerned that by overlooking this key research finding as to why its customers express less interest in DSM than those of other utilities, Ameren Missouri has underestimated long term customer participation rates in DSM programs. As clearly stated in 4 CSR-22.050(5), market research activities should be designed to not only gather information about how and by whom energy-related decisions are made, but also address "the most appropriate and cost-effective methods of influencing these decisions in favor of greater long-run energy efficiency." GDS finds that Ameren Missouri has not adequately addressed this aspect of the rule.

DEFICIENCY #10 – AMEREN MISSOURI FAILED TO DOCUMENT MARKET STUDIES THAT ARE PLANNED OR IN PROGRESS.

The Chapter 22 rules appropriately require utilities to conduct market research studies, pilot programs, test marketing programs and other demand-side resource studies as an ongoing effort by the utility. While Ameren Missouri documented market research studies prepared for its 2011 filing, it did not document its plans for future studies as is required by the Chapter 22 rules.

DEFICIENCY #11 – AMEREN MISSOURI FAILED TO CONSIDER SIGNIFICANT COMBINED HEAT AND POWER (CHP) POTENTIAL IDENTIFIED IN ITS DISTRIBUTED GENERATION (DG) POTENTIAL STUDY

While Ameren Missouri conducted a comprehensive distributed generation (DG) potential study to look at renewable energy and energy technologies at the point of use, it is deficient in that it failed to seriously consider the most promising and cost-effective technology identified in the study - combined heat and power (CHP).

DEFICIENCY #12 – AMEREN MISSOURI DID NOT ADEQUATELY CONSIDER POTENTIAL DISTRIBUTED GENERATION PROGRAMS IN THE PORTFOLIOS INCLUDED IN ITS ALTERNATIVE RESOURCE PLANS AND ANALYZED IN DETERMINING ITS PREFERRED RESOURCE PLAN

Ameren Missouri is deficient in that it did not include in its preferred resource plan any program plans to address the acquisition of DG resources and ignored the impact that potential program incentives might have on its estimates of DG market penetration.

DEFICIENCY #13 - AMEREN MISSOURI'S T&D AVOIDED COST METHODOLOGY RELIES ON UNSUBSTANTIATED "ADJUSTMENT FACTORS" AND IS INAPPROPRIATE FOR ASSESSING THE VALUE OF TARGETED DSM

While Ameren Missouri did include the required estimate of avoided transmission and distribution (T&D) avoided costs in its analysis of DSM measures and programs, GDS finds that its methodology for developing these avoided T&D costs relies too heavily on subjective, unsubstantiated "adjustment factors" and is inappropriate for assessing the value of targeted DSM, Demand Response (DR) and Distributed Generation (DG) in deferring T&D investments. (4 CSR 240-22.050(2))

3.0 LOAD ANALYSIS AND FORECASTING

Consistent with the requirements of 4 CSR 240-22.030, including waivers and/or stipulations and agreements, related to the preparation of energy and peak load forecasts, Ameren Missouri has prepared a range of forecasts out to the year 2030. These energy and peak load forecasts provide the basis for estimating the utility's future supply resource needs and also provide the load information needed to perform its demand-side resource analysis. Ameren Missouri presents its load analysis and discusses the forecast methodology employed in Chapter 3 of the 2011 Integrated Resource Plan.

Although Ameren Missouri has been diligent in its compliance with overall requirements of 4 CSR 240-22.030, it can be faulted for not closely reviewing or assessing the goodness of the forecast drivers and assumptions provided to them by their consultants.

The observed deficiencies and proposed remedies in Ameren Missouri's load analysis and forecast are discussed below.

DEFICIENCY #1 – AMEREN MISSOURI'S CHOICE OF LOAD FORECAST DRIVERS IS SUSPECT

4 CSR 240-22.030(2)(A) states that: "The utility shall identify appropriate driver variables as predictors of the number of units for each major class or subclass. The critical assumptions that influence the driver variables shall also be identified."

Ameren Missouri is deficient in that it did not update or reinterpret its load forecast to take into account new economic forecast data that became available from Moody's Analytics. Further, Ameren Missouri's Integrated Resource Plan did not discuss the possible effect of the Moody's more recent economic projections on its load forecast. In addition, Ameren Missouri's industrial sales forecast may be overstated due to the Company's choice of an economic driver that proposes stronger growth than would be expected based upon Moody's manufacturing employment growth forecast. Also the Company's household forecast is of concern, because both income per household and average household size are key factors influencing residential kWh use per customer. If Ameren Missouri had used its own forecast of the number of residential customers, rather than Moody's forecast of households, in its equation to predict kWh usage per customer, the resulting residential sales forecast would be lower.

DISCUSSION

A. Failure to Use the Most Recent Moody's Data Available. Ameren Missouri receives economic forecast data from Moody's Analytics twice a year. The economic forecast data used to prepare its 2011 Integrated Resource Plan was delivered to the Company in the autumn of 2009. Prior to its February 2011 filing, Ameren Missouri received two updates, one in the spring of 2010, and a second in the autumn of 2010. In response to DNR-0001, Ameren Missouri provided economic forecast information related to its Base Forecast for the IRP as well as data for the two more recent forecasts. In Figures 3-1 and 3-2, we compare the growth rates for two of the broadest performance measures for the Ameren Missouri economy: annual percentage growth in total employment and Gross Domestic Product for the region. As can be seen, Moody's perspective on the effect of the national

recession on Ameren Missouri's service territory has intensified over time. Moody's more recent forecasts show a deeper recession and a slower economic recovery than the Base Forecast for the IRP.

**** Figures 3-1 and 3-2 are Highly Confidential in Their Entirety ****

Figure 3-1: GDP Growth in Ameren Missouri's Service Territory

Figure 3-2: Employment Growth in Ameren Missouri's Service Territory

As Figures 3-1 and 3-2 suggest, if Ameren Missouri had used Moody's more recent economic forecast, the Company's load forecast would be lower by some magnitude.[1] As a practical matter, Ameren Missouri did need to call the forecast done at some point so that it could move on to subsequent stages of the IRP analysis. The Company told stakeholders that it was still working on its forecast in March 2010; in September, the company told stakeholders that it was still updating and reinterpreting its forecast.[2] Given the context of the worst economic recession since the Great Depression, Ameren Missouri could have updated its economic drivers with Moody's Spring 2010 forecast, or it could have used one of Moody's monthly updates.[3] Given the enormous uncertainty that existed at that time related to the economic recovery, it would have been prudent for Ameren Missouri to update its economic drivers. At very least, the Company should have discussed the possible effect of the Moody's more recent economic projections on its load forecast in its Integrated Resource Plan, but it did not.

[1] It is not possible for GDS to provide an estimate of how much lower Ameren Missouri's load forecast would be. In response to DNR-0001, Ameren Missouri did not provide level data for its economic drivers that can be compared across forecasts.
[2] Stakeholder meeting presentations for March 8 2010 and September 14 2010 stakeholder meetings.
[3] Moody's Analytics produces monthly updates to its national and state economic forecasts.

B. Choice of Economic Drivers. The basis for Ameren Missouri's residential sales forecast is problematic. In Chapter 3, Ameren Missouri remarks: "In the SAE model framework for residential sales, household income and the number of people per household in the service territory act as drivers for use per customer, and the number of households."[4] The functional framework of the SAE model used to develop Ameren Missouri's residential kWh use per customer forecast incorporates both "index" and "use" variables. The index variable captures trends in appliance saturation and efficiency. The use variable is a composite of variables that represent the utilization of the appliances, including income per household, the number of persons per household, heating & cooling degree days, price of electricity and the relevant elasticities. Average household size is inversely related to average kWh use per customer, and average household income is positively related to customer usage. In this framework it is essential that Ameren Missouri correctly represents the number of households, both in the past and the future. We are not confident that the Company has done this.

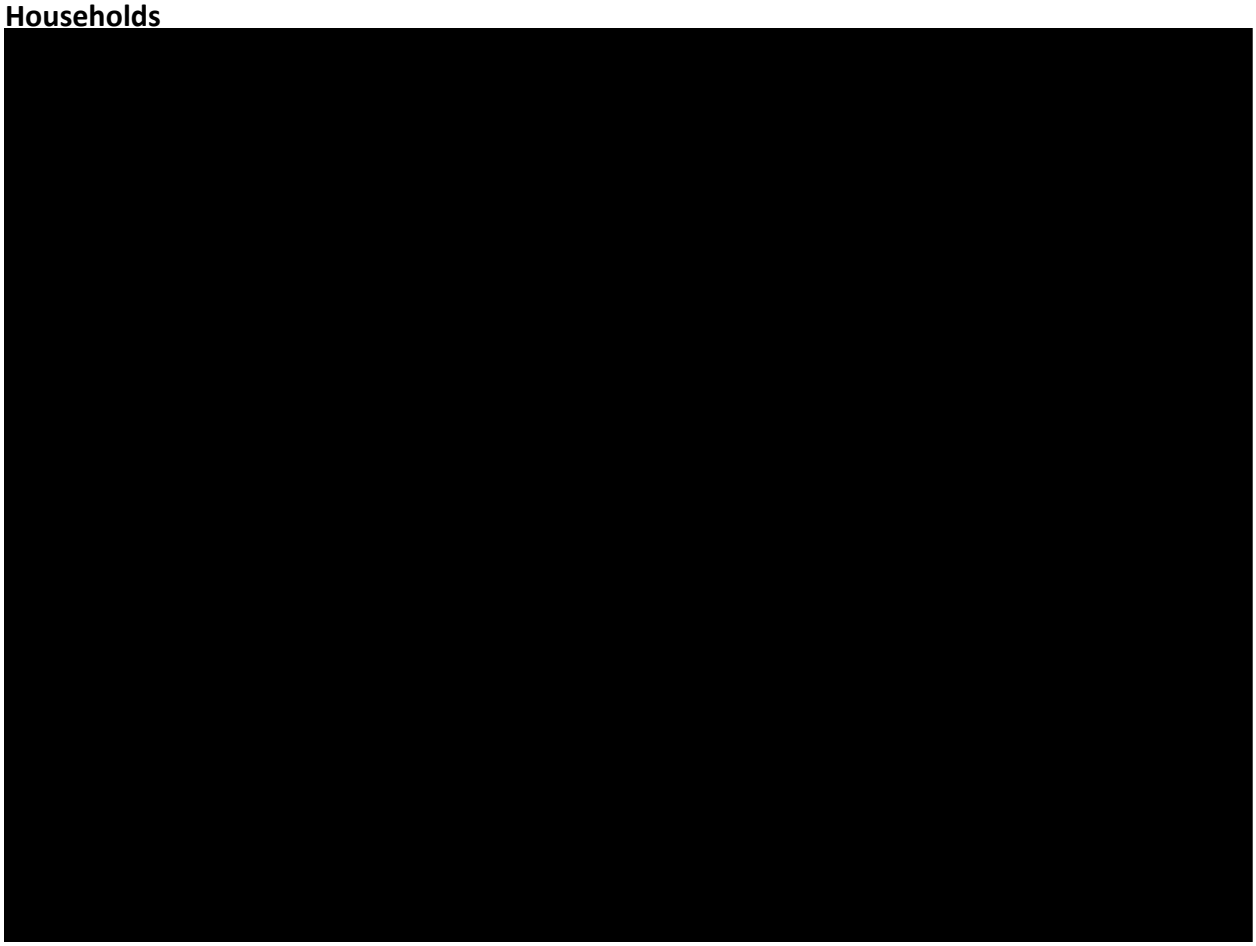
Ameren Missouri states: "The income variable in the residential forecast is from Moody's Analytics (formerly Economy.com). Household income is used in the forecast model, and it is the total personal income in the service territory divided by the number of households. The historical and forecast household data, as with the personal income data, is from Moody's Analytics."[5] While it is clear what driver variables Ameren Missouri intended to use, we are not certain that the Company has correctly calculated residential kWh use per customer.

Consider the household and residential customer forecasts that Ameren Missouri has provided.[6] Looking at Figure 3-3, it is evident that the number of residential customers in Ameren Missouri's service territory has been, and is expected to continue, growing faster than the number of households, as projected by Moody's Analytics. Two key variables used in the SAE model framework are household size and household income, and it would make a difference if one used the number of residential customers rather than households in the estimation process.

**** Moody's household forecast shown in Figure 3-3 is Highly Confidential; however, Ameren's residential customer forecast is not confidential ****

[4] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, p. 13.
[5] See Ameren's response to DNR-0015.
[6] Moody's Autumn 2009 forecast of households was used as Ameren Missouri's base forecast for the IRP; it was provided in response to DNR-0001. The Company's residential customer forecast was provided in Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, Appendix A, pp. 35 and 56.

Figure 3-3: Ameren Missouri's Forecast of the Number of Residential Customers and Households



For example, Moody's Analytics projects that the total population in Ameren Missouri's service territory in 2030 will be ** [redacted] ** and that the number of households will be ** [redacted] ** – with an average household size of ** [redacted] ** persons.[7] On the other hand, Ameren Missouri's forecast for the number of residential customers in 2030 is 1,197,195 – which implies ** [redacted] ** persons per residential billing unit based on Moody's population forecast. This amounts to about a 10% difference in household size, which should result in a significant difference in kWh usage per customer.

Further, Moody's Analytics projects that total personal income in Ameren Missouri's service territory will reach ** [redacted] ** billion in 2030 and that the average household income will be ** [redacted] **.[8] However, if one used the number of residential customers as the denominator in the calculation of average income, you would get an estimate of ** **$188,907** **. Again, this amounts to about a 10% difference in household income, which should result in a significant difference in kWh usage per customer.

Based upon Ameren Missouri's description in Chapter 3 and related data responses, it appears that the Company has used Moody's forecast of households and household income. This

[7] See the Company's response to DNR-0001.
[8] Ibid.

choice results in a larger household size value and a higher household income estimate than if residential customers were used. Consequently, Ameren Missouri's choice would result in higher kWh usage per customer estimate than if residential customers were used. Thus, it is possible that Ameren Missouri's residential sales forecast is biased upwards.[9]

Additionally, Ameren Missouri's industrial sales forecast may be overstated for two reasons. First, Ameren Missouri is forecasting a very strong recovery in industrial sales from the depths of the recession; for example, it is projecting sales growth of nearly 11% in 2011.[10] As Ameren Missouri itself remarks: "… the choice of employment as opposed to output as a driver has big implications for electricity sales in the future. If industrial sales are driven by output then Ameren Missouri's industrial energy sales will grow over the IRP horizon, but if they are instead driven by manufacturing employment they will decline."[11] Figure 3-4 highlights the difference in these two possible economic drivers.[12]

**** Moody's manufacturing employment and manufacturing output forecasts shown in Figure 3-4 are Highly Confidential ****

[9] It should also be noted that the SAE residential model produces an estimate if kWh usage per customer. Ameren Missouri takes the resulting usage estimate and multiplies it by its forecast of residential customers, not Moody's forecast of households.
[10] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, pp. 25 and 29.
[11] Ibid., Chapter 3, p. 20.
[12] Provided in the Company's response to DNR-0001.

Figure 3-4: Moody's Outlook for Growth in Manufacturing Output and Employment, Ameren Missouri, 2009-2030

Using growth in manufacturing output (as the primary driver of industrial kWh usage) would suggest sales growth on the order of ** [redacted] ** per annum. However, Moody's manufacturing employment forecast implies relatively flat industrial sales growth. In effect, Ameren Missouri has chosen to split the difference between these two economic drivers. However, this may not be the correct choice, and it may be more appropriate to use employment as the primary driver of industrial sales. Looking at Ameren Missouri's actual experience between 2000 and 2009, one finds that that the percentage change in manufacturing employment shows a 64% positive correlation[13] with the percentage change in industrial sales (excluding Noranda).[14] On the other hand, the correlation between output and sales is only 16%. Second, Ameren Missouri's industrial forecast is purely an econometric forecast which does not explicitly recognize the

[13] In statistics, the Pearson correlation coefficient (r) is a measure of the linear dependence between two variables. It is provides a measure of the strength of linear dependence between two variables. The coefficient of determination (r^2), on the other hand, is used in the context of statistical models where the primary purpose is explain the behavior of a variable based upon information for other independent variables. The coefficient of determination provides a measure of the amount of variation in a data set that is explained by the statistical model. For example, in a simple case of linear dependence between two variables where r=0.64, r^2=0.41.

[14] Annual growth rates for industrial sales are shown in Table 3.4 of Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, p. 25. Annual growth rates for manufacturing employment output were calculated using data provided in the Company's response to DNR-0001.

impact of the new EISA motor efficiency standards on its sales and peak load forecast.[15] This factor may result in a forecast that is biased upwards.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

(a) Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should rerun its base load forecast with Moody's most current economic projection and compare the results to its IRP filing. If the results of this effort are significantly different from the load forecast used in the IRP, the Company should discuss how a revised load forecast would affect its preferred resource plan.

(b) Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should prepare an alternative projection for industrial sales that is based upon Moody's manufacturing employment forecast. If the results of this effort are significantly different from the planning forecast used in the IRP, the Company should discuss how a revised load forecast would affect its preferred resource plan.

(c) In the interim period prior to its next regularly scheduled compliance filing, Ameren Missouri should consider how it could incorporate national efficiency standards into its econometric forecast for the industrial sector.

(d) Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should clearly identify the driver variables it has used in preparing its residential sales forecast. Assuming that it has used Moody's forecast of households and household income, the Company should identify what difference it would make if residential customers were used instead of Moody's household forecast. Ameren Missouri should also explain why its expectation for residential customer growth is different from Moody's expectation for household growth.

DEFICIENCY #2 – AMEREN MISSOURI'S ESTIMATES OF THE END-USE CONTRIBUTION TO PEAK DEMAND ARE DUBIOUS

4 CSR 240-22.030(3)(B)(2) states that: "For each end-use, the utility shall estimate end-use monthly energies and demands at time of monthly system peaks and shall calibrate these energies and demands to equal the weather-normalized monthly energies and demands at time of monthly peaks for each major class for the most recently available data."

Ameren Missouri is deficient in that it has not provided convincing evidence that the end-use load profiles it uses are appropriate for its service territory. While Ameren Missouri has attempted to calibrate Itron's end-use load profiles to available utility load research data, the resulting end-use peak load relationships are suspect.[16] For example, the Company appears to

[15] See the Company's response to DNR-0114.
[16] In response to DNR-0167, the Company noted: "The actual 2008 residential summer peak load was 3,815 MW. The estimated peak load based on the eShapes end use load profiles and the end use energy from the SAE model was 4,401 MW. The difference

have overstated its residential cooling load and understated the contribution of other end-uses to summer peak load. In turn, these end-use estimates could have important implications for Ameren Missouri's demand-side resource analysis.

DISCUSSION

Ameren Missouri estimates that 80% of its residential load at the time of the 2010 summer peak was cooling. The Company calculates that its residential cooling load is on the order of 3,115 MW while that for all other residential end-uses is only 774 MW.[17] These estimates are not credible.

Ameren Missouri had 1,027,660 residential customers in 2010.[18] Dividing the hypothesized residential cooling load in that year by the number of customers yields a coincident peak demand of 3.03 kW per customer. This estimate of peak demand for cooling is significantly higher than other available estimates. Figure 3-5 compares Ameren Missouri's estimates with those reported in a recent Electric Power Research Institute (EPRI) report.[19] The chart breaks residential demand at the time of the summer peak into cooling and all other end-use components.

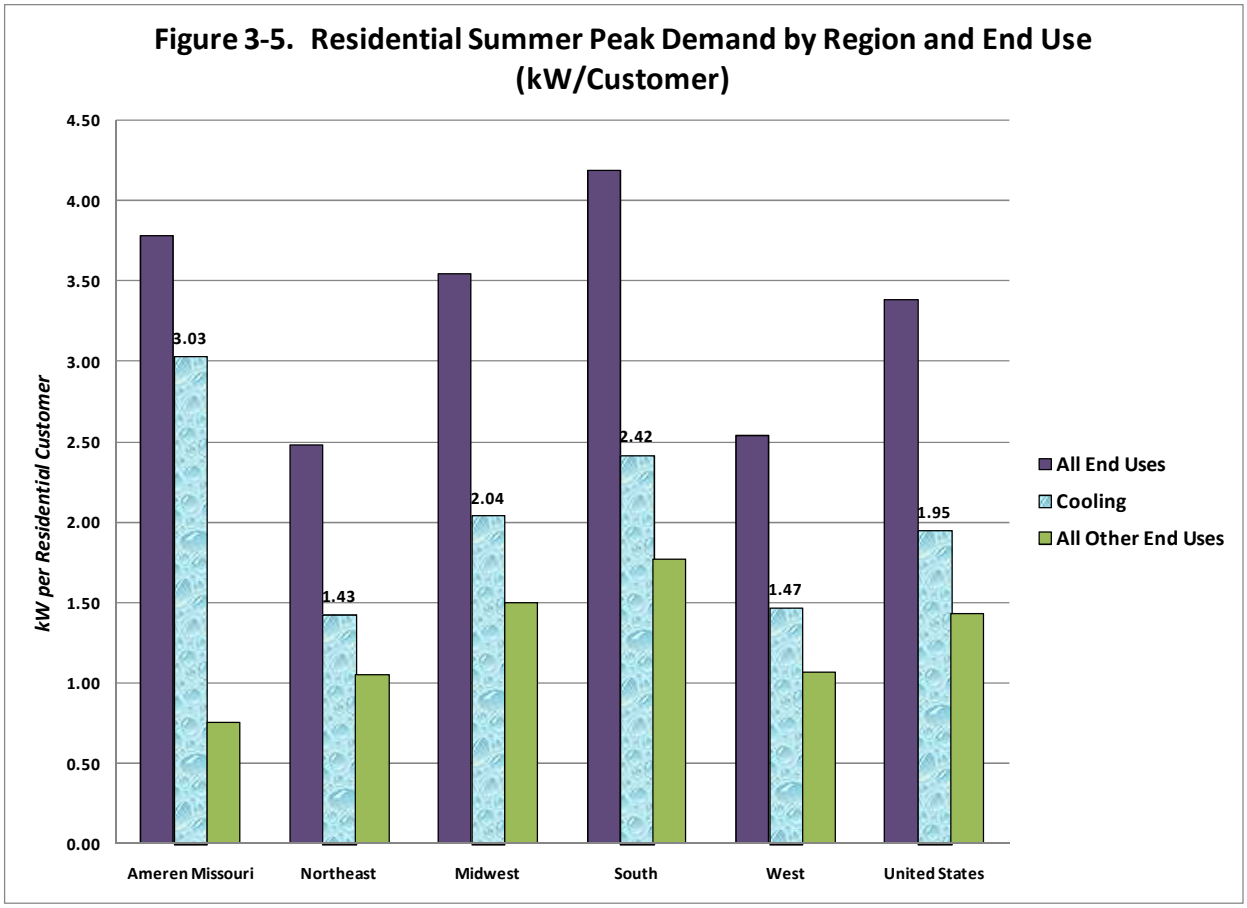
underscores the need for the adjustments that were made through the process described in chapter 3 to bring the load shapes more in line with current usage patterns in the Ameren Missouri territory."

[17] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, p. 49.

[18] Ibid., Chapter 3, Appendix A, p. 56.

[19] Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.: (2010–2030). EPRI, Palo Alto, CA: 2009. 1016987. See p. 3-17.

Figure 3-5: Residential Summer Peak Demand by Region and End-Use



The EPRI estimates for different regions of the U.S. are for the year 2008 while the Ameren Missouri estimates are for 2010. EPRI's kW per customer cooling demand estimate for the Midwest region is 2.04 kW compared to Ameren Missouri's 3.03 kW. This suggests that Ameren Missouri's kW per customer estimate may be overstated by as much as 33%, or by roughly 1,019 MW in 2010. As a counterpoint to this, the peak demand associated with other residential end-uses would appear to be understated.

Looked at differently, how much air conditioning are Ameren Missouri's customers using at the time of the system peak? For the typical home with 2.5 tons of air conditioning (where one ton is equivalent to approximately 12,000 Btu/hr) and a SEER efficiency of 10.0, one might expect to see about 3.0 kW if the system were operating at the time of the system peak. However, not all air conditioning systems are fully operating at the time of the system peak. For example, one recent study has found that: "On afternoons that reach 90°F or higher, about one in five systems are not operating at all, and about 30 percent are running flat out; the rest are cycling on and off. The data suggest an overall average of about 50 percent duty cycle."[20] Assuming a 50% duty cycle, we'd expect to see on average 1.5 kW per customer. EPRI's estimate of 2.04 kW would be consistent with a duty factor of close to 70%. Ameren Missouri's estimate of 3.03 kW would seem to entail a duty factor of about 100%.

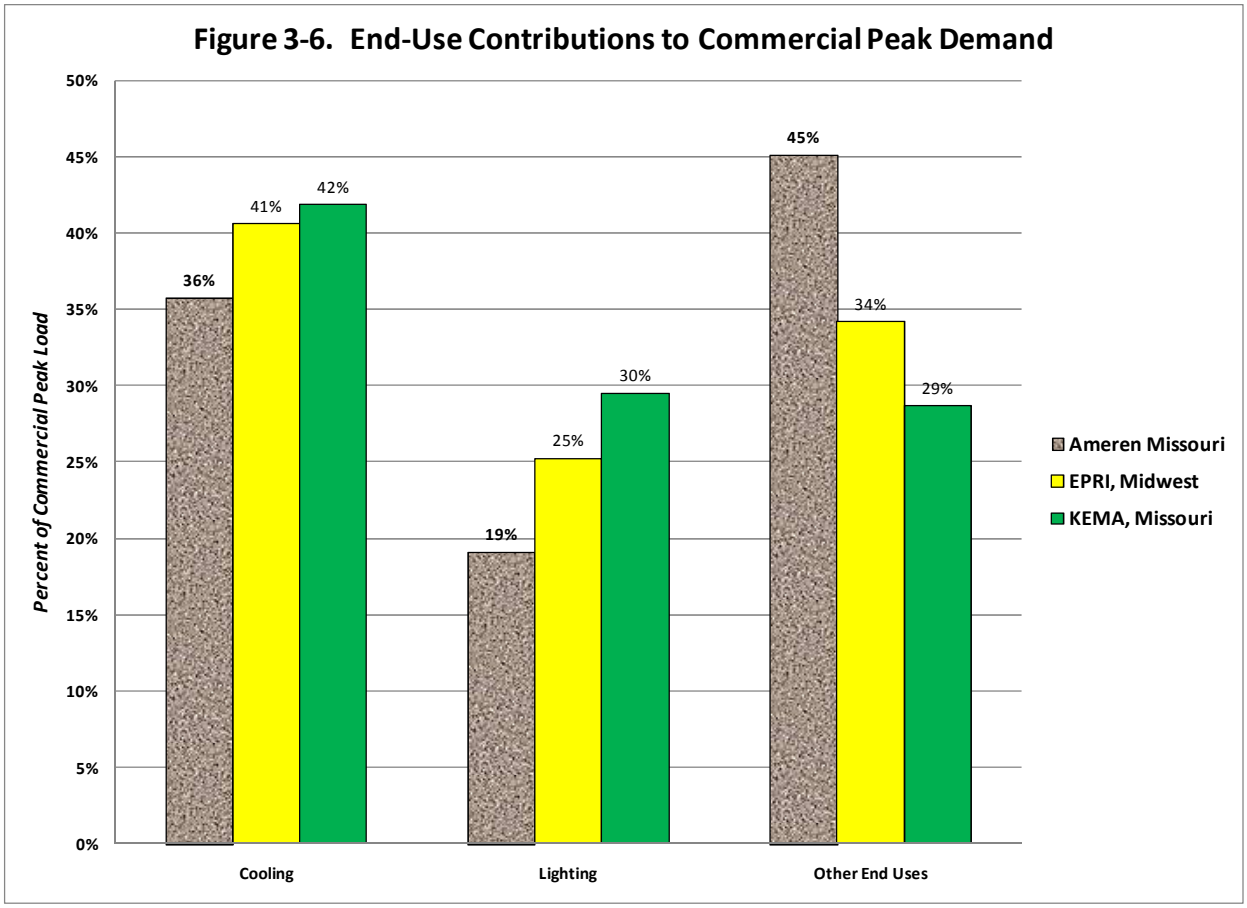
[20] Energy Center of Wisconsin, Central Air Conditioning in Wisconsin: A Compilation of Recent Field Research, ECW Report Number 241-1, May 2008, emended December 15, 2010, p. 2.

Thus, it appears that Ameren Missouri has overstated its residential cooling load and understated the contribution of other end-uses. In turn, these estimates can have important implications for demand-side resource analysis. For example, Ameren Missouri's DSM assessment may undervalue non-cooling efficiency measures, because it has underestimated their contribution to peak load.

Ameren Missouri's allocation of its commercial end-use load to summer peak is also suspect. The Company estimates that 36% of its commercial load at the time of the 2010 summer peak was cooling and that 19% was associated with lighting.[21] Figure 3-6 compares Ameren Missouri's estimates with those reported in the above referenced EPRI report[22] and with KEMA's estimate for the State of Missouri[23]. The chart breaks commercial demand at the time of the summer peak into cooling, lighting and all other end-use components. Ameren Missouri's allocation of its commercial load to cooling and lighting is less than what would be expected based upon the EPRI and KEMA studies. This raises a concern that Ameren Missouri's demand-side resource analysis may undervalue cooling and lighting efficiency measures, because it has underestimated their contribution to peak load.

[21] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 3, p. 50.
[22] Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.: (2010–2030). EPRI, Palo Alto, CA: 2009. 1016987. See p. 3-19.
[23] KEMA, Inc., Missouri Statewide DSM Market Potential Study, Final Report, Burlington, MA. March 4, 2011 rev. 4/14/11. See p. 4-23.

Figure 3-6: End-Use Contributions to Commercial Peak Demand



REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

(a) In the interim period prior to its next regularly scheduled compliance filing, Ameren Missouri should clarify the extent to which its DSM analysis is affected by its assumptions related to residential and commercial end-use contributions to peak load. If the demand-side resource analysis is sensitive to these assumptions, Ameren Missouri should consider conducting a load research study related to residential air conditioning use in its service territory. This study would provide an empirical basis for its cooling load shape assumptions.

(b) In the interim period prior to its next regularly scheduled compliance filing, Ameren Missouri should determine the exact sources of Itron's end-use load profiles. Further, Ameren Missouri needs to better support the proposition that it is reasonable for the Company to use Itron's end-use load profiles as proxies for its service territory in Missouri.

4.0 THERMAL RESOURCES

Ameren Missouri performed a comprehensive analysis of thermal supply-side resources which, for the most part, conforms to the rules set forth in 4 CSR 240-22.040. While most aspects of the rule were addressed, and in fact all aspects were mentioned except for those for which waivers were granted, we feel that certain areas should have received additional attention. The supply-side analysis was most deficient in the area of purchased power analysis.

DEFICIENCY #3 - AMEREN MISSOURI DID NOT ADEQUATELY DEFEND ITS DISMISSAL OF PURCHASED POWER OPTIONS FROM CONSIDERATION IN THE IRP

4 CSR 240-22.040(1) states that:" The analysis of supply-side resources shall begin with the identification of a variety of potential supply-side resource options which the utility can reasonably expect to develop and implement solely through its own resources or for which it will be a major participant. These options include new plants using new generation technologies; life extension and refurbishment at existing generating plants; enhancement of the emission controls at existing or new generating plants; purchased power from utility sources, cogenerators, or independent power producers; efficiency improvements which reduce the utility's own use of energy; and upgrading of the transmission and distribution systems to reduce power and energy losses."

4 CSR 240-22.040(5) states that: "The utility shall identify and evaluate potential opportunities for new long-term power purchases and sales, both firm and nonfarm, that are likely to be available over all or part of the planning horizon."

Ameren Missouri is deficient in that it did not conduct an evaluation of purchased power options. Instead, Ameren simply dismissed purchased power options as a viable long term resource option based on internal discussion with its Asset Management and Trading organization.

DISCUSSION

In its written discussion of the review of supply-side resources, Ameren Missouri dismissed the evaluation of purchased power options. [24] This dismissal was based on internal discussion with its Asset Management and Trading organization. No information regarding the scope of those discussions is provided other than an indication that the discussions were limited to only "pending potential long-term power purchases for consideration at the time of the analysis." Ameren also notes in the IRP that it "learned from its experience in developing the 2008 IRP that soliciting the market for long-term power purchases or sales is not productive for bidders given the data at this stage of the analysis is generic." While this may be a valid point, no specific information is provided in the IRP regarding the results of that solicitation and how those results from 3 years ago factored into Ameren Missouri's current thinking regarding the market for long term purchased power agreements.

A quantitative approach to assessing the availability of purchased power options would be more appropriate for demonstrating whether or not purchases from other entities should be

[24] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 4, p. 19.

included in the IRP process. Projections of regional loads and expected regional generating resource capability would be useful for such a demonstration, as would descriptions and terms of current transactions in the area. As Ameren Missouri's Preferred Resource Plan does not call for additional supply-side resources until 2029, an amendment to the current IRP would not be useful. However, if aggressive environmental regulation is put in place, a need for additional capacity occurs in 2016. Under that scenario, Ameren should evaluate purchase opportunities, as well as self-build opportunities, to satisfy the additional need.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

In its next regularly scheduled compliance filing, Ameren Missouri should provide a quantitative demonstration of the availability of purchased power opportunities. In the event that the decision is made to retire Meramec, Ameren Missouri should evaluate purchased power opportunities, in addition to self-build options, as potential sources of supply.

DEFICIENCY #4 - AMEREN MISSOURI DID NOT PRESENT ANY DISCUSSION OF THE HISTORIC FORECAST ACCURACY OF PREVIOUS FUEL PRICE FORECASTS PRODUCED BY CHARLES RIVER ASSOCIATE'S MRN-NEEM MODEL

4 CSR 240-22.040(8)(A)(2)states that: "The utility shall consider the accuracy of previous forecasts as an important criterion in selecting providers of fuel price forecasts."

Ameren Missouri is deficient in that it presented no discussion in its IRP filing regarding the accuracy of previous fuel price forecasts produced by CRA's MRN-NEEM and whether or not such information was considered by Ameren Missouri in selecting providers of fuel price forecasts.

DISCUSSION

Ameren Missouri used CRA's MRN-NEEM model to produce integrated, nationally defined projections of inputs for its IRP evaluations. The model is discussed in detail in Chapter 2 of the IRP document; the discussion includes references to reviews of the model performed by other entities and the positive ratings that resulted from those reviews. There is no discussion, however, of the accuracy of previous forecasts produced by the MRN-NEEM model, or whether or not Ameren Missouri considered previous forecast accuracy in the decision process that was employed to select the provider of fuel price forecasts. Analysis of the performance of previous forecasts can help characterize the magnitude of the uncertainty in current projections over the panning horizon. Historical forecast accuracy can be very useful as a benchmark, especially when compared to other available forecasts sources. This might ultimately lead to increased forecast accuracy through selection of another forecast provider or forecast methodology.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

In its next regularly scheduled compliance filing, Ameren Missouri should address the issue of previous forecast accuracy as a criterion for selecting providers of fuel price forecasts.

DEFICIENCY #5 - AMEREN MISSOURI DID NOT ADEQUATELY CONSIDER THE FACTORS THAT MAY CAUSE UNCERTAINTY ASSOCIATED WITH SUPPLY-SIDE CAPITAL & O&M COSTS

4 CSR 240-22.040(8)(B)(2)states that: The provider of the estimate shall be required to identify the critical uncertain factors that may cause the capital cost estimates to change significantly and to provide a range of estimates and an associated subjective probability distribution that reflects this uncertainty.

4 CSR 240-22.040 (8) (C) (2) states that "The critical uncertain factors that affect these cost estimates (fixed and variable operation and maintenance cost estimates) shall be identified and a range of estimates shall be provided, together with an associated subjective probability distribution that reflects this uncertainty."

Ameren Missouri is deficient in that it did not identify the critical uncertain factors that may cause the capital and O&M costs to vary significantly as required in 4 CSR 240-22.

DISCUSSION

Ameren Missouri provides uncertainty distributions for coal and gas: (1) capital cost, (2) project schedule, (3) fixed O&M, (4) variable O&M, and (5) forced outage in Chapter 4, Table 4.12. While the table shows price and performance variations along with associated subjective probability, there is no identification of the critical uncertain factors that cause the price and performance variations and as such there is no probability associated with critical uncertain factors.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

In its next regularly scheduled compliance filing, Ameren Missouri should identify and provide a discussion of the critical uncertain factors that may cause capital & O&M costs to vary significantly along with price variations and probability distributions that were provided in the 2011 IRP.

In a supplemental filing, Ameren Missouri should provide a detailed discussion of Ameren Missouri's consideration of critical uncertain factors that affect the upper boundary of fuel costs, non-carbon environmental compliance costs and other capital and O&M costs for Ameren's existing fleet of coal-fired power plants over the 20-year planning horizon. Additional details of the information and analysis that should be included in this supplemental filing appear in the proposed remedy for MDNR Deficiency #11.

5.0 RENEWABLE & STORAGE RESOURCES

Ameren Missouri has included Chapter 5 in its 2011 Integrated Resource Plan a method to meet the requirements of Missouri's Renewable Energy Standard (RES). Additionally, Chapter 5 of the IRP describes the consideration of storage technology, but includes no actual plans to implement electrical storage technologies.

The plan outlined by Ameren Missouri for meeting the Missouri RES relies heavily on existing renewable resources, banked Renewable Energy Credits (RECs), with small additions of wind energy, solar electric technology, and landfill gas through 2031.[25] The Plan does envision Ameren Missouri being able to achieve the portfolio percentages as outlined in the Missouri RES due to the constraint that such renewable energy additions may not create greater than a one percent increase in rates.[26] In addition to planning for the Missouri RES, Ameren Missouri considered the potential impact of several federal RES proposals.

In developing the underlying technical and economic assumptions for its acquisition of renewable energy resources in excess of its current supply, Ameren Missouri relied substantially on a report prepared by Black and Veatch, entitled Ameren UE Renewable Portfolio Study, Black and Veatch, July 2009, which is considered highly confidential. Some of the IRP analysis and presentation deviated from the Black and Veatch analysis or relied on other sources.

Ameren Missouri has presented a thorough plan for addressing the requirements and constraints of the Missouri RES. However, Ameren Missouri has been deficient in meeting all the requirements and stipulations in File No, EO-2009-0437 of the planning process. These gaps occur through: (1) relying heavily on the constraints used in the Black and Veatch study, (2) changing assumptions from the Black and Veatch study, (3) failing to address stipulation requirements, (4) ignoring or otherwise poorly considering risks in its plans for acquiring renewable energy resources, and (4) failing to consider market options that may provide for greater compliance with the Missouri RES without running afoul of the one percent rate cap.

DEFICIENCY #6 – AMEREN MISSOURI FAILED TO ADDRESS SEVERAL CRITICAL WIND ENERGY FACTORS

Stipulation Agreement EO-2009-0437 covers Ameren Missouri's analysis and consideration of wind energy resources. Specifically, the stipulation requires the following as it relates to wind resource considerations:[27]

- *Demonstrate that its assumptions regarding capacity factors are consistent with the most recent data on capacity factors for the best commercially available wind sites;*
- *Demonstrate that its assumptions regarding the timing of transmission capacity upgrades, and the allocation of the costs associated with those upgrades, are based on*

[25] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 5, p. 40.
[26] Ibid, p. 41.
[27] Documentation provided by Missouri DNR in 2011.

the most recent system planning studies and currently effective transmission cost allocation principles;

- *Present scenarios for acquiring wind resources that identify the region being considered utilizing multi-county areas, with a characterization of the wind resources available for each. To make a meaningful comparison of the regions under consideration, the information presented should include estimates at various turbine hub heights (e.g., 80, 100 or 120 meters, where practical) of wind density, transmission upgrades required and the levelized cost of energy per MWh under a Purchase Power Agreement and/or an ownership arrangement.*

- *AmerenUE (Ameren Missouri) will provide cross references for information whenever possible in its next IRP filing.*

Ameren Missouri is deficient in that its consideration of wind energy options did not: (1) consider capacity factors for the *best* commercially available wind sites; (2) adequately document its assumptions regarding the timing of transmission capacity upgrades as it relates to potential wind energy resources; (3) identify multi-county regions with a characterization of the wind resources available to each, or the transmission upgrades required to access those resources; and (4) address a purchase power agreement and/or ownership arrangement.

DISCUSSION

For the consideration of wind energy options in its 2011 IRP, Ameren Missouri fails to address several factors of the stipulation. Those failures are:

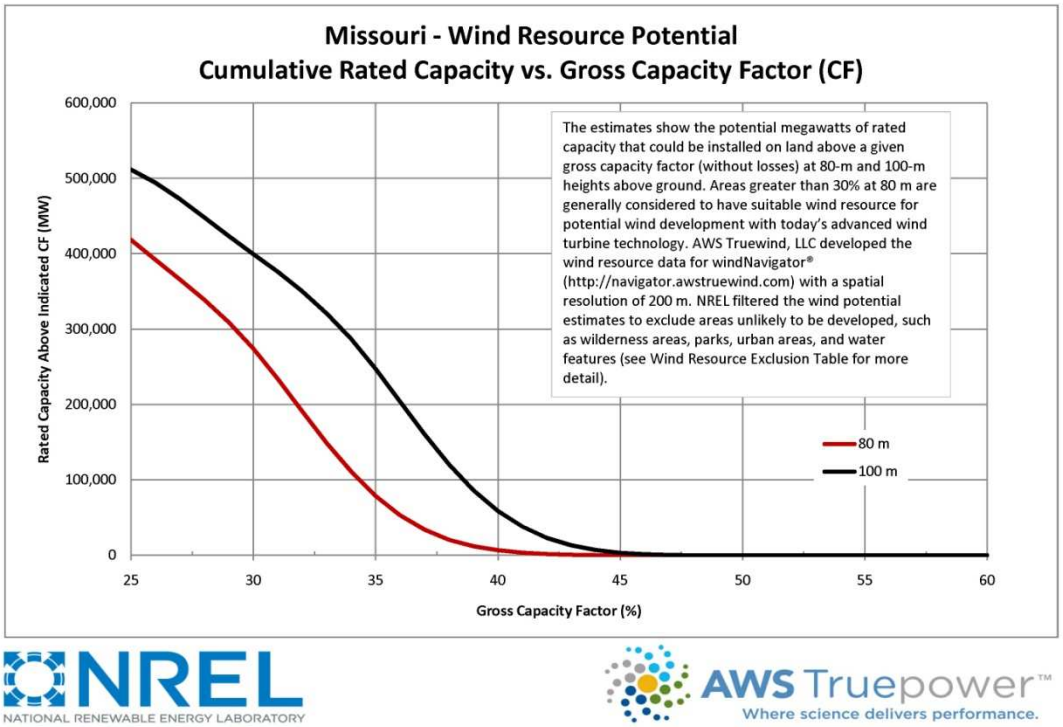
(1) Ameren Missouri did not consider the capacity factors for the *best* commercially available wind sites, but used an average of capacity factors across several Midwest states.[28]

In its response to DR1, Ameren explained that "For resource planning purposes Ameren Missouri characterized a generic wind resource in the Midwest (North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Minnesota, Iowa, Missouri, Wisconsin, Illinois, and Indiana). A capacity factor of 37.5% was estimated using the latest wind potential estimates from the National Renewable Energy Laboratory (NREL) for the Midwest at an 80 meter hub height."[29] Clearly Ameren did not isolate on specific multi-county regions, though one could argue that multi-state regions include multi-county regions. However, it is clear that the capacity factor of an *average* wind resource was considered, rather than the *best* wind resource at *commercially available wind sites*.

Ameren did provide the analysis for two locations (Callaway and Coffeen) that was supported by 3Tier's First Look wind analysis product. These analysis were for specific locations (latitude and longitude to three decimal places), rather than a multi-county area. Further, the analyses showed capacity factors of 20 to 23 percent for a generic wind turbine at 80 meters, illustrating that the analyses were not representative of the IRP.

[28] Data request response DR1 – DNR 85, MPSC Case No. EO-2011-0271
[29] Ibid

The U.S. Dept. of Energy (USDOE) has published new analyses for each state. Supply curves indicating MW potential at various capacity factors were included in the USDOE results.[30] For Missouri, the USDOE analysis indicated substantial potential for new wind capacity at 35 percent capacity factors at an 80 meter hub height, and 40 percent capacity factors with a 100 meter hub height, as illustrated below.[31]



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Ameren Missouri indicated that their generic 37.5 percent capacity factor assumption was based on a consideration of the wind resource available in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Minnesota, Iowa, Missouri, Wisconsin, Illinois, and Indiana.[32] That many of these states have indicated wind resources that would produce well above a 37.5 percent capacity factor suggests that Ameren Missouri did not consider the *best* wind sites as required in the Stipulation. It is unclear how this assumption may or may not affect the one percent rate cap constraint on RES compliance, but higher capacity factors may well allow for more cost effective wind projects and thus greater ability to acquire renewable resources before reaching the one percent rate cap.

(2) Failure to address documentation of its assumptions regarding the timing of transmission capacity upgrades as it relates to the potential wind energy resources.[33]

[30] http://www.windpoweringamerica.gov/wind_maps.asp
[31] http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=mo
[32] Data request response DR1 – DNR 85, MPSC Case No. EO-2011-0271
[33] Ibid

The stipulation in File No. EO-2009-0437 requires that Ameren Missouri address the transmission timing and costs as they would affect the analysis of the wind resource options. As only a generic wind resource was analyzed for the IRP, the consideration of transmission issues appears to have been necessarily generic as specific locations could not be analyzed. Ameren Missouri indicated that they expected the MISO Multi-Value Project (MVP) system expansion over the next 25 years "to alleviate additional transmission costs associated with specific wind projects."[34] No documentation was provided to support the specific timing and claims.

As Ameren Missouri assumed that the MISO MVP system expansion was the sole resource for addressing wind system transmission issues, they imply that any wind project or wind energy that would be acquired would have any additional transmission costs covered within the levelized cost of energy. While it is our understanding that many wind farm projects cover the expense of tying into existing transmission facilities, the rules for covering cost allocation are evolving. Indeed, the Federal Energy Regulatory Commission (FERC) approved rules for cost allocation within MISO[35] that may impact the 2011 Ameren Missouri IRP wind energy cost analysis. However, given the generic nature of Ameren Missouri's analysis of wind project options and costs, the specific impact is unknown.

The lack of addressing transmission system expansion timing in the IRP makes it difficult to confirm the cost factors of wind relative to the best commercially available locations. Indeed, existing transmission capacity or near term near transmission capacity may indicate that the Ameren Missouri assumption of a 37.5 percent capacity factor is reasonable for the present time. However, the timing and geography of the MVP system expansion may allow for better wind resources to be accessed during the 20 year IRP timeframe. The lack of a specific analysis in this area means that it is simply unclear how the geography and timing may or may not make these resources available or which resources may be considered the best available.

(3) Ameren Missouri did not identify multi-county regions with a characterization of the wind resources available to each, nor the transmission upgrades required to access those resources.

Thirdly, Ameren Missouri failed to present an analysis based on a multi-county region, but instead utilized a generic assumption related to Midwestern states' average capacity factors. The absence of this analysis indicates a lack of compliance with the stipulation. Were there a multi-county study included, the specificity of wind capacity factors would be increased and greater certainty achieved. Indeed, by failing to consider multi-county areas in Missouri, Ameren admits that it failed to utilize the 1.25 multiplier available for RES REC compliance for Missouri sited facilities. "…the 1.25 in-state-multiplier was not included for wind resources as part of the RES compliance plan."[36] The multiplier could allow Missouri based wind resources to be utilized at a valuation that would require a higher capacity factor in the larger Midwest region. For example, a Missouri based project with a 30 percent capacity factor could provide the same RES compliance value as a project outside Missouri with a 37.5 percent capacity factor (the average that Ameren Missouri assumed).

[34] Data request response DR1 – DNR 85, MPSC Case No. EO-2011-0271
[35] http://www.ferc.gov/media/news-releases/2010/2010-4/12-16-10-E-1.asp
[36] Data request response DR1 – DNR 85, MPSC Case No. EO-2011-0271

(4) Ameren Missouri did not address a Purchase Power agreement and/or ownership arrangement.[37]

In their DR response on this subject, Ameren Missouri states:

> *"After discussions with Ameren Fuels and Services organization it was determined that there were no pending potential long-term power purchases for consideration at the time of the analysis. Ameren Missouri will continue to evaluate bids from third-party developers as opportunities arise. Evaluation of generic power purchase agreements would not be expected to yield different results in terms of relative performance of resource types, as the only reasonable assumption that could be made absent specific information would be that such an agreement would be cost-based."* [38]

While this statement confirms that Purchase Power agreements were not considered for the IRP, it also invites questions related to wind acquisition timing. Ameren Missouri's timing for additional wind resources is expected to occur after 2012, when the current federal production tax credit legislation expires. Their cost analysis assumes no future tax credit will be available.[39] However, based on general industry knowledge, we are aware of existing wind developments that have taken advantage of the tax credits and are selling power into the MISO wholesale market. Assuming RECs were available, these projects may be able to provide more cost effective wind energy than that modeled in the Ameren Missouri IRP. Furthermore, advance acquisition of energy and RECs could allow ratepayers to take advantage of the banking opportunities for RECs within the Missouri RES, driving the cost of future renewable acquisitions for RES compliance down due to timing and the potential for an available market now that would enter into a Purchase Power agreement.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

Ameren Missouri should comply with Stipulation Agreement EO-2009-0437, by addressing all of the following deficiencies that are discussed above. Specifically Ameren Missouri should:

- In a supplemental filing prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should document its assumptions regarding the timing of transmission capacity upgrades as it relates to the potential wind energy resources
- Prior to agreement of the parties in Case No. EO-2011-0271, Ameren Missouri should analyze the impact of capacity factors for the *best* commercially available wind sites in addition to the average capacity factors that were used in the IRP.

[37] Ibid
[38] Data request response DR1 – DNR 85, MPSC Case No. EO-2011-0271
[39] Data request response DR1 – DNR 87, MPSC Case No. EO-2011-0271

- In a supplemental filing prior to agreement of the parties in Case No. EO-2011-0271, Ameren Missouri should present a more detailed discussion to support their decision not to consider long term power for wind energy.

- In the interim period prior to its next regularly scheduled compliance filing, Ameren Missouri should identify multi-county regions with a characterization of the wind resources available to each and the transmission upgrades required to access those resources.

DEFICIENCY #7 – AMEREN MISSOURI DID NOT CONSIDER RENEWABLE ENERGY RESOURCES THAT COULD BE DEVELOPED BY INDEPENDENT POWER PRODUCERS

4 CSR 240-22.040(1) states that: (1) The analysis of supply-side resources shall begin with the identification of a variety of potential supply-side resource options which the utility can reasonably expect to develop and implement solely through its own resources or for which it will be a major participant. These options include new plants using existing generation technologies; new plants using new generation technologies; life extension and refurbishment at existing generating plants; enhancement of the emission controls at existing or new generating plants; purchased power from utility sources, cogenerators or independent power producers; efficiency improvements which reduce the utility's own use of energy; and upgrading of the transmission and distribution systems to reduce power and energy losses. The utility shall collect generic cost and performance information for each of these potential resource options which shall include at least the following attributes where applicable:

(A) Fuel type and feasible variations in fuel type or quality;

(B) Practical size range;

(C) Maturity of the technology;

(D) Lead time for permitting, design, construction, testing and startup;

(E) Capital cost per kilowatt;

(F) Annual fixed operation and maintenance costs;

(G) Annual variable operation and maintenance costs;

(H) Scheduled routine maintenance outage requirements;

(I) Equivalent forced-outage rates or full and partial-forced-outage rates;

(J) Operational characteristics and constraints of significance in the screening process;

(K) Environmental impacts, including at least the following:

1. *Air emissions including at least the primary acid gases, greenhouse gases, ozone precursors, particulates and air toxics;*
2. *Waste generation including at least the primary forms of solid, liquid, radioactive and hazardous wastes;*
3. *Water impacts including direct usage and at least the primary pollutant discharges, thermal discharges and groundwater effects; and*

> *4. Siting impacts and constraints of sufficient importance to affect the screening process; and*
>
> *(L) Other characteristics that may make the technology particularly appropriate as a contingency option under extreme outcomes for the critical uncertain factors identified pursuant to 4 CSR 240-22.070(2).*

Ameren Missouri is deficient in that it does not consider the option of independent power producers with smaller generating capacities that are not "utility scale." Furthermore, the analysis of costs in the IRP assumes full costs would be allocated to capital expenditures, which may or may not be relevant for all technologies considered in the IRP, or the market conditions under which those technologies are developed.

DISCUSSION

4 CSR 240 22.240 (1) presents the requirements for the consideration of supply side resources and the requirements for what Ameren Missouri should include in its IRP. In its 2011 Integrated Resource Plan, Ameren Missouri considers a variety of renewable resource options, but does not consider the option for independent power producers with generating capacities that were not considered in the 2009 Black and Veatch study.[40]

In the Black and Veatch study, various resources were considered, but only if the capacity was deemed to be "utility scale."[41] In DNR 0054, MDNR requested that the definition and justification of the limitation and capacity constraints to "utility scale" systems be explained. Ameren Missouri responded that larger projects tend to have better economics, so practically limiting the scope of the study by eliminating small projects does not detract from determining which resource types are most promising.

Moreover, in response to DNR 0058, Ameren Missouri stated the following regarding the consideration of non-utility owned renewable energy projects for purposes of the IRP:

> *"After discussions with Ameren Fuels and Services organization it was determined that there were no pending potential long-term power purchases for consideration at the time of the IRP analysis. Ameren Missouri will continue to evaluate bids from third-party developers as opportunities arise. Evaluation of generic power purchase agreements would not be expected to yield different results in terms of relative rate impact, as the only reasonable assumption that could be made absent specific information would be that such an agreement would be cost-based."*[42]

Two major positions are evident in this statement:

1) Ameren is not considering IPP options in its IRP, and
2) The basis for opportunities would be cost based.

[40] Ameren UE Renewable Portfolio Study, Black and Veatch, July 2009.
[41] Ibid
[42] Data request response DR1 – DNR 58, MPSC Case No. EO-2011-0271

A number of potential renewable energy resources could be developed from Independent Power Producers (IPP) and assist Ameren Missouri in meeting its RES obligations. These would include: solar electric, biogas, and distributed wind systems. Methods of acquiring these resources vary, but could include a Purchase Power Agreement (PPA) and/or a Standard Offer (which could take the form of a PPA). By not completing the analysis for IPPs to make a contribution to the Ameren Missouri renewable energy supply mix, it appears that Ameren Missouri is deficient in its obligations. Further, assumptions are made that exclude any consideration of non-utility scale IPPs, though 4 CSR 240 22.040 (1) does not allow for such exclusion.

The cost base assumption is a secondary issue related to the renewable energy deficiency in 4 CSR 240 22.040. The implication of this assumption is that any costs would need to be recouped by the IPP using the same economic logic as a utility. However, in cases too numerous to mention, profitable investments have been made by IPPs in renewable energy technologies that utilities deem as having low potential due to utility cost assumptions.

The cost base assumption has clear implications based on Ameren Missouri's response to several data requests. When asked to provide information regarding biogas systems less that 1 MW in capacity (the Ameren Missouri definition of "utility scale"), the response was: "Individual projects under 1 MW were not considered "Utility Scale" and are less cost effective to study and potentially develop than larger projects."[43] However, absent studying the issue, it is unclear how Ameren Missouri came to the cost effectiveness conclusion. Indeed, Table 5.5 in the IRP presents levelized costs of energy (LCOE) for biogas systems in the range of 40 to 48 cents per kWh[44] However, biogas projects around the U.S. have proven to have a much lower PPA cost[45] than what was presented as the cost based LCOE in the IRP.

Further complicating the issue is that Ameren Missouri did not allow for future potential tax credits or other positive tax impacts to influence potential IPP project costs. By not allowing for the leveraging of IPP tax benefits, future scenario and contingency planning for IPP contributions to Ameren Missouri's renewable energy portfolio is absent in the IRP.

Due to the fact that Ameren did not consider "non utility scale" generation options via PPAs or Standard Offers in its IRP, it is difficult to determine the impact such consideration would have on the aggregate renewable energy acquisition. We acknowledge that gathering such information for the Ameren Missouri service territory can be challenging, though complete market research may or may not be needed. With the examples from other utilities of successful renewable energy acquisitions from IPPs and "non utility scale" systems, however, it appears that a significant gap in the IRP is evident and not in compliance with 4 CSR 240.22.040 (1).

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

[43] Data request response DR1 – DNR 67, MPSC Case No. EO-2011-0271
[44] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 5, p. 16.
[45] As an example, please see: http://www.we-energies.com/pdfs/etariffs/wisconsin/ewi_sheet190-192.pdf

In its next regularly scheduled compliance filing, Ameren Missouri should provide a comprehensive and accurate consideration of IPP options, including "non utility scale" systems as part of its renewable energy planning. The analysis should include a review of other utilities' methods for acquiring such resources and not be based solely on cost based assumptions used by Ameren Missouri or Black and Veatch. Given the complexities of scale economies and range of potential technologies and resources, the analysis should be based on research related to the provision of renewable energy via IPPs in the current market, with a projection of future uptake, including known tax benefits as well as contingencies for future tax benefit opportunities that would impact the price of IPP provided renewable energy.

6.0 DEMAND SIDE RESOURCES

Consistent with the requirements of 4 CSR 240-22.050, including waivers and/or stipulations and agreements, related to the methods by which demand-side resources shall be developed, analyzed and evaluated, Ameren Missouri has used the results of their 2010 DSM Market Potential Study to develop a range of potential DSM portfolios for evaluation in the integration and risk portions of the IRP analysis. In Chapter 7 of the 2011 Integrated Resource Plan, Ameren Missouri presents its potential DSM portfolios, including what it calls the "low risk" portfolio. It is this low risk portfolio that Ameren has included in its preferred plan.

Although Ameren Missouri has been diligent in its compliance with overall requirements of 4 CSR 240-22.050, GDS has found some deficiencies regarding the equivalent treatment of demand and supply-side alternatives, DSM market research, consideration of distributed generation resources, the calculation of T&D avoided costs.

The observed deficiencies and proposed remedies in Ameren Missouri's consideration of demand-side resources in its 2011 IRP are discussed below.

DEFICIENCY #8 - AMEREN MISSOURI HAS NOT CONSIDERED DSM ON AN EQUIVALENT BASIS WITH SUPPLY-SIDE ALTERNATIVES

4 CSR 240-22.010(2)(A) states that utilities shall: "Consider and analyze demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the resource planning process."

4 CSR 240-22.010(2)(B) states that utilities shall: "Use minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan."

Ameren Missouri is deficient in that its Integrated Resource Plan (IRP) fails to consider demand-side management resources ("DSM") on an equivalent basis with supply-side alternatives due in part to the constraints that it places on the amount of DSM spending. Ameren Missouri has selected as its preferred demand side resource option a budget constrained plan which it calls a "Low Risk" portfolio and readily admits that it would increase its spending on energy efficiency if it had better cost recovery treatment. What results is a less than optimal resource acquisition strategy that delays the implementation of significant energy efficiency resources at the expense of Ameren Missouri's customers. Moreover, in selecting candidate resource plans from the alternative resource plans that were analyzed, Ameren Missouri developed and applied a preliminary scorecard that gave only a 25% weight to the Present Value of Revenue Requirements (PVRR). It is highly questionable that a 25% weight satisfies the requirement that a utility use the present worth of long-run utility costs as a "primary selection criteria." The relative low weight given to cost results in less favorable treatment of lower cost plans that rely primarily on demand-side resources compared to higher cost plans that rely primarily on supply-side resources.

Finally there is an additional "equivalence" issue regarding the use of a load forecast to develop demand-side potential estimates that is different than the load forecast that was used to

analyze the need for supply side options. The level of load that is forecast can affect the potential for DSM programs especially those focused on new construction.

DISCUSSION

In our analysis of the Ameren Missouri 2011 IRP filing, we do not find that the utility has considered demand-side efficiency and energy management measures on an equivalent basis with supply-side alternatives in the IRP. Instead, Ameren Missouri has artificially constrained the amount of cost-effective demand-side management (DSM) by choosing to include in its Preferred Resource Plan what it calls a Low Risk DSM Portfolio. According to the utility, the Low Risk Portfolio:

> *"Reduces Cycle 1 levels of program spending and savings to a level commensurate with the Company's growing concerns with the current DSM regulatory framework, especially lost revenues. This portfolio only slightly escalates these levels over time."*[46]

Ameren Missouri does state in its response to DNR 0090 that it is working with stakeholders in the current electric rate case to obtain better financial treatment for DSM efforts, and that it is also investigating other options such as a DSIM filing through the MEEIA rules or additional legislation, but has not made a decision on which options to pursue at this time. Also in DNR 0090, Ameren Missouri admits that it would, "increase its spending on energy efficiency from the low risk scenario if it had better cost recovery treatment. The exact spending level would need to be determined based upon the cost recovery plan that was approved."

So, while the Low Risk Portfolio represents a comprehensive set of programs, the savings that those programs contribute to the Preferred Resource Plan are significantly constrained by Ameren's desire for "better budget treatment." As shown in Figure 7.1 of Chapter 7 of the IRP, the Low Risk Portfolio budget is ** [redacted] ** in 2030 and represents a total budget expenditure of ** [redacted].[47] ** This compares with a total utility budget estimate of ** [redacted][48] ** and ** [redacted][49] ** that Ameren Missouri estimates would be required to achieve the savings associated with the Realistic Achievable Potential Portfolio (RAP) and the Maximum Achievable Potential Portfolio (MAP), respectively. The Low Risk Portfolio budget results in incremental energy savings that are ranked far below the industry leaders according to ACEEE. For example, Table 7.3 in Chapter 7 of the IRP shows an incremental annual energy savings in 2014 that is 0.18% of the baseline system energy forecast.[50] This would rank 25th on the ACEEE list of Incremental Electricity Savings by State for the year 2008 as reported in 2010 State Energy Efficiency Scorecard[51]. The top 5 states saved between 1.14% and 2.59% of electricity sales. Also from Table 7.3, the annual budget as a

[46] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, page 2.
[47] Ameren Missouri's 2011 IRP Workpapers - HC\KFS - HC\Portfolio Screens\Low Risk\Aggregate _ALL_LOWRISK_AUE_2010-08-30-Elec.xls.
[48] Ameren Missouri's 2011 IRP Workpapers - HC\KFS - HC\Portfolio Screens\RAP\Aggregate _ALL _RAP_AUE_2010-08-30-Elec.xls.
[49] Ameren Missouri's 2011 IRP Workpapers - HC\KFS - HC\Portfolio Screens\MAP\Aggregate_ALL_ MAP_AUE_2010-08-30-Elec.xls.
[50] GDS notes that .18% as shown in Table 7.3 of Chapter 7 of the IRP represents incremental DSM as a percent of Total System Energy, as labeled in the table. Calculating this percentage based on the annual sales forecast as reported in Chapter 3, Appendix A of the IRP would result is the same .18%.
[51] American Council for an Energy Efficient Economy, The 2010 State Energy Efficiency Scorecard, October 2010.

percent of total revenue requirements in 2014 of 0.58% would rank 27th on the ACEEE list of Electricity Program Budgets by State for the year 2009 as reported in 2010 State Energy Efficiency Scorecard. The top 5 states spent between 2.44% and 4.4% of revenue.

A further comparison of Ameren Missouri's projected incremental energy savings as a percent of the baseline system energy forecast (0.18% in 2014) with data reported by the U.S. Energy Information Administration[52] shows that Ameren Missouri's projected incremental DSM savings in 2014 would rank below the incremental savings reported in 2009 for the top 20 investor owned utilities in the U.S. (See Table 6-1). Several top investor owned utilities on this list reported incremental energy savings as a percent of annual retail sales in 2009 that approached or exceeded 1%, which is five times greater than what Ameren Missouri is suggesting it can achieve through its preferred Low Risk Portfolio.

[52] EIA Form 861 data for 2009

Table 6-1: Incremental Annual DSM Savings as a Percent of 2009 Retail Sales for Investor Owned Utilities – Top 20 Performers

Utility	State	2009 EE kWh Savings as % of 2009 Retail Sales
Massachusetts Electric Co	MA	1.08%
Southern California Edison Co	CA	0.90%
Puget Sound Energy Inc	WA	0.87%
Rockland Electric Co	NY	0.82%
Dayton Power & Light Co	OH	0.75%
Nevada Power Co	NV	0.72%
NorthWestern Corporation	MT	0.71%
Western Massachusetts Elec Co	MA	0.70%
Sierra Pacific Power Co	NV	0.69%
United Illuminating Co	CT	0.69%
Pacific Gas & Electric Co	CA	0.66%
Madison Gas & Electric Co	WI	0.63%
The Narragansett Electric Co	RI	0.55%
Connecticut Light & Power Co	CT	0.51%
Tucson Electric Power Co	AZ	0.48%
Potomac Electric Power Co	DC	0.48%
UNS Electric, Inc	AZ	0.47%
Baltimore Gas & Electric Co	MD	0.43%
Avista Corp	WA	0.39%
Arizona Public Service Co	AZ	0.37%
Ameren Missouri (projected in 2014)	MO	0.18%

As evidenced by its response to DNR 0155, Ameren Missouri apparently has no information regarding the DSM cost and lost revenue recovery mechanisms of utilities that operate in many of the states with the most successful DSM programs. In that data request Ameren Missouri was asked to provide any information that it has on the top twenty investor-owned utilities in the US that have saved the most kWh on an annual basis with DSM programs (as a percent of total annual kWh sales), and provide whether these investor-owned utilities have any kind of recovery of lost revenues due to DSM programs or DSM incentives. In response Ameren Missouri stated that it "does not have any information on the top twenty investor-owned utilities in the US that have saved the most kWh on an annual basis with DSM programs." Moreover, in response to DNR 0154, Ameren Missouri states that "Ameren Missouri has not

conducted any analyses, reports, or studies of DSM cost recovery, lost revenues recovery, and DSM incentive mechanisms in other states." Ameren's responses to these data request speak to the apparent lack of comprehensiveness of their analysis of potential cost recovery, lost revenues recovery, and DSM incentive mechanisms and their commitment to finding a DSM financial treatment that will support an aggressive portfolio of DSM programs.

While GDS has identified other deficiencies with respect to Ameren Missouri's consideration of demand-side resources in its 2011 IRP filing, the inclusion of the Low Risk Portfolio in the Preferred Resource Plan is of particular concern. It clearly represents a less than optimal demand-side resource acquisition strategy as it delays the implementation of significant energy efficiency resources at the expense of its customers. As evidenced by the Ameren Missouri's statement on page 20 of Chapter 1 of the IRP:

> *"The IRP analysis showed aggressive DSM plans are likely to result in the lowest cost to customers over the planning horizon,* so if regulatory barriers to implementation are removed the aggressive DSM plan could become the preferred plan."

To justify choosing something other than aggressive DSM as its preferred plan, Ameren Missouri presents the results of an approach for scoring alternative resource plans and assessing risk that while very complex, relies on many multiple layers of subjective judgments including the weighting of plan screening factors and the assignment of probability estimates for uncertain factors. One of the most obvious problems with such an approach is that such decision factors and risk estimates are easily biased and difficult to estimate accurately. In particular, GDS notes that in the selection of candidate resource plans from the alternative resource plans that were analyzed, Ameren Missouri developed and applied a preliminary scorecard that gave only a 25% weight to the Present Value of Revenue Requirements (PVRR). It is highly questionable that a 25% weight satisfies the requirement in 4 CSR 240-22.010(2)(B) that utilities "Use minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan." PVRR is the primary metric in IRP analysis and as Ameren notes in their IRP filing, "the lowest cost plans are the DSM-only plans, while the base load plans are the highest cost."[53] Yet, the preferred resource plan proposed by Ameren Missouri is ultimately a plan that minimizes DSM investment resulting in higher long-run utility costs. This burden will ultimately be borne collectively by all of Ameren Missouri's customers. Ameren's discussion in Chapter 10 of the IRP is somewhat vague regarding how the final Preferred Resource Plan was selected, citing their scorecard approach and dashboard summaries as tools to "facilitate deeper discussion and consideration by Ameren Missouri's senior management in selecting the Preferred Resource Plan."[54]

Finally, GDS notes another potential issue regarding equal treatment of demand and supply-side resources: The load forecast used to develop demand-side potential estimates is different than the load forecast that was used in the 2011 IRP filing. The higher load forecast used in the IRP would imply more potential for DSM programs, especially those focused on new construction. According to Ameren Missouri, their consultant Global Energy Partners (GEP)

[53] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 9, page 7.
[54] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 10, page 14.

used a bottom-up, end-use approach to develop estimates of energy efficiency potential.[55] After reviewing the energy efficiency study reports it is not clear to GDS how a different forecast would impact the energy efficiency potential estimates developed by GEP. However we do note that at the September 14, 2010 Stakeholder meeting Mr. Costenero of Ameren Missouri was asked if the different IRP forecast (compared to the forecast that GEP used in their potential analysis) would impact the estimated DSM potential. He responded that he thought that the "forecasts from the IRP and from the GEP potential study were close enough that the effect would be minimal," and that he would "go back and look at it and check it out"[56] GDS was unable to find any follow-up that was provided by Ameren Missouri in response to this issue.

REMEDY

GDS recommends that Ameren Missouri should commit to the following actions:

a. Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should clearly articulate its position regarding the "better" DSM cost treatment that it would require to increase its DSM spending beyond that which is proposed in the Low Risk portfolio. This should include the recommended financial treatment of DSM that would cause the company to move forward with either the RAP or MAP options.

b. Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should conduct and present analysis of the impact on the selection of candidate resource plans of changing the weighting factor applied to PVRR from 25%, looking at various alternative weighting factors that would meet the requirement that PVRR be the primary selection criterion. GDS suggests that at a minimum Ameren Missouri should analyze the impact of assigning a 50% weighting factor to PVRR.

c. Prior to agreement of the parties in Case EO-2011-0271, Ameren Missouri should provide the results of their review of the impact of a different IRP load forecast (compared to the forecast that GEP used in their potential analysis) that is referenced on pages 98-99 of the Transcript of the , September 14, 2010 Stakeholder Meeting (see footnote 56)

DEFICIENCY #9 - AMEREN MISSOURI'S CONCLUSIONS REGARDING THEIR CUSTOMER'S INTEREST IN DSM IGNORE A CRITICAL MARKET RESEARCH FINDING REGARDING THE POTENTIAL CONNECTION BETWEEN LOW CUSTOMER SATISFACTION AND DSM PROGRAM PARTICIPATION RATES.

4 CSR 240-22.050(5) states that the utility shall conduct market research studies, customer surveys, pilot demand-side programs, test marketing programs and other activities as necessary to estimate the technical potential of end-use measures and to develop the information necessary to design and implement cost-effective demand-side programs. These research activities shall be designed to provide a solid foundation of information about how and by whom energy-related decisions are made and about the most appropriate and cost-effective methods of influencing these decisions in favor of greater long-run energy efficiency.

[55] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, page 17.
[56] AMERENUE IRP STAKEHOLDER MEETING, GOVERNOR OFFICE BUILDING' 200 MADISON STREET JEFFERSON CITY, MISSOURI, September 14, 2010, Transcript, pages 98 -99.

While Ameren Missouri should be commended for conducting comprehensive market research to support the design and delivery of DSM programs, it is deficient in that it chose to ignore a critical finding of that research when it concluded that its customers are different than others in the nation with regard to their level of interest in DSM. It is clear from the research that Ameren Missouri has a problem with how some customer groups view the company and that lower levels of customer satisfaction among these groups appears to be a key factor in their decision to participate in DSM programs. This may explain why the overall realistic take rates for Ameren Missouri's programs are lower than those for many other U.S. utilities. GDS is concerned that by overlooking this key research finding as to why its customers express less interest in DSM than those of other utilities, Ameren Missouri has underestimated long term customer participation rates in DSM programs. As clearly stated in 4 CSR-22.050(5), market research activities should be designed to not only gather information about how and by whom energy-related decisions are made, but also address "the most appropriate and cost-effective methods of influencing these decisions in favor of greater long-run energy efficiency." GDS finds that Ameren Missouri has not adequately addressed this aspect of the rule.

DISCUSSION

Ameren Missouri should be commended for conducting a comprehensive energy efficiency potential study[57] that included a primary market research[58] effort to better understand the attributes of the Ameren Missouri's service territory, including end-use saturations and program interest. The saturation survey focused on the home or premise characteristics, electricity end-use data, and the saturation of appliances, equipment, and measures. The program interest survey collected similar information about the home or premise characteristics for comparison, but focused on the customer demographics, psychographics, and attitudes. In addition, trade ally in-depth interviews were conducted to gain a qualitative understanding of the willingness of these entities to work with Ameren Missouri and to promote energy efficiency in Ameren Missouri's service area.

Based on the results of this study, Ameren Missouri concluded that its customers are "different than others in the nation. They typically express less interest in DSM investments at this time."[59] In particular, Ameren Missouri states in their response to DNR 0093, that the basis of this statement comes from the Ameren Missouri DSM Market Potential Study, Volume 2: Chapter 4, page 22 (page 67 of 185 in the overall Volume) and Chapter 7, page 26 (page 143 of 185 in the overall Volume). Global Energy Partners, the consultant that conducted the DSM market potential study for Ameren notes in their report that the market research described in Volume 2 of their study "informed the description of the current AmerenUE (Ameren Missouri) market (particularly customer preferences for various programs and technology types)."[60] Additionally they state that "both the MAP and RAP cases are grounded in the primary market

[57] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, Appendix B (Executive Summary) - Full report is available at http://www.ameren.com/sites/aue/Environment/Renewables/Pages/IRPenergyefficiencystudy.aspx.
[58] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 2: Market Research Results from the Saturation, Program Interest and Trade Ally Research, Report Number 1287-2, prepared by Global Energy Partners, LLC, January 2010.
[59] DNR 0093.
[60] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 4: Program Analysis, Global Report Number 1287-4, prepared by Global Energy Partners, LLC, January 2010, page 2-2.

research conducted as part of this project (and reported in Volume 2 of this study)."[61] While GDS again commends Ameren Missouri for conducting primary market research and using that research to inform the DSM program participation rate assumptions used in the development of RAP and MAP, we are concerned that a key conclusion of this research was overlooked in the determination of long term customer participation rates in DSM programs. Specifically, GDS found in its review of the references cited by Ameren Missouri (in DNR 0093) to support its conclusions regarding customer interest in DSM that a critical fact was overlooked. For the residential sector the market research study concluded the following:

> *"It appears that psychographic factors (attitudes) have a larger impact on customer response to tested EE programs than do demographic differences. This means that how customers think about AmerenUE (Ameren Missouri) is likely to be much more important in predicting how they will respond to new EE programs offered by the company, than will differences in how they are situated (where they live or how large is their income)"*[62]

Similarly, for the C&I sector, the market research concluded that:

> *"It appears that psychographic factors (attitudes) have a larger impact on customer response to tested EE programs than do most firmographic differences. This means that how business customers think about AmerenUE (Ameren Missouri) is likely to be in some, or even many situations, more important in predicting how they will respond to new EE programs offered by the company, than will differences in their business (by size, industry, or the like)"*[63]

For both the residential and C&I sectors, the study concluded that:

> *"How customers think about AmerenUE (Ameren Missouri) may explain why the overall realistic take rates for Ameren UE's (Ameren Missouri's) programs are lower than they are for those observed at many other U.S. utilities"*[64]

It is clear from the above statements that Ameren Missouri's consultant Global Energy Partners believes that customer attitudes towards Ameren Missouri may be a key determinant in predicting DSM program participation rates and might explain why take rates for Ameren Missouri programs are lower than those for many other U.S. utilities. The research does not support the Ameren Missouri's conclusion that its customers are simply different from others in the nation. Instead the conclusion might be restated that if Ameren improved its customer satisfaction ratings in regard to Ameren Missouri as an energy provider, then the market research indicates that it is likely that the willingness of its customers to participate in DSM programs would increase accordingly. It is ironic that DSM programs have been determined to be an effective way to improve customer satisfaction. According to the *National Action Plan for*

[61] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 4: Program Analysis, Global Report Number 1287-4, prepared by Global Energy Partners, LLC, January 2010, page 5-1.
[62] AmerenUE Demand Side Management (DSM) Market Potential Study Volume 2: Market Research Results from the Saturation, Program Interest and Trade Ally Research, Report Number 1287-2, prepared by Global Energy Partners, LLC, January 2010, Chapter 4, page 22 (page 67 of 185 in the overall Volume).
[63] Ibid., Chapter 7, page 26 (page 143 of 185 in the overall Volume).
[64] Ibid., Chapter 4, page 22 (page 67 of 185 in the overall Volume) and Chapter 7, page 26 (page 143 of 185 in the overall Volume).

Energy Efficiency, DSM delivers lower energy bills, greater customer control, and greater customer satisfaction. The report goes on to say that:

> *"Well-designed energy efficiency programs can provide opportunities for customers of all types to adopt energy savings measures that can improve their comfort and level of service, while reducing their energy bills. These programs can help customers make sound energy use decisions, increase control over their energy bills, and empower them to manage their energy usage. Customers are experiencing savings of 5, 10, 20, or 30 percent, depending upon the customer, program, and average bill. Offering these programs can also lead to greater customer satisfaction with the service provider."*[65]

Ameren Missouri apparently fails to recognize this connection and further, has not developed a plan to address the low customer satisfaction ratings among some groups identified in the market research. This was confirmed by the company in its response to DNR 0172 in which it stated, "Ameren Missouri has not developed a specific plan to address customer satisfaction ratings among certain groups identified in the DSM Potential Study."

While Ameren Missouri also states in DNR 172 that it has a separate team focused on monitoring, reporting, and acting on customer satisfaction, "consideration of EE programs comprise only a small part of the customer satisfaction team's overarching strategy." [66]

REMEDY

GDS recommends that Ameren commit to the following actions:

(a) Within 90 days following Commission approval of agreement on this remedy, Ameren shall initiate additional research to determine:

1. Whether customer satisfaction has changed significantly during the interim period among those groups that are identified in Volume 2 of the Market Potential Study.
2. Whether customer satisfaction has been influenced by Ameren's DSM efforts since the GEP study was conducted.
3. How Ameren can improve customer satisfaction (and hence DSM program participation), especially among those groups that are identified in Volume 2 of the Market Potential Study as having the lowest levels of satisfaction with Ameren Missouri as an energy provider

(b) Within 270 days following Commission approval of agreement on this remedy, Ameren shall, develop and implement an action plan, with measurable goals, to improve customer satisfaction, if this is still found to be a problem among certain customer groups.

[65] The National Action Plan for Energy Efficiency Report, U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency, July 2006, page ES-4.
[66] DNR 0172

(c) Ameren's next annual filing shall address the impact that improved customer satisfaction will have on DSM program penetration rates, to include a discussion of the progress and results of these efforts in its annual report.

DEFICIENCY #10 – AMEREN MISSOURI FAILED TO DOCUMENT MARKET STUDIES THAT ARE PLANNED OR IN PROGRESS.

4 CSR 240-22.050(11) states "To demonstrate compliance with the provisions of this rule, and pursuant to the requirements of 4 CSR 240-22.080, the utility shall prepare a report that contains at least the following information:…(E) Copies of completed market research studies, pilot programs, test marketing programs and other studies as required by section (5) of this rule and descriptions of those studies that are planned or in progress and the scheduled completion dates"

DISCUSSION

While Ameren Missouri documented the demand side potential study and other research it completed for its 2011 compliance fling, it failed to describe its future plans for research activities required by 4 CSR 240-22.050(5).

REMEDY

GDS recommends that Ameren should identify where its future plans can be found in the filing or commit to the following actions:

(a) Within 90 days following Commission approval of agreement on this remedy, Ameren shall file its plans for future research as required by 4 CSR 240-22.050(5), including the research referenced in the remedy to GDS Deficiency #9. These plans shall include at least the following elements:

   a. Purpose of the research and questions it is intended to answer,
   b. Tentative start and completion dates,
   c. Proposed methodology,
   d. State whether the company intends to contract with an outside consultant to conduct or evaluate the research,
   e. State whether the company intends to solicit stakeholder input, and
   f. an indication of the nature and timing of the input.

DEFICIENCY #11 – AMEREN MISSOURI FAILED TO CONSIDER SIGNIFICANT COMBINED HEAT AND POWER (CHP) POTENTIAL IDENTIFIED IN ITS DISTRIBUTED GENERATION (DG) POTENTIAL STUDY

4 CSR 240-22.050(1)(D) states that: "The analysis of demand-side resources shall begin with the development of a menu of energy efficiency and energy management measures that provide broad coverage including — Renewable energy sources and energy technologies that substitute for electricity at the point of use."

While Ameren Missouri conducted a comprehensive distributed generation (DG) potential study to look at renewable energy and energy technologies at the point of use, it is deficient in that it failed to seriously consider the most promising and cost-effective technology identified in the study - combined heat and power (CHP).

DISCUSSION

As described in Chapter 7 of the IRP[67], Ameren Missouri chose to evaluate the potential opportunities for distributed generation technologies as part of a complete set of demand side energy options. The utility commissioned a market penetration study to analyze various distributed generation (DG) technologies and also to identify the market potential for those technologies in Ameren Missouri's service territory. The utility noted that because DG technologies are often small units which are used to offset customer load, Ameren Missouri chose to analyze these technologies alongside other demand side technologies. Further, GDS notes that Chapter 22 rules are structured so that utility-scale DG are treated under 040 and customer-based DG are treated under 050 -- see 4 CSR 240-22.050(1)(D).

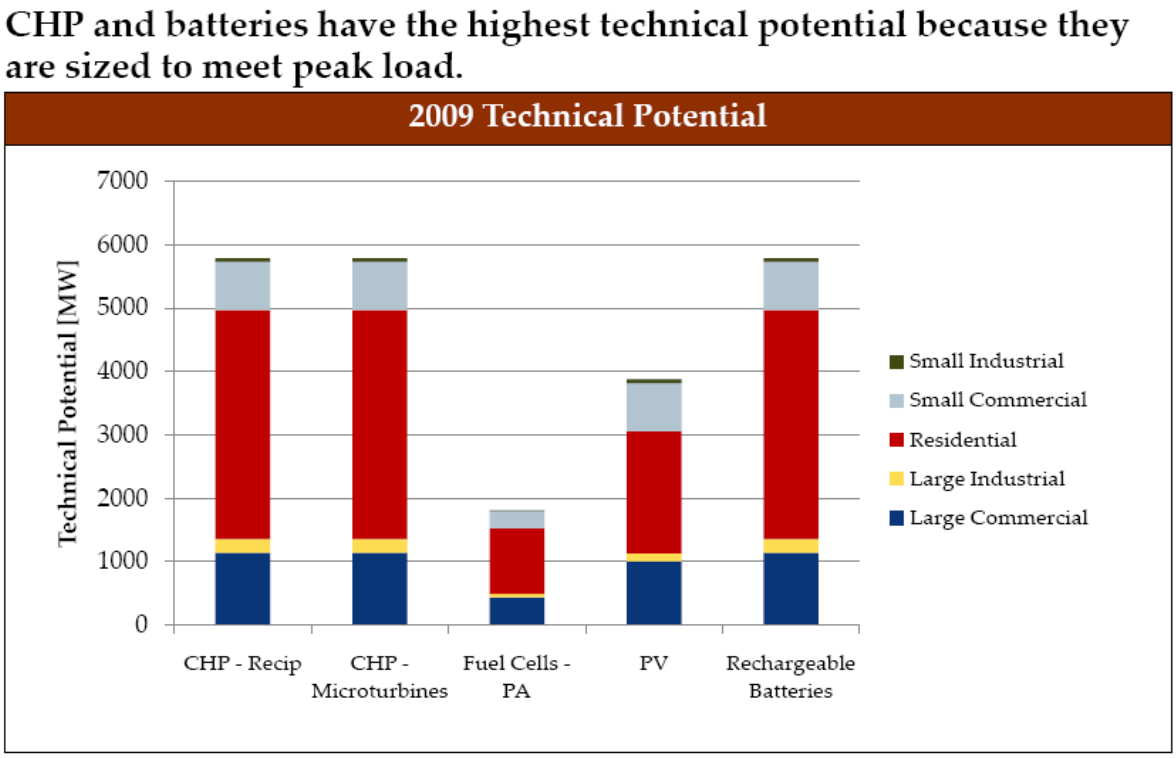
Ameren Missouri's DG analysis found that:

> *"Combined heat and power (CHP) has the most promising future due to the relative mature nature of the technology and the added benefit of recouping waste heat. Due to the relatively low capacity factors, long payback periods, and insufficient rebates, PV ("solar photovoltaics") witnesses little market penetration in the planning horizon."*

In spite of this finding, Ameren Missouri states in the IRP that, "PV provides the best opportunities in the current operating environment and has therefore received a majority of the resources thus far."[68] Explaining this focus on PV in their response to DNR 0107, Ameren Missouri states that, "distributed solar photovoltaics represent an opportunity for Ameren Missouri to comply with renewable energy standard (RES) requirements. While CHP does have favorable economics, their generation technologies have significantly more emissions and the utility cannot utilize any CHP to count towards meeting the RES requirements." It does not follow that because one DG technology, PV, helps Ameren Missouri comply with RES requirements that it should therefore eliminate another DG technology, CHP, from potential inclusion in its portfolio of DSM programs, especially if, as the utility states, CHP has favorable economics and the most promising future. The following chart from the Ameren Missouri's DG Market Penetration Assessment shows that CHP has significant market potential.

[67] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, page 56.
[68] Ibid., p. 64.

Figure 6-1: CHP Technical Potential From DG Market Penetration Assessment[69]



According to the Combined Heat & Power Partnership of the U.S. Environmental Protection Agency, CHP projects can yield numerous benefits to electric and gas utilities and to the public, including:

- Bringing economic development to a state.
- Reducing peak electrical demand on the grid.
- Yielding improvements to electric grid system efficiency by reducing grid congestion.
- Deferring or displacing more expensive transmission and distribution infrastructure investments.
- Reducing the environmental impact of power generation.
- Helping to meet state mandated renewable portfolio standards in states where CHP constitutes an eligible resource.
- Reducing fuel price volatility.

REMEDY

GDS recommends that Ameren commit to the following actions:

[69] AmerenUE DG Market Penetration Assessment, Final Report, prepared for Ameren UE by Navigant Consulting September 30, 2009, page 57.

Within 120 days following the Commission approval of agreement on this remedy, Ameren Missouri should provide a detailed analysis to support the elimination of CHP as a primary DG resource option that at a minimum considers all of the potential benefits identified by the Combined Heat & Power Partnership of the U.S. Environmental Protection Agency (See above discussion).

DEFICIENCY #12 – AMEREN MISSOURI DID NOT ADEQUATELY CONSIDER POTENTIAL DISTRIBUTED GENERATION PROGRAMS IN THE PORTFOLIOS INCLUDED IN ITS ALTERNATIVE RESOURCE PLANS AND ANALYZED IN DETERMINING ITS PREFERRED RESOURCE PLAN

4 CSR 240-22.050(6)(D) states that: The utility shall develop a set of potential demand-side programs that: "Include a delivery strategy that outlines the anticipated approach to promotion and delivery of the programs to the target market segment. This delivery strategy shall include basic information regarding marketing and implementation strategy as an element of program design and will outline approach, channels, and incentive, outreach and administrative processes. The strategies should be detailed enough to provide the Company and the parties with a sense of the proposed approaches as a basis for: (1) estimating program costs and aggregate load impacts and (2) making a high level assessment of the reasonableness of the proposed marketing plan and delivery strategy. The detailed delivery strategy will be available at the time of the appropriate proceeding before program implementation."

Ameren Missouri is deficient in that it did not include in its preferred resource plan any program plans to address the acquisition of DG resources and ignored the impact that potential program incentives might have on its estimates of DG market penetration.

DISCUSSION

GDS finds that while Ameren Missouri developed a set of potential demand-side programs that are designed (with the exception of the level of financial commitment) to deliver an appropriate selection of end-use energy efficiency measures to each market segment it did not meet this requirement with distributed generation (DG) programs. As noted in the above discussion of Deficiency #11, Ameren Missouri chose to analyze DG alongside other demand side technologies because DG technologies are often small units which are used to offset customer load. Using both qualitative and quantitative screens, Ameren Missouri identified PV, CHP, Fuel Cells and Rechargeable Batteries to be included in their analysis of market potential. Table 6.2 below from Chapter 7 of the IRP filing shows the projected DG market penetration in MWh for these technologies over the planning horizon. As can be seen in Table 6-2, DG offers significant potential with CHP clearly the dominant DG opportunity. In total, even the Business as Usual (BAU) DG scenario has significant potential across all technologies identified in Table 6-2 (15,654,052 MWh) that exceeds the total cumulative energy net savings in 2030 for the Low Risk Portfolio (13,625,840 MWh)[70]

[70] Ameren Missouri's 2011 IRP Workpapers - HC\KFS - HC\Portfolio Screens\Low Risk\Aggregate _ALL_LOWRISK_AUE_2010-08-30-Elec.xls.

Table 6-2: Market Penetration Estimates from DG Market Penetration Assessment[71]

Table 7. 22: Market Penetration (MWh)

Technology	2010	2020	2030
CHP Microturbine			
BAU	816	110,304	4,451,305
High Infrastructure	766	102,761	6,531,089
Tech Revolution	866	141,265	6,629,786
CHP Reciprocating Engine			
BAU	-	171,121	11,142,749
High Infrastructure	-	185,767	13,041,603
Tech Revolution	-	208,984	13,177,549
Phosphoric Acid Fuel Cell			
BAU	-	-	-
High Infrastructure	-	-	219,101
Tech Revolution	-	-	-
PV Residential			
BAU	-	-	62
High Infrastructure	-	-	324
Tech Revolution	-	-	104,330
PV Commercial			
BAU	-	-	4,545
High Infrastructure	-	-	6,585
Tech Revolution	-	1,007	203,606
Batteries			
BAU	-	31	55,391
High Infrastructure	-	1	98,738
Tech Revolution	-	477	608,182

In estimating DG market penetration it should be noted that Ameren Missouri stated in response to DNR 0106 that it did not investigate offering DG incentives with the exception of $2 per installed watt of photovoltaics. The utility also acknowledged that it did not review the current "minimum bill" requirements of Ameren's Supplemental Service Rate, Rider E and the potential impact on CHP installations of revising this element of Ameren's rate structure. Instead of presenting DG program delivery strategies, including incentives, in the IRP, Ameren Missouri states[72] that is evaluating various DG options and developing strategies to connect with customers. Further Ameren Missouri states that it has dedicated a core group of specialists to this effort that will include analyzing various technologies, identifying communication strategies, and determining necessary incentive dollars to move the market. However, Ameren Missouri provided no work plan and schedule for this effort.

[71] AmerenUE DG Market Penetration Assessment, Final Report, prepared for Ameren UE by Navigant Consulting September 30, 2009, page 57
[72] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, page 56.

REMEDY

GDS recommends that Ameren commit to the following actions:

Within 60 days following the Commission approval of agreement on this remedy, GDS recommends that Ameren be required to provide a detailed scope of work and schedule for its ongoing evaluation of various DG options and development of strategies to connect with customers. Ameren Missouri notes in its 2011 IRP filing that it has dedicated a core group of specialists throughout the corporation to focus on multiple aspects of a distributed generation strategy. Analyzing the various technologies, identifying communication strategies, and determining necessary incentive dollars to move the market are all within the scope of this group.[73]

DEFICIENCY #13 - AMEREN MISSOURI'S T&D AVOIDED COST METHODOLOGY RELIES ON UNSUBSTANTIATED "ADJUSTMENT FACTORS" AND IS INAPPROPRIATE FOR ASSESSING THE VALUE OF TARGETED DSM

4 CSR 240-22.050(2) states that AmerenUE (Ameren Missouri) shall include an estimate of avoided transmission and distribution costs. In addition, Ameren Missouri shall describe its method for (1) grouping hourly forecasted prices into avoided cost periods to reflect significant differences in the seasonal and/or hourly variation in prices, and (2) for allocating capacity costs to these periods, and (3) a description of the assumptions and procedures used for avoided capacity costs including Ameren Missouri forward view of the market price of regulatory capacity, the MISO CONE, the development of avoided cost estimates for transmission and distribution facilities.

While Ameren Missouri did include the required estimate of avoided transmission and distribution (T&D) avoided costs in its analysis of DSM measures and programs, GDS finds that its methodology for developing these avoided T&D costs relies too heavily on subjective, unsubstantiated "adjustment factors" and is inappropriate for assessing the value of targeted DSM, Demand Response (DR) and Distributed Generation (DG) in deferring T&D investments.

DISCUSSION

While Ameren Missouri did include the required estimate of avoided transmission and distribution (T&D) avoided costs in its analysis of DSM measures and programs, GDS finds that its methodology for developing these avoided T&D costs relies too heavily on subjective, unsubstantiated "adjustment factors" and is inappropriate for assessing the value of targeted DSM, Demand Response (DR) and Distributed Generation (DG) in deferring T&D investments. Regarding the latter point, Ameren Missouri acknowledges in their response to DNR 0097 that its DSM planners are "working with Ameren Missouri distribution system planners in the review and analysis of new tools, such as the DataRaker software, that can interface with the Transformer Load Management system to identify specific areas where targeted DSM opportunities might exist." In that same response, Ameren Missouri also responded that it has not reviewed geographically targeted DSM programs designed to avoid or offset transmission investments that have been studied or implemented in other states.

[73] Ameren Missouri's 2011 Integrated Resource Plan, Chapter 7, page 64.

In regard to the adjustment factors that Ameren Missouri employed in their development of T&D avoided costs, these factors are purely judgmental[74] and unsupported.[75] The impact of these judgmental adjustment factors on the final avoided T&D values used by Ameren Missouri is significant, as can be seen in Table 6-3, which shows the following calculation of transmission avoided cost from Ameren Missouri's IRP workpapers.[76] As can be seen, the application of multiple judgmental adjustment factors reduces the potential avoided transmission project budget from [redacted]**, a 72% reduction. Without this adjustment, the avoided transmission cost shown as **$8.55** in Table 6-3 would be **$30.55.** While GDS understands that some T&D projects cannot be deferred with DSM, which is the reason that Ameren Missouri uses judgmental adjustment factors in its calculation of T&D avoided costs, we are concerned by the lack of rigor in the approach and support for the adjustment factors that were chosen.

Table 6-3: Transmission Avoided Cost Calculation from Ameren Missouri Work Papers

[redacted]

Table Source: See Footnote #78

Proper assessment of the avoided T&D value of DSM (including DG & DR), requires that a more rigorous and well documented approach be applied than what Ameren Missouri has presented in the 2011 IRP. While avoided T&D capacity costs, on a service area average basis, are included in the cost effectiveness evaluation of DSM, this approach is appropriate only if DSM options are assumed to be uniformly distributed over the service area. But with greater interest in DG, DR and targeted DSM programs among utilities, different approaches are needed that incorporate some local area integrated resource planning and closer coordination between system level resource planning and T&D planning functions.

REMEDY

GDS recommends that Ameren commit to the following actions:

[74] Ameren Missouri's 2011 IRP Workpapers - HC\WRD - HC\Avoided Costs\Avoided T&D\Transmission Avoided Cost Description.doc.
[75] See response to DNR 0098, part b.
[76] Ameren Missouri's 2011 IRP Workpapers - HC\WRD - HC\Avoided Costs\Avoided T&D\Transmission Avoided Cost Factors.xls

a. In the next regularly scheduled compliance filing, Ameren Missouri should develop a more rigorous and well documented approach for the development of avoided T&D costs to support the cost effectiveness analysis of DSM resources that are expected to be uniformly distributed over the service area. If judgmental "adjustment factors" continue to be utilized, Ameren should provide documentation to support the assumed adjustment factors and also test the sensitivity of DSM cost effectiveness to a reasonable uncertainty range around each adjustment factor.

b. Within 60 days, Ameren Missouri should be required to provide a detailed scope of work and schedule for its development of new tools that can interface with the Transformer Load Management system to identify targeted DSM opportunities with the goal of incorporating new planning tools into the next IRP