GDS Associates, Inc.
Engineers and Consultants

FINAL REPORT

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Review of Kansas City Power & Light 2012 Utility Resource Filing Pursuant to 4 CSR 240 – Chapter 22

(CASE NO. EO-2012-0323)

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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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1.0 INTRODUCTION

On April 9, 2012, pursuant to Chapter 22 of the Missouri Public Service Commission's Rules (4 CSR 240-22), Kansas City Power & Light Company ("KCP&L") filed an Integrated Resource Plan ("IRP") in compliance with the Commission's Electric Utility Resource Planning report requirements.

The Missouri Department of Natural Resources ("MDNR") then contracted with GDS Associates, Inc. ("GDS") to identify whether KCP&L's IRP filing complies with the provisions of the Electric Utility Resource Planning rules in the following areas:

- Load forecast bandwidths
- Weather normalized energy sales.
- Potential double counting of DSM impacts
- Combined KCP&L and /KCP&L-Greater Missouri Operations (GMO) planning approach
- Assumed coal prices
- Treatment of ultra-low sulfur coal
- Consideration of natural disasters
- Relationship between power plant capacity factors and renewable resources in the preferred plan
- Wind resource cost assumptions
- Transmission interconnection costs for wind resources

The above review areas for GDS were determined jointly with MDNR based on a preliminary review of the KCP&L IRP filing and support documents, and the identification of IRP review areas, such as DSM, that were already being addressed by MDNR.

This report provides MDNR with GDS's comments on KCP&L's IRP compliance filing in Case EO-2012-0323. In the report, we identify and discuss deficiencies and concerns in KCP&L's filing in those areas referenced above, and recommend remedies.

This report references the following KCP&L's sources:

- The primary narrative volumes and appendices included in KCP&L's April 9, 2012 (IRP) filing, referenced by the Chapter or Appendix numbers assigned by KCP&L;
- Accompanying work papers distributed to MDNR by KCP&L as part of its April 9 IRP filing, referenced by the file name assigned by KCP&L;
- KCP&L's responses to MDNR data requests, referenced by data request number

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

2.0 SUMMARY OF DEFICIENCES AND CONCERNS

After reviewing KCP&L's 2012 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 and concerns to the attention of the MDNR. The GDS review was limited to those areas identified above in Section 1. Following the description of each listed deficiency is an identification of the relevant section of 4 CSR 240-22, to which the deficiency applies. A detailed discussion of each deficiency and concern, and a proposed remedy can be found in Sections 3 – 6 of this report.

DEFICIENCY #1 – KCP&L FAILED TO FULLY DESCRIBE ADJUSTMENTS MADE TO THE HISTORICAL DATA USED IN DEVELOPING THE ENERGY SALES FORECASTING MODELS

KCP&L failed to fully describe how the historical energy consumption data series for each class were adjusted to reflect existing DSM programs. As a result, there is an apparent double counting of DSM impacts in development of the net energy and net load forecasts. (4 CSR240-22.030(6)(C)(2))

DEFICIENCY #2 – KCP&L HAS NOT CONSIDERED ULTRA-LOW SULFUR COAL IN ITS IRP IGNORING ITS POTENTIAL AS A PRACTICAL CONTINGENCY OPTION AND ITS ABILITY TO ADDRESS ENVIRONMENTAL COMPLIANCE REQUIREMENTS.

KCP&L did not include the use of ultra-low sulfur coal in the development of its IRP. Ultra-low sulfur coal is, however, an available fuel that could provide benefits to KCP&L's customers and could also potentially impact the selection of new generating resources during the term of the IRP. Furthermore, it offers additional value as an environmental compliance option. (4 CSR 240-22.040(5)(A) and (D))

DEFICIENCY #3 – KCP&L DID NOT PROVIDE ADEQUATE DOCUMENTATION TO SUPPORT THE REASONABLENESS OF WIND RESOURCE COST ASSUMPTIONS

** [redacted] ** However, it is more likely that wind energy capital costs and fixed O&M costs will decline in the future based on a number of factors. The IRP is deficient in its failure to "fairly" analyze and compare costs of wind against other resources. That wind energy has had and is expected to continue to have ongoing per MWh cost reductions suggests that a "fair" analysis of wind energy costs would consider this market trend. (4 CSR 240-22.040(1) and 4 CSR 240-22.040(5)(B))

DEFICIENCY #4 – KCP&L DID NOT PROVIDE ADEQUATE DOCUMENTATION TO SUPPORT THE TRANSMISSION INTERCONNECTION COSTS FOR WIND RESOURCES

[redacted]

DEFICIENCY #5 – KCP&L HAS NOT CLEARLY SHOWN IN THE IRP HOW THE ALLOCATION OF RESOURCES FROM THE COMBINED-COMPANY TO EACH SEPARATE COMPANY IS DETERMINED

KCP&L's IRP filing contains no discussion of how the combined company alternative resource plans were developed. KCP&L's plan is also deficient in that there is no explanation of how resources included in the combined company alternative resource plans were subsequently allocated between GMO and KCP&L. Further, KCP&L's plan is deficient in that combined company alternative resource plans were defined using not only potential resources that were developed by KCP&L in response to 4 CSR 240-22.040(4) but also potential GMO candidate resources that were not developed by KCP&L. The inclusion by a utility of resources that were not developed pursuant to 4 CSR 240-22.040(4) by that utility is a deviation from the rule. *(4 CSR 240-22.060(1) and 4 CSR 240-22.060(3))*

CONCERN #1 – KCP&L'S ASSUMED FORECAST BANDWIDTHS FOR POPULATION AND NUMBER OF HOUSEHOLDS APPEAR TO BE TOO NARROW.

In developing the high and low bandwidth projections for population and number of households in its 2012 IRP, KCP&L based the projections on an assumption that produces unreasonably narrow bandwidths. As a result, the high and low growth case load forecasts also do not reflect a reasonable bandwidth when compared to historical growth. The number of households is the driver variable in the residential customer model.

[1] KCPL 240-22.040(4)(C) Transmission Interconnection Costs.xlsx

CONCERN #2 – KCP&L'S USE OF CERTAIN INDEPENDENT VARIABLES IN THE MODELS USED TO WEATHER NORMALIZE ENERGY SALES IS QUESTIONABLE

Most of the models developed by KCP&L to weather normalize historical class energy sales include one or more variables that are not statistically significant at a 95% confidence level. KCP&L fails to report the R-squares and goodness of fit measures for their models.

CONCERN #3 – KCP&L HAS NOT CONSIDERED A BROAD ENOUGH RANGE OF POTENTIAL COAL PRICES IN ITS IRP

KCP&L has not considered a significant enough range of coal fuel prices in the development of its preferred or alternative resource plans. For KCP&L's High and Low coal price forecasts, the variation from the Mid case is less than or equal to approximately ** [redacted] ** for 11 years of the 20 year study period, and the maximum variation between cases in any year is approximately ** [redacted] **. Also, the levelized growth rate for each of the cases is less than ** [redacted] ** per year from 2013 through 2031. A broader range in coal prices used for the development of the preferred plan would further ensure that a robust plan is selected.

CONCERN #4 – KCP&L'S ASSUMED COAL PLANT CAPACITY FACTORS ARE NOT REPRESENTATIVE OF RECENT ACTUAL OPERATING EXPERIENCE AND THE IMPACT OF THESE ASSUMED HIGHER CAPACITY FACTORS ON WIND OPTIONS HAS BEEN OVERLOOKED.

KCP&L may have overstated the capacity factors of coal plants in their comparison of costs for coal plants and in their expected supply of MWh from coal plants. This issue affects the ability of existing supply resources to meet expected demand and limits the potential role of new renewable resources such as wind in the preferred plan.

CONCERN #5 – KCP&L DID NOT ADDRESS THE IMPACT OF NATURAL DISASTERS, SUCH AS THE FLOOD AT THE IATAN COAL PLANT, IN CONTINGENCY PLANS

KCP&L has failed to consider in its contingency plans the potential impact of natural disasters such as the extreme flooding that occurred in 2011. While such flood related outages affecting multiple units may occur infrequently and in some instances be addressed through flood control measures, they should not be overlooked due to the potentially devastating impacts and costs associated with such multi-plant events

3.0 LOAD ANALYSIS AND FORECASTING (4 CSR 240-22.030)

Consistent with the requirements of 4 CSR 240-22.030 as it relates to the preparation of energy and peak load forecasts, KCP&L has prepared a range of forecasts out to the year 2035. These energy and peak load forecasts provide the basis for estimating the utility's future supply resource needs as well as the load information needed to perform its demand-side resource analysis. KCP&L presents its load analysis and discusses its load forecasting methodology in Volume 3 of the 2012 Integrated Resource Plan.

Although KCP&L has been diligent in its compliance with the overall requirements of 4 CSR 240-22.030, it can be faulted for developing unreasonably narrow bandwidth forecast of population and households, specifying models that include variables that are not significant, and failing to fully document adjustments to historical data used in developing the energy forecasting models.

The observed rule deficiencies and concerns with KCP&L's load analysis and forecast as well as proposed remedies are discussed below.

DEFICIENCY #1 – KCP&L FAILED TO FULLY DESCRIBE ADJUSTMENTS MADE TO THE HISTORICAL DATA USED IN DEVELOPING THE ENERGY SALES FORECASTING MODELS

4 CSR240-22.030(6)(C)(2) states that: "The utility shall explain any adjustments that it made to historical data prior to using it in its development of the forecasting models".

KCP&L failed to fully describe how the historical energy consumption data series for each class were adjusted to reflect existing DSM programs. As a result, there is an apparent double counting of DSM impacts in development of the net energy and net load forecasts.

DISCUSSION

KCP&L developed statistically adjusted end-use econometric models to forecast class energy sales. The models incorporate numerous factors that influence energy consumption, including economic activity, weather conditions, price of electricity, end-use market shares, appliance efficiencies and federal appliance standards. The energy sales forecasts feed into the peak demand forecasting models to generate the peak demand forecasts.

KCP&L presented projected energy and demand requirements on a gross and net basis. Gross requirements do not include the impacts of energy efficiency and demand side management (DSM) program measures and thus represent requirements that would have occurred had there not been any company DSM programs since 2005. Net requirements include the impacts of company DSM programs. Neither gross nor net requirements include potential impacts of programs that might be adopted by the company in the future.

At question is the potential double counting of existing DSM and energy efficiency program impacts. The energy sales forecasting models were developed using historical sales, which reflect the impacts of existing DSM and energy efficiency programs. Unless the historical data was adjusted up to account for program impacts, the gross forecast would reflect program

impacts and the net forecast would reflect sales where program impacts were accounted for two times, once in the actual historical data, and secondly, in the post-model adjustment made by KCP&L to remove program impacts.

GDS investigated this issue in discovery. In response to Question No. 43, KCP&L indicates that savings from the energy efficiency programs were added to the historical sales data prior to running the forecasting models.

REMEDY

GDS recommends that KCP&L should commit to the following action:

(a) Prior to agreement of the parties in Case EO-2012-0323, KCP&L should clearly describe the process used to adjust historical energy sales so that they reflect zero impact of existing demand side management programs.

CONCERN #1 – KCP&L'S ASSUMED FORECAST BANDWIDTHS FOR POPULATION AND NUMBER OF HOUSEHOLDS APPEAR TO BE TOO NARROW.

In developing the high and low bandwidth projections for population and number of households in its 2012 IRP, KCP&L based the projections on an assumption that produces unreasonably narrow bandwidths. As a result, the high and low growth case load forecasts also do not reflect a reasonable bandwidth when compared to historical growth. The number of households is the driver variable in the residential customer model. The Company's projections for the baseline forecast and the high and low bandwidths are presented in the following graph.

[redacted]

DISCUSSION

The economic outlook quantified in KCP&L's forecasting models is based on information and data developed by Moody's Analytics. With respect to population, Moody's revised the process previously used in developing the high and low growth scenarios. The reason for changing the methodology was Moody's conclusion that the Kansas City metro area is characterized by solid economic growth drivers that would, over time, enable population growth to outpace the nation. Given the outlook of solid economic growth, Moody's assumed that a significant change from the base case projection could not be justified for the high and low growth scenarios. Projections of the number of households, the primary driver of residential customer growth, were based in large part on changes in projected population; therefore, the high and low growth scenarios for number of households also show little change from the base case projection.

Moody's high and low growth scenarios for population and number of households were based on historical variation in the growth rates of the time series. Moody's reports that historical growth in the number of households for the Kansas City metro area, measured on a quarterly basis, has ranged from ** [redacted] **, with a standard deviation of just over ** [redacted] **[2] Using the household data provided by KCP&L for 1990-2010, GDS computes the quarterly growth rates to range from ** [redacted] **, with a standard deviation of ** [redacted] **.

Analysis of historical population and household data clearly indicates that changes in the series from 1990-2010 have been stable with little variation. However, considering the standard deviation alone in conjunction with the base case forecast is not sufficient. What KCP&L has failed to address in its analysis is the possibility of a fundamental change in the projected long-term growth rates in population and number of households due to potential structural changes in the economy and the resulting impacts on population and housing starts. It's possible that the number of households in the Kansas City metro area increases or decreases at rates higher or lower than those assumed by KCP&L and that the standard deviations corresponding to these higher or lower projections remain equal to the historical period.

For the 20 year period ending 2010, the average annual growth rate in number of households was 1.2%, ranging from a low of 0.9% to a high of 1.5%.[3] The average annual growth rates assumed by KCP&L for the number of households for the baseline, high case and low case are ** [redacted] **, respectively.

Moody's economist Benjamin Kanigel states that it would be "too unlikely" that the projected number of households in 2035 for the high case could be ** [redacted] ** higher than the baseline projection.[4] An average annual growth rate of 1.3% would be required to yield a projection in 2035 that is ** [redacted] ** higher than the baseline forecast value for 2035. The actual average growth rate from 1990-2010 was 1.2%, and this historical period includes three recessions, one of which was the most severe since the great depression beginning in 1929. According to Mark

[2] KCP&L's 2012 Integrated Resource Plan, Volume 3, p.57.
[3] KCP&L's 2012 Integrated Resource Plan, Volume 3 Workpapers, file KCPL Bs_hi_low.xls.
[4] KCP&L's 2012 Integrated Resource Plan, Volume 3, p.57.

Zandi, chief economist at Moody's Analytics, the worst housing slump in the post-World War II era occurred during this period[5]. Considering the events since 1990, it is not unreasonable that the average growth rate for the number of households in the high range, or optimistic scenario, would be about equal to the historical average of the past 20 years.[6]

The residential customer forecast is based on number of households; therefore, GDS concludes that the high and low range forecasts of residential customers and associated residential class energy sales and peak demand are too narrow. By expanding the high and low range projections for the number of households, the forecast would provide more reasonable high and low scenarios of energy sales and peak demand projections as it would incorporate a more reasonable consideration of future unknowns with respect to household growth.

REMEDY

KCP&L should revise the high and low case population and households projections. Rather than applying a standard deviation to the base case projection, KCP&L should develop high and low range projections of population and number of households that address potential changes from the baseline forecast due to significant changes in economic activity and resulting growth. The previous method used by Moody's to develop the range forecasts for population and number of households appears to reflect such potential changes.[7] The range between the high and low growth scenarios of energy sales and peak demand would expand and provide for a more reasonable bandwidth forecast of potential outcomes around the baseline forecast.

The following graph presents the Company's current baseline and high/low projections for number of households. In addition, the graph displays alternative high and low scenarios that are based on a simulation conducted by GDS. Based on the monthly data provided by the Company in its working papers, the standard deviation on monthly growth in number of households is 0.18. Simulating projected growth using the projected growth rate for the baseline forecast and a standard deviation of 0.18, the high and low range projections for the number of households become higher and lower than the Company's series.

[5] http://www.cnbc.com/id/22125224/, Housing Prices to Drop 30% before Slump Ends: Report, December 2007
[6] KCP&L's 2012 Integrated Resource Plan, Volume 3, p.57.
[7] Ibid, page 56, Figure 25.

[redacted]

CONCERN #2 – KCP&L'S USE OF CERTAIN INDEPENDENT VARIABLES IN THE MODELS USED TO WEATHER NORMALIZE ENERGY SALES IS QUESTIONABLE

4 CSR 240-22.030(1)(C)(2)(C) states that: "The utility shall document the methods used to develop weather measures and the methods used to estimate the effect of weather on electric loads. If statistical models are used, the documentation shall include at least: the functional form of the models; the estimation techniques employed; the data used to estimate the models, including the development of model input data from basic data; and the relevant statistical results of the models, including parameter estimates and tests of statistical significance.

Most of the models developed by KCP&L to weather normalize historical class energy sales include one or more variables that are not statistically significant at a 95% confidence level. KCP&L fails to report the R-squares and goodness of fit measures for their models.

DISCUSSION

KCP&L identifies the models developed to weather normalize class energy sales in its IRP report at section 2.3.3, Tables 1-18. The models specify relationships between energy sales and degree days and capture the non-linear relationship between energy sales and degree days during the course of the year. Binary variables are also included in the majority of the models to account for changes in energy sales due to unique or nonrecurring events.

As indicated by the t-statistics presented for each model developed by KCP&L, a number of the independent variables in the models are not statistically significant at alpha (α) levels of 0.10 or lower. For example, and with respect to evaluating KCP&L's models, an alpha value of 0.01 for a particular independent variable indicates a probability of 99% that the variable contributes significantly to the model. In quite a few instances, independent variables are not significant even at the 0.50 level, indicating there is only a 50% probability that the independent variable

contributes significantly to the model. In instances when the t-statistic for an independent variable is less than the critical t-value corresponding to a specific probability, the variable contributes little impact to changes in the dependent variable. In other words, a low t-statistic indicates that the true value of the coefficient being estimated is not significantly different than zero, and the value that the coefficient takes within ±1 standard error ranges from negative to positive.

In response to discovery questions MDNR_Q5 and MDNR_Q37, KCP&L states that their models developed to weather normalize class energy sales specify Taylor polynomial equations. Polynomial equations are used to reflect non-linear relationships between a dependent variable and one or more independent variables. By definition, all polynomial terms up to the number of terms defined are included in the model, regardless of their corresponding statistics. GDS agrees that the relationship between energy sales, weather conditions and other factors is non-linear; however, many of the variables included in the models are not statistically significant at alpha (α) levels of 0.10 or lower. As a result, these variables provide no significant explanation of weather impacts on energy sales. With respect to development of the weather normalized sales estimates, the impact of including the insignificant variables in the models is insignificant.

REMEDY

While GDS concludes that many of the independent variables included in the models used to weather normalize class energy sales are not statistically significant at high probability levels, the variables in question do not deter from the overall reliability of using the models to weather normalize energy sales. GDS agrees that the relationship between energy sales and weather conditions should be modeled with a non-linear specification; however, the models should be further refined to remove all variables that are not statistically significant at the 20% or lower alpha level.

4.0 SUPPLY SIDE RESOURCES (4 CSR 240-22.040)

KCP&L performed a comprehensive analysis of supply-side resources which, for the most part, conforms to the rules set forth in 4 CSR 240-22.040 which establishes minimum standards for the scope and level of detail required in supply-side resource analysis. While most aspects of the rule were addressed, and in fact all aspects were mentioned, GDS found that certain areas should have received additional attention.

KCP&L's evaluation of potential supply-side resource options included the identification of forty-one existing or new technology alternatives, including base, intermediate, peaking and renewable resources. In addition, KCP&L evaluated life extension and emission control enhancement options (to identify retrofits that would facilitate reductions in SO2, NOx, PM, and Hg emissions), capacity and energy market options, and plant efficiency improvements. Certain technologies such as central station geothermal, pumped storage and animal waste were excluded because of lack of technology maturity, lack of suitability for the geographic region, and environmental concerns. KCP&L presents its supply side resource analysis in Volume 4 of the 2012 Integrated Resource Plan.

Although KCP&L has been diligent in its compliance with overall requirements of 4 CSR 240-22.040, GDS finds it can be faulted for not adequately addressing the impact of potential escalation in coal prices and the availability of ultra-low sulfur coal.

The observed rule deficiencies and concerns with KCP&L's supply side resource analysis and proposed remedies are discussed below.

DEFICIENCY #2 – KCP&L HAS NOT CONSIDERED ULTRA-LOW SULFUR COAL IN ITS IRP IGNORING ITS POTENTIAL AS A PRACTICAL CONTINGENCY OPTION AND ITS ABILITY TO ADDRESS ENVIRONMENTAL COMPLIANCE REQUIREMENTS.

4 CSR 240-22.040(5)(A) and (D) state that: "The utility shall develop, and describe and document, ranges of values and probabilities for several important uncertain factors related to supply-side candidate resource options identified in section (4). These cost estimates shall include at least the following elements, as applicable to the supply-side candidate resource option:

- *(A) Fuel price forecasts, including fuel delivery costs, over the planning horizon for the appropriate type and grade of primary fuel and for any alternative fuel that may be practical as a contingency option;"*
- *(D) Forecasts of the annual cost or value of emission allowances to be used or produced by each generating facility over the planning horizon;*

KCP&L did not include the use of ultra-low sulfur coal in the development of its IRP. Ultra-low sulfur coal is, however, an available fuel that could provide benefits to KCP&L's customers and could also potentially impact the selection of new generating resources during the term of the IRP. Furthermore, it offers additional value as an environmental compliance option.

DISCUSSION

The use of ultra-low sulfur coal (sulfur content no greater than 0.25 lbs/MMBtu) is an option that could assist in the reduction of SO2 emissions. KCP&L evaluated life extension and refurbishment at its existing units, as well as the enhancement of existing emission controls. However, KCP&L did not evaluate the use of ultra-low sulfur coal as an alternative to enhancing existing emission controls or installation of new controls. In contrast, Ameren Missouri in Chapter 3 of its 2012 IRP evaluated SO2 compliance through continued use of ultra-low sulfur coal at all coal-fired plants without flue-gas desulfurization (FGD) technology installed. Moreover, Ameren Missouri has recently agreed to buy approximately 91 million tons of ultra-low sulfur coal from Peabody Energy through 2017. Peabody Energy has acquired millions of tons of ultra-low sulfur coal in the Powder River Basin ("PRB") recently. The actions of one utility need not necessarily dictate the actions of another; however, the use of ultra-low sulfur coal is a viable option for reducing SO2 emissions and should have been by analyzed by KCP&L during the development of its IRP. While all PRB coal generally has a lower sulfur content than coal mined in other portions of the United States (less than 1.2 lbs/MMBtu), the ultra-low sulfur coal has a significantly lower sulfur content, as well as an average heat content in excess of 9,000 Btu/lb.

Ultra-low sulfur coal is, an available (as evidenced by Ameren's Missouri's planned use) fuel that could provide benefits to KCP&L's customers by delaying or mitigating the need for expensive emission controls on existing units. Not only does the KCP&L IRP fail to even mention ultra-low sulfur coal, ** [redacted][8]** While ultra-low sulfur coal is admittedly more expensive than coals with higher sulfur content, our assessment of Montrose cost estimates leads us to believe that a cost differential greater than $5.00/ton of delivered coal could be economically justified if the use of ultra-low sulfur coal might eliminate the need for emission controls. This certainly bears investigation, as the current price differential between mid and ultra-low sulfur coals is well below that amount.

REMEDY

KCP&L should include the use of ultra-low sulfur coal as an option in its next IRP filing.

CONCERN #3 – KCP&L HAS NOT CONSIDERED A BROAD ENOUGH RANGE OF POTENTIAL COAL PRICES IN ITS IRP

KCP&L has not considered a significant enough range of coal fuel prices in the development of its preferred or alternative resource plans.

DISCUSSION

In Volume 4 if its IRP filing, KCP&L provides discussion of the preparation of the fuel forecasts utilized in the development of its IRP as well as forecasted annual prices associated with each

[8] Kansas City Power & Light - Greater Missouri Operations Co., Study for Environmental Retrofits Montrose Generating Station, Final, Sega Project No. 09-0203-01, November 2010.

fuel. Price forecasts are provided for "Mid", "High", and "Low" cases. The Mid coal price forecast represents the average of prices from several different sources. This methodology was used in order to "create a composite price forecast that represents the base case consensus of the major forecast sources."[9] The variation of individual forecasts used to create the composite, or Mid-case, was then used to create high and low case prices.

For KCP&L's High and Low coal price forecasts, the variation from the Mid case is less than or equal to approximately ** ** for 11 years of the 20 year study period, and the maximum variation between cases in any year is approximately ** ** Also, the levelized growth rate for each of the cases is less than ** ** per year from 2013 through 2031. In contrast, the Energy Information Administration's 2012 Reference Case Steam Coal price forecast for the West North Central region shows a levelized growth rate of 3.7% per year for the 2013 through 2031 period, almost ** ** that of the fuel price cases defined by KCP&L. The EIA 2031 Reference Case price is approximately ** ** higher than KCP&L's 2031 Mid coal price The coal price forecasts used in the development of the IRP are so stable that the levelized growth from the Low price value in 2013 to the High price value in 2031 is just over ** ** per year (The 2013 Low price value is ** ** the 2031 High price value is ** **). A broader range in coal prices used for the development of the preferred plan would further ensure that a robust plan is selected.

REMEDY

KCP&L should consider, in its next IRP, the impact that more coal price volatility would have on the analysis of alternative resource plans.

[9] KCP&L's 2012 Integrated Resource Plan, Volume 4, p. 59.

5.0 RENEWABLE RESOURCES (4 CSR 240-22.040)

Renewable technologies were considered by KCP&L as a separate resource group due to the requirement that some renewable alternatives would have to be passed on to the integrated resource analysis, irrespective of the cost ranking, in order to meet the MO Renewable Energy Standard (RES).[10] Renewable technologies for wind and solar were included in the integrated resource analysis. The wind energy passed the screening and was included in the integrated resource analysis. Wind energy was included to assist in meeting MO RES requirements and due to its relatively low cost per MWh compared to other prescreened technologies. Central solar photovoltaic (PV) thin-film technology was also included in the integrated resource analysis as an alternative for meeting the MO RES solar carve out requirements. KCP&L presents its supply side resource analysis, including renewables, in Volume 4 of the 2012 Integrated Resource Plan.[11]

The observed rule deficiencies and concerns with KCP&L's renewable resource analysis and proposed remedies are discussed below.

DEFICIENCY #3 – KCP&L DID NOT PROVIDE ADEQUATE DOCUMENTATION TO SUPPORT THE REASONABLENESS OF WIND RESOURCE COST ASSUMPTIONS

4 CSR 240-22.040(1) states that: "The utility shall collect generic cost and performance information sufficient to fairly analyze and compare each of these potential supply-side resource options, including at least those attributes needed to assess capital cost, fixed and variable operation and maintenance costs, probable environmental costs, and operating characteristics

4 CSR 240-22.040(5)(B) states that: "The utility shall develop, and describe and document, ranges of values and probabilities for several important uncertain factors related to supply-side candidate resource options identified in section (4). These cost estimates shall include at least the following elements, as applicable to the supply-side candidate resource option:

(B) Estimated capital costs including engineering design, construction, testing, startup, and certification of new facilities or major upgrades, refurbishment, or rehabilitation of existing facilities;

** [redacted] ** However, it is more likely that wind energy capital costs and fixed O&M costs will decline in the future based on a number of factors. The IRP is deficient in its failure to "fairly" analyze and compare costs of wind against other resources. That wind energy has had and is expected to continue to have ongoing per MWh cost reductions suggests that a "fair" analysis of wind energy costs should consider this market trend.

[10] KCP&L's 2012 Integrated Resource Plan, Volume 4, p. 10.
[11] Ibid, pp. 41-42.

DISCUSSION

According to the International Energy Agency (IEA) *Wind Task 26: The Past and Future Cost of Wind Energy* (May 2012), a number of factors are likely driving the costs of wind energy downward. According to the report, turbine upscaling and design advancements and industry learning curve factors will lead to capital cost reductions. The report indicates that based on a review of a number of studies, a 20% to 30% reduction in the levelized cost of wind energy through 2030 can be expected.

Through the IRP planning horizon, those cost reduction will have varying per MWh impacts, depending on the timing of the wind acquisitions. However, the net effect may be to alter the relative ranking of wind among other supply side resource options considered in the IRP. The outcome may or may not change the preferred plan option, but would likely have an impact on the revenue requirements for meeting the planned wind energy acquisitions.

REMEDY

** [redacted] ** A remedy to address cost reductions in wind energy would be to re-run the Midas analysis using either a negative inflation, or deflation, rate or range of possible cost decreases. ** [redacted] **

The results should be tabulated and reconsidered in the context of the larger IRP in order to determine whether additional wind energy resources should be acquired in the preferred or alternate plans or whether revenue requirements would change.

DEFICIENCY #4 – KCP&L DID NOT PROVIDE ADEQUATE DOCUMENTATION TO SUPPORT THE TRANSMISSION INTERCONNECTION COSTS FOR WIND RESOURCES

4 CSR 240-22.040(4)(C) states that: "The utility shall include the cost of interconnection and any other transmission requirements, in addition to the utility cost and probable environmental cost, in the cost of supply-side candidate resource options advanced for purposes of developing the alternative resource plans required by 4 CSR 240-22.060(3)."

4 CSR 240-22.040(5)(F) states that: "The utility shall develop, and describe and document, ranges of values and probabilities for several important uncertain factors related to supply-side candidate resource options identified in section (4). These cost estimates shall include at least the following elements, as applicable to the supply-side candidate resource option:

(F) Estimated costs of interconnection or other transmission requirements associate with each supply-side candidate resource option.

4 CSR 240-22.045(3)(A)(1) states that: " The utility shall compile information and perform analyses of the transmission networks pertinent to the selection of a resource acquisition strategy."

(A) The utility shall provide, and describe and document, its—

1. Assessment of the cost and timing of transmission upgrades to reduce congestion and/or losses, to interconnect generation, to facilitate power purchases and sales, and to otherwise maintain a viable transmission network

** [redacted] **

DISCUSSION

Although interconnection costs are a relatively small portion of overall costs associated with deploying a new generating facility, small cost differences within the components of total costs may shift the relative rankings of supply side resources. In Volume 4 of the IRP, interconnection costs for wind are compared to interconnection costs for all other supply side options. ** [redacted] **

Volume 4 explains that average interconnection costs for recent SPP interconnection requests were compared to reach the cost differential. GDS reviewed the workpapers to understand the cost averaging. ** [redacted] **

[12] KCPL 240-22.040(4)(C) Transmission Interconnection Costs.xlsx

[13] http://sppoasis.spp.org/documents/swpp/transmission/GENInterPAGE.CFM

The National Renewable Energy Lab indicates that over 3,200 MW of wind energy has been installed as of 2012 in Kansas and Oklahoma alone.[14] **T[redacted]** The use of a larger sample of wind projects to develop estimates of interconnection costs, may have led to a different analysis result. Further, a 2008 report by Boston Pacific Company[15] indicates that a large amount of natural gas power capacity was installed in the year 2000 up to 2008 (over 10,000 MW). **[redacted]** Again, the implication is that a more in-depth study may result in a different outcome if a more representative sample is used in the interconnection cost analysis.

Finally, it would be logical that future wind acquisitions would be selected based on the lowest total cost per MWh. Thus, the average interconnection request cost may not reflect the cost of interconnection for competitively solicited projects, in that those with the lowest cost would be most competitive and likely to be selected for future acquisitions.

REMEDY

It may be that an averaging of past interconnection costs is appropriate for making future projections of interconnection costs. However, a more comprehensive sample of projects taken from interconnections in the SPP may reveal a different outcome. The outcome of a more comprehensive review of interconnection requests may cause wind energy to be ranked differently than presented in the IRP and may lead to different conclusions relative to supply side preferences or revenue requirements. Once a more comprehensive review of interconnection costs is completed the IRP's supply side preferences and revenues should be remodeled.

CONCERN #4 – KCP&L'S ASSUMED COAL PLANT CAPACITY FACTORS ARE NOT REPRESENTATIVE OF RECENT ACTUAL OPERATING EXPERIENCE AND THE IMPACT OF THESE ASSUMED HIGHER CAPACITY FACTORS ON WIND OPTIONS HAS BEEN OVERLOOKED.

KCP&L may have overstated the capacity factors of coal plants in their comparison of costs for coal plants and in their expected supply of MWh from coal plants. This issue affects the ability of existing supply resources to meet expected demand and limits the potential role of new renewable resources such as wind in the preferred plan.

DISCUSSION

According to two publically available investor documents from Great Plains Energy, the holding company of KCP&L and GMO, in 2010 and 2011, coal plants achieved capacity factors of 71% in

[14] http://www.windpoweringamerica.gov/wind_installed_capacity.asp
[15] http://www.spp.org/publications/SPP%202008%20State%20of%20the%20Market%20Report.pdf

2010 and 64% in 2011.[16] GDS understands that the low 2011 coal capacity factors were a likely the result of the Midwest flooding, which resulted in coal deliveries to coal plants being curtailed or limited for a period of time. However, a further review of Great Plains Energy coal plant operating statistics show that individual coal plant capacity factors in other years never achieve the ** ** capacity factors that are assumed by KCP&L IRP, as presented in EPA eGrid data[17]. Moreover, as a group, the 2009 capacity weighted capacity factor for the Great Plains fleet of coal plants was less than 50%.[18] According to Volume 4 of the IRP, capacity factors for coal plants were modeled based on an assumed ** ** capacity factor. The shortfall in actual capacity factors leads to a deficit of approximately 1,840 MWh per MW of coal capacity.

If KCP&L cannot reasonably demonstrate that their coal plants will achieve the IRP's assumption of ** ** capacity factors, which has not been addressed in the IRP, a shortfall in supply may result, requiring additions of alternative supply. Further, financial modeling of coal plant costs may underestimate the cost per MWh of production due to capital and fixed O&M costs being allocated across fewer MWh. Offsetting the higher per MWh costs may be lower environmental costs. If the risks or other underlying drivers of the capacity factor shortfall cannot be expected to change significantly from the 2010 and 2011 capacity factor shortfall situation, the IRP is incorrectly stating assumed available supply from coal plants.

If the coal plant supply resource is in shortfall during the IRP planning horizon, additional supply resources may be needed to meet demand. The timing of specific supply shortfalls is relevant to renewable supply as the scale of shortfall may or may not suggest that the addition of additional coal supply is cost effective. Renewable energy, and to a lesser extent natural gas plants, provide for more control over scaling factors. For example, wind projects can be added in a range of 10s or 100s of MW with relatively short lead times and with similar costs across the scale of development, while coal plants will only be available for addition in the 100s of MW with longer lead times.

In Volume 4 of the IRP, ** ** Thus, if additional supply resources are needed, wind energy supply would be considered the next most cost effective option after coal.

REMEDY

First, KCP&L should clearly demonstrate that the actual experience with lower capacity factors for coal plants will not occur for the duration of the planning horizon and that risk factors or other drivers of capacity factors less than ** ** are controlled for and addressed in the IRP risk analysis. Second, KCP&L should provide a supply plan which demonstrates the shortfall in supply due to lower coal capacity factors and increases and timing in acquiring supply

[16] http://www.greatplainsenergy.com/investor/SuppFin/11_1QSuppFin.pdf
http://www.greatplainsenergy.com/investor/SuppFin/12_1QSuppFin.pdf
[17] http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html
[18] http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html

alternatives to coal. Third, if wind energy is not selected as the sole supply option for making up coal capacity factor shortfalls, KCP&L should justify use of non-wind resources.

6.0 INTEGRATED RESOURCE PLAN (4 CSR 240-22.060)

KCP&L presents its Alternative Resource Plans in Volume 6 of its IRP filing. Twenty-two plans are presented, all of which are said to comply with renewable energy mandates and demand-side mandates. Certain plans of the twenty-two were developed to comply with IRP rules contained in 4 CSR 240-44.060(3)(A) items (1) through (6). KCP&L states that, in response to CSR 240-44.060(3)(A)(8), alternate resource plans were developed that are based on KCP&L and GMO combining resources. The two lowest cost combined company plans were then used as the basis for two KCP&L specific resource plans. KCP&L states that these two KCP&L specific plans are based on allocating resource additions in the combined company plans between GMO and KCP&L.

DEFICIENCY #5 – KCP&L HAS NOT CLEARLY SHOWN IN THE IRP HOW THE ALLOCATION OF RESOURCES FROM THE COMBINED-COMPANY TO EACH SEPARATE COMPANY IS DETERMINED

4 CSR 240-22.060(1) states in part that: "The utility shall describe and document its additional planning objectives and its guiding principles to design alternative resource plans that satisfy all of the planning objectives and priorities."

4 CSR 240-22.060(3) states that "Demand-side resources are the demand-side candidate resource options and portfolios developed in 4 CSR 240-22.-050(6). Supply-side resources are the supply-side candidate resource options developed in 4 CSR 240-22.040(4)."

KCP&L's IRP filing contains no discussion of how the combined company alternative resource plans were developed. KCP&L's plan is also deficient in that there is no explanation of how resources included in the combined company alternative resource plans were subsequently allocated between GMO and KCP&L. Further, KCP&L's plan is deficient in that combined company alternative resource plans were defined using not only potential resources that were developed by KCP&L in response to 4 CSR 240-22.040(4) but also potential GMO candidate resources that were not developed by KCP&L. The inclusion by a utility of resources that were not developed pursuant to 4 CSR 240-22.040(4) by that utility is a deviation from the rule.

DISCUSSION

Although KCP&L's filing includes descriptions of alternative resource plans with respect to timing and size of potential resource additions, there is a lack of documentation as to how the KCP&L specific alternative plans were developed. There is mention of two planning models in the IRP filing (MIDAS and CapEx), but there is no discussion of how these models were used in the development of the plans. There was also a similar lack of documentation with respect to how the combined company plans were developed. Further, the allocation of resource additions included in combined company plans to KCP&L is not described in any detail. 4 CSR 240-22.060(3) requires that for the development of Alternative Resource Plans, candidate resources developed in response to other portions of the rule should be used. 4 CSR 240-22.050(6) describes the development of demand-side resources. 4 CSR 240-22.040(4) describes the development of supply-side resources.

The development of combined company resource plans by definition includes candidate resources that were developed for GMO in addition to those developed for KCP&L. Therefore,

the potential to allocate GMO candidate resources to KCP&L violates the requirements of the rule. KCP&L refers to savings achieved through the allocation of a combined company plan as compared to the preferred stand-alone plan. However, the IRP does not include documentation to support the referenced savings. Without a better understanding of how combined company plans were developed and resources were allocated to KCP&L and GMO it is unclear if the combined company planning process and allocation decisions are designed to maximize financial performance at the holding company level or benefit the customers of each utility.

REMEDY

KCP&L should be required to provide additional discussion and if necessary, work papers to support the process and methodology used in the development of the company specific plans as well as the development and allocation of the combined company alternative resource plans. This additional discussion should address the allocation of resources as well as the allocation of costs.

7.0 RESOURCE ACQUISITION STRATEGY SELECTION (4 CSR 240-22.070)

In Volume 7 of its IRP, KCP&L presents its preferred plan, contingency plans, implementation plans and a resource acquisition strategy. It also discusses critical uncertain factors, the value of better information and DSM program evaluation plans. In this volume, KCP&L notes that the Preferred Plan was not the lowest cost plan from a Net Present Value of Revenue Requirement (NPVRR) perspective, and that this plan is based upon resource planning in tandem with KCP&L-Greater Missouri Operations Company (GMO). This assumption has changed the risk impact when comparing stand-alone company alternatives. As such some critical uncertain factors do not remain critical to the decision of the joined company. KCP&L also identified a single contingency resource plan that performs better than the preferred plan under certain extreme risk conditions.

CONCERN #5 – KCP&L DID NOT ADDRESS THE IMPACT OF NATURAL DISASTERS, SUCH AS THE FLOOD AT THE IATAN COAL PLANT, IN CONTINGENCY PLANS

KCP&L has failed to consider in its contingency plans the potential impact of natural disaster such as the extreme flooding that occurred in 2011. While such flood related outages affecting multiple units may occur infrequently and in some instances be addressed through flood control measures, they should not be overlooked due to the potentially devastating impacts and costs associated with such multi-plant events

DISCUSSION

In 2011, flooding in the Midwest impacted the ability of trains to deliver coal to several of KCP&L's coal units. Deliveries were slowed to Hawthorn and LaCygne and were curtailed to Iatan. To make up for lost coal generation, KCP&L purchased power from other sources. KCP&L should consider factors such as flooding, and the subsequent impacts, as a contingency in the development of its IRP. Subsequent impacts include reductions in plant capacity factors, increased O&M expenses, and increased purchased energy amounts and costs.

While such flood related outages affecting multiple units may occur infrequently and in some instances be addressed through flood control measures, they should not be overlooked due to the potentially devastating impacts and costs associated with such multi-plant events. It is important to develop a basis for estimating the frequency and duration of such events for any site or class of generating units. The year 2011 highlighted the disruption the Missouri River can present to the operation of KCP&L's power plants located in the river's flood plain. Conversely, low river levels resulting from prolonged droughts may also lead to constriction in power generation limits due to thermal limitations.

REMEDY

KCP&L should include contingency analysis related to reductions in fuel availability and plant capacity factors in its next IRP filing.