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MISSOURI PUBLIC SERVICE COMMISSION

File No. EO-2015-0055

SURREBUTTAL TESTIMONY

OF

S. HANDE BERK

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

St. Louis, Missouri
April 2015

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I. INTRODUCTION

Q. Please state your name and business address.

A. S. Hande Berk, One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. By whom and in what capacity are you employed?

A. I am employed by Ameren Services Company ("Ameren Services") as Senior Corporate Planning Analyst.

Q. Please describe your educational and professional background.

A. I received a Bachelor of Science degree in Economics from Orta Doğu Teknik Üniversitesi in Ankara, Turkey in June of 2000 and a Master of Science degree in Economics and Finance from Southern Illinois University Edwardsville in August of 2002. I joined Ameren Services Corporate Planning Department as a Forecasting and Load Research Specialist in July of 2003. I was responsible for electricity and gas sales and peak demand forecasts, weather normalization, load research data management and analysis to support cost of service studies and electric rate design, and monthly economic outlook reports for senior management. In September of 2008, I became a Corporate Planning Analyst. My responsibilities included fuel budgeting for Ameren Missouri's generating fleet, benchmarking and calibrating the MIDAS tool used for long-term resource planning analysis to the Company's official fuel budget, and modeling and analyzing the alternative resource

plans in the Company's 2011 Integrated Resource Plan ("IRP") filing. I was promoted to Senior Corporate Planning Analyst in October of 2011, and I led the efforts for the Company's 2012 IRP Annual Update in that capacity. I became a Senior Corporate Model Specialist in December of 2011. My duties included financial forecasting, monthly margin analysis, analysis support for the divestiture of Ameren Energy Resources and project evaluation. I was transferred back to the Corporate Analysis group in June of 2013 as a Senior Corporate Planning Analyst. I was the project lead on Ameren Missouri's 2014 IRP filing. I developed the revenue requirements model that replaced MIDAS in addition to overseeing all of the assumptions and analyses used in the filing. I am currently working in that same capacity and am responsible for long-term resource planning related analyses.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your surrebuttal testimony?

A. The purpose of my testimony is to 1) respond to the rebuttal testimony of the Missouri Public Service Commission ("Commission") Staff's ("Staff") witness John Rogers regarding his concerns on whether Ameren Missouri's ("Company") proposed energy efficiency plan benefits all customers, and 2) respond to the rebuttal testimony of Sierra Club's witness Tim Woolf regarding Ameren Missouri's decision to choose the Realistic Achievable Potential ("RAP") demand-side management ("DSM") portfolio over the Maximum Achievable Potential ("MAP") DSM portfolio and the Company's treatment of greenhouse gas ("GHG") regulations in its 2014 Integrated Resource Plan ("IRP") filing.

Q. Please summarize the rebuttal testimony of Mr. Rogers regarding benefits of DSM programs as it relates to the IRP and your conclusions.

A. In his rebuttal testimony, Mr. Rogers uses three comparable plans from the IRP, with no additional DSM after MEEIA Cycle 1, RAP DSM or MAP DSM. He adjusts the average annual rate increases of these three plans to include performance incentive awards similar to those requested by the Company in this case. He estimates the average increase in average rates over the 2016-2035 period for the plan with RAP DSM to be 0.3% higher than average increase for the plan with no further DSM and concludes that, "the RAP DSM strategy contained in the 2014 IRP and proposed in MEEIA Cycle 2 application is expected to result in no overall long-term benefits for all customers of Ameren Missouri."[1]

My conclusion is that the RAP portfolio benefits all customers whether or not they participate in the programs. I suggest two changes for the evaluation of rate impacts: 1) Levelized average rates should be used to account for time value of money as opposed to average increase in average rates; and 2) Comparisons should be made over the entire span of the IRP analysis period and not just 2016-2035, since the latter would lead to biased conclusions by disregarding the benefits of programs assumed to be implemented in the later years of the planning horizon.

In addition to reduced levelized rates relative to the no DSM plan, the RAP portfolio also provides flexibility in long-term planning and helps mitigate risks, and therefore provides other benefits to all customers. For these reasons, Mr. Rogers' assertion that not all customers benefit from the programs should be rejected.

Q. Please summarize the rebuttal testimony of Mr. Woolf regarding the Company's decision to choose RAP over MAP and its treatment of GHG regulations in its 2014 IRP filing.

[1] John Rogers Rebuttal, p. 30, l. 15-17.

A. Mr. Woolf criticizes Ameren Missouri's decision to choose RAP instead of MAP DSM in its preferred resource plan because he alleges that MAP would reduce electricity costs and average bills by significantly more than the RAP portfolio. He also alleges that by assuming very low probabilities, there will be any federal GHG emission regulations and by assuming relatively low estimates for carbon dioxide ("CO_2") allowance prices, the Company significantly understates additional cost that could be avoided by energy efficiency programs.

I explain in detail why Mr. Woolf's allegations have no basis. As part of the IRP analysis, we have concluded that the RAP portfolio most appropriately balances the achievement of cost-effective energy efficiency savings with the risks and rate impacts to all customers. The MAP portfolio does not because it 1) results in higher levelized rates over the IRP study period, which means it does not reduce average bills 2) requires much higher incremental spending for each additional kWh saved, and 3) does not result in net savings to all customers until 2034.

Ameren Missouri has appropriately considered GHG regulations as part of its IRP analysis and has properly evaluated the potential impacts of the Environmental Protection Agency's ("EPA") proposed Clean Power Plan ("CPP"). All of the scenarios in the IRP analysis do, in fact, include federal GHG regulation assumptions in either direct or indirect form. The direct CO_2 emissions price scenarios have a combined probability of 15%. The high probability (85%) assigned by Ameren Missouri's subject matter experts to regulations that impose indirect costs on CO_2 emissions is appropriate in light of the EPA's proposed CPP, which does not impose an explicit price on CO_2 emissions. The retirement of existing coal-fired plants, including some owned by Ameren Missouri, and replacement of these

plants with resources that produce lower (or no) CO_2 emissions fully account for the indirect costs of such regulations. As a result, there is no need to also impose an explicit price for CO_2 emissions. The CO_2 prices assumed by the Company are exactly equal to those produced by Synapse in its last study prior to the filing of the Company's IRP and are similar to those produced by Synapse in its updated study released last month. For these reasons, Mr. Woolf's assertions regarding Ameren Missouri's selection of the RAP portfolio and the Company's treatment of GHG regulations in arriving at its decision should be rejected.

III. THE COMPANY'S RAP PORTFOLIO BENEFITS ALL CUSTOMERS

Q. Please explain Mr. Rogers' analysis regarding the DSM plans evaluated in the Company's 2014 IRP.

A. Mr. Rogers analyzed three alternative resource plans that were evaluated in the Company's 2014 IRP: "RAP-Plan I" (includes RAP DSM), also the Company's preferred resource plan, "MAP-Plan R" (includes MAP DSM) and "No DSM Plan K" (includes no further DSM after MEEIA Cycle 1, the current 2013-2015 three-year DSM plan). He compared the average annual rate increases, after adjusting for the requested performance incentive in this case, and found that average annual rate impacts for MAP-Plan R and RAP-Plan I were 1.10% and 0.3% higher, respectively, than the No DSM Plan K rate impacts for the 2016-2035 time frame. He concluded that the "RAP DSM strategy contained in the 2014 IRP and proposed in MEEIA Cycle 2 application is expected to result in no overall long-term benefits for all customers of Ameren Missouri" since RAP-Plan I shows a 0.3% higher "average annual average rate impact" than No DSM-Plan K for the 2016-2035 planning horizon.

Q. Do you agree with Mr. Rogers' conclusion?

A. No, I do not.

Q. Why not?

A. I disagree for three reasons, in addition to the flaws in Mr. Rogers' analyses addressed in Company witness Steve Wills' surrebuttal testimony: 1) the time frame Mr. Rogers is using should not end in 2035, but should be expanded to include results through 2044 to capture end effects of decisions made during the 20-year period; 2) instead of using the average percent increase in average rates over that time period, levelized rates should be used in evaluating whether or not all customers benefit from the programs; and 3) including energy efficiency provides flexibility in planning for the future and helps Ameren Missouri in adapting to changing conditions, resulting in continued risk mitigation benefits to customers.

Q. Please explain your first reason. Why should results be evaluated through 2044 instead of 2035?

A. While Ameren Missouri develops its resource plans looking at a 20-year period, it is important to include ten additional years in the analysis to capture longer-term financial and operational "end-effects" resulting from decisions reflected in the 20-year planning horizon.

Q. Why is it important to capture end-effects?

A. Simply put, leaving out the end-effects will cause biased comparisons between different resource plans because you may underestimate the costs and benefits of a resource decision. For example, assume the Company adds a new supply-side resource in the last year of the planning horizon. If the analysis ends there, the costs of adding this new

resource will be vastly underestimated as the analysis will include only one year of return on equity, depreciation expense, etc. This will lead to erroneous conclusions about the relative cost of that resource. The opposite is true in the case of energy efficiency. As is evident from the Company's proposed DSM plan, the expenditure must be made first and most of the benefits are realized in the subsequent years. If the assumption is that there will be continuous energy efficiency expenditures throughout the 20-year planning horizon, the analysis will fail to reflect benefits resulting from the last few years of those expenditures because the study period does not extend beyond the planning horizon. While shorter-term impacts are also important and are of course considered, it is important to include all costs and benefits. Extending the evaluation through 2044, beyond the 20-year planning horizon, paints a much more complete and accurate picture of the costs of resource decisions for our decision makers. In fact, Synapse Energy Economics' report – Best Practices in Electric Utility Integrated Resource Planning – was prepared for the Regulatory Assistance Project and recommends the use of end-effects to avoid bias:

> The study period for IRP analysis should be sufficiently long to incorporate much of the operating lives of any new resource options that may be added to a utility's portfolio— typically at least 20 years—*and should consider an "end effects" period* to avoid a bias against adding generating units late in the planning period.[2] [*Emphasis added*].

Q. Have any parties raised any concerns with Ameren Missouri's use of 2015-2044 as the full analysis time frame?

A. No. In fact, Ameren Missouri has been using the same rationale since at least the 2008 IRP and, to my knowledge, no stakeholder has ever raised an issue with this approach.

[2] Wilson, R. and Biewald, B, June 2013, Best Practices in Electric Utility Integrated Resource Planning, p. 31.

Q. Is an additional ten years beyond the planning horizon long enough to capture the benefits of all the DSM program expenditures?

A. It is for two reasons. First, the average life of the measures is approximately ten years; therefore, most, if not all, of the benefits are captured. Second, present value impacts of any costs and benefits would likely be negligible if you extend the analysis beyond thirty years.

Q. Moving on to your second observation; why should the levelized rates be used instead of an average increase in average rates to evaluate customer rate impacts?

A. Simply because the time value of money has to be accounted for when evaluating the rates, as we do when we use present value of revenue requirements ("PVRR") in evaluating long-term customer costs reflected in an IRP. We don't use average revenue requirements for that purpose, and we should not take the same kind of approach in evaluating rate impacts here. This same reasoning might be why the Commission's resource planning rule specifies levelized average rates as one of the specified performance measures to be used in the evaluation of alternative resource plans. 4 CSR 240-22.060(2)(A)4 states in part:

> (2) Specification of Performance Measures. The utility shall specify, describe, and document a set of quantitative measures for assessing the performance of alternative resource plans with respect to resource planning objectives.
> (A) These performance measures shall include at least the following:
> 4. Levelized annual average rates;

Average increase in average rates is not included in the measures the resource planning rule requires the utilities to include as one of the performance measures.

Q. Has Ameren Missouri used levelized rates as a performance measure in its 2014 IRP?

A. Yes. On page 29 of Chapter 9 in the Company's 2014 IRP, a chart that shows the levelized rates results without utility performance incentives is provided; this chart shows RAP-Plan I has the lowest levelized average rates, and No DSM Plan K has the highest levelized average rates. On page 40 of Chapter 9-Appendix A, a chart that shows the levelized rates results with utility performance incentives is provided.[3] It is important to note that we included a higher performance incentive assumption in the IRP solely based on the earnings opportunities from the two avoided natural gas combined cycle plants. With the higher performance incentives, the levelized average rates from the RAP-Plan I are only one-thousandth of a cent (0.001) higher than the No DSM Plan K. When I recalculate the levelized rates with the incentive levels requested in this case, then the levelized average rates for the RAP plan are lower than those for the No DSM plan. The levelized rates are shown in Table 1 below:

Table 1: Levelized Rates with and without Performance Incentives[4]

Levelized Rates (Cents/kWh)	No Utility Performance Incentives 2015-2044	With Utility Performance Incentives IRP Assumption 2015-2044	With Utility Performance Incentives Requested in This Case 2015-2044
No DSM-Plan K	12.062	12.062	12.062
RAP-Plan I	12.008	12.064	12.027
MAP-Plan R	12.054	12.121	12.073
Difference from No DSM Plan			
RAP-Plan I	(0.054)	0.001	(0.035)
MAP-Plan R	(0.008)	0.059	0.011

As the table shows, the MAP plan results in higher levelized average rates for customers, but the RAP plan reduces the levelized average rates by 0.035cents/kWh; therefore, from a long-

[3] PVRR and rate impact results in risk analysis have been provided in the IRP filing work papers: 22.060 Integrated Resource Plan-Risk\3-Risk\Results\ PVRR 08-25-14_HC.xlsx.
[4] MAP-Plan R includes the same incentive level as RAP-Plan I for the comparison reflecting the incentive level requested by the Company in this case.

term levelized rate perspective, the Company's RAP DSM programs do benefit all customers whether or not they participate in the programs.

Q. Disregarding for a moment that using average rates to measure customer benefit is inappropriate, has Mr. Rogers made any errors in his analysis of average rates?

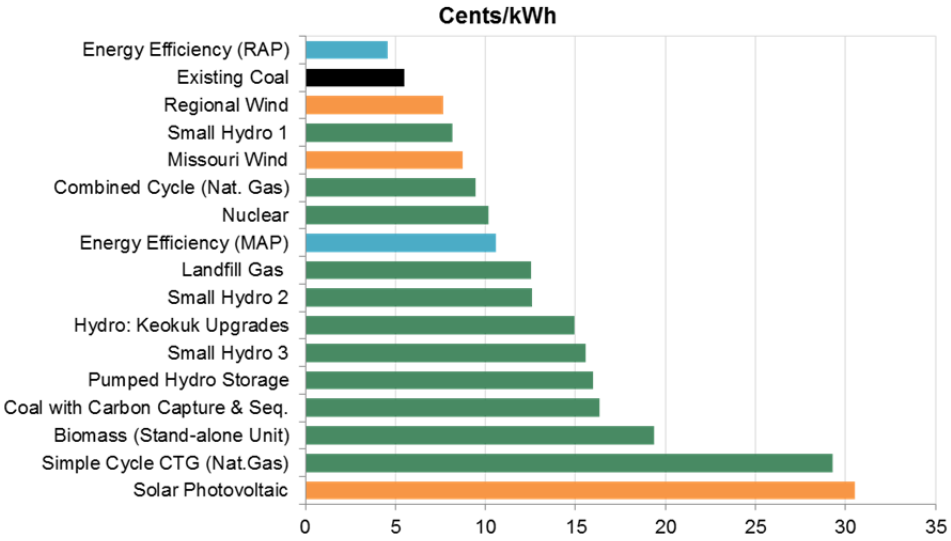
A. Yes. As stated in Mr. Rogers' testimony on page 27 in footnote 26, Staff assumed a performance incentive award annual rate impact of 0.45% in several years, seven of which were in the 2035-2044 timeframe. This period represents the end-effects years during which we do not assume implementation of additional DSM programs. Since there are no additional programs implemented, performance incentive rate impacts should not be included in those years after accounting for the performance incentive for the last year of additional energy efficiency programs in 2034. When that is corrected, the average annual average rate impacts over the 2016-2044 analysis period for RAP-Plan I and MAP-Plan R are -.03% and .29%, respectively. By Mr. Rogers' definition of customer benefits, the negative rate impact for RAP-Plan I would mean there are overall long-term benefits for all Ameren Missouri customers.

Q. Are there other considerations in deciding whether or not energy efficiency benefits all customers?

A. Yes. Levelized cost of energy ("LCOE") is a very useful tool in assessing how a resource may stack up against other options even though it does not tell the whole story for a resource's performance as part of an integrated plan. RAP level energy efficiency is the lowest cost resource available to Ameren Missouri to serve its customers as evident from Figure 1 below, which is similar to the figures included in Chapters 1 and 9 of Ameren

Missouri's 2014 IRP[5], except performance incentives requested by the Company in this case have been added to both RAP and MAP level energy efficiency costs in Figure 1:

Figure 1: Levelized Cost of Energy



Note: Does not reflect inclusion of tax incentives. Orange denotes intermittent resources.
MAP energy efficiency reflects costs and energy savings incremental to RAP
Performance incentives at the level requested in this case are included in RAP and MAP costs

Absent RAP level energy efficiency programs, the Company would have to invest in two 600 MW natural gas fired combined cycle ("CC") generation plants to serve its customers much earlier than it otherwise would with RAP level DSM programs. These two additional CC plants are included in the No DSM Plan -- the first CC would be needed in 2023 after Meramec Energy Center is retired, and the second CC would be needed in 2031 to meet reserve margin requirements.

Q. But the impacts of these additional CCs are included in the analysis results, aren't they?

A. Yes, they are included, hence the higher present value of revenue requirements and levelized average rates for the No DSM Plan as compared to the RAP DSM

[5] Ameren Missouri 2014 IRP Ch. 1, p. 7 and Ch. 9, p. 9.

Plan. Again, it is necessary to include the end-effects to more accurately capture the costs of these assets, one of which is assumed to go in-service in 2031, only three years before the end of the 20-year planning horizon. What is not included in the numbers is the benefit RAP energy efficiency adds by the flexibility it provides for planning for the future and the risks it helps the Company and all of its customers to continue to avoid. This brings me to my third observation regarding the benefits of our DSM programs for all customers.

Q. Please explain what you mean by flexibility in planning.

A. If there is one thing we know today, it is that the future is uncertain. We do not know how conditions that characterize the planning environment will evolve. Investing in energy efficiency helps delay investment in costly generation assets and lets us see how environmental regulations will evolve, what happens with fuel prices, or what technological advancements are taking place for a longer period of time. On the other hand, once you make the decision to build a CC, or any other generating resource, you have eliminated the ability to defer it and have given up some of that flexibility you had going forward. You are committed. Ameren Missouri does not have an unlimited amount of capital to invest. If that capital is used to build two CCs in eight years, there will be less low-cost capital available for other projects. This is another form of lost flexibility.

Thanks to the energy efficiency savings due to the already implemented programs and the assumed future programs, Ameren Missouri is able to retire its oldest and least efficient energy center, Meramec, in 2022 without the need to add costly new generating resources to serve its customers. Continuing to offer energy efficiency programs will help us identify more cost effective energy efficiency savings, and preserve flexibility for future resource

decisions, including the potential for additional retirements if conditions warrant consideration of such actions.

Q. Are there any benefits related to the proposed GHG emissions regulations?

A. Yes, energy efficiency is very likely to be part of our plan for compliance with the final version of the CPP, currently in proposed form and under consideration by the EPA. This regulation is expected to require utility generator CO_2 emission rates to be reduced, in part through the implementation of energy efficiency programs. The EPA released its proposed CPP to reduce GHG emissions on June 2, 2014. At this point, we do not know what the final rule will look like, but what we can be sure of is that energy efficiency will almost certainly be part of that compliance plan. Whatever shape or form the final rule takes, if we do not include cost effective energy efficiency programs as part of our plan, it is quite probable that the cost of compliance to our customers will be higher.

Q. Please summarize your conclusion with respect to Mr. Rogers' contentions that RAP portfolio does not benefit all customers.

A. RAP portfolio benefits all customers because it 1) reduces levelized average rates relative to the levelized rates that would otherwise be realized in the absence of further DSM programs at RAP level, and 2) provides flexibility in long-term planning and helps mitigate risks.

IV. AMEREN MISSOURI'S DECISION TO INCLUDE THE RAP PORTFOLIO IN ITS PREFERRED PLAN IS APPROPRIATE

Q. What are the issues you will address in Mr. Woolf's rebuttal testimony related to Ameren Missouri's decision to choose RAP instead of MAP level energy efficiency in its 2014 IRP?

A. I will address Mr. Woolf's allegations that 1) 'IRPs should not define energy efficiency so narrowly, with only two possible future efficiency portfolios'[6], and 2) Ameren Missouri chose RAP even though MAP would reduce costs and average bills significantly.

Q. Please describe Mr. Woolf's criticism regarding Ameren Missouri's focus on the RAP and MAP energy efficiency portfolios.

A. Mr. Woolf claims that the IRP defined energy efficiency so narrowly, with only two possible future efficiency portfolios (RAP and MAP) that the Company did not fully investigate the amount of cost effective energy efficiency savings available.

Q. Would analyzing more than RAP and MAP portfolios be beneficial?

A. Perhaps in an academic sense, but not as a practical matter. Making the decision today on what is the best energy efficiency plan for the next twenty years is not practical. Avoided costs, technology and customer behavior are subject to periodic changes, all of which can result in changes to the potential for energy efficiency. RAP and MAP establish the range of reasonable possibilities over time. However, because of and in light of changing conditions, we will be re-evaluating the potential frequently. That is why the Commission's MEEIA rules require utilities to perform a potential study at least every four years, and the Commission's resource planning rules require utilities to file an IRP every three years. Ameren Missouri prefers to also perform the potential study every three years in order to match the MEEIA and IRP filings. We will continue to implement, assess and evaluate energy efficiency programs and to identify the most cost effective savings as we gain more experience. In turn, that will inform our planning and manifest itself in the specifics of future portfolios.

[6] Tim Woolf Rebuttal, p. 33, l. 13-14.

Q. Mr. Woolf states that the Company should at least investigate a portfolio of efficiency programs consistent with the assumptions used by the EPA in the proposed CPP;[7] how do you respond to that?

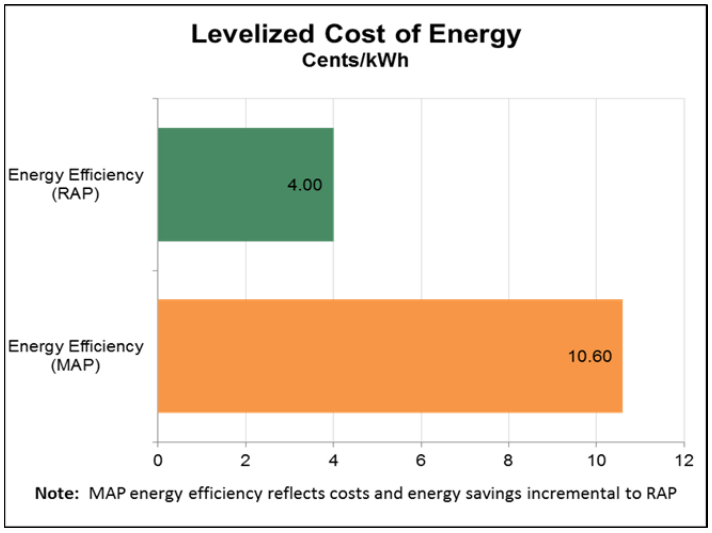
A. In his surrebuttal testimony, Ameren Missouri's witness Richard Voytas explains all the issues related to the EPA's energy efficiency savings potential in the proposed CPP and why such a level of savings is not appropriate to assume for Ameren Missouri.

Q. You mentioned levelized costs in your earlier response to Mr. Rogers' contentions. How do the levelized costs for MAP DSM compare to the levelized costs for RAP DSM?

A. Figure 2 below, which presents only the RAP and MAP energy efficiency levelized costs from the figure provided in the IRP filing Chapter 1, page 7, shows that levelized cost of energy efficiency savings for RAP is 4cents/kWh, whereas the levelized cost of achieving incremental savings up to the MAP level is 10.6cents/kWh.

[7] *Id.,* l. 20-21 and p. 34, l. 1.

Figure 2: LCOE for RAP vs MAP



LCOE is not a metric that can definitively assess the performance of a resource relative to others as part of an integrated resource plan, but it is a very good indicator of costs over the lifetime of a specific resource in isolation. Incremental costs that would be incurred to achieve additional savings to reach MAP level savings are more than double the cost of RAP level savings. RAP and MAP levels of energy efficiency savings and the costs of achieving them are explained in detail by Mr. Voytas in his surrebuttal testimony.

Q. How do you respond to Mr. Woolf's claim that the MAP portfolio would reduce costs and average bills by significantly more than the RAP portfolio?

A. This claim is only half correct. As shown in Table 2 below, while the total cost (PVRR) is lower for the MAP-Plan R, this plan results in higher levelized average rates than the RAP-Plan I, even without the inclusion of utility incentives. The levelized average rates for MAP-Plan R are 0.046cents/kWh higher than the levelized average rates for RAP-Plan I, without the inclusion of performance incentives or with the performance incentives requested in this case. When performance incentives using the IRP assumptions are added,

which are higher for MAP than RAP and makes the rate impact for MAP-Plan R even greater, it is 0.057cents/kWh higher than the RAP Plan.

Table 2: RAP vs MAP Plan PVRR and Levelized Rates

	PVRR without Utility Performance Incentives 2015-2044 $Million	No Utility Performance Incentives 2015-2044 Cents/kWh	With Utility Performance Incentives IRP Assumption 2015-2044 Cents/kWh	With Utility Performance Incentives Requested in This Case 2015-2044 Cents/kWh
RAP-Plan I	61,352	12.008	12.064	12.027
MAP-Plan R	61,081	12.054	12.121	12.073
Difference MAP - RAP	(271)	0.046	0.057	0.046

Q. What is the significance of higher levelized average rates for the MAP Plan rather than the RAP Plan?

A. It means that, compared to the RAP Plan, implementing the MAP Plan would not reduce average bills for non-participants, but would cause an increase in the non-participants' average bills, contrary to what Mr. Woolf is claiming. Also shown in Table 1, the MAP Plan results in an increase in levelized rates compared to the No DSM Plan, while the RAP Plan results in a reduction in levelized rates. This is the same issue Mr. Rogers has raised -- 'do the programs benefit all customers whether or not they participate in the programs?' The answer for the MAP Plan is that it definitely does not reduce average rate impacts for non-participating customers like the RAP Plan does.

Q. Did consideration of these expected rate impacts cause Ameren Missouri to choose the RAP Plan in the IRP?

A. It certainly was an important consideration, because the rate impacts for non-participants are clearly unfavorable in the MAP Plan. In addition to that, we looked at total

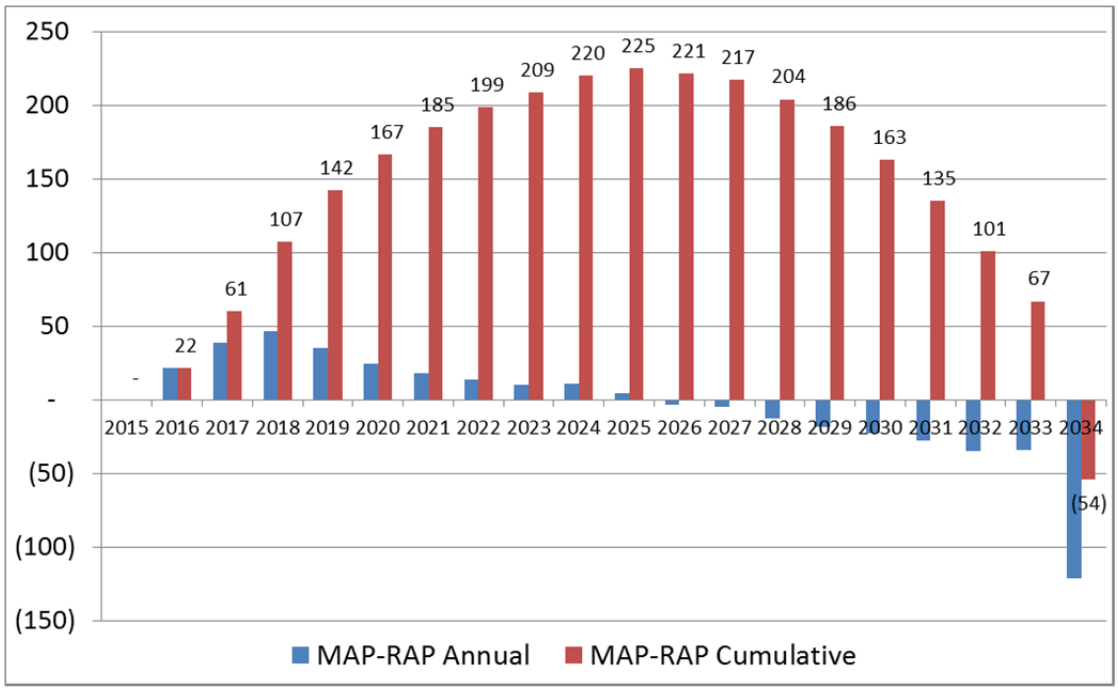
costs with utility performance incentives and/or participant out-of-pocket costs, which showed a de minimis cost advantage for MAP over the 30-year study period.

Table 3: Comparison of Total Cost to Customers for RAP and MAP[8]

$ Million	PVRR	PVRR w/ Incentives	PVRR w/ DSM Participant Costs	PVRR w/ Incentives & DSM Participant Costs
R - CC-MAP-Balanced	61,081	61,420	61,834	62,172
I - CC-RAP-Balanced	61,352	61,635	61,928	62,211
MAP Cost Advantage	271	215	94	38

We also looked at the year-by-year PVRR differences between RAP and MAP energy efficiency, which is shown in Figure 3 below and can also be found on page 9 in Chapter 10 of Ameren Missouri's 2014 IRP filing.

Figure 3: Year-by-year Cost Comparison for RAP and MAP[9]



[8] This table was provided in the IRP filing (EO-2015-0084) Ch. 10, p. 8.
[9] *Id.*, p. 9.

Q. What is the significance of this chart?

A. In short, it shows that any net benefit for the MAP portfolio is not realized until 2034 – the last year of the 20-year planning horizon. The chart shows the annual and cumulative PVRR differences between the RAP and MAP portfolios. It is noteworthy that the RAP energy efficiency Plan costs customers less than the MAP Plan through 2025 annually, and the cumulative cost advantage of RAP energy efficiency continues until 2034. All of the analysis results suggested that it would be a much better approach to start with RAP level energy efficiency programs instead of starting out with MAP energy efficiency and subjecting customers to higher rate and cost impacts with a great deal of uncertainty as to the benefit. As I stated earlier, it is not possible to decide what the best portfolio for the next twenty years would be right now, which is why the potential studies and IRPs are conducted periodically. The Commission's IRP and MEEIA rules recognize the ever-changing nature of the resource planning environment by requiring frequent updates to potential studies and resource planning analyses and by allowing for changes to our plans when circumstances warrant changes. Our approach provides us with the flexibility to identify and offer the most cost effective savings to our customers as we gain more experience through continued market research, program implementation and EM&V, and shields our customers from unnecessary cost and rate increase risks.

Q. Please summarize your conclusions with respect to Mr. Woolf's contentions regarding the Company's selection of the RAP portfolio over the MAP portfolio.

A. Based on our extensive analysis, Ameren Missouri has concluded that the RAP portfolio most appropriately balances the achievement of cost effective energy

efficiency savings with the risks and rate impacts to all customers. The MAP portfolio does not because it 1) results in higher levelized rates over the IRP study period, 2) requires much higher incremental spending for each kWh saved, and 3) does not result in net savings to customers until 2034.

V. AMEREN MISSOURI'S TREATMENT OF CO_2 PRICES AND EVALUATION OF EPA'S PROPOSED GHG EMISSIONS REGULATIONS ARE APPROPRIATE

Q. Please explain Mr. Woolf's criticisms of Ameren Missouri's CO_2 emissions regulation assumptions and CPP compliance analysis.

A. Mr. Woolf claims, "by assuming very low probabilities that there will be *any* [*emphasis added*] federal greenhouse gas emission requirements, and by assuming relatively low estimates for CO_2 allowance prices, the Company significantly understates the additional costs that could be avoided by efficiency programs."[10] Mr. Woolf also claims that the Company does not intend to use energy efficiency resources to comply with the eventual final form of the EPA's proposed CPP.[11]

Q. How would you briefly respond to these criticisms?

A. Ameren Missouri's estimate of costs that could be avoided by energy efficiency programs is appropriate because the Company has properly considered and included costs of complying with environmental regulations, including federal GHG regulations. In its IRP, the Company assumed some type of GHG regulations through indirect mechanisms that do not include an explicit price on CO_2 emissions with an 85% probability, and through mechanisms that include an explicit CO_2 price with a 15% probability. Mr. Woolf's assertion that the Company does not intend to use energy efficiency

[10] Tim Woolf Rebuttal, p. 38, l. 20-22.
[11] Id., p. 39, l. 7-8.

to comply with the CPP is not correct at all, as it is fully expected to be part of our plan for compliance with the final form of the EPA's currently proposed CPP and was reflected in our IRP analysis of compliance with these regulations.

Q. Please describe how Ameren Missouri considered and included costs of complying with GHG regulations.

A. Ameren Missouri identified three key drivers for wholesale market prices of electricity: load growth, natural gas prices and environmental regulations. Various combinations of these key driver variables provided us with the fifteen distinct power price scenarios under which we evaluated the performance of the alternative resource plans and the illustrative plan we evaluated for compliance with the proposed CPP. For the environmental regulations scenarios, our internal experts considered existing, proposed and future regulations, including but not limited to National Ambient Air Quality Standards ("NAAQS"), Mercury and Air Toxics Standards ("MATS"), Coal Combustion Residuals ("CCR"), Clean Water Act regulations, and federal GHG emissions regulations. Compliance with these current/proposed/future regulations would manifest themselves through existing coal generation retirements and replacement generation additions. Our experts then developed the assumptions for the amount of retirements and the timing, and the likelihood of these retirements. The highest level of retirement scenarios also included explicit CO_2 prices.

Q. Can you please describe in more detail how the GHG regulations were considered in the scenarios?

A. Our assumptions in the scenario development concerning the GHG regulations were framed in our 2014 IRP filing as follows:

In addition to the existing and future regulations outlined above, we must also consider potential actions with respect to climate policy and regulation of GHG emissions beyond what was recently proposed by EPA in the form of its Clean Power Plan. To help frame the ongoing possibilities for carbon policy and regulation of GHG emissions, we examined reports from several research and consulting companies, such as Wood Mackenzie, IHS Cera, and Synapse Energy Economics, Inc. We also reviewed US government reports on the so-called "social cost of carbon." Through this process we considered the structures [by which] a future GHG policy could be implemented which included the following;

- Legislative
- Regulatory
- International Treaty

We identified three general mechanisms by which GHG policy could be implemented through any of the above structures. Each implementation path could seek to achieve GHG reductions through any, or a combination of, three mechanisms:

- Policies to mandate and/or promote low/no carbon resources
- Specified limits on GHG emissions (emission rates or mass emission)
- Implementation of an explicit price on GHG emissions

This framework provided a vehicle for discussion with our internal experts to identify the probable ranges of coal retirements and carbon prices that define our scenarios. Through this process an updated set of assumptions was developed to reflect environmental policy effects on coal retirement expectations, as well as the timing, magnitude and probability of an explicit price on carbon dioxide emissions.[12]

It is important to note that two of these mechanisms – policies to mandate and/or promote low/no carbon resources and specified limits on GHG emissions – are the 'indirect' mechanisms that I mentioned earlier, represented by scenarios that carry a combined 85% probability. These "indirect" mechanisms are the same mechanisms that were mentioned in the study by Synapse Energy Economics – 2013 Carbon Dioxide Price Forecast – that the

[12] Ameren Missouri 2014 IRP (File No. EO-2015-0084) Ch. 2, p. 19.

Company relied on for CO_2 price assumptions, and was also referenced by Mr. Woolf in his rebuttal testimony.[13] This study is attached to my surrebuttal testimony as Schedule SHB-1.

Q. What does the 2013 Synapse study say regarding what you refer to as methods of imposing "indirect" costs on CO_2 emissions?

A. On page 6 of this study, it reads:

> However, many other types of climate policies work not by making polluting more expensive per se, but instead by requiring firms to use one technology instead of another, or to maintain particular emission limitations in order to avoid legal repercussions.

Moreover, Dr. Ezra Hausman, who is one of the co-authors of the study mentioned above, referred to the same kinds of indirect regulations used in Ameren Missouri's assumptions as part of his testimony in Ameren Missouri's most recent rate case:

> A more likely impact of CO_2 regulation would be to directly or indirectly increase the cost of generation from carbon-intensive resources such as coal plants. "Directly" would mean by imposing a carbon tax or a tradable allowance system, neither of which is currently part of EPA's proposal; "indirectly" would be any other mechanism that effectively imposes a preference for low-carbon resources, leading to curtailed operations or shutdown of existing coal plants. [14]

These indirect mechanisms are exactly the kind that were assumed when the timing and amount of coal retirements were determined for the environmental regulation scenarios that did not include explicit CO_2 prices, as determined by our subject matter experts. Therefore, all scenarios included some type of GHG emission regulation assumption, contrary to Mr. Woolf's allegation that the Company assumed very low probabilities that there will be *any* federal GHG emission requirements.

[13] Tim Woolf Rebuttal, p. 36, footnote 10.
[14] Ezra D. Hausman Direct in File No. ER-2014-0258, p.7, l. 6-9.

Q. What you have referenced in Dr. Hausman's testimony above states that a carbon tax or tradable allowance system are not part of EPA's proposal. Is this the same proposed CPP you have discussed previously in your testimony?

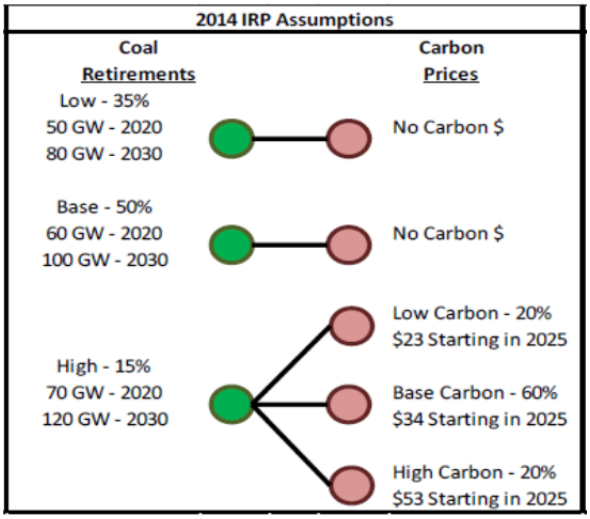
A. Yes, exactly. EPA's proposed CPP to reduce GHG emissions does not impose an explicit price on CO_2 emissions but instead makes use of the indirect mechanisms described by Dr. Hausman, and further affirms the appropriateness of Ameren Missouri's scenario assumptions.

Q. What are the resulting coal plant retirement assumptions in these scenarios?

A. Figure 4 below, which is reproduced from Ameren Missouri's IRP filing,[15] illustrates the timing and magnitude of the retirement assumptions. The least stringent environmental scenario assumptions result in 80 gigawatts ("GW") of coal retirements by 2030, the base level environmental regulations include 100 GW of retirements by 2030 and the high level retirement scenario with varying explicit carbon prices assume 120 GW of retirements by 2030.

[15] Ameren Missouri 2014 IRP (File No. EO-2015-0084), Ch. 2, p. 20.

Figure 4: Coal Retirement Assumptions



Q. Do you know how IRP retirement assumptions in the scenarios compare to other estimates?

A. Yes. They are consistent with what we are seeing from other sources. For example, the EPA's own analysis estimates that the CPP will result in approximately 100 GW of coal plant retirements.[16] Another study by the Bipartisan Policy Center assumes 50 GW of coal retirements by 2030 in its reference case, which does not include any GHG emission regulations, and an additional ~40 GW of retirements as a result of the proposed CPP that bring the total retirement estimate to just above 90 GW.[17] Another study by NERA Economic Consulting also shows 51 GW of retirements due to environmental regulations other than GHG emission regulations, and estimates a total of 97 GW of coal retirements by 2031 with the inclusion of the proposed CPP.[18] Again, our retirement assumptions that range from 80 to 120 GW with the highest probability given to 100 GW of retirements are entirely consistent with estimates from other sources, including the EPA.

[16] http://www.epa.gov/airmarkets/powersectormodeling/docs/Option%201%20State.zip.
[17] Modeling Proposed Clean Power Plan: Preliminary Results, September 22, 2014.
[18] Potential Energy Impacts of the EPA Proposed Clean Power Plan, October 2014.

Q. Are the retirements of Ameren Missouri coal units in the Company's IRP preferred resource plan also in line with these retirement estimates?

A. All of the estimates from the external sources I cited point to about 100 GW of coal retirements out of approximately 316 GW of available coal capacity, which is slightly less than one-third of all coal generation capacity in the U.S. In the IRP, with the retirement of Meramec and Sioux Energy Centers within the next twenty years, we are reflecting retirement of about one-third of our existing coal generation. I do not know how anyone can claim this is not consistent.

Q. How do you respond to Mr. Woolf's allegation that "Ameren's assumptions about the probability of CPP are clearly too low"?[19]

A. Mr. Woolf is confusing Ameren Missouri's scenario assumptions for GHG regulation with our analysis of a specific regulation that is currently only in proposed form. After the EPA released the details of its proposed CPP, we performed an analysis of a potential compliance plan based on the proposed regulations. Separately, and as explained earlier, we did include GHG emission regulation assumptions in all scenarios through either direct or indirect means, the latter of which are consistent with the kinds of mechanisms reflected in the proposed CPP and for which a probability of 85% was assigned by our subject matter experts. Ameren Missouri did not explicitly assign a probability to the proposed CPP.

Q. Given what you just stated, is Mr. Woolf's assertion that "Ameren applied a forecast of CO_2 allowance costs to represent the costs of complying with the

[19] Tim Woolf Rebuttal, p. 37, l. 6-7.

CPP"[20] correct?

A. No, it is not. The explicit CO_2 prices that Ameren Missouri assumed in its scenarios do not represent the costs of complying with the CPP but only the costs imposed on CO_2 emitting resources per ton of CO_2 emitted under those scenarios in which an explicit CO_2 price is included.

Q. Does Mr. Woolf agree with the timing and the probabilities the Company assigned to the CO_2 price scenarios?

A. No. We assumed there would not be any explicit CO_2 price through 2024, but assumed explicit prices equal to those presented in the Synapse 2013 Carbon Dioxide Price Forecast starting in 2025. Since the Synapse report has CO_2 price estimates in 2020-2024, Mr. Woolf does not agree with our timing assumption. A total of 15% probability was assigned to these scenarios, which, as I understand, Mr. Woolf claims to be low. But as I have demonstrated, this does not represent the entire range of GHG regulation based on imposing indirect costs, which carry a combined 85% probability.

Q. Mr. Woolf takes issue with the absence of a CO_2 price prior to 2025 in the scenarios in which a CO_2 price is assumed. Why did Ameren Missouri assume a 2025 starting point for CO_2 prices?

A. This assumption was based on our internal subject matter experts' assessments as part of the process described earlier in my testimony. On the environmental regulation scenario development, we worked with members of executive management who have direct relationships with policymakers, lobbyists, legislators, and regulators including EPA staff. The first issue regarding CO_2 prices that our experts deliberated on was whether the

[20] *Id.*, p. 36, l. 7-8.

imposition of a CO_2 price was likely under the existing regulations; the consensus was that it was not. This meant that new legislation would have to be passed by Congress and signed into law by the President to make imposition of CO_2 prices possible by regulations. Our internal experts did not see a favorable political climate for such a scenario in the near future and therefore determined that 2025 would likely be the first year in which an explicit CO_2 price would take effect. These same considerations were also the reason for the 15% probability assigned to the explicit CO_2 price scenarios.

Q. Does Mr. Woolf agree with the magnitude of CO_2 prices Ameren Missouri used in the scenarios?

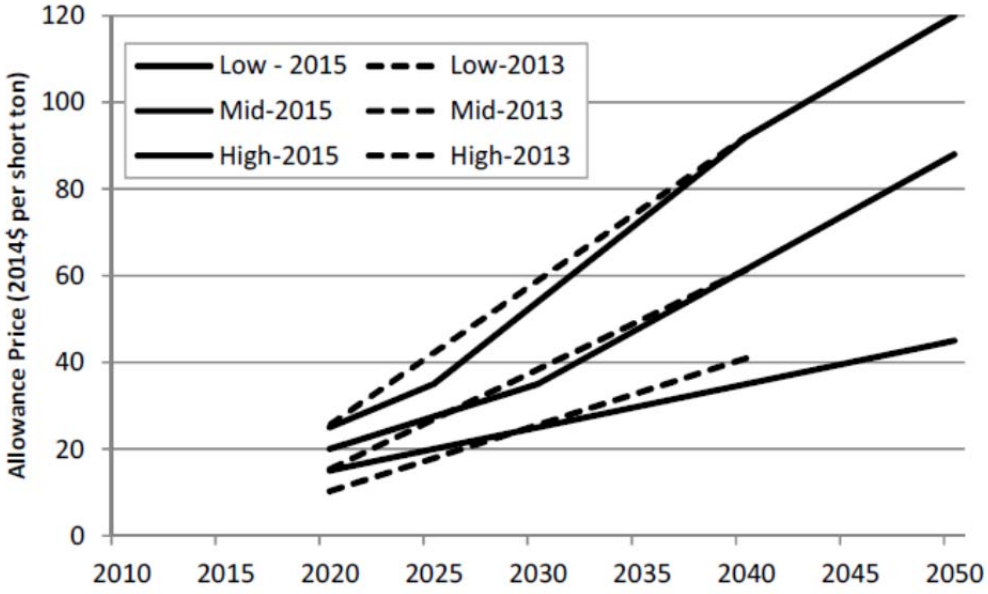
A. No, surprisingly, he does not seem to agree with the magnitude of CO_2 prices used by Ameren Missouri,[21] even though the prices we used were taken from the 2013 Carbon Price Forecast by Synapse Energy Economics, by whom Mr. Woolf is employed. He does state that a recent update to the Synapse CO_2 price forecast provides a much more reasonable range of future CO_2 prices.[22]

Q. What does the more recent Synapse study show?

A. The following figure is taken from Page 37 of this updated report, which I have attached to my surrebuttal testimony as Schedule SHB-2.[23]

[21] *Id*., p. 38, l. 21.
[22] *Id*., p. 37, l. 8-10.
[23] Carbon Dioxide Price Forecast, Synapse Energy Economics, March 3, 2015.

Figure 5: Comparison of 2013 and 2015 Synapse CO_2 Price Forecasts



As can be seen from the figure, between 2025 and 2040, most of the data points for the 2013 forecasts, used as the basis for Ameren Missouri's IRP assumptions, are higher than those in the 2015 Synapse update. Mr. Woolf's characterization that the CO_2 price assumptions used by Ameren Missouri are too low clearly cannot be based on a comparison to the more recent Synapse study.

Q. What is Mr. Woolf's basis then for claiming the CO_2 prices used in the IRP scenarios are too low?

A. I am really having a hard time understanding his basis. Maybe it is a misunderstanding on Mr. Woolf's part about the $53/ton cost we estimated for complying with the CPP that Mr. Woolf references in this testimony[24] followed by his assertion that "the Company does not explain why its modeling assumptions differ so dramatically from its

[24] Tim Woolf Rebuttal, p. 37, l. 14-18.

position that compliance costs are likely to be higher than the costs assumed in the High CO_2 Case."[25]

Q. Did the Company's modeling assumptions differ dramatically from its position that compliance costs are likely to be higher than the costs assumed in the High CO_2 case?

A. No. We explained all the assumptions and the results of our analyses, including a plan for compliance with the proposed CPP, and there is no inconsistency between the assumptions and the results and our position.

Q. What causes Mr. Woolf to make such a claim?

A. There seems to be some confusion and a case of comparing apples to oranges on Mr. Woolf's part. Within weeks after the proposed CPP was released, we did formulate an illustrative compliance plan that would require several changes to our IRP preferred plan – advancing retirement of Meramec to the end of 2019, advancing CC to 2020 and doubling the size, adding more wind energy, and uneconomically dispatching coal and natural gas plants. We estimated these changes could cost an additional $4 billion between 2020 and 2035. We presented this same information in a different way by calculating cost per ton of CO_2 reduction over that same time period, which is the $53/ton Mr. Woolf cites from the IRP.[26] The additional $4 billion in costs divided by the total CO_2 emission reductions estimated in that 15-year period resulted in that number. So, the $53/ton figure is the result of the analysis and is not an input to the analysis. It is also not analogous to an effective price, explicit or otherwise, on CO_2 emissions.

[25] *Id*., p. 38, l. 1-3.
[26] *Id.*, p. 37, l. 16-18.

Q. Mr. Woolf also argues that Ameren Missouri did not explain why the High CO_2 case has a probability of only three percent; what is your response to that?

A. The scenario development process described previously, including the assumptions and the resulting probabilities assigned to each price scenario, have been explained in the IRP filing in Chapter 2. The final probability tree for the market price scenarios is provided as an attachment to my surrebuttal testimony as Schedule SHB-3.

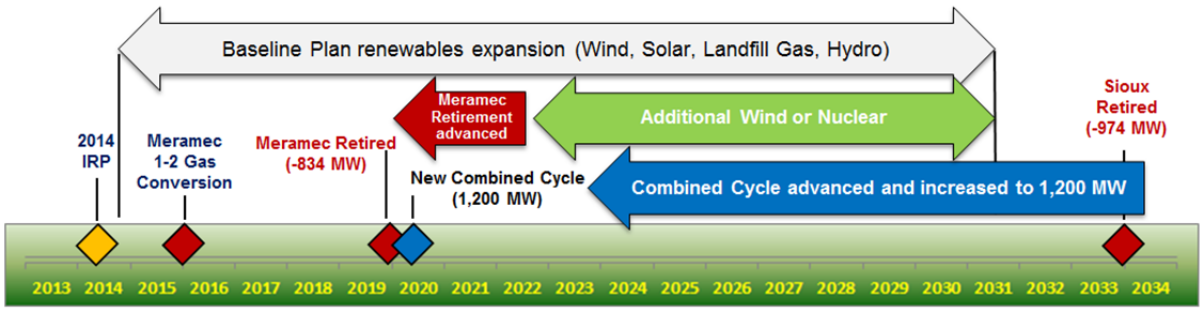
Q. Does Ameren Missouri consider energy efficiency an option for complying with the CPP plan?

A. Yes, it does.

Q. Then why does Mr. Woolf claim Ameren Missouri does not intend to use energy efficiency resources to mitigate the cost of complying with the CPP?[27]

A. I believe it is another misunderstanding on Mr. Woolf's part. He makes the claim, referencing a figure we provided in the IRP filing in Chapter 1, page 17, that "there is no mention of using efficiency to respond to the CPP regulations."[28] The figure referenced by Mr. Woolf is reproduced below as Figure 6.

Figure 6: Impacts of GHG Regulations on Preferred Resource Plan



[27] *Id.*, p. 39, l. 5-8.
[28] *Id.*, l. 15.

This figure shows only the changes that would have to be made to the Company's IRP preferred plan to be compliant with the proposed CPP. The preferred resource plan already includes RAP level energy efficiency. Therefore, energy efficiency is also part of the illustrative CPP compliance plan. Had energy efficiency not been included in the compliance plan, the costs would have been even higher than we estimated. It is important to keep in mind that this is just one approach to compliance with a proposed rule. The CPP rule is expected to be finalized in summer 2015, there is high probability of legal challenges, and state implementation plans are supposed to be finalized in 2016. Given that MEEIA insures the utility incentives will be aligned with helping customers use energy more efficiently, Ameren Missouri expects to utilize opportunities to increase energy efficiency savings as we identify and offer the most cost effective savings to our customers including any such savings that will help Ameren Missouri comply with GHG regulations.

Q. Please summarize your conclusions with respect to Mr. Woolf's criticism of the Company's consideration of GHG regulations.

A. Ameren Missouri has appropriately considered GHG regulations as part of its IRP analysis and has properly evaluated the potential impacts of the EPA's proposed CPP. The high probability (85%) assigned by Ameren Missouri's subject matter experts to regulations that impose indirect costs on CO_2 emissions is appropriate in light of the EPA's proposed CPP, which does not impose an explicit price on CO_2 emissions. The retirement of existing coal-fired plants, including some owned by Ameren Missouri, and replacement of these plants with resources that produce lower (or no) CO_2 emissions fully account for the indirect costs of such regulations. As a result there is no need to also impose an explicit price for CO_2 emissions. The CO_2 prices assumed by the Company, with an estimated 15%

probability of occurrence, are exactly equal to those produced by Synapse in its last study prior to the filing of the Company's IRP and are similar to those produced by Synapse in its updated study released last month. Only the starting year for these prices, 2025 versus 2020, is different based on Ameren Missouri's own expert assessment of the policy landscape. Mr. Woolf's criticisms therefore have no basis in fact.

Q. Please summarize your conclusions.

A. The RAP portfolio benefits all customers whether or not they participate in the programs. In addition to reduced levelized rates relative to the No DSM plan (i.e., reduced average bills), the RAP portfolio also provides flexibility in long-term planning and helps mitigate risks, and therefore provides other benefits to all customers.

The Company's decision to include RAP DSM in its preferred plan instead of MAP DSM is appropriate as the Company considered and analyzed costs and benefits extensively, including any federal CO_2 emission regulations. Ameren Missouri has concluded that the RAP portfolio most appropriately balances the achievement of cost effective energy efficiency savings with the risks and rate impacts to all customers. The MAP portfolio does not because it 1) results in higher levelized rates over the IRP study period, 2) requires much higher incremental spending for each kWh saved, and 3) does not result in net savings to all customers until 2034.

Q. Does this conclude your surrebuttal testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's 2nd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as Allowed by MEEIA.	))))	File No. EO-2015-0055

AFFIDAVIT OF S. HANDE BERK

STATE OF MISSOURI)
) **ss**
CITY OF ST. LOUIS)

S. Hande Berk, being first duly sworn on her oath, states:

1. My name is S. Hande Berk. I work in the City of St. Louis, Missouri, and I am employed by Ameren Services Company as Senior Corporate Planning Analyst.

2. Attached hereto and made a part hereof for all purposes is my Surrebuttal Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 33 pages and Schedule(s) SHB-1 thru SHB-3, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

S. Hande Berk

Subscribed and sworn to before me this 27th day of April, 2015.

Notary Public

My commission expires:

Julie Irby - Notary Public
Notary Seal, State of
Missouri - St. Louis County
Commission #13753418
My Commission Expires 1/15/2017