Review of the Union Electric Company Integrated Resource Plan

The Office of the Public Counsel

Technical Report

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1. Executive Summary

The Union Electric Company (UE or the Company) IRP contains several significant errors and deficiencies, as described below. Individually, each of these problems with the analysis causes some concern regarding the outcome of the IRP. Taken as a whole, these errors and deficiencies indicate several important themes that apparently have influenced the preparation and outcome of this IRP. First, the Company is not taking the necessary steps to plan for and respond to expected future environmental constraints, either in terms of EPA regulations for environmental controls on fossil plants or in terms of requirements to address climate change. Second, the Company is explicitly ignoring and rejecting the opportunities to reduce electricity costs, lower customer bills, and reduce environmental impacts through energy efficiency programs. Third, the Company is ignoring or downplaying the opportunities available from wind resources. Finally, the Company demonstrates a bias towards using new nuclear plants to meet future electricity needs, despite the risks and potential high costs of nuclear power.

Resource Options

The IRP investigates a new nuclear generator as one of the primary resources needed to meet new load. The Company's assumptions regarding nuclear unit construction times and cost are unrealistically optimistic, and the Company has not adequately addressed the tremendous financial and economic risks associated with this technology type. It is impossible to tell from this inadequate analysis whether a new nuclear generator is a viable future resource option for the Company.

The IRP analysis of wind resources contains three flaws, which when combined significantly limit the extent to which wind can play a role in the IRP. First, it inappropriately assumes that 346 MWs of simple cycle gas turbines are built for every 800 MWs (nameplate capacity value) of wind turbines installed, resulting in significantly inflated costs for wind resources. Second, it applies a very high build threshold of 210 MW, and only installs wind turbines in 800 MW blocks, which limits the ability of this modular resource to be introduced to the system. Third, it applies a single average cost to the entire amount of wind resources available, rather than allowing the IRP model to accept the lowest-cost wind resources first.

The Company's analysis of energy efficiency resources is completely dominated by its concern about recovering lost revenues from reduced sales. Because of this concern, the IRP study significantly understates the savings potential and the economic value of energy efficiency resources.

- First and foremost, the Company selects the Low Risk Portfolio for its preferred resource plan, which includes efficiency savings that are *less than* the program currently being implemented by the Company. The Company's own analysis indicates that higher levels of efficiency savings in the Reasonably Achievable Potential (RAP) Portfolio can reduce electricity costs by $1.5 to $2.5 billion relative to the portfolio chosen by the Company. UE's decision to select the Low

Risk Portfolio is directly in conflict with the IRP regulations that require demand-side and supply-side resources be evaluated on an equivalent basis and that the primary selection criterion should be the minimization of the present worth of long-run utility costs.

- The RAP Portfolio understates the amount of energy efficiency savings that could be reasonably achieved by (a) assuming low financial incentives to participating customers, and (b) assuming low awareness of the efficiency programs. The Company has control over both of these factors, by increasing financial incentives and expanding outreach programs, and could significantly increase efficiency savings by adhering to best practices used by leading energy efficiency program administrators in other states.
- The IRP assumes that there will be no demand response before 2016 in the Low Risk scenario, which understates the potential for demand response. More importantly, the Company does not integrate any demand response resources in most of the resource plans with the RAP Portfolio, significantly understating the potential benefits from this important resource.
- The IRP should include a broader range of demand-side resources, both energy efficiency and demand response, including savings levels above those in the RAP portfolio, in order to allow the model to identify the cost-effective level of demand-side resources.

Finally, the IRP does not fully investigate the opportunities for retiring or repowering the Company's existing coal facilities. While the IRP includes a commendable analysis of the options for modifying or retiring the Meramec coal plant, it should go further and include analyses of modifying or retiring additional coal units – particularly in light of the future environmental regulation compliance costs for these units. The Company's own estimates indicated that these costs could be on the order of $2.3 to $2.7 billion over the next ten years. Furthermore, the IRP indicates that there is a significant amount of new resource options available to replace any retired coal capacity. At a minimum, the IRP should be consistent with the analyses and considerations undertaken by UE's parent company, Ameren in its new Generation Initiative.

Initial Screening

The IRP scenario modeling starts with 216 plausible scenarios, and then applies a scorecard to rank them and reduce them to a much smaller set of "semi-finalists." There are several problems with the way the Company applied this initial scorecard approach:

- The metric used to measure customer satisfaction is overly simplistic and can potentially lead to illogical results, where scenarios with delayed rate impacts can be considered worse than those with constant rate impacts or equal to those with accelerated rate impacts.
- The metric to account for employment impacts assumes that UE will own 100 percent of the new nuclear unit, when it is planning to actually own only 30 percent or 50 percent.

- The probability distribution used to assess the likely costs of the nuclear plant does not sufficiently account for the likelihood of significant cost overruns.
- The scorecard uses a "unitized" scoring system where a scenario is given a score ranging from 0.000 to 1.000, for each metric. However, the Company does not apply this approach equally across the metrics in that UE does not always score the lowest case at 0.000. Because of the math behind the scoring, this results in "effective weights" that are considerably different than the weights the Company claims it is using.

We used the scorecard system to correct for these problems and identify the impact that they have on the semi-finalist plans. In general, the energy efficiency scenarios fare even better, the nuclear scenarios fare much worse, and the Meramec early retirement plans fare better.

Selection of the Preferred Resource Plan

After the semi-finalist selection process, UE then identifies 14 candidate resource plans as finalists, and conducts a slightly different scoring approach to determine its Preferred Resource Plan. There are several problems with the way the Company applies its Preferred Plan Selection Scorecard.

One of the most significant problems is that the Company's approach is based on a direct comparison between two different, mutually exclusive futures; the moderate environmental scenario and the aggressive environmental scenario. Five of the final candidate resource plans comply with the former and nine comply with the latter. Comparison of resource plans across these two different scenarios is inappropriate and misleading, because the aggressive environmental scenario will be more expensive by definition as it will require billions of dollars of environmental controls.

To make matters worse, applying the scorecard across the different environmental scenarios skews the policy objective metrics and leads to spurious results. Each of the resource plans is ranked from one to five for each of the six policy objectives, where the rank is assigned by the Company relative to the other resource plans. The Company develops ranks across all 14 resource plans – despite the fact that the five plans in the moderate environmental scenario are not comparable to the nine plans in the aggressive environmental scenario. The appropriate way to develop these scores would be to rank the five resource plans in the moderate environmental scenario relative to each other and then rank the nine resource plans in the aggressive environmental scenario relative to each other. The Company's approach dramatically skews some of the resource plan ranks, calling into question the validity of the scorecard results.

The Company applies scores based on whole numbers between one and five. In several cases, this requires using judgment about just what the score should be. In some cases the judgments do not make sense or are in error. In particular, (a) the RAP efficiency plan does not get a high score for environmental diversity based on the questionable logic that reducing demand does not increase resource diversity; (b) the RAP efficiency plans do not get the highest score for efficiency savings, apparently through an error; and (c) the economic development scores do not correspond to the

economic development estimates associated with the different plans, with the energy efficiency plans being underscored.

In applying the scorecard UE used different weights across the six categories than the weights they presented in Chapter 9 of the IRP. The weight of the energy efficiency metric was reduced from 10 percent to zero, and the customer satisfaction and cost metrics were each increased by five percent. It is not clear why the Company shifted these weights, but it results in a blatant reduction in score for the energy efficiency plans.

The Company applied a weight of 25 percent (or 30 percent in the actual scoring) to the cost metric. The most logical interpretation of the IRP regulations would require this metric to be weighted at least 50 percent, as the primary criterion for selecting the preferred resource plan.

Again, we used the company's scoring system to correct for some of these problems, to see how corrections would influence the selection of the preferred resource plan. We find that the energy efficiency scenarios fare better, the nuclear scenarios fare worse, and the early retirement of Meramec continues to score high.

Presentation to the Board of Directors

The Company's bias against energy efficiency is made evident in its presentations given to the Union Electric Board and the Ameren Board. In both of those presentations the Company refers to the Low Risk Portfolio of energy efficiency programs as the "Lowest Cost Resource Plan," when their own analyses indicate that the RAP Portfolio of energy efficiency programs results in lower costs when compared correctly with the Low Risk Portfolio. In addition, in those presentations the Company claims that the RAP Portfolio has a moderate disadvantage in terms of the cost criteria relative to the Low Risk Portfolio, when all of its analyses indicate that the opposite is true. It is very troubling to see the Boards of Directors being provided inaccurate and misleading information on this important issue.

New Nuclear Generation

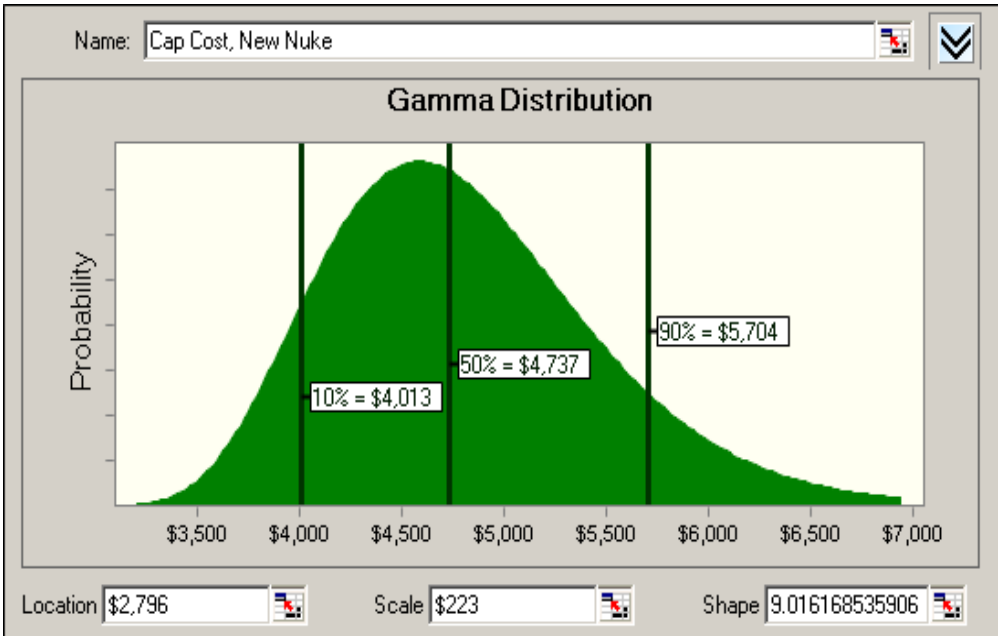
New nuclear options considered by UE include the U.S. EPR, APWR, and AP-1000, with U.S. EPR ultimately chosen. UE's total capital cost estimate of a new 1600 MW nuclear unit is $6.755 Billion. UE evaluates having the plant in service as soon as 2019, although the soonest it would be operational in a plan which made the final stage of analysis was 2025.

There are a number of significant problems with UE's treatment of a new nuclear resource. The estimates of nuclear power construction costs are notoriously low[1], and

[1] *Nuclear Power Plant Construction Costs*, David Schlissel and Bruce Biewald, July 2008.

UE demonstrates a lack of appreciation for the magnitude of the possible cost overruns in their capital cost probability distribution, shown below.[2]

This cost distribution demonstrates UE's belief that coming in 50% or more over budget has a probability well under 1%. Capital cost experience within the United States in the 1960s and 1970s and with Olkiluoto[3] (also a European Pressurized Reactor) in the past decade suggest that significant capital cost overruns are the norm. UE should include the not-insignificant possibility of a significant cost overrun to nuclear power capital cost both by choosing a distribution with a thicker right tail and by including the cost and probability of a significant cost overrun in their model.



In addition to cost, nuclear power plant construction has historically faced significant delays. The United States Nuclear Regulatory Commission is currently scheduled to issue a final ruling on the U.S. EPA design in February 2013, but a number of intermediate dates must be kept on schedule first, certainly no guarantee. In response to the Fukushima disaster, Standard and Poor has warned that "approval and construction delays are likely."[4] Delays don't just make it difficult for the utility to balance load; their impact on the total cost of the project can be staggering. While UE may persuade the Missouri legislature to allow the recovery of costs of successfully obtaining an early site permit and may even gain other more favorable financing options, the financial risk due to non-legislative and non-financial delays is tremendous. Even obtaining CWIP could create problems: Progress Energy is being challenged before

[2] From the workpapers provided by UE: SHB - HC\Supply Side\ Nuclear Capital Cost.pptx
[3] See http://www.world-nuclear-news.org/newsarticle.aspx?id=24732
[4] See http://www.standardandpoors.com/products-services/articles/en/us/?assetID=1245300452844

regulators and in the courts over CWIP for their $17 billion nuclear project (now expected to cost more than $22 billion)[5][6].

Reflecting on the low prices for natural gas, Exelon CEO John Rowe stated recently that "new nuclear plants started to look very expensive" and that "wind began to look more attractive."[7] Given the risk of substantial construction delays and severe cost overruns, UE is significantly understating risk associated with new nuclear power. This is especially problematic given the variety of resources available to the Company with significantly lower risk.

Existing Coal Power Plants

UE has four coal-fired power plants: Labadie, Rush Island, Meramec, and Sioux. While UE exerted considerable effort analyzing the economics of controlling, converting, operating, or closing Meramec, it has not performed similar economic analyses on their other coal fired resources. Given the likely additional costs of compliance with new EPA fossil regulations, as well as the costs of compliance with future CO2 requirements, a thorough resource planning exercise should consider the economics of retiring or repowering another coal-fired plant in addition to Meramec.

It is important to note that the Company is well aware of the likely future costs of compliance with new EPA fossil regulations. In its annual report to the Security and Exchange Commission, the Company notes that it anticipates as much as $2.3 to $2.7 billion dollars of expenditures over the next ten years to upgrade its coal plants to comply with existing and future EPA regulations on coal facilities (not including CO2 regulations). In discussing this issue, the Company states:

> In addition to existing laws and regulations governing our facilities, the EPA is developing numerous new environmental regulations that will have a significant effect on the electric utility industry. These regulations could be particularly burdensome for certain companies, including UE and Genco, that operate coal-fired power plants… Actions required to ensure that our facilities are in compliance with environmental laws and regulations could be prohibitively expensive. As a result, these regulations could require us to close or to significantly alter the operation of our generation facilities…[8]

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5 Kevin Spear. Nuclear costs face double challenge, *Orlando Sentinel*, September 08, 2009, online at http://articles.orlandosentinel.com/2009-09-08/news/0909070139_1_utility-customers-progress-energy-nuclear-costs

6 Fred Hiers. Suit challenges Progress Energy's charges for proposed nuclear plant, *Star-Banner* (Ocala, FL), online at February 23, 2010, http://www.ocala.com/article/20100223/ARTICLES/100229891?p=1&tc=pg

7 John W. Rowe (Exelon Corporation). "*Fixing the Carbon Problem Without Breaking the Economy*," [presented at the] Resources for the Future Policy Leadership Forum, National Association of Home Builders, Washington, D.C., May 12, 2010, 12:45 p.m., online at http://www.exeloncorp.com/assets/newsroom/speeches/docs/Rowe_RFF_Remarks_Slides_FINAL%2020100512.pdf, p. 6. "Remarks as Prepared"

8 UE Illinois Co, *Annual Report to the Securities Exchange Commission* (10K), Filed Period 12/21/2010, Filed on 2/24/2011, page 57.

In addition, the UE's parent company has recently established the Ameren-wide Generation Initiative to address this very issue. UE provided documents describing this initiative in its responses to OPC DR Nos. 2012 and 2013. The Company's response to DR No. 2012 included a December 2010 presentation to the Ameren Board of Directors which states on page 2 that the objective of this initiative is "to create a strategy for Ameren's generation fleet that:

- Provides a transition path to reduce risk exposure of the Ameren fleet to new laws and regulations and determines through robust analysis and long term energy policy considerations an "optimal" generation portfolio for the benefit of our key stakeholders
- Addresses financial risks and opportunities associated with existing and potential future laws and regulations
- Considers the impact of key policy matters on the economy, the costs to customers and the return to shareholders."

Page 28 of the Ameren Board of Directors presentation contains a comprehensive list of the potential new laws and EPA regulations that will primarily impact coal-fired generation facilities. Given that the Company has so clearly recognized the potential implications of EPA regulation on coal facilities, it is incumbent upon it to investigate in the IRP alternative ways of responding to those regulations, including the retirement or repowering of additional existing coal units. Of course, it will also be important that the new Generation Initiative business planning process and the plans resulting from that process are consistent with the IRP planning process as required by the Commission's revised IRP rules that will soon become effective.

Furthermore, the Company assumes in the IRP that there is a 33 percent chance of CO2 cap-and-trade requirements in the future, and a 57 percent chance of federal energy bill mandates addressing CO2 in the future (see Chapter 5). Under either of these scenarios the costs of operating the existing coal generators will increase, thus the IRP should investigate the implications of these higher costs on the continued operation of those generators.

UE's own studies show that energy efficiency, demand response, new wind, and natural gas power plants could easily ensure sufficient capacity should Meramec be closed, suggesting that there may be sufficient alternative resource options if another coal plant were to be closed as well. Furthermore, if the Company were to investigate levels of cost-effective energy efficiency and demand response resources beyond those included in the Reasonably Achievable Scenario (see Chapter 4), then they may find increased opportunities for retiring additional coal generators.

2. Renewable Resources

Potential New Renewable Resources

The report lists a number of potential renewable resource options:

- Landfill Gas (LFG) [21 MW < 12.5 cents/kWh, 92% capacity factor, base load].
- Hydroelectric [9.6 MW < 12.5 cents/kWh, 40-60% capacity factor, base load].
- Anaerobic Digestion: Municipal Biosolids & Animal Manures [all LCOW > 39 cents/kWh].
- Biomass [28.8 MW < 12.5 cents/kWh, co-firing, 5.9 cents/kWh, 91% capacity factor, base load].
- PV: $6,000/kW, capacity factor 21%.
- Wind: generic cost 10.81 cents/kWh, overnight project cost of $2,000/kW. No additional transmission costs included. Unlimited project availability.

Our biggest concern with the renewable resource analysis is how the wind resources were modeled in the alternative resource plans. First, UE assumes that 346 MWs of simple cycle gas turbines are built for every 800 MWs (nameplate capacity value) of wind turbines installed and that wind is always installed in 800 MW increments.[9] These assumptions are entirely inappropriate. Wind turbines can be built for the energy that they contribute to the system; there is no need to include additional capacity to support them. Furthermore, UE already has a "robust fleet of peaking resources;"[10] there is no need to add additional peakers simply because the wind resources do not operate all the time. This assumption adds a significant amount of capital costs to the wind scenarios.

Second, UE applied "build thresholds" to their generation resources, whereby a particular generator would not be called upon until the reliability need (expressed in MWs) reached a certain capacity level. Table 9.1 indicates that the build threshold for the wind/CT combination was 205 MW of accredited capacity, under the assumption that average wind farm capacity would be 800 MWs of name plate capacity. One of the advantages of wind projects is that they are modular, and can be built in relatively small increments need not be built all at once. Requiring a build threshold of 205 MW and only considering 800 MW wind installations will significantly limit consideration of smaller wind projects, or large wind projects that could be built in small increments over time.

Third, UE assumed that all wind projects have an average cost of $2,000/MW with no variation in capacity factors for the entire amount of wind capacity. While this may be a reasonable assumption for average wind projects, there are likely to be some that cost less than the average and some that cost more. A more precise analysis would include a range of costs and/or capacity factors for the wind resources, in order to allow the model to choose the lowest cost options first and only pick the higher cost options if they

[9] UE IRP, Chapter 5, page 33; and UE IRP, workpapers, excel file: 14 candidate resource plans - 060(6)A REVISED.xlsx.

[10] UE IRP, Chapter 9, page 21.

turn out to be economic. These three assumptions (regarding average cost, additional peakers and the build threshold) are very simplistic and inaccurate ways to represent how wind could be introduced to the UE system, and significantly skew the Company's modeling against new wind resources.

UE dismisses biomass co-firing because it doesn't add to capacity, arguing that RES compliance *plus* the added capacity offered by other options is more attractive. UE should have explored using co-firing in the years where it has surplus capacity and has met RES compliance, perhaps allowing for a delay of constructing new renewable capacity until their overall capacity requirements necessitate the construction of additional capacity.

The non-wind projects total 56 MW when adjusted for capacity factor, including co-firing, as described in Chapter 5 Appendix B. Since the co-firing wouldn't result in new capacity, the total excluding co-firing is 31.55 MW. UE chose not to pursue any of these options in the IRP, describing the projects as "small and opportunistic in nature." This is extremely problematic. Since their cost is less than new thermal generation, each of these projects should be built before any new thermal is built, in an effort to keep electricity bills and rates lower by generating electricity at the lowest cost. Furthermore, it might be possible to use these projects to comply with Missouri or potential Federal RES requirements, either immediately or banked for future compliance.

Renewable Energy Standards

UE considers two Renewable Energy Standard (RES) policies: the Missouri standard, and a potential Federal standard. UE claims that the 1% cumulative rate impact cap for the Missouri RES significantly limits the addition of renewable resources. The Company assumes that new wind or biomass resources are used to comply with the Missouri RES, up to the amount of renewable energy that reaches the 1% cap. UE also assumes that for solar compliance they purchase renewable energy credits for the first five years and then assume the addition of utility scale solar resources.[11]

For the Federal RES, UE aggregated a variety of proposals, including Waxman Markey, Bingaman, and the Clean Energy Act. The modeled 4% rate cap had no effect on the amount of new renewables. The suite of renewables used to meet the Federal RES included existing resources, wind, co-firing biomass, energy efficiency, and their REC bank. By 2030, wind and co-firing make up the vast majority of the suite. Demand side management reduces the amount of MWh necessary for RES compliance but there is a disconnect between assuming in this analysis that UE will implement DSM at the RAP level when they ultimately choose a preferred resource plan with much lower levels of DSM because the Company claims that the DSM cost recovery framework in Missouri will not support implementation of DSM at the RAP level.

While the IRP describes the Company's analysis of the two RES options, it does not make clear how the results of this analysis were used in developing and selecting the

[11] UE IRP, Chapter 5, page 38.

candidate resource plans. Based on our review of the Company's workpapers, it appears as though the Company did not apply the renewable resources identified in their RES analyses (either for the Missouri RES or the Federal RES) in the candidate resource plans.[12] At a minimum, the Company should make clear in the IRP how the results of its Missouri and Federal RES requirements were integrated into its candidate resource plans and its selection process. More importantly, the IRP should include candidate resource plans that comply with either a Missouri RES or a Federal RES or both, depending upon appropriate assumptions regarding the likelihood of each occurring.

3. Demand Side Resources

The Company's demand-side resource assessment is based upon a market potential study performed by Global Energy Partners in January 2010. We address the issues in this potential study first, and then turn to the demand-side assessment in the IRP.

Demand-Side Management Potential Study

The study uses a conventional methodology for identifying and assessing energy efficiency potential, including the standard definitions for the different levels of efficiency potential: technical, economic, maximum achievable potential (MAP), realistic achievable potential (RAP), business as usual (BAU), and a baseline forecast. The study begins with what appears to be a comprehensive list of potential efficiency measures. The study identifies a large potential for energy efficiency and demand response, at a relatively low cost. In addition, the study includes a fairly comprehensive list of energy efficiency and demand response program options, using good industry practice with regards to characterizing customer types and attempting to overcome market barriers.

However, the energy efficiency potential study suffers from significant problems, in particular regarding the assumptions that are made for the different levels of efficiency potential. Especially for the RAP case the study applies limits to how much efficiency can be achieved – significantly reducing the potential estimates. While there may be some grounds for these limits, the study does not note or acknowledge that UE has control over some of these limits, and could go beyond them if it wanted to. The primary control levers are greater financial incentives to customers and additional marketing efforts. By not acknowledging these levers, the study implies that the MAP and RAP levels are hard-and-fast caps when they are not.

The technical potential assessment is based on "frozen technology" assumptions, i.e., only technologies that are available today will be available throughout the study period, and that there will be no improvements to efficiency technologies in the future. This is a commonly-used assumption, as it is very difficult to predict how efficient technologies will change over the study period. It is also not an unreasonable assumption to use for this

[12] UE IRP, workpapers, excel file: 14 candidate resource plans - 060(6)A REVISED.xlsx.

study. However, the study should recognize that there will likely be additional technology options available in future years (especially in the latter half of the study period), and note that the technical potential may be higher than what is indicated here.

Similarly, the technical potential assessment appears to assume that as efficiency measures reach the end of their useful lives they will be replaced with baseline measures, as opposed to new measures that are as efficient as the retired measures. Again, this is a common assumption and it is difficult to develop better replacement assumptions. However, the study should note that the technical potential could be higher than indicated in their results (especially in the later years of the study period) due to the use of this assumption.

These two points above explain why the study shows that there are little additional savings beyond 2020, and especially beyond 2025.

The economic potential is limited in the same way that the technical potential is, as noted in the previous paragraphs.

The maximum achievable potential assessment is limited in the way that the study applies market acceptance rates. The study authors conducted customer interest research using surveys, and determined the likelihood that UE customers would accept energy efficiency measures under three different financial incentives: a one-year payback level, a three-year payback level, and a five-year payback level. For the MAP scenario, the study assumes customers are offered a financial incentive that leads to a one-year payback. While this is a relatively aggressive financial incentive, it is a simplistic characterization of how customers might be induced to adopt energy efficiency measures. Different levels and types of marketing can help customer adopt efficiency measures, as can different types of technical assessment and other types of support such as on-bill financing. At a minimum, this scenario should not be characterized as a "maximum" potential, given that additional participation could be achieved through additional customer support.

The efficiency potential identified for the realistic achievable potential is limited by the study's application of three-year payback levels. Experience indicates that there are many customers that would adopt measures with a one-year payback, but not for a three-year payback. UE has control over the amount of payback used, and therefore would be in a position to offer higher incentives in order to achieve higher energy efficiency savings. This is quite likely the biggest single assumption that limits the DSM potential study. While the study claims to follow best industry practice in designing energy efficiency programs, this one assumption clearly deviates from best practice and explains why the RAP energy savings are lower than energy savings that are currently being achieved by energy efficiency industry leaders.

The efficiency potential identified for the realistic achievable potential is further limited by the study's application of customer awareness rates. The study assumes that customer awareness would start at 25 percent in 2010 and ramp up to 85 percent by 2019. While it may be true that customer awareness of UE energy efficiency programs is currently low, this is a factor that UE has a lot of control over. By increasing its marketing and

outreach campaign UE can significantly increase awareness rates among customers, and thereby significantly increase the potential energy efficiency savings. These awareness rates represent an artificial cap on the RAP savings potential. Again, energy efficiency industry leaders have successfully implemented significant, sophisticated outreach campaigns, and UE could do the same in order to achieve higher energy savings.

In sum, the MAP case does not necessarily represent the "maximum" amount of efficiency savings that can be achieved, especially over the long term. The RAP case could be easily achieved, and if UE were to truly undertake best industry practices then it would be reasonable to expect UE to achieve energy savings comparable to the savings levels in MAP.

It is useful to note that the primary difference between the RAP, the MAP and even the economic potential scenarios is how quickly UE can encourage customers to adopt energy efficiency measures. When seen in this light, the primary difference between RAP and MAP is how much effort and resources UE puts into achieving energy efficiency savings. In other words, the difference between RAP and MAP is much more institutional and political than it is technical or economic.

Demand-Side Resources in the Integrated Resource Plan

UE makes it very clear in the IRP that it is concerned about the lost revenues associated with energy efficiency savings, and that this concern was a consideration in evaluating different energy efficiency scenarios and selecting its preferred resource plan. This concern about lost revenues completely dominates the Company's analysis of energy efficiency potential, and explains why the analysis significantly understates the potential and value of energy efficiency resources.

For the demand side management resources considered in the IRP, UE creates six different energy efficiency portfolios, as follows:

- Low Risk Portfolio (Low Risk): This portfolio actually *reduces* company expenditures on demand side, relative to current levels. The rationale for this is that lower spending is "commensurate with the Company's growing concerns with the current DSM regulatory framework, especially lost revenues."
- Capacity Calibrated Portfolio (CCP): this portfolio is tuned to meet only annual capacity needs during the planning horizon; this plan doesn't appear often in the report.
- Realistic Achievable Potential Portfolio (RAP): this portfolio is based on the RAP efficiency case from their DSM Potential Study (see above) although demand response programs are generally not fully utilized at RAP levels.
- Maximum Achievable Potential Portfolio (MAP): this portfolio is based on the MAP efficiency case from their DSM Potential Study (see above).

- 1% Per Year Portfolio (1PPY): this portfolio is described as a "very aggressive portfolio" designed to achieve 1% incremental energy savings every year after 2015, designed to be equivalent to MAP.
- 2% Per Year Portfolio (2PPY): This portfolio is described as "extremely aggressive portfolio" designed to achieve 2% incremental energy savings every year after 2020. It's not clear what it offers 2012-2019.

The energy efficiency analysis in the IRP contains some of the same strengths and weaknesses as the DSM Potential study. All the DSM portfolios are cost-effective and result in significant net benefits to customers, with the exception of the 2PPY scenario. In fact, the Company claims that this portfolio is not possible – despite the fact that some energy efficiency program administrators in other states are currently achieving this level of savings.

The most significant problem with the energy efficiency analysis in the IRP is that it is almost exclusively focused on the Low Risk portfolio, which includes very little energy efficiency savings, significantly less savings than the Company's 2008 IRP.[13] This is despite the fact that the other energy efficiency portfolios offer significantly higher savings and benefits. Under a range of different candidate resource plans, the RAP portfolio can reduce electricity costs to customers by $1.5 to $2.5 billion present value dollars over the course of the IRP planning period.

The Company's IRP should investigate a broader array of energy efficiency plans, in order to properly evaluate demand-side and supply-side resources on an equivalent basis as required by the rule. The Company should investigate efficiency portfolios with savings levels between those of the RAP and MAP portfolios, and even scenarios with savings greater than the MAP portfolio (see previous section). As indicated in our discussion in Sections 5.C and 5.D below, the RAP portfolio results in significantly lower electricity costs relative to the Low Risk case, under all future scenarios. Additional levels of cost-effective energy efficiency savings, beyond the RAP case, would likely result in additional reductions in cost.

The Company explains several times in the IRP that the Low Risk portfolio includes program spending and savings at "a level commensurate with the Company's growing concerns with the current DSM regulatory framework, especially lost revenues."[14] In other words, the Company has expressed a clear preference for the Low Risk portfolio, regardless of the benefits that higher levels of energy efficiency offer to customers, and regardless of how well more aggressive energy efficiency portfolios fare under the Company's resource plan scoring system. This approach to limiting energy efficiency resources is directly in conflict with the Missouri IRP rules,[15] and undermines the fundamental objective of the IRP rules which includes minimization of the present value of revenue requirements (PVRR).

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[13] UE IRP, Chapter 7, Figure 7.38.
[14] UE IRP, Chapter 7, page 2.
[15] 4 CSR 240-22.050(2)(A) and 4 CSR 240-22.050(2)(B).

4. Plan Development and Screening

UE used a multistage process to generate possible plans, analyze them, and determine which were best. This process had a number of critical flaws.

A. Probability Tree

The probabilities used to develop the probability tree appear reasonable at first glance, but, a closer and more careful look reveals some fundamental problems.

CO_2 Scenarios

UE considers four distinct CO_2 scenarios:

- Cap-and-Trade (33%). The prices UE used for this model, described in Chapter 2's Appendix A, closely track the low price band proposed by Synapse in its *2011 Carbon Dioxide Price Forecast*[16]. UE's high estimate, however, is far less than the high estimate provided by Synapse.
- Energy Bill Mandates (57%). In this scenario there is no CO_2 cap; instead, a suite of other regulations are considered. A national renewable energy standard (RES) requiring 9.5% in 2015, 20% in 2020, and 40% in 2040; baseline exemptions for new hydro, new nuclear power, and carbon capture and storage (CCS); compliance payments of $25/MWh (2009 dollars); and no energy efficiency carve-outs. This scenario also assumes incentives and subsidies for new nuclear, coal with CCS, and central-station solar thermal plants, resulting in 15 GW of new nuclear power by 2020, 50 GW of coal with CCS by 2035, and 35 GW of solar thermal by 2035. Energy efficiency provisions were also assumed, predicting a small reduction in electricity demand growing to 5% by 2040, and a similar reduction in household and commercial natural gas demand. A "cash for clunkers" program was presumed to result in the cumulative retirement of 10 GW of coal units by 2015, growing to 60 GW in total retirements by 2025. Finally, it was presumed that no new coal power plants could be built without CCS.
- EPA Regulation (9.5%). In this scenario, no new coal is allowed to be built without CCS, but no other regulations are proposed for this scenario.
- Business-as-usual (0.5%). This scenario is a continuation of current policies, indefinitely.

Assigning a 10% chance of minimal carbon regulation seems appropriate. Regarding the Cap-and-Trade scenario, UE's proposed price for 2015 ($7.50/metric ton) is significantly less than that in the Synapse 2011 forecast, but otherwise the prices used by UE are within the band considered reasonable. The deviation on carbon price may be explained by the Untrimmed Probability Tree found on page 6 of Chapter 2 of the IRP. The Untrimmed Probability Tree shows that UE expects that a "low" Cap-and-

[16] 2011 Carbon Dioxide Price Forecast, February 2011. Lucy Johnston, Ezra Hausman, Bruce Biewald, Rachel Wilson, David White.

Trade price is three times more likely than a "high" Cap-and-Trade price. This skewed "high" and "low" branch deviates from UE's model of other "high" and "low" bifurcations; "high" and "low" outcomes for natural gas price and load growth occur with 50% probability each. By not modeling "low" and "high" as 50% each, the model obfuscates UE's emphasis on low carbon prices.

One of the flaws of the probability tree is that the four options are mutually exclusive. While it is true that the BAU and EPA scenarios are mutually exclusive to each other and to the two more comprehensive and more likely scenarios, those two scenarios (Cap-and-Trade and Federal Energy Bill) are not mutually exclusive, contrary to UE's response to Data Request No. OPC 2030. It's plausible that Congress implements major components of both Cap-and-Trade and the Federal Energy Bill Scenario. There are ample examples of this "belt and suspenders" approach within the United States – nine member states of the Regional Greenhouse Gas Initiative (RGGI) have both a cap-and-trade program *and* a number of the Federal Energy Bill concepts, including renewable energy standards, new capacity incentives (typically for renewables), and energy efficiency provisions. The Western Climate Initiative (WCI) will begin its cap-and-trade program on January 1, 2012, and many of its member states also have programs similar to components of the Federal Energy Bill concept. Not considering the possibility that both a federal cap-and-trade policy and some or all of the Federal Energy Bill components are implemented is a fundamental flaw in the probability tree design. UE should have added a branch representing the possibility of both cap-and-trade and a Federal Energy Bill becoming law. The probability of this new branch, plus the revised probability of the solely cap-and-trade and the solely Federal Energy Bill branches, should remain 90%.

Additional Environmental Regulations

An even more significant flaw is that the probability tree did not include the possibility of other environmental regulations in the near or more distant future, including more stringent regulations related to SO_2, NO_x, mercury, particulates, ash, water use, nor did the probability tree consider how more stringent regulations on coal mining and extraction might influence fuel prices. As noted above in Chapter 2, the Company was well aware of the likelihood of additional EPA regulations affecting coal generation, and was well aware of the significant costs that may be associated with these additional regulations.

While UE aggregated additional EPA regulations expected to pass in the next year or two into two scenarios (the so-called moderate and aggressive environmental scenarios described in Section 8.7 of the IRP), it did not include these or any other scenarios in the probability tree. Ameren failed to include these scenarios despite the immediate and substantial impact these regulations would have on Ameren's existing coal fleet, and despite the fact that the United States is very unlikely to have a 20-year period free of additional environmental regulations impacting coal fired power plants.

UE's decision to model the additional EPA regulations through specific scenarios (the moderate and aggressive environmental scenarios), as opposed to modeling them in

the probability tree leads to some significant flaws in its modeling approach and fails to comply with the requirement in 4 CSR 240-22.070(2)(C) to consider any major future changes in environmental laws, regulations or standards as an uncertain factor which could potentially be a critical uncertain factor In sum, when the Company gets to its preferred plan selection process (described in Chapter 10 of the IRP), it compares 14 candidate resource plans, five of which are based on the moderate environmental scenario (Meramec continues as is and new EPA regulations affecting environmental retrofit costs for the entire coal fleet are moderate relative to the aggressive environmental scenario), and nine of them are based on the aggressive environmental scenario (Meramec is retired or somehow modified and new EPA regulations affecting environmental retrofit costs for the entire coal fleet are more costly and some occur sooner relative to the moderate environmental scenario). Consequently, the five moderate environmental scenario candidate plans cannot properly be compared to the nine aggressive environmental scenario candidate plans because they represent mutually exclusive futures having vastly different impacts on resource plan revenue requirements over the 20 year planning horizon. Yet the Company does make direct comparisons across all these candidate resource plans, which significantly skews its scorecard mechanism and leads to spurious results. This issue is discussed in more detail in Sections 5.C and 5.D below.

Natural Gas Price Scenarios

The probability tree branches for natural gas prices represent a strange decision. For two of the four carbon policy scenarios, the probability tree contains two branches: a 50% chance of high gas prices in the future, and a 50% chance of low gas prices. However, for two other carbon policy scenarios (BAU and EPA), the probability tree only contains one branch: 100% chance of average natural gas prices. While too many branches do make modeling difficult, to not consider high and low gas prices is particularly concerning because the future price of natural gas has such a significant impact on future operating costs and the cost of generation expansion plans which rely heavily on additional gas generation units.

Load Growth

UE considers both a “high” and a “low” load growth scenario for two of the four carbon policy scenarios, which seems to comply with 4 CSR 240-22.070 (2)(A). However, similar to the natural gas price scenarios, UE only considers an “average” load growth scenario for two other carbon scenarios. This is concerning because a low load growth scenario interacts with energy efficiency and demand response substantially differently from a high load growth scenario.

B. Initial Screening of 216 Candidate Resource Plans

UE uses a preliminary scorecard to rank the 216 initial proposals, using six policy objective categories:

Policy Objective Category(ies)	Measure	Weighing
Environment/Renewable/Resource Diversity	Total plan carbon emissions	20%

Energy Efficiency	EE Portfolio	10%
Financial/Regulatory	PV Free Cash Flow	20%
Customer Satisfaction	Rate Increases	15%
Economic Development	Primary Job Growth (FTE)	10%
Cost	PVRR	25%
Total		**100%**

The preliminary process seeks to whittle down the 216 possibilities without excessive analysis, which is probably why UE uses fairly simple measures to place a numerical value on each of the six policy objective categories. These simple measures do, however, raise some concerns about Ameren's modeling.

Distilling all environmental considerations to simply carbon emissions ignores the harmful effects of SO_2, NO_x, particulates, mercury, coal ash, nuclear waste, and so forth and the costs associated with controlling or mitigating those harmful impacts. This simplistic measure makes both coal (with carbon capture) and nuclear power appear less environmentally damaging and potentially less costly than their actual emissions and byproducts suggest.

UE's metric for customer satisfaction is to take the arithmetic mean of all rate increases, add it to the largest rate increase, and divide by two. While CSR 240-22.060 (2) requires that UE include "levelized annual average rates and maximum single-year increase in annual average rates" as one of the performance measures, it doesn't stipulate how heavily each should be weighted in the calculation of this measure. The problem with weighting them equally is that a plan which delays large rate increases until further into the future is judged worse, despite resulting in lower total utility bills each year.

Consider the three scenarios shown in the table and chart below. In the Constant Growth scenario, rates increase from $0.069/kWh in 2010 to $0.14/kWh in 2028, growing by a constant 4% per year. In the Delayed Growth scenario, rates also increase from $0.069/kWh in 2010 to $0.14/kWh in 2028, but instead of a constant growth rate, the retail price grows more slowly at first and more quickly after 2023. Finally, in the Accelerated Growth scenario, rates too go from $0.069/kWh in 2010 to $0.14/kWh in 2028, but this time the price grows very quickly at first and very slowly after 2016.

In all three scenarios the ratepayer faces the same electric bill in 2010, and the same electric bill in 2028. However, for every single year in between, the ratepayer's lowest cost bill is under the Delayed Growth scenario, and his highest cost bill is under the Accelerated Growth scenario.

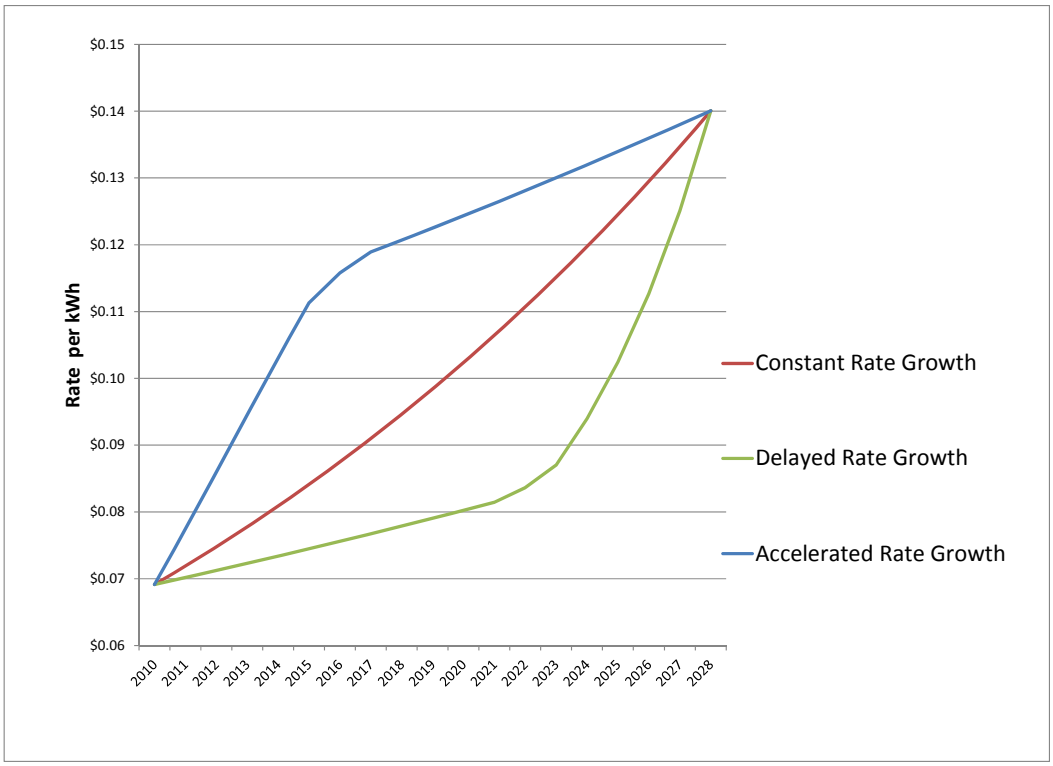
The customer satisfaction metric has two clear problems. Firstly, it awards the Constant Growth scenario a score twice as strong as the Delayed Growth scenario, despite the total ratepayer cost of the Delayed Growth scenario being 14% lower. Secondly, it awards the Delayed Growth and the Accelerated Growth scenarios equal scores, despite the Delayed Growth scenario costing 25% less than the Accelerated growth scenario. A well-tuned customer satisfaction metric shouldn't score moderately priced plans significantly better than inexpensive plans, nor should it score a costly plan equal to an inexpensive plan.

Year	Constant Growth Price	Percent Increase	Delayed Growth Price	Percent Increase	Accelerated Growth Price	Percent Increase
2010	$0.07	4.0%	$0.07	1.5%	$0.07	12.0%
2011	$0.07	4.0%	$0.07	1.5%	$0.08	11.0%
2012	$0.07	4.0%	$0.07	1.5%	$0.09	10.0%
2013	$0.08	4.0%	$0.07	1.5%	$0.09	9.0%
2014	$0.08	4.0%	$0.07	1.5%	$0.10	8.0%
2015	$0.08	4.0%	$0.07	1.5%	$0.11	4.0%
2016	$0.09	4.0%	$0.08	1.5%	$0.12	2.7%
2017	$0.09	4.0%	$0.08	1.5%	$0.12	1.5%
2018	$0.09	4.0%	$0.08	1.5%	$0.12	1.5%
2019	$0.10	4.0%	$0.08	1.5%	$0.12	1.5%
2020	$0.10	4.0%	$0.08	1.5%	$0.12	1.5%
2021	$0.11	4.0%	$0.08	2.7%	$0.13	1.5%
2022	$0.11	4.0%	$0.08	4.0%	$0.13	1.5%
2023	$0.12	4.0%	$0.09	8.0%	$0.13	1.5%
2024	$0.12	4.0%	$0.09	9.0%	$0.13	1.5%
2025	$0.12	4.0%	$0.10	10.0%	$0.13	1.5%
2026	$0.13	4.0%	$0.11	11.0%	$0.14	1.5%
2027	$0.13	4.0%	$0.13	12.0%	$0.14	1.5%
2028	$0.14	--	$0.14	--	$0.14	--
Total Bill/kWh	$1.91		$1.65		$2.21	
Average Increase	4.0%		4.1%		4.1%	
Max Increase	4.0%		12.0%		12.0%	
Score	**4**		**8**		**8**	

Secondly, the model doesn't weigh the rates by the probability of each scenario[17], creating a bias in the rate results. Recall that there are ten scenarios with varying probabilities, ranging from four different "Energy Bill" Mandates each with 14.25% probability to the Business As Usual case with probability 0.5%. Instead of weighing the rates required by each scenario by that scenario's probability, the Company's model simply sums the rates and divides by 10, as if each scenario were equally likely. This modeling error results in future electricity rates related to the BAU scenario (a 1/200 chance) being substantially overweighed, whereas results from more likely scenarios such as Federal Energy Policy being substantially underweighted. This error is rectified in the corrected model Synapse produced and applied to the final set of candidate resource plans.

Finally, in direct contradiction to CSR 240-22.060 (2), the customer satisfaction calculation in the model uses a simple mean average rate rather than a levelized annual average rate.

[17] File KAB - HC\Work on scoring matrix\Scoring matrix with 12-29 data.xls, Rates tab, columns BQ and BR



The metric for the economic development category is primary job growth, measured in full time equivalent jobs created. There is a significant problem with this metric: although UE would only own perhaps 30% of the nuclear plant, it claims 100% of the jobs created in its analysis, using the faulty logic that all the jobs will be created by UE's participation. It the other utilities also included 100% of the jobs, it would be the case that two or three times the actual number of jobs created would be reported in total. If UE only reports 30% of the cost of building and operating the nuclear plant, it's not appropriate for it to claim 100% of the benefits with respect to job creation.

In addition to problems with the metrics, there are problems with the arithmetic. In order to compare across metrics, UE calculates a "unitized score," whereby the most attractive resource plan option in that metric gets a score of 1.000, and others are assigned a value between 0.000 and 1.000 in a linear function. If the best value is 10 in a given metric, then a score of 5 for a particular plan would get a unitized score of 0.5. The problem with UE's application of unitized score in this ranking system is that it isn't the case that the lowest score in each category is equal. The worst case isn't always scored 0.0.

To understand why this is a problem, consider the following example, where there are two plans (1 and 2), each ranked within two categories (A and B). Each category is weighed equally, 50%. Category A has scores ranging from a low of 0.8 to a high of 1.0, whereas category B has scores ranging from a low of 0.2 to a high of 1.0, shown in the table below.

Category	Score Range	Nominal Weighting
Category A	[0.8, 1.0]	50%
Category B	[0.2, 1.0]	50%

The two plans score differently in each category: Plan 1 scores the highest score in Category A but the lowest score in Category B, whereas Plan 2 scores the lowest score in Category A but the highest score in Category B. Since the two categories are both weighted equally, we expect that Plan 1 and Plan 2 will have equal final composite scores. The table below summarizes the two plans, and their scores.

Plan	Category A Score	Category B Score	Final Score[18]
Plan A	1.0	0.2	0.6
Plan B	0.8	1.0	0.9

Notice that their final scores aren't the same, despite equal weighting of Category A and Category B. Because the range of possible scores for Category A and Category B aren't the same, the category's *effective weights* aren't the same as their nominal weights. Categories with broader ranges have larger effective weights: in this example, scoring poorly in Category B carries a much bigger punishment than scoring poorly in Category A, despite both categories purporting to weight their results equally. To calculate the effective weight of a category, one must divide the range of scores in that category by the sum of ranges in all categories, multiply that fraction by the nominal rate, and then divide that result by the sum of that calculation across all categories. The effective weight of Category A is ((0.2/(0.2+0.8))*0.5)/(((0.2/(0.2+0.8))*0.5)+((0.8/(0.2+0.8))*0.5)) = 20%. Similarly, Category B has an effective weight of 80%.

This problem of unaligned nominal and effective weights has a simple fix: within each category, adjust each score linearly so that the minimum score is 0.0 and the maximum is 1.0, thereby guaranteeing that the nominal weight is equal to the effective weight.

In the analysis performed by UE, there were six policy objective categories with different unitized score ranges and nominal weights. Those categories, ranges, nominal weights, and effective weights are summarized in the table below.

Policy Objective Category(ies)	Unitized Score Range	Nominal Weights	Effective Weights
Environment/Renewable/Resource Diversity	[0.817, 1.000]	20%	7.5%
Energy Efficiency	[0.000, 1.000]	10%	20.6%
Financial/Regulatory	[0.427, 1.000]	20%	23.6%
Customer Satisfaction	[0.337, 1.000]	15%	20.5%
Economic Development	[0.000, 1.000]	10%	20.6%
Cost	[0.858, 1.000]	25%	7.3%
Total		**100%**	**100%**

[18] The final score is obtained by multiplying each category score by the nominal weight (50%), and summing across each plan.

Because the model doesn't scale scores within a category so that the unitized score range is always [0.000, 1.000], the model effectively weights environmental issues and costs substantially less than the other four categories. The 25% nominal weight that UE assigned to cost was already too low to comply with 4 CSR 240-22.060 (2) and the requirement in 4 CSR 240-22.010 (2)(B) to use cost (PVRR) as the primary plan selection criteria and the effective weights that were actually applied further increases the degree of non-compliance.

While scrutinizing the preliminary scorecard methodology further does turn up a number of other problems in the model, the conclusions drawn by UE based on the preliminary scorecard don't necessitate a deeper analysis at this time because UE doesn't choose its 16 semifinalists based on the actual preliminary scores. Instead, the 16 semifinalists were determined by the following steps: (1) resources that were clearly undesirable according to the scorecard were eliminated; (2) the scorecard results were used to identify several sets of plans to investigate (e.g., Meramec continues as is, Meramec is controlled, Meramec is converted to gas, and Meramec is retired); and (3) these plans were combined with other resources to develop a range of plausible resource combinations for each plan.

It's helpful to analyze the conclusions drawn from the preliminary analysis to determine if the conclusions are sound, despite the problems with the model identified in this report. To analyze UE's conclusions, UE's preliminary scorecard model was corrected in three ways. To correct for the nuclear jobs miscalculation, the number of jobs created in the nuclear scenarios were scaled by UE's ownership percentage. To correct for the customer satisfaction error, we did not change the 50/50 weighing of average and maximum rate change; rather, we used the levelized average rate instead of the simple mean average rate, as described in CSR 240-22.060 (2). Finally, to correct the effective weighing problem, the scores within each category were adjusted linearly to ensure that the range was [0.000, 1.000]. The conclusions UE draws on page 11 in Chapter 9 from its model and our subsequent analysis based on the three corrections to UE's scoring method are as follows.

- *The top plans were the DSM-only plans and nuclear plans.* **Verdict: half right.** The DSM plans which become semi-finalists all score in the top 12 out of the 216 proposals, with a total score between 0.725 and 0.860. In fact, DSM-only plans make up all of the top 20 plans. The nuclear plans, however, perform far worse, with total scores 0.404 (ranked 131) and 0.349 (ranked 172), and this uses UE's nuclear cost probability model which flagrantly ignores nuclear power plant construction's history of severe cost overruns.
- *Plans with Federal RES requirements are more expensive. Only the Missouri RES portfolios were analyzed further.* **Verdict: half right.** While it is true that in many cases the Federal RES requirements were more expensive, it isn't always the case and the results were likely biased by UE's flawed approach to modeling wind resources. Furthermore, UE should preserve Federal RES scenarios in the semi-final round precisely because they are sometimes more expensive.

Ensuring that good decisions are made even if regulation increases overall cost is a fundamental component of integrated resource planning.

- *The three combined cycle options are nearly indistinguishable on the various performance measures. The Greenfield combined cycle option was analyzed further as a representative of the combined cycle resource type.* **Verdict: mostly right.** The corrected model shows that Greenfield CC almost always outperforms Venice CC and Meramec CC, suggesting that the Greenfield CC scenario should be preserved and the others jettisoned, just as UE has done.
- *The 50% nuclear resource option can be eliminated from further analysis considering its relative performance. The 30% option adequately represents the nuclear supply-side type…* **Verdict: right.**
- *The analysis also shows the no-DSM option is more costly than the Low Risk portfolio. Therefore, there is no need to continue to analyze the alternative resource plans without DSM.* **Verdict: mostly right.** While there are a few combinations for which the no-DSM option was less expensive than the Low Risk DSM, they were rare. Eliminating the no-DSM options is reasonable. Strangely, UE didn't also note that MAP and RAP consistently outperform the low-risk DSM, thereby concluding that low-risk DSM should also be jettisoned for the same reason.
- *The analysis indicates the cost of a plan increases as the time remaining before retirement of Meramec is shorter.* **Verdict: wrong.** Of the 20 lowest cost plans, only four involve a Meramec life extension. Eight call for Meramec to be retired in 2015, and eight call for Meramec to be retired in 2022. The lowest cost plan of the 216 calls for Meramec to be retired in 2015.

Based on its conclusions, UE reduced the resource plans to a preliminary set of 16 candidate resource plans, shown below.

Supply-Side	Meramec Status	Renewable Portfolio	DSM Portfolio	Noranda Status
-	Retired 2022	Missouri RES	MAP	Continues
				Expires
-	Retired 2022	Missouri RES	RAP	Continues
				Expires
Coal w/CCS	Retired 2022	Missouri RES	Low Risk	Continues
				Expires
CC-Greenfield	Retired 2022	Missouri RES	Low Risk	Continues
				Expires
Simple Cycle	Retired 2022	Missouri RES	Low Risk	Continues
				Expires
Pumped Storage	Retired 2022	Missouri RES	Low Risk	Continues
				Expires
Nuclear 30%	Retired 2022	Missouri RES	Low Risk	Continues
				Expires
Wind/SC	Retired 2022	Missouri RES	Low Risk	Continues
				Expires

These sixteen plans do not represent an appropriate set of semi-finalists. UE should have investigated the implications of a plan that includes the retirement of an additional coal plant combined with both an aggressive DSM Portfolio scheme (RAP or MAP or something in between) *and* new supply side resources, particularly more renewables (although wind should not be limited to 800 MW increments). In addition, UE should have included some sensitivity analysis on the two RES possibilities (Missouri, Federal) in order to better understand how expensive it would be to adapt each candidate to a Federal RES policy. UE's only rationale for not performing further analysis of a Federal RES is its statement on page 11 in Chapter 9 that "plans with Federal RES requirements are more expensive." Also, as previously discussed, UE did not fairly evaluate the potential for wind resources to fit into a plan that performed well in the various categories due to the extensive constraints imposed on how the size of wind additions were modeled and the coupling of wind with large amounts of additional gas CT generation in all instances.

C. Risk Analysis – Fine Tuning the 16 Candidate Plans

The Company applied a set of so-called risk analyses to the 16 candidate resource plans, in order to tailor them a little further into the finalist plans. One of their findings was that the status of Noranda's continuation as an UE customer does not affect the relative performance of the different resource options, and therefore Ameren eliminated the plans where Noranda is no longer an UE customer. The two other findings of interest relate to the treatment of Meramec and the relative benefits of the plans containing the RAP level of energy efficiency.

The Treatment of Meramec

The Company also conducted an analysis of different options for treating the Meramec coal facility, including: continue as-is, retire and replace with new resources, continue with additional environmental controls and conversion to natural gas boiler operation. As described in Section 5.A above, the Company assumed five plans with moderate environmental controls and nine additional plans with aggressive environmental controls where Meramec was either (1) further controlled with environmental retrofits, (2) converted to operate as a simple cycle natural gas plant or (3) retired and replaced by adding other resources that were not needed in the moderate case where Meramec continued to operate without substantial new environmental controls. Based on this initial risk analysis, the Company reaches the conclusion that "continuing to operate Meramec without significant additional environmental controls will yield the lowest PVRRs"[19]

However, this is a spurious conclusion that simply results from the construct that the Company used in developing the candidate resource plans. By including five candidate resource plans under the moderate environmental scenario and nine candidate plans

[19] UE IRP, Chapter 9, page 24.

under the aggressive scenario, the Company has compared resource plans that are not comparable. It is not appropriate to compare the PVRR results for scenarios that assume moderate environmental regulations with PVRR results for scenarios that assume aggressive environmental regulations the way the Company has done, because the aggressive regulations will require more costs on the entire system *by definition* (and may also include the costs of repowering Meramec or replacing it with other resources).

Figures 9.16 through 9.18 in Chapter 9 of the IRP illustrate this point. Note that in all of the figures the five scenarios with Meramec as-is have the lowest PVRRs, relative to the other options for treating Meramec. This result is why UE draws the conclusion that continuing to operate Meramec without additional controls will yield the lowest PVRRs. However, this result occurs simply because those five scenarios all have less stringent environmental requirements for the entire UE system. This result occurs because the aggressive environmental scenario is more expensive than the moderate environmental scenario (due to the need to either retrofit or replace Meramec plus add additional controls to the other three UE coal plants and in some cases accelerate the installation of controls that were included in the moderate environmental case) – not because operating Meramec as-is is the lowest cost option.

The Decision to Rely Solely on Combined Cycle as the "First Supply-Side Option" in the Final Set of Resource Plans for the Aggressive Environmental Scenario

On page 22 in Chapter 9, UE states:

> **Multi-resource plans are only necessary in the case of Meramec retirement** where resource needs are coincident with the 2016 Meramec retirement. **As discussed in section 9.3.1, the combined cycle resource option is an attractive option to be developed in the near-term so it was used as the first major supply-side resource** followed by one of the top four supply-side options: combined cycle, simple cycle, simple cycle/wind, and nuclear. Even with Meramec retirement in 2016, no supply-side resources are needed with RAP DSM. In the cases in which Meramec is not retired, only one major supply-side resource is needed late in the planning horizon. Table 9.11 shows the 14 final candidate resource plans that are created by incorporating the Meramec retirement analysis into the risk analysis. [Emphasis added]

Figures 9.14 and 9.15 show plans with CC gas generation performing slightly better that plans with Wind/SC both with and without Noranda continuing as a customer. As noted earlier in this report, UE modeled wind in a very limited way with unnecessary limits on the minimum size of wind resource additions (800 MWs) and only in conjunction with added CT's even though UE acknowledges in its IRP that its "existing resource portfolio includes a robust fleet of peaking resources already." In addition, UE's development of resource plans should have sought to discover the optimal combination of aggressive levels of DSM coupled with wind additions that best minimize PVRR and this analysis was not performed. For all these reasons, it was not appropriate for UE to eliminate combinations of wind and DSM as the first major supply-side resource addition in some

of the final candidate resource plans that were analyzed under the aggressive environmental scenario.

The Relative Benefits of the Energy Efficiency Scenarios

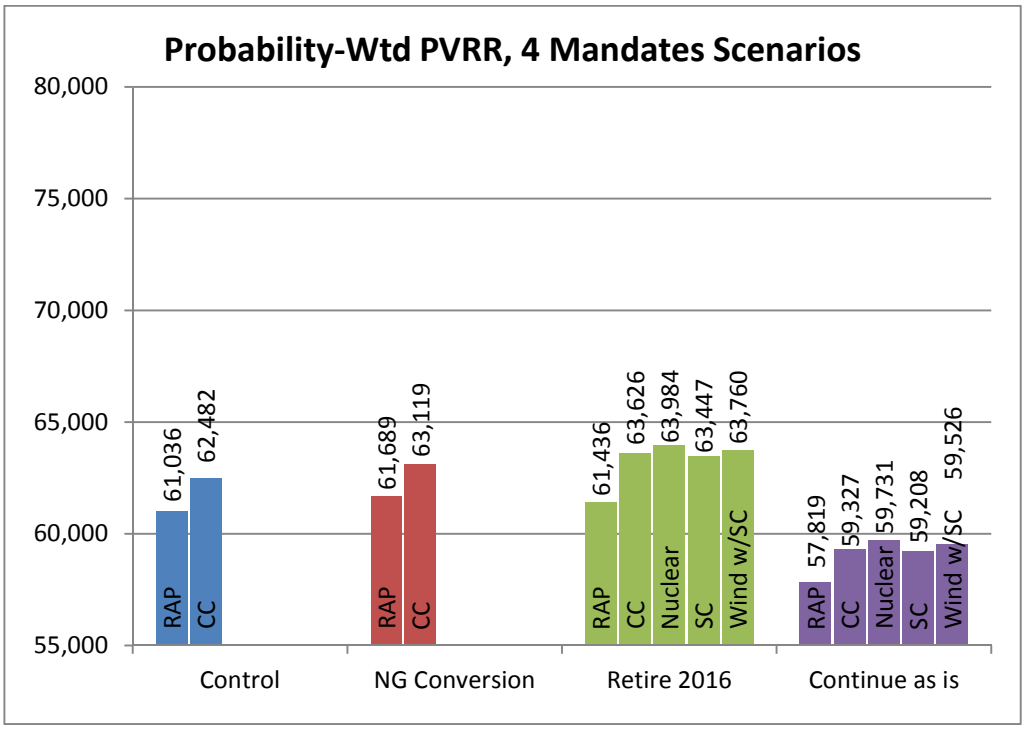
One of the most striking results of the risk analysis at this point is the finding that the plans containing the RAP level of energy efficiency clearly result in the lowest PVRR under all scenarios and sensitivities. First, UE conducts some comparisons of the RAP scenario with the Capacity Calibrated Portfolio (CCP) scenario, which combines energy efficiency and demand response at just enough amounts to defer future capacity additions. The CCP scenario includes less energy savings than the RAP scenario but greater amounts of demand response than is included in some plans with the RAP level of energy efficiency. Under all sensitivities run by the Company (including Meramec controlled, Meramec converted and Meramec retired in 2016), the RAP plans result in lower PVRR than the CCP plans.[20] Based on these findings, the Company decides that further analysis of plans with CCP is unnecessary.[21]

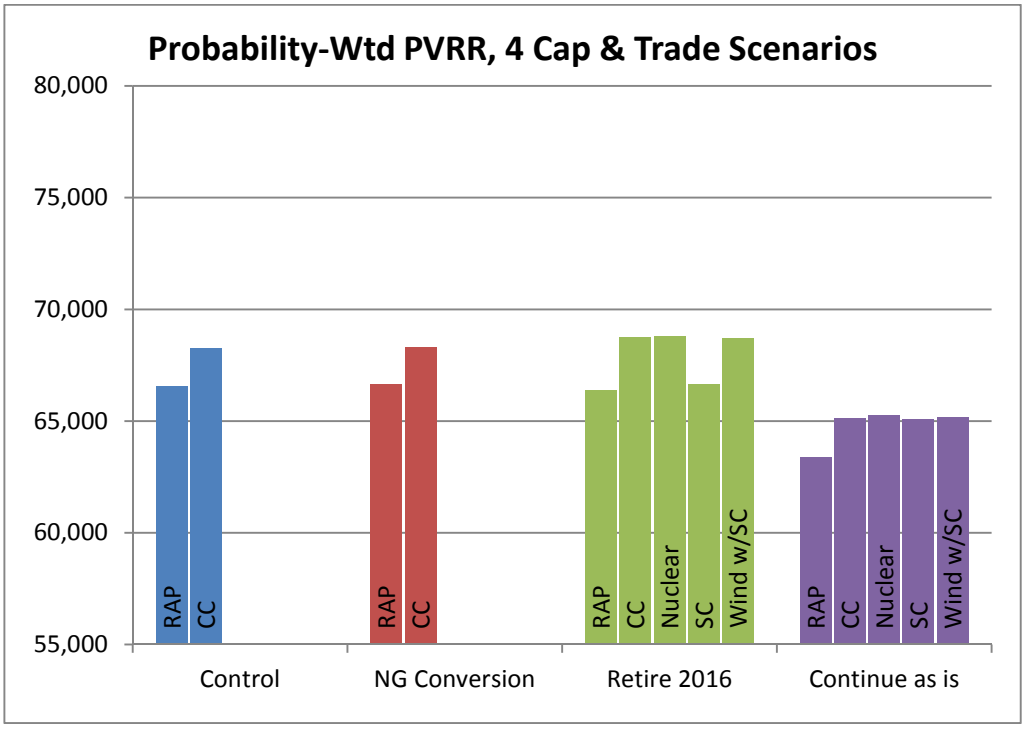
Second, UE conducts several risk analysis sensitivities of the 14 candidate resource plans. Every sensitivity conducted demonstrates that the RAP efficiency plans result in the lowest PVRR. In the cap-and-trade scenarios, RAP has lower cost than combined cycle (CC), nuclear, simple cycle (SC), and wind, whether Meramec is controlled, converted to natural gas, retired in 2016, or allowed to continue as-is. Under the environmental mandate scenarios, the same is true: RAP performs best. When all ten scenarios are probability weighted, RAP again turns out to be cheapest.

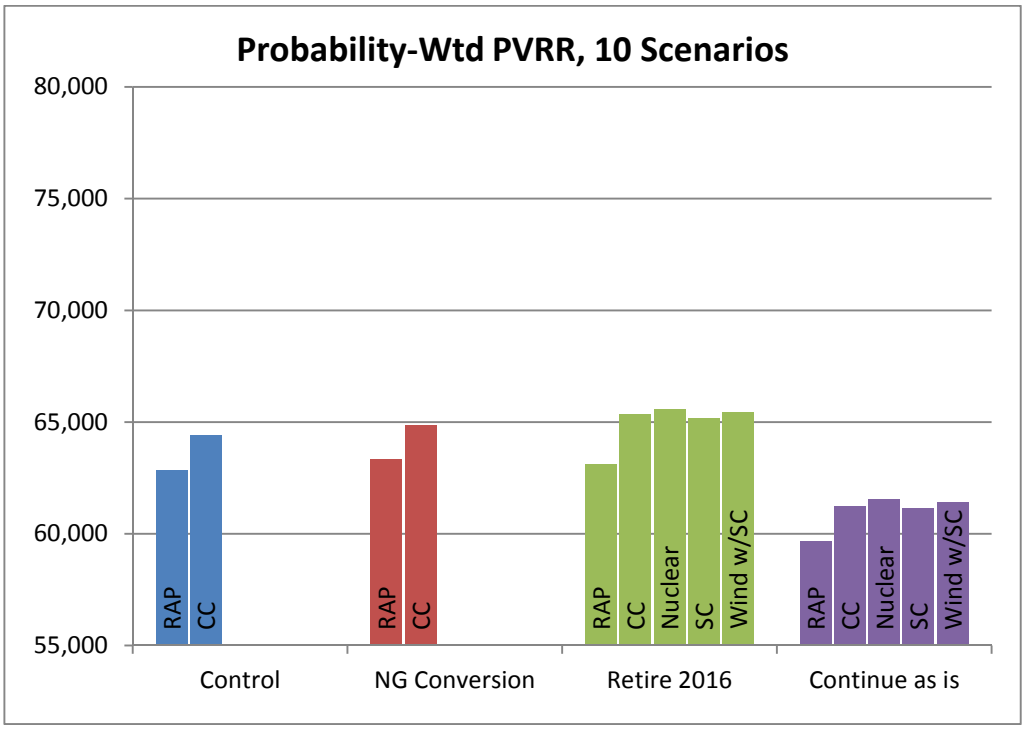
This point is demonstrated in the charts below. These charts were derived by simply rearranging the data presented in Figures 9.16, 9.17, and 9.18 in Chapter 9. The PVRR results for the RAP plans were placed directly next to the PVRR results for comparable Meramec scenarios, to provide an indication of how much money the RAP plan can save relative other plans in a directly comparable scenario. As indicated in the charts, the RAP plans result in the lowest PVRR under all of the risk analyses.

[20] See Figure 9.15 in Chapter 9 of the UE IRP.

[21] UE IRP, Chapter 9, page 23. It is interesting to note that the Company did not use the same approach to rejecting the Low Risk scenario, even though both the Low Risk and the CCP scenarios result in higher PVRRs than the RAP scenario.


Probability-Wtd PVRR, 4 Mandates Scenarios
80,000
75,000
70,000
65,000
60,000
55,000
61,036
62,482
61,689
63,119
61,436
63,626
63,984
63,447
63,760
57,819
59,327
59,731
59,208
59,526
RAP
CC
RAP
CC
RAP
CC
Nuclear
SC
Wind w/SC
RAP
CC
Nuclear
SC
Wind w/SC
Control
NG Conversion
Retire 2016
Continue as is


Probability-Wtd PVRR, 4 Cap & Trade Scenarios
80,000
75,000
70,000
65,000
60,000
55,000
RAP
CC
RAP
CC
RAP
CC
Nuclear
SC
Wind w/SC
RAP
CC
Nuclear
SC
Wind w/SC
Control
NG Conversion
Retire 2016
Continue as is



D. Strategy Selection – Choosing the Preferred Plan

Fourteen plans are identified by UE as finalists, designed to represent a robust variety of choices and each have desirable properties. The fourteen finalists are listed in the table below, all with the Missouri RES Renewable Portfolio, and Noranda Status of continued operation.

Plan Name	Envir. Scenario	Meramec Status	First Supply-Side	Second Supply-Side	DSM Portfolio
R0	Moderate	Continues As-Is	--	--	RAP
B1	Moderate	Continues As-Is	Combined Cycle	--	Low Risk
B3	Moderate	Continues As-Is	Simple Cycle	--	Low Risk
B2	Moderate	Continues As-Is	Nuclear 30%	--	Low Risk
B4	Moderate	Continues As-Is	Wind/SC	--	Low Risk
R3	Aggressive	Retired 2016	--	--	RAP
C3	Aggressive	Retired 2016	Combined Cycle	Combined Cycle	Low Risk
H2	Aggressive	Retired 2016	Combined Cycle	Simple Cycle	Low Risk
H1	Aggressive	Retired 2016	Combined Cycle	Nuclear 30%	Low Risk
H3	Aggressive	Retired 2016	Combined Cycle	Wind/SC	Low Risk
R1	Aggressive	Controlled	--	--	RAP
C1	Aggressive	Controlled	Combined Cycle	--	Low Risk
R2	Aggressive	Gas Conversion	--	--	RAP
C2	Aggressive	Gas Conversion	Combined Cycle	--	Low Risk

Preferred Plan Selection

At this stage UE uses a new metric to help evaluate which of the 14 plans are relatively strong, moderate, or weak. The Company's approach to evaluating and selecting among the 14 candidate resource plans contains several fundamental flaws, and thereby leads to spurious and misleading results.

One of the most significant problems with the Company's scorecard approach is that it is based on a direct comparison between two different, mutually exclusive futures; the moderate environmental scenario and the aggressive environmental scenario. (This issue is also addressed in Sections 5.A and 5.C above.) UE displays the scorecard results of all 14 plans in one table, and applies its scoring metrics across all 14 plans.

The first five plans (B1, B2, B3, B4, and R0) are all applicable only if the moderate environmental scenario accurately reflects the level and type of environmental regulations that occur over the planning horizon. If future environmental regulations turn out to be "aggressive" then none of these five plans are permissible – and in that case, UE would need to pursue one of the other nine plans (R1, R2, R3, C1, C2, C3, H1, H2, or H3). UE appears to have recognized the distinction between these two environmental scenarios, because the five resource plans associated with the moderate environmental scenario are colored differently than the remaining nine resource plans on the scorecard. However, comparing scenarios where each of UE's thermal plants need fewer and delayed environmental retrofits with scenarios where the coal fired power plants owned by UE require additional environmental retrofits totaling nearly a billion dollars plus (2) either the cost of additional retrofits to control Meramec or the cost of additional resources to replace it is inappropriate and misleading.

More importantly, applying the scorecard across the two different environmental scenarios skews the metrics and leads to spurious results. Each of the six policy objectives is ranked from one to five, where the rank for each resource plan is assigned by the Company relative to the other resource plans. The Company develops ranks across all 14 resource plans – despite the fact that the five plans in the moderate environmental scenario are not comparable to the nine plans in the aggressive environmental scenario. The appropriate way to develop these ranks would be to rank the five plans in the moderate environmental scenario from one to five *relative to each other*, and then rank the nine plans in the aggressive environmental scenario *relative to each other*. This would dramatically change some of the scores.

For example, note how in the table below with the integers, the five plans under the moderate environment scenario are all given the score of one for the Environmental/Diversity policy objective, even though they clearly have different environmental and diversity impacts. This flaw in the Company's approach can so significantly skew the scores in the scorecard that it makes the results of the scorecard unreliable as a source of information to inform management decision-making in selecting a preferred resource plan.

In order to demonstrate some of the additional flaws with the Company's approach, we present below the results of the Preferred Plan Selection Scorecard – first with the Company's results, and then with several results obtained by making corrections and adjustments to the scorecard. The first table below presents the Company's scorecard split into two parts – the first five resource plans, and then the remaining nine plans. The information in this table is the same as that presented in the IRP, Chapter 10, Figure 10.5.

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
		B1	B2	B3	B4	R0
Policy Objective	Measure(s)	MM Continues "As Is" Low Risk DSM CC in 2029	MM Continues "As Is" Low Risk DSM Nuclear in 2028	MM Continues "As Is" Low Risk DSM SC in 2029	MM Continues "As Is" Low Risk DSM Wind/SC in 2028	MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity	○	○	○	○	○
	Carbon Emissions					
	SO2 Emissions					
	NOx Emissions					
Financial/Regulatory	ROE	●	◔	●	◑	◔
	EPS					
	ROIC					
	Free Cash Flow					
	Stranded Cost Risk					
	Transaction Risk					
	Recovery Risk					
Customer Satisfaction	Average Rate Impact	●	●	●	●	◔
	Single Year Rate Impact					
Economic Development	FTE-Years	○	●	○	◑	◕
Cost	PVRR	◕	◕	◕	◕	●
Overall Assessment		🟢	🟢	🟢	🟢	🔶

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

🟢 Top-tier plan
🔺 Mid-tier plan
🔶 Bottom-tier plan

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
Policy Objective	Measure(s)	MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2016 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Environmental/Diversity	Resource Diversity	◔	◑	◕	◔	◑	◕	●	◕	●
	Carbon Emissions									
	SO2 Emissions									
	NOx Emissions									
Financial/Regulatory	ROE	○	◔	◔	◔	◕	◕	◔	◕	◑
	EPS									
	ROIC									
	Free Cash Flow									
	Stranded Cost Risk									
	Transaction Risk									
	Recovery Risk									
Customer Satisfaction	Average Rate Impact	◔	◔	◔	◕	◕	◑	◑	◑	◑
	Single Year Rate Impact									
Economic Development	FTE-Years	◑	◑	◑	◔	○	◔	●	◔	◔
Cost	PVRR	◕	◕	◕	◔	◔	◔	◔	◔	◔
Overall Assessment		🔶	🔺	🟢	🔶	🔺	🔺	🟢	🔺	🔺

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

🟢 Top-tier plan
🔺 Mid-tier plan
🔶 Bottom-tier plan

While symbols can sometimes provide visual cues about the underlying data, the actual data can provide information that is obfuscated by symbols. For this reason, the identical two charts are provided again, this time with the underlying numbers instead of the symbols.

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
Policy Objective	Measure(s)	B1 MM Continues "As Is" Low Risk DSM CC in 2029	B2 MM Continues "As Is" Low Risk DSM Nuclear in 2028	B3 MM Continues "As Is" Low Risk DSM SC in 2029	B4 MM Continues "As Is" Low Risk DSM Wind/SC in 2028	R0 MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	1	1	1	1	1
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	5	2	5	3	2
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	5	5	5	5	2
Economic Development	FTE-Years	1	5	1	3	4
Cost	PVRR	4	4	4	4	5
Overall Assessment		**1.00**	**0.82**	**1.00**	**0.82**	**0.45**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
Policy Objective	Measure(s)	MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2016 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	2	3	4	2	3	4	5	4	5
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	1	2	2	2	4	4	2	4	3
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	2	2	2	4	4	3	3	3	3
Economic Development	FTE-Years	3	3	3	2	1	2	5	2	2
Cost	PVRR	4	4	4	2	2	2	2	2	2
Overall Assessment		**0.09**	**0.30**	**0.64**	**0.00**	**0.30**	**0.30**	**0.64**	**0.30**	**0.30**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

For some policy objectives, UE uses the coarser-grained whole numbers 1 – 5 when more precise data exists. Specifically, with respect to Cost (PVRR), Economic Development (Jobs), and Customer Satisfaction (Rate impact metric), UE has developed an actual number for the corresponding objective. UE uses a unitization in their model to "convert" metrics to a decimal between 0 and 1; we use the same method here, instead requiring the numbers be between 1 and 5. The same two charts are shown below, using actual model results for three of the five policy objectives, and a recalculated overall assessment. Because UE didn't develop a single metric for the other two objectives (Environmental/Diversity and Financial/Regulatory), we retain their integers for those two rows.

Ameren Missouri 2011 IRP
Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
		B1	B2	B3	B4	R0
Policy Objective	Measure(s)	MM Continues "As Is" Low Risk DSM CC in 2029	MM Continues "As Is" Low Risk DSM Nuclear in 2028	MM Continues "As Is" Low Risk DSM SC in 2029	MM Continues "As Is" Low Risk DSM Wind/SC in 2028	MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	1	1	1	1	1
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	5	2	5	3	2
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	5.0	4.7	5.0	4.4	4.9
Economic Development	FTE-Years	1.3	5.0	1.2	1.2	2.4
Cost	PVRR	3.9	3.7	4.0	3.8	5.0
Overall Assessment		**0.99**	**0.77**	**1.00**	**0.64**	**0.88**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Ameren Missouri 2011 IRP
Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
Policy Objective	Measure(s)	MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2026 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	2	3	4	2	3	4	5	4	5
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	1	2	2	2	4	4	2	4	3
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	2.1	1.8	1.7	2.4	2.0	1.0	1.0	1.0	1.0
Economic Development	FTE-Years	2.4	2.4	1.8	1.3	1.3	1.1	4.9	1.0	1.0
Cost	PVRR	2.8	2.5	2.7	1.8	1.5	1.2	1.0	1.3	1.1
Overall Assessment		**0.11**	**0.26**	**0.38**	**0.00**	**0.28**	**0.20**	**0.29**	**0.22**	**0.19**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Notice that when the actual data from the model is used that a number of values change considerably. The R0 numbers in the “moderate” environmental scenario change so

much that the plan elevates from last place of the five plans to third place, despite its Economic Development score decreasing from 4 to 2.4. Scores under the "aggressive" environmental scenario also change considerably, with substantially lower scores for Cost and Customer Satisfaction when the actual values from UE's scoring calculations are used instead of the whole numbers that UE substituted for the actual values.

The above tables simply use UE's scoring model data, as presented in their work papers, in a clearer presentation with UE's more precise data. However, these tables don't yet correct the errors UE made in its models. Specifically:

- For plan R3, Environmental/Diversity is scored a "moderate advantage" because of *coal reduction and no additional emitting resources, but also no additions to generation diversity.* In fact, just like with the wind and nuclear options, this item should be scored a 5 because resource diversity is gained through subtraction: by significantly reducing UE's reliance on coal, the R3 plan would result in a fuel mix which increases reliance on nuclear, natural gas, and renewables while reducing reliance on coal, just like the items which were scored a 5.
- Intermediate work papers included an Energy Efficiency category and comments about the scoring. Energy Efficiency was defined as one of the six policy objectives earlier in the plan selection process. UE removed this category without explanation. The corrected scorecard restores the Energy Efficiency category and uses the number of MWh conserved as the metric to determine the score. It was especially inappropriate to remove the Energy Efficiency category without expanding the customer satisfaction category to reflect the contribution to customer satisfaction that UE expects to achieve from its efficiency programs instead of retaining only the rate increase metric as a measurement of customer satisfaction.
- Within the Economic Development policy objective, UE inappropriately claims 100% of the jobs created with the nuclear plant when it only proposes to own 30% of the plant. Our revised model attributes 30% of the jobs created by building and operating the nuclear plant to UE, not 100%. As a result, the values of each plan within this policy objective change to maintain the worst performer receiving a 1.0 and the best performer earning a 5.0.
- By examining the work papers, it is clear that in applying the scorecard UE used different weights across the six categories than the weights it presented in Chapter 9 of the IRP. To demonstrate the implications of the Company's model alterations not documented in UE's IRP report, we have restored the weights within the final scorecard to those which were carefully described earlier in the UE IRP report, as shown below.

Policy Objective	Chapter 9 Documented Weight	Work Paper Final Scorecard Weight	Corrected Final Scorecard Weight
Environmental/Diversity	20%	20%	20%

Energy Efficiency	10%	0%	10%
Financial/Regulatory	20%	20%	20%
Customer Satisfaction	15%	20%	15%
Economic Development	10%	10%	10%
Cost	25%	30%	25%

- Because the first five plans were modeled based on the "moderate" environmental scenario and the remaining nine plans were modeled based on the "aggressive" environmental scenario, it is appropriate to scale the Overall Assessment from 0 to 1 for the plans under each of the two scenarios. As a result, the Overall Assessment for the five plans B1, B2, B3, B4, and R0 are scaled to include a 1.0 score for the best plan and a 0.0 score for the worst. The same is done for the remaining nine plans.

The resulting scorecards are included below.

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Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
		B1	B2	B3	B4	R0
Policy Objective	Measure(s)	MM Continues "As Is" Low Risk DSM CC in 2029	MM Continues "As Is" Low Risk DSM Nuclear in 2028	MM Continues "As Is" Low Risk DSM SC in 2029	MM Continues "As Is" Low Risk DSM Wind/SC in 2028	MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	1	1	1	1	1
Energy Efficiency	Energy Savings	1.0	1.0	1.0	1.0	5.0
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	5	2	5	3	2
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	5.0	4.7	5.0	4.4	4.9
Economic Development	FTE-Years	1.8	4.5	1.7	1.6	5.0
Cost	PVRR	3.9	3.7	4.0	3.8	5.0
Overall Assessment		**0.58**	**0.12**	**0.58**	**0.00**	**1.00**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
		MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2016 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Policy Objective	Measure(s)									
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	2	3	4	2	3	4	5	4	5
Energy Efficiency	Energy Savings	5.0	5.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	1	2	2	2	4	4	2	4	3
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	2.1	1.8	1.7	2.4	2.0	1.0	1.0	1.0	1.0
Economic Development	FTE-Years	5.0	5.0	3.4	1.8	1.8	1.2	4.0	1.0	1.0
Cost	PVRR	2.8	2.5	2.7	1.8	1.5	1.2	1.0	1.3	1.1
Overall Assessment		**0.58**	**0.79**	**1.00**	**0.00**	**0.37**	**0.29**	**0.32**	**0.30**	**0.27**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Notice that for the "moderate" environmental future, the RAP DSM plan significantly outperforms the other plans both in overall assessment and in cost. Notice too that the nuclear and wind/SC plans perform extremely poorly. For the "aggressive" environmental future, the RAP DSM plans all significantly outperform the non-RAP DSM plans. Furthermore, among the RAP DSM plans, R3 (Meramec retired, RAP DSM) clearly performs best in overall assessment. As noted earlier, UE's failure to properly model wind generation means that there are no aggressive environmental regulation plans that were modeled and scored to see how plans containing significant amounts of wind generation that is well matched with optimal levels of energy efficiency and demand response would compare to the plans that were modeled.

Rules of the Missouri Department of Economic Development 4 CSR 240-22.010(2)(B) require that UE *Use minimization of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan*. UE's model initially weighs Cost as 25%, later increasing that number to 30% as detailed in the prior paragraph. Public Counsel interprets 4 CSR 240-22.010(2)B as requiring that Cost be weighed at greater than 50% for the weight to be in compliance with the rule requiring use of PVRR as the primary selection criteria. In order to better understand the ramifications of a greater emphasis placed on Cost, we have calculated a final scorecard with Cost weighed 50% and the other weights reduced by the same ratio to maintain the 100% total scale. The table of weights adjusted for cost to be 50% of the total score is below.

Policy Objective	Chapter 9 Documented Weight	Work Paper Final Scorecard Weight	Adjusted Final Scorecard Weight

Environmental/Diversity	20%	20%	13%
Energy Efficiency	10%	0%	7%
Financial/Regulatory	20%	20%	13%
Customer Satisfaction	15%	20%	10%
Economic Development	10%	10%	7%
Cost	25%	30%	50%

The charts with cost weighed at 50% are included below.

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
Policy Objective	Measure(s)	B1 MM Continues "As Is" Low Risk DSM CC in 2029	B2 MM Continues "As Is" Low Risk DSM Nuclear in 2028	B3 MM Continues "As Is" Low Risk DSM SC in 2029	B4 MM Continues "As Is" Low Risk DSM Wind/SC in 2028	R0 MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	1	1	1	1	1
Energy Efficiency	Energy Savings	1.0	1.0	1.0	1.0	5.0
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	5	2	5	3	2
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	5.0	4.7	5.0	4.4	4.9
Economic Development	FTE-Years	1.8	4.5	1.7	1.6	5.0
Cost	PVRR	3.9	3.7	4.0	3.8	5.0
Overall Assessment		**0.39**	**0.03**	**0.41**	**0.00**	**1.00**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
		MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2016 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Policy Objective	Measure(s)									
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	2	3	4	2	3	4	5	4	5
Energy Efficiency	Energy Savings	5.0	5.0	5.0	1.0	1.0	1.0	1.0	1.0	1.0
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	1	2	2	2	4	4	2	4	3
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	2.1	1.8	1.7	2.4	2.0	1.0	1.0	1.0	1.0
Economic Development	FTE-Years	5.0	5.0	3.4	1.8	1.8	1.2	4.0	1.0	1.0
Cost	PVRR	2.8	2.5	2.7	1.8	1.5	1.2	1.0	1.3	1.1
Overall Assessment		**0.73**	**0.79**	**1.00**	**0.00**	**0.18**	**0.03**	**0.01**	**0.07**	**0.00**

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

Top-tier plan
Mid-tier plan
Bottom-tier plan

The resulting tables aren't significantly different than the ones where cost did not make up 50% of the total weighing. However, the new tables serve to emphasize what we've already determined – that the RAP DSM plans, which have the lowest PVRRs in their respective futures, gain the best overall assessments. In the "moderate" environmental future, plan R0 remains the best, and now has an even larger advantage over the other plans. Likewise, for the "aggressive" environmental future, the RAP DSM plans retain their relative order and dramatically outperform the Low-Risk DSM based plans in overall assessment.

Finally, for completeness, we re-introduce the symbols so that the reader can compare UE's initial scorecard with a revised scorecard which uses actual data when available and also corrects a few modeling errors made in the initial scorecard.

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans				
Policy Objective	Measure(s)	B1 MM Continues "As Is" Low Risk DSM CC in 2029	B2 MM Continues "As Is" Low Risk DSM Nuclear in 2028	B3 MM Continues "As Is" Low Risk DSM SC in 2029	B4 MM Continues "As Is" Low Risk DSM Wind/SC in 2028	R0 MM Continues "As Is" RAP DSM
Environmental/Diversity	Resource Diversity Carbon Emissions SO2 Emissions NOx Emissions	○	○	○	○	○
Energy Efficiency	Energy Savings	○	○	○	○	●
Financial/Regulatory	ROE EPS ROIC Free Cash Flow Stranded Cost Risk Transaction Risk Recovery Risk	●	◔	●	◑	◔
Customer Satisfaction	Average Rate Impact Single Year Rate Impact	●	●	●	●	●
Economic Development	FTE-Years	◔	●	○	○	●
Cost	PVRR	◕	◕	◕	◕	●
Overall Assessment		△	◇	△	◇	○

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

○ Top-tier plan
△ Mid-tier plan
◇ Bottom-tier plan

Ameren Missouri 2011 IRP

Preferred Plan Selection Scorecard

Policy Objectives, Weights and Measures		Candidate Resource Plans								
		R1	R2	R3	C1	C2	C3	H1	H2	H3
Policy Objective	Measure(s)	MM Controlled 1/1/2016 RAP DSM	MM Gas Conv. 1/1/2016 RAP DSM	MM Retired 12/31/2015 RAP DSM	MM Controlled 1/1/2016 Low Risk DSM CC in 2028	MM Gas Conv. 1/1/2016 Low Risk DSM CC in 2028	MM Retired 12/31/2015 Low Risk DSM CC in 2016 CC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Nuclear in 2025	MM Retired 12/31/2015 Low Risk DSM CC in 2016 SC in 2026	MM Retired 12/31/2015 Low Risk DSM CC in 2016 Wind/SC in 2024
Environmental/Diversity	Resource Diversity									
	Carbon Emissions									
	SO2 Emissions									
	NOx Emissions									
Energy Efficiency	Energy Savings									
Financial/Regulatory	ROE									
	EPS									
	ROIC									
	Free Cash Flow									
	Stranded Cost Risk									
	Transaction Risk									
	Recovery Risk									
Customer Satisfaction	Average Rate Impact									
	Single Year Rate Impact									
Economic Development	FTE-Years									
Cost	PVRR									
Overall Assessment		△	△	●	◆	◆	◆	◆	◆	◆

Scoring Guide	
Significant Advantage	●
Moderate Advantage	◕
No Advantage or Disadvantage	◑
Moderate Disadvantage	◔
Significant Disadvantage	○

● Top-tier plan
△ Mid-tier plan
◆ Bottom-tier plan

In sum, the following changes were made to the Company's original scorecard. First, the scorecard is divided into two distinct sections, in order to differentiate from the mutually exclusive "moderate" and "aggressive" environmental futures. Then, because actual modeling outputs exist in the work papers, data are used to replace UE's coarser integer approximations. Next, the Energy Efficiency policy objective, found throughout the IRP and the scorecards in the work papers, is re-inserted into the final scorecard, with the weights restored to those outlined in the IRP document. Finally, the Cost policy objective (measured by PVRR) is increased to 50% to ensure compliance with 4 CSR 240-22.010(2)(B); a change which doesn't re-order which plans have the strongest overall assessment.

Note that the first flaw described above in the Company's scorecard approach – the way it combined the moderate and aggressive environmental scenarios for scoring – is not demonstrated or corrected for in the charts above. In order to correct for this flaw, it would be necessary to establish new rankings for each of the policy objectives and for each of the resource plans.

Resource Acquisition Strategy Approval by the Union Electric Company (UE) Board of Directors

Appendix D in Chapter 10 of UE's IRP filing contains the minutes from a January 31, 2011 meeting of the UE Board of Directors where the resource acquisition strategy was approved. These meeting minutes indicate that the UE directors who were present at the meeting and approved the resource acquisition strategy were Board Chairman and UE President Warner Baxter and directors Dan Cole, Adam Heflin, Marty Lyons and Steve Sullivan. The meeting minutes indicate that Steve Kidwell and Ajay Arora were also present at the meeting and they reviewed the proposed resource acquisition strategy with the UE Board. A resolution attached to the meeting minutes shows that the UE

Board approved "the UE Missouri 2011 Resource Acquisition Strategy, as submitted to this meeting."

OPC DR No. 2008 requested UE to provide "a copy of all documents provided to the Union Electric Company Board of Directors as part of their review of some or all elements of the resource acquisition strategy contained in UE's February 2011 IRP filing." UE's response stated "Attached is a presentation that was delivered to the UE Missouri Board of Directors on January 31, 2011, which shows key elements of the resource acquisition strategy included in UE Missouri's February, 2011, IRP filing." The presentation referenced in this response is attached to this report as Attachment A.

OPC DR No. 2007 requested similar documents that were provided to the Ameren Board and requested UE to provide "a copy of all documents provided to the Ameren Board of Directors as part of their review of some or all elements of the resource acquisition strategy contained in UE's February 2011 IRP filing." UE's response stated "Attached is the excerpt of a presentation to the Ameren Board of Directors in December, 2010, which shows key elements of UE Missouri's resource acquisition strategy contained in its February, 2011, IRP filing." The presentation referenced in this response is attached to this report as Attachment B.

Pages 2, 3 and 4 of the presentation given to the UE Board are nearly identical to pages 24, 25, and 26 of the presentation given to the Ameren Board. The only significant difference is that the "decision roadmap" diagram on page 2 of the UE presentation labels the chosen alternative resource plan as the "Preferred Resource Plan" while the "decision roadmap" diagram on page 24 of the Ameren presentation labels the chosen alternative resource plan as the "Low Cost Resource Plan". The diagrams contain exactly the same wording that describes the major elements of this resource plan and both descriptions clearly refer to the plan that is named B1 on the Preferred Plan Selection Scorecard which appears on page 13 in Chapter 10 of UE's IRP filing.

Plan B1 also appears on page 4 of the UE presentation and page 26 of the Ameren presentation where it is compared to three other alternative resource plans using the Policy Objectives that are used in the Preferred Plan Selection Scorecard. The title of these two presentation slides (pages 4 and 26) are nearly identical. Page 4 of the UE presentation has the title "Comparison of Ameren Missouri IRP Top Plans" while page 26 of the Ameren presentation has the title "Comparison of Ameren Missouri DRAFT IRP Top Plans." These two slides are essentially simplified versions of the Preferred Plan Selection Scorecard which compare only 4 plans instead of the 14 plans compared in the scorecard. Unfortunately, these slides contain some of the same major flaws present in the Preferred Plan Selection Scorecard that were pointed out earlier in this report. Both of these slides compare plan B1 which assumes "Moderate Environmental Regulation" with other plans which assume "Aggressive Environmental Regulation." This creates an apples to oranges comparison since the plans modeled under "Aggressive Environmental Regulation" (1) assume that Meramec will be retired and replaced with some other supply and /or demand-side resources that have capital and operating costs associated with those resources and (2) contain additional and accelerated environmental compliance costs not included in plan B1. The apples to oranges

comparison can be easily observed by looking at the “moderate disadvantage” rating that is given to the “Aggressive Energy Efficiency Plan” on the “Cost (PVRR)” criteria. As shown earlier in this report, the aggressive energy efficiency plans containing the RAP level of energy efficiency resources always perform better than other plans in head to head competition on the PVRR criteria.

The information presented on page 4 of the UE presentation and page 26 of the Ameren presentation contain inaccurate information when they state that plan B1 is the “Lowest Cost Resource Plan” and when they state that the “Aggressive Energy Efficiency Plan” has a moderate disadvantage relative to plan B1 on the “Cost (PVRR)” criteria. The PVRR comparison is the most glaring inaccuracy and is especially troubling given that the Missouri IRP rule requires utility decision makers to “*Use* minimization *of the present worth of long-run utility costs as the primary selection criterion in choosing the preferred resource plan*.” How can utility decision makers comply with this requirement if their analysts are not providing them with accurate PVRR comparisons to assist them in selecting a preferred plan in a manner that complies with the rule? UE’s decision makers have not selected a preferred resource plan that complies with the rule requirement referenced above.

Attachment C contains a table that is similar to the tables presented on page 4 of the UE presentation and page 26 of the Ameren presentation except that it provides a much more complete comparison of some of the key alternative resource plans. It also removes the inaccurate characterization of the preferred resource plan as the “lowest cost resource plan.” This table was part of the workpapers that UE provided to support its IRP filing. By looking at this table, it is easy to identify which plans are being referenced in the tables presented on page 4 of the UE presentation and page 26 of the Ameren presentation. This table also clearly indicates that when comparing plans under the moderate environmental case, the plan that contains the RAP DSM portfolio has an advantage relative to the selected preferred resource plan in when compared on a cost (PVRR) basis. If the table in Attachment C had been provided to the UE board when they were choosing a preferred resource plan, the board would have had much more comprehensive and accurate information to use in making decisions for this IRP filing.

The errors made in referring to resource plan B1 as the “Lowest Cost Resource Plan” on page 4 of the UE presentation and page 26 of the Ameren presentation were also made in the “decision roadmap” diagram on page 24 of the Ameren presentation where it labels plan B1 as the “Lowest Cost Resource Plan.”

Ameren Missouri
Response to OPC Data Request
MPSC Case No. EO-2011-0271
Union Electric Company d/b/a Ameren Missouri's 2011 Utility Resource Filing pursuant to 4 CSR 240 - Chapter 22

Data Request No.: OPC 2008 Ryan Kind

Please provide a copy of all documents provided to the Union Electric Company Board of Directors as part of their review of some or all elements of the resource acquisition strategy contained in UE's February 2011 IRP filing.

RESPONSE

Prepared By: Matt Michels
Title: Managing Supervisor – Resource Planning
Date: May 26, 2011

Attached is a presentation that was delivered to the Ameren Missouri Board of Directors on January 31, 2011, which shows key elements of the resource acquisition strategy included in Ameren Missouri's February, 2011, IRP filing.

Attachment A

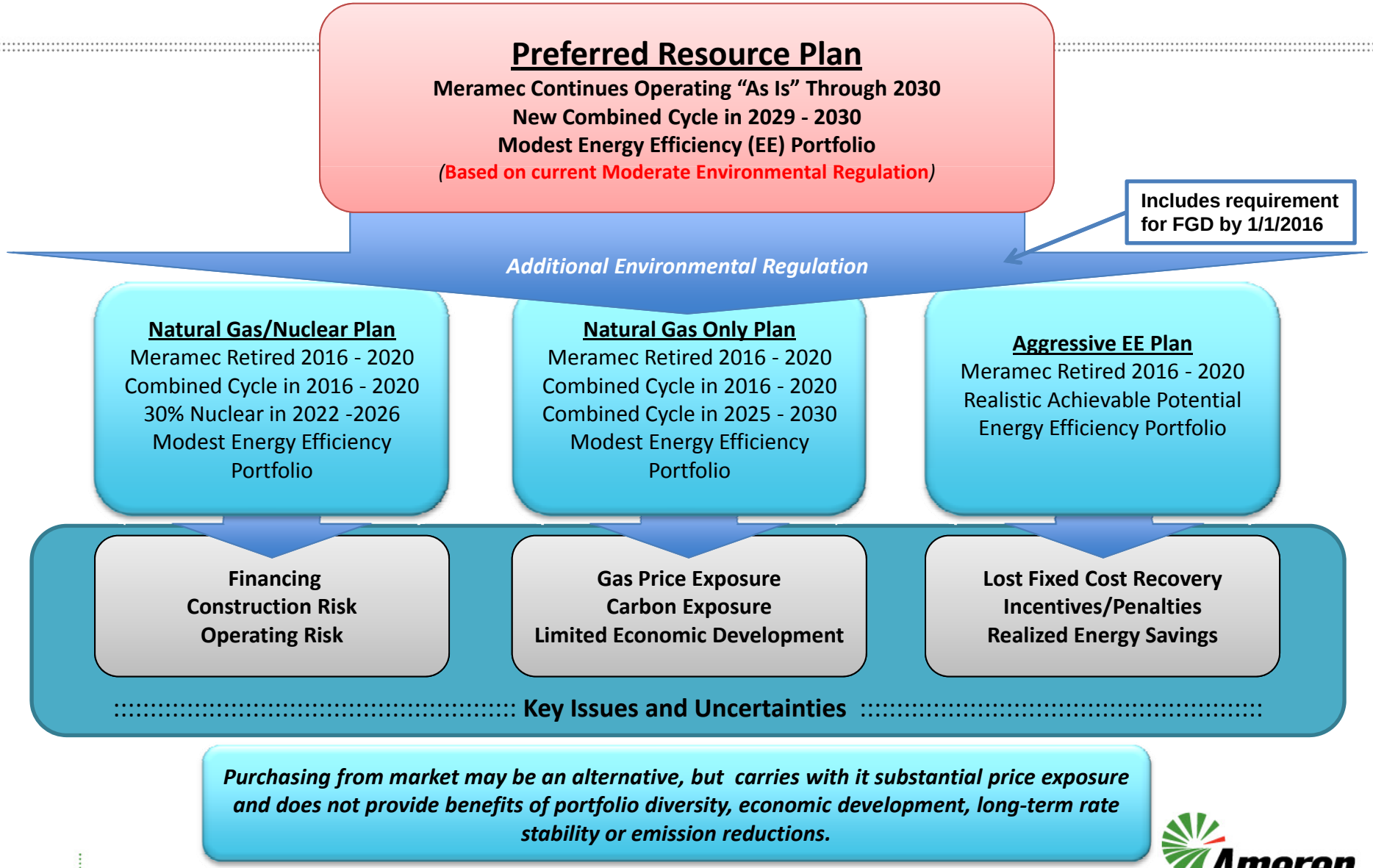
Ameren Missouri 2011 IRP
Resource Acquisition Strategy

Ameren Missouri Board of Directors

January 2010

Attachment A

IRP PREFERRED PLAN AND CONTINGENCY PLANS



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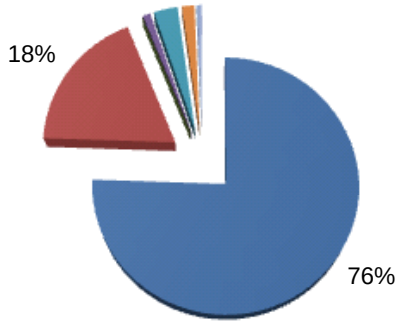
Attachment A

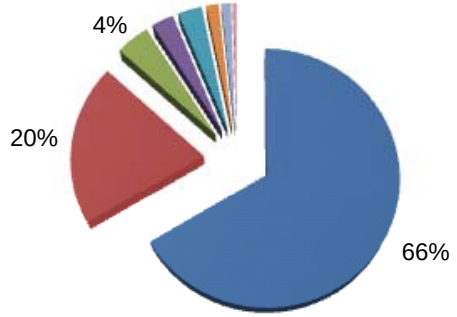
IRP TOP RESOURCE PLANS - PORTFOLIO DIVERSITY

MWh Generation Mix

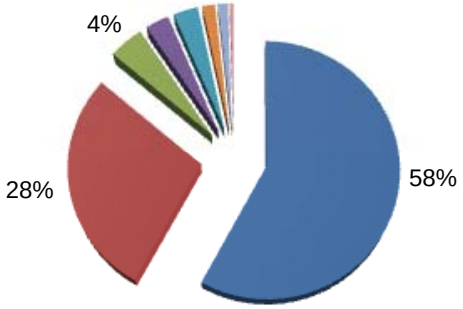
2011 - Current



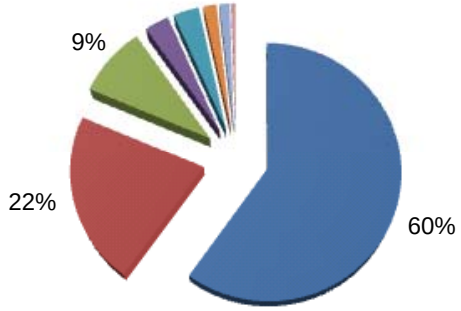
2030 – Preferred Resource Plan



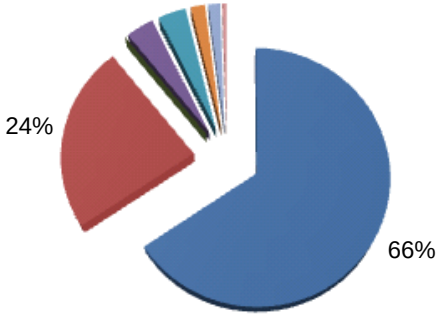
2030 – Natural Gas/Nuclear Plan



2030 – Natural Gas Only Plan



2030 – Aggressive Energy Efficiency Plan



Coal | Nuclear | Intermediate Gas | Peaking Gas and Oil
Hydro | Pumped Hydro | Wind | Other

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Attachment A

COMPARISON OF AMEREN MISSOURI IRP TOP PLANS

Policy Objectives / Decision Criteria	Lowest Cost Resource Plan	Natural Gas Only Plan	Natural Gas / Nuclear Plan	Aggressive Energy Efficiency Plan
Environmental (Emissions)	Lowest Cost Resource Plan	---	↑↑	↑↑
Portfolio Diversity		↑	↑↑	---
Financial/Regulatory		---	↓↓	↓↓
Rate Impacts		↓	↓	↓
Economic Development		---	↑↑	↑
Cost (PVRR)		↓↓	↓↓	↓
Implementation Steps to Preserve Options		1. Evaluate Potential Combined Cycle Sites	1. Early Site Permit Application 2. Explore Regulatory / Financing Methods 3. Explore Alternative Financing sources 4. Complete Nuclear technology review	1. Explore regulatory / financing method 2. Explore Cost Recovery and Incentive Solutions 3. Assess Capability Needs for Implementation

Comparison to Lowest Cost Resource Plan	
Significant Advantage	↑↑
Moderate Advantage	↑
No Advantage or Disadvantage	---
Moderate Disadvantage	↓
Significant Disadvantage	↓↓

Note: Analysis does not include any potential federal or state incentives

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Attachment A

IMPLEMENTATION PLAN

- Implementation of programs for the Low Risk DSM portfolio (see detail on next page)
- Advocate for better alignment of incentives for energy efficiency
- Evaluate options for combined cycle resources, including Meramec conversion, Venice repowering and new greenfield
- Support legislation for recovering costs for an early site permit for new nuclear generation
- Explore regulatory and legislative options that support financing for potential large plant investments, including nuclear and environmental retrofits for coal generation
- Comply with solar requirements of Missouri's Renewable Energy Standard through the purchase of SRECs and installation of solar panels at Ameren's General Office Building
- Evaluate costs of continued operation of Meramec plant in greater detail
- Refine plans and cost estimates for compliance with environmental regulations

IMPLEMENTATION PLAN – DSM PROGRAM DETAILS

LOW RISK	Incremental GWh			Incremental MW			Budget (millions of $)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014
Lighting	44.3	30.5	17.1	1.3	0.9	0.5	$3.8	$2.7	$1.5
HVAC	9.2	10.8	14.0	4.4	5.1	6.5	$3.1	$3.7	$5.0
Appliance Recycling	7.0	3.9	3.4	1.0	0.6	0.5	$1.7	$1.0	$0.9
Low Income	3.3	2.8	2.2	0.2	0.2	0.2	$2.8	$3.0	$3.1
EE Residential Total	**63.9**	**48.1**	**36.8**	**6.9**	**6.8**	**7.7**	**$11.3**	**$10.3**	**$10.5**
Standard	9.8	11.5	13.7	3.9	4.6	5.5	$2.9	$3.4	$3.9
Custom	23.6	17.7	19.2	6.3	4.8	5.3	$5.6	$4.3	$4.8
RCx	1.0	0.8	0.8	0.2	0.2	0.2	$0.1	$0.1	$0.1
New Construction	1.2	1.4	1.7	0.4	0.5	0.6	$0.4	$0.5	$0.7
Multifamily Common	0.9	0.9	0.9	0.2	0.2	0.2	$0.2	$0.2	$0.2
EE Business Total	**36.5**	**32.3**	**36.3**	**10.9**	**10.2**	**11.7**	**$9.2**	**$8.4**	**$9.7**
EE PORTFOLIO TOTAL	**100.4**	**80.4**	**73.1**	**17.8**	**17.0**	**19.4**	**$20.5**	**$18.8**	**$20.2**

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Attachment A

Ameren Missouri
Response to OPC Data Request
MPSC Case No. EO-2011-0271
Union Electric Company d/b/a Ameren Missouri's 2011 Utility Resource Filing pursuant to 4 CSR 240 - Chapter 22

Data Request No.: OPC 2007 Ryan Kind

Please provide a copy of all documents provided to the Ameren Board of Directors as part of their review of some or all elements of the resource acquisition strategy contained in UE's February 2011 IRP filing.

RESPONSE

Prepared By: Matt Michels
Title: Managing Supervisor – Resource Planning
Date: June 2, 2011

Attached is the excerpt of a presentation to the Ameren Board of Directors in December, 2010, which shows key elements of Ameren Missouri's resource acquisition strategy contained in its February, 2011, IRP filing.

Attachment B

Ameren Missouri Draft Integrated Resource Plan Executive Summary

Warner Baxter

Attachment B

INTEGRATED RESOURCE PLAN

Overview of Integrated Resource Plan (IRP) Requirements

- Regulatory requirement to file an IRP every three years that informs the Missouri Public Service Commission (MPSC) and other key stakeholders of Ameren Missouri's 20-year resource needs and generation technologies available to fulfill customer needs.
- The MPSC evaluates the process to develop and select the resource plans but does not approve the final resource plan.
- IRP filing requires:
  - Equivalent treatment of demand side and supply resources
  - Formal Risk Analysis
  - Identification of a Preferred Resource Plan and a 3-year Implementation Plan
  - Documentation of management decision making
- Requires notification to the MPSC if Preferred Resource Plan is no longer appropriate

Other objectives of IRP filing

- Utilize a robust analysis framework that is useful for long-term strategic planning
- Engage key stakeholders on long-term resource planning
- Enhance understanding of key issues, challenges and uncertainties

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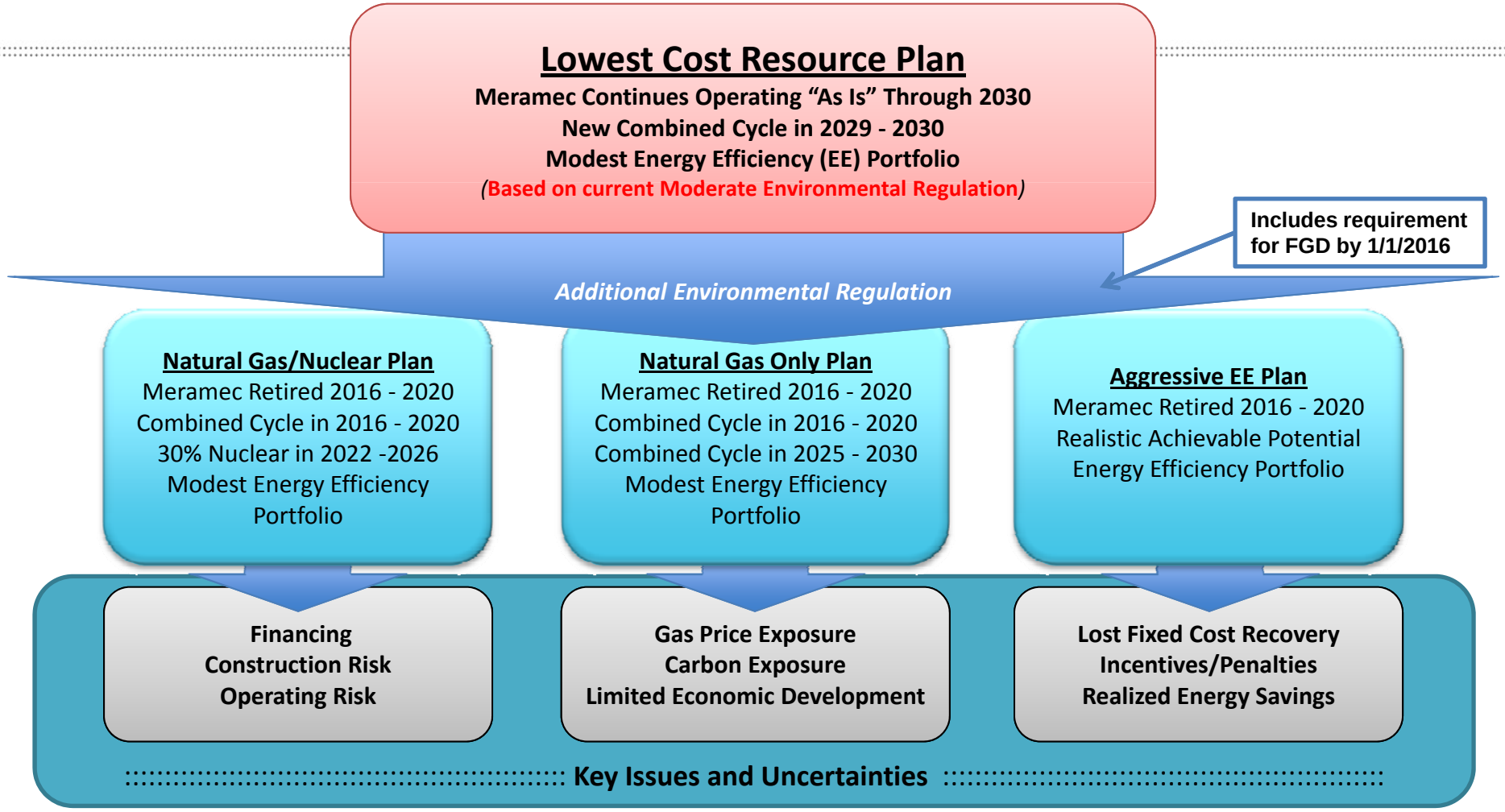
Attachment B

DRAFT IRP TOP RESOURCE PLANS – EXECUTIVE SUMMARY



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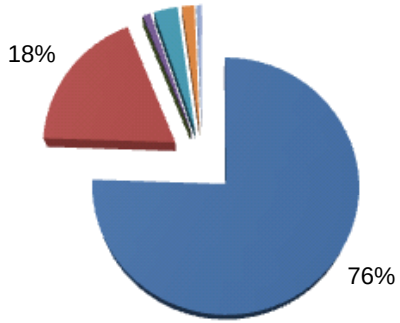
Attachment B

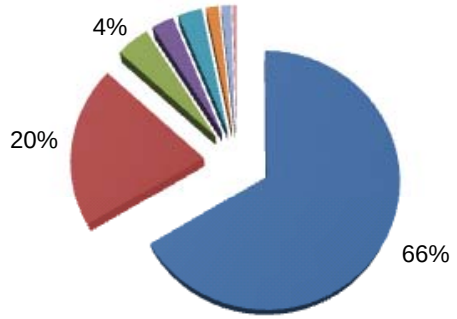
DRAFT IRP TOP RESOURCE PLANS - PORTFOLIO DIVERSITY

MWh Generation Mix

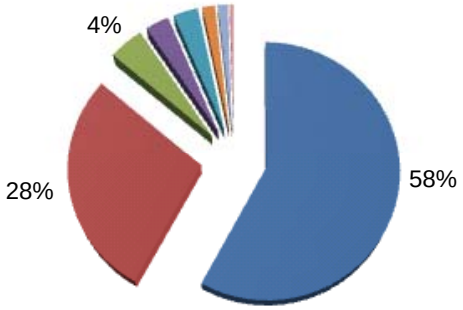
2011 - Current



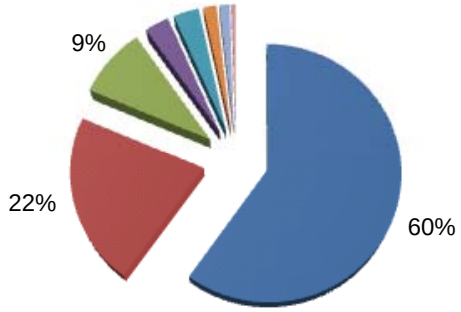
2030 – Lowest Cost Resource Plan



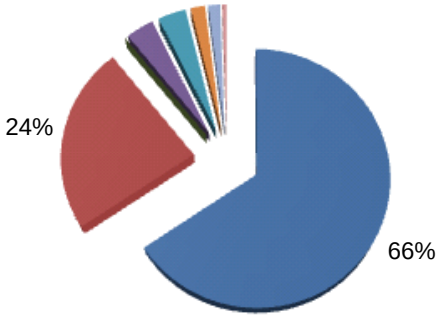
2030 – Natural Gas/Nuclear Plan



2030 – Natural Gas Only Plan



2030 – Aggressive Energy Efficiency Plan



Coal | Nuclear | Intermediate Gas | Peaking Gas and Oil
Hydro | Pumped Hydro | Wind | Other

Ameren

Attachment B

COMPARISON OF AMEREN MISSOURI DRAFT IRP TOP PLANS

Policy Objectives / Decision Criteria	Lowest Cost Resource Plan	Natural Gas Only Plan	Natural Gas / Nuclear Plan	Aggressive Energy Efficiency Plan
Environmental (Emissions)	Lowest Cost Resource Plan	---	↑↑	↑↑
Portfolio Diversity		↑	↑↑	---
Financial/Regulatory		---	↓↓	↓↓
Rate Impacts		↓	↓	↓
Economic Development		---	↑↑	↑
Cost (PVRR)		↓↓	↓↓	↓
Implementation Steps to Preserve Options		1. Evaluate Potential Combined Cycle Sites	1. Early Site Permit Application 2. Explore Regulatory / Financing Methods 3. Explore Alternative Financing sources 4. Complete Nuclear technology review	1. Explore regulatory / financing method 2. Explore Cost Recovery and Incentive Solutions 3. Assess Capability Needs for Implementation

Comparison to Lowest Cost Resource Plan	
Significant Advantage	↑↑
Moderate Advantage	↑
No Advantage or Disadvantage	---
Moderate Disadvantage	↓
Significant Disadvantage	↓↓

Note: Analysis does not include any potential federal or state incentives

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Attachment B

Ameren Missouri 2011 IRP

Head-to-head Plan Comparison

Policy Objectives / Decision Criteria	Meramec Continues Combined Cycle 2029	Meramec Retired 12/31/15 Combined Cycles in 2016, 2026	Meramec Continues Nuclear 2028	Meramec Retired 12/31/15 Combined Cycle 2016 Nuclear 2025	Meramec Continues RAP DSM Portfolio	Meramec Retired 12/31/15 RAP DSM Portfolio
Environmental (Emissions)	Preferred Resource Plan	---	↑	↑↑	↑	↑↑
Portfolio Diversity		↑	↑	↑↑	↓	---
Financial/Regulatory		---	↓↓	↓↓	↓↓	↓↓
Rate Impacts		↓	---	↓	---	↓
Economic Development		---	↑↑	↑↑	↑	↑
Cost (PVRR)		↓↓	---	↓↓	↑	↓
Implementation Steps to Preserve Options		**1. Evaluate Potential Combined Cycle Sites**	**1. Early Site Permit Application 2. Explore Regulatory / Financing Methods 3. Explore Alternative Financing sources 4. Complete Nuclear technology review**		**1. Explore regulatory / financing method 2. Explore Cost Recovery and Incentive Solutions 3. Assess Capability Needs for Implementation**	

Comparison to Preferred Resource Plan	
Significant Advantage	↑↑
Moderate Advantage	↑
No Advantage or Disadvantage	---
Moderate Disadvantage	↓
Significant Disadvantage	↓↓

Attachment C
Highly Confidential

Missouri Public Service Commission
Service List for Case No. **EO-2011-0271** Last Updated: **5/9/2011**

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