

Portfolio Transition Risk Analysis

Ameren Missouri – 2020 Integrated Resource Plan

Background

On September 27, 2020, Ameren Missouri filed its triennial Integrated Resource Plan (IRP) with the Missouri Public Service Commission (Commission). On or before March 31, 2021, the Commission Staff (Staff) and other stakeholders filed comments on Ameren Missouri's IRP filing, identifying certain alleged deficiencies and concerns in accordance with 20 CSR 4240-22.080(7) & (8). Agreement could not be reached on remedies for certain alleged deficiencies and concerns. On August 18, 2021, the Commission issued its Order regarding Ameren Missouri's 2020 IRP. That Order found that the Company's IRP meets the standards set forth in 20 CSR 4240-22. The Commission also ordered that, "Ameren Missouri shall provide detailed analysis comparing ratepayer risks and shareholder risks for additional generation resources, which are not required to meet federal, state, or MISO requirements as part of its next IRP annual update." This document and associated workpapers are provided in response to that requirement in the Commission's Order.¹

Summary of Key Conclusions

Ameren Missouri's IRP preferred plan includes a sustained series of investments in wind and solar generation resources over the next twenty years. This sustained approach provides substantial mitigation of risks associated with the inevitable transition of Ameren Missouri's generation portfolio to cleaner sources of electricity. Such risks include risks associated with expectations of a price on carbon emissions and the resulting impact on the market price for power. They also include risks of implementation, including project development and construction, and siting and construction of enabling transmission investments. A sustained transition also provides opportunities to capitalize on more attractive projects that may not be available in the future and guards against rapid and significant changes to other portions of the generation portfolio that may result from changes in energy policy or market conditions, such as a clean energy standard or increased requirements under Missouri's Renewable Energy Standard (RES). Finally, a sustained transition supports the need to ensure continued system reliability as Ameren Missouri and the entire U.S. power industry significantly increase their reliance on intermittent renewable resources and reduce overall carbon emissions. The risk mitigation provided by the planned sustained transition could not be provided by a plan that reflects deployment of new renewable only when new capacity is expected to be needed, which the IRP preferred plan estimates would not occur until more than 15 years from now.

¹ The included workpapers are also based in part on the risk analysis workpapers provided in File No. EO-2021-0021.

Our assessment of risks to customers in the 2020 IRP includes a robust analysis of market risks associated with the planned portfolio transition. This risk analysis shows that the Company expects its planned transition to mitigate the impacts of a range of probable market prices and that customers will likely see lower long-run costs than if the addition of renewable resources were delayed. In effect, the mitigation for the risks described above not only results in no additional costs, it results in market risk mitigation and expected savings. Customers may also realize savings in terms of financing costs related to the planned sustained transition and its perception among investors, who are increasingly focused on the need to transition to cleaner sources of energy and may demand higher returns associated with the perceived risk of a delay in such a transition.

Shareholders also face risks associated with the transition that may affect their ability to realize expected investment returns. Such risks may take a number of forms but can be generally quantified in terms of the overall risk to recovery of investments made and fair returns on those investments. This may result from project management risks, retail sales risks, or risks associated with rate recovery mechanisms.

Ameren Missouri is focused on executing its preferred plan to transition its portfolio to a cleaner and more diverse mix of resources in a responsible fashion that ensures continued reliability and affordability for our customers. The flexibility inherent in the Company's transition plan provides it the opportunity to adjust the plans as appropriate as conditions and assumptions change as part of the Company's continuous resource planning efforts.

Approach

In considering the potential risks and risk mitigation associated with portfolio transition, it is also important to consider risks to both customers and shareholders of not pursuing the portfolio transition set forth in the IRP preferred resource plan. As described in the 2020 IRP filing, there are a number of risks that our customers may face if this transition is not carried out in a thoughtful and methodical fashion rather than a reactive one. This supplemental analysis therefore includes discussion of these risks and the mitigation provided by the planned transition, primarily drawing from relevant discussion previously included in the 2020 IRP filing.

Ameren Missouri's IRP process includes a rigorous assessment of risk from the perspective of the Company's customers, as required in 20 CSR 4240-22.060. The assessment of customer risk for purposes of this analysis draws primarily from the risk analysis performed for the 2020 IRP. The IRP risk analysis includes consideration of the impact on customer costs and rates of a number of key variables, or uncertain factors, such as costs and performance characteristics for new resources and prices for carbon emissions, natural gas, coal, and electric energy and capacity. The risk analysis presented in this document includes summary results from the IRP risk analysis along

with supplemental analysis based on the same assumptions used in the IRP to provide a concise understanding of customer risks associated with the planned portfolio transition.

For analysis of shareholder risks, the Company relied on new analysis, because the risk analysis set forth in the Commission's IRP rules is focused on risks from a customer perspective. Shareholder risks can be considered in terms of the risk of achievement of the expected return on investment. While such risks can take a number of forms and cover a wide range of impacts in financial terms, specific risks are virtually impossible to predict or estimate with any degree of confidence. For that reason, the evaluation of shareholder risk in this supplemental analysis focuses on general categories of risk and aggregate estimates of the range of the possible magnitude of such risks.

Finally, it is important to note that analyses of the kind presented here must be considered at a snapshot in time and are intended to be representative of a reasonable approach to assessing risk. It is possible, and perhaps likely, that changing conditions could significantly alter the results and conclusions presented here. This is the nature of all planning, including IRP. As a result, it may be necessary to revisit this assessment at appropriate times.²

Portfolio Transition Risks

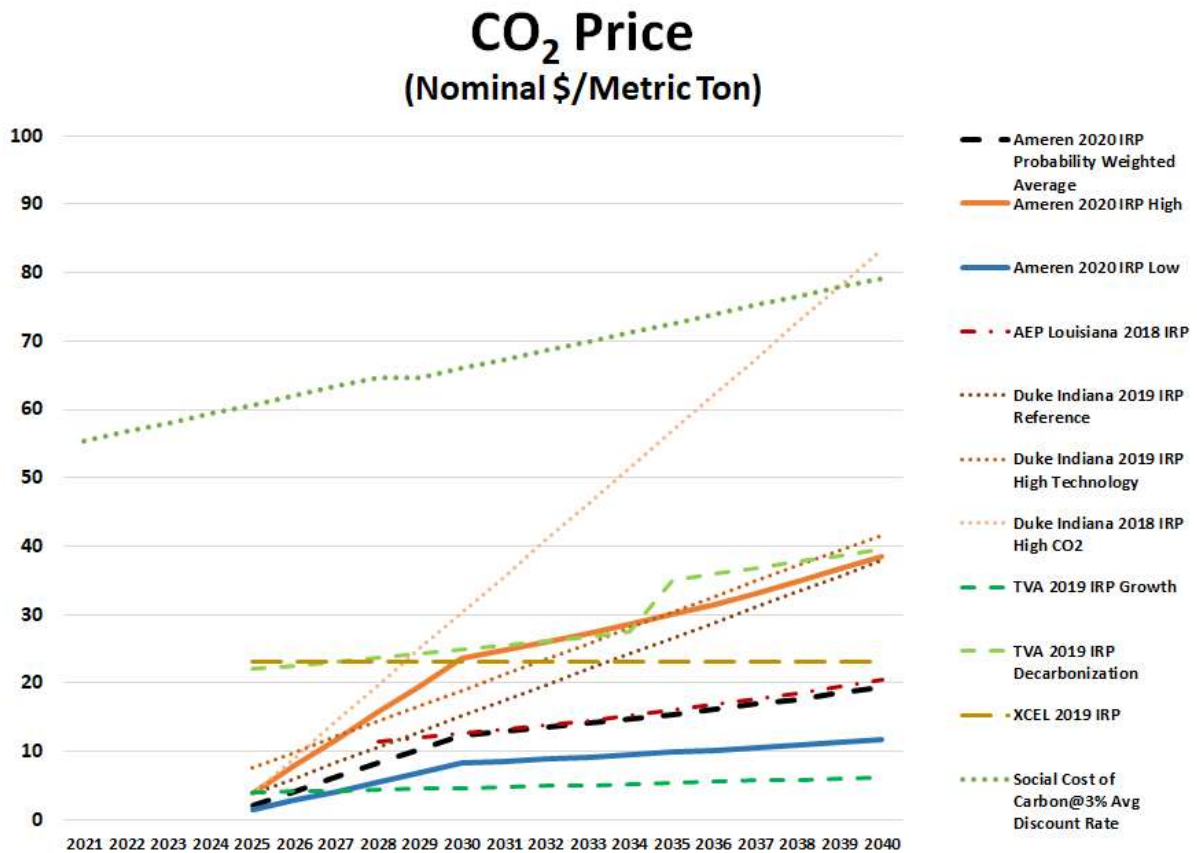
To provide important context regarding the Company's risk assessment, it is important to think about the rationale for the planned transition and the risks of delaying that transition. A detailed discussion of key considerations regarding the deployment of renewable resources in the discussion of the Company's preferred plan, found in Chapter 10 of the Company's 2020 IRP filing, is included as an appendix to this document in its entirety for easy reference. In short, the Company's planned deployment of renewable resources addresses significant key risks involved in the transition of the generation resource portfolio. While certain risks may prove over time to be more significant than others, the Company's approach addresses them collectively and in a manner that ensures flexibility to adjust to changing conditions so the Company can continue to ensure reliable and affordable electric service for its customers. The key risks are briefly described below and are discussed in greater detail in the IRP excerpt in Appendix A.

- Changes in Energy Policy – The enactment of federal or state policies, such as Clean Energy Standards (CES), changes to state Renewable Energy Standards (RES), or the imposition of an explicit price or tax on carbon emissions continues to receive serious attention. Such policies, which could be enacted in any number of combinations, would likely further accelerate the need for renewable resources and challenge the supply chains

² As indicated in the Company's 8-K issuance on December 13, 2021, it is now expected that the Rush Island Energy Center will retire significantly earlier than the 2039 retirement date used to develop the IRP preferred plan presented in this docket. The impact of that change in retirement date will be the subject of additional filings as needed in accordance with the Commission's IRP rules.

for labor, equipment and other goods and services that are needed for the deployment of renewable resources. They could also necessitate consideration of further acceleration of the retirement of coal-fired resources and result in a need for new energy resources much sooner than currently expected. While the outcome of current legislative efforts at the federal level remains uncertain, it is clear that the appetite for policies, both legislative and regulatory, encouraging a more rapid transition continues to remain strong.

- Carbon Pricing – As is demonstrated in the Company's IRP filing, the economics of various resources are sensitive to assumptions for carbon emission prices and may drive consideration of changes to the timing of resource retirements and additions. This is particularly true for coal-fired resources, but is also significant for renewable resources in as much as they benefit from the inclusion of such charges in the market price of power. In light of this reality, while the preferred plan represents an appropriate balance of risks and benefits today, that may change. The figure below presents the carbon price assumptions used by the Company in its 2020 IRP analysis along with assumptions from other utility IRPs and the social cost of carbon as estimated at the time the IRP assumptions were developed.



- **Implementation Risks** – The potential challenges of deploying over 5,000 MW of wind and solar resources should not be underestimated, and such challenges have been evident in the Company's implementation of new resources already. Potential challenges are present in every stage of implementation, including project planning, siting, permitting, contract negotiation, construction, commissioning, testing and transmission interconnection. Waiting to begin the deployment of renewable resources allows such potential challenges to compound, particularly in the context of any nationwide clean energy policies that may be enacted. The Biden administration has maintained a focus on transitioning the U.S. power system to net zero carbon emission by 2035 through a combination of legislative and regulatory action. Should those efforts or subsequent such efforts be successful, the challenges of implementation will be further magnified. Waiting to begin deployment of renewable resources also risks lost opportunities with respect to higher quality projects that may not be available later.

- **Reliability Risks** – Deployment of over 5,000 MW of new wind and solar resources also requires a particularly deep focus on integration and reliable operation of these new renewable generation resources to ensure the Company can continue to provide the reliable energy supply upon which all its customers depend. The experience of Texas and other regions during the last winter season highlights the need to ensure that resources, systems, regulatory processes, and market mechanisms are in place and properly coordinated to ensure reliability of critical energy services to customers. Other lower probability, high impact events must be considered to ensure reliability at the most critical times. It is therefore vitally important to deploy new renewable generation in a continuous and balanced manner in order to operate new renewable resources over an extended period, while existing coal-fired generation is available to provide reliability services. Through that methodical deployment of new renewable resources, the Company can fully understand how best to optimally and reliably operate the renewable generation portfolio that will replace much of its current generation portfolio, and system operators and regulators can implement necessary measures to ensure reliability with confidence.

Ameren Missouri's planned expansion of renewable resources is a reasonable and necessary approach to ensuring adequate and reliable service to customers at a reasonable cost over the planning horizon in light of the broader shift toward cleaner energy sources, the implementation risks inherent in executing that shift, and long-term risks faced by its existing portfolio of resources, most notably its fleet of coal-fired generation. Ameren Missouri has selected its preferred resource plan to balance the costs and risks to customers over the planning horizon, specifically accounting for real and potential challenges to execution of a large-scale buildout of clean, renewable generation resources. Chapter 10 of its IRP sets forth the Company's rationale for its planned renewable expansion. That discussion can be found in Appendix A for ease of reference and in support of the general points that follow. Below is an overview of the thought

process Ameren Missouri management and planning staff used to determine the appropriate pathway for the expansion of renewable resources.

1. **The Company began with the end in mind.** Ameren Missouri will need energy resources during the planning horizon to replace the energy produced by retiring coal and other resources and avoid over-reliance on a market that is expected to have a diminishing supply of surplus generation. See "Ameren Missouri's Need for Energy Resources" in the IRP Chapter 10 discussion in Appendix A.
2. **The Company considered the risks and challenges of a large renewable buildout.** A large buildout of renewable resources is unlikely to be successful in a very short period, so it is necessary to stage the investment in renewable resources to manage the inherent challenges and risks. These include project development and negotiation, permitting, regulatory approval, transmission interconnection, and availability of labor, materials and equipment at reasonable prices. Staging the renewable resource expansion also allows the Company to learn and gain vital operational experience from each project and apply the lessons to subsequent project acquisition, execution, and operation. The steady addition of renewable projects will allow the Company to better achieve operational excellence and extract the most value for customers from each project as it is added to the portfolio. In addition, a staged renewable buildout allows the Company to continue to monetize federal tax benefits that are available for renewable generation to support affordability of the transition to a cleaner energy portfolio. See "Practical Considerations for Large-Scale Renewable Expansion" in the IRP Chapter 10 discussion reproduced in Appendix A.
3. **The Company tested the economics of a staged renewable buildout.** To make a proper comparison of alternatives and assess the extent to which a staged buildout might be advantageous to customers in terms of cost, in addition to the other benefits of renewable energy, the Company included evaluation of a plan in which the renewable resources were added only when there was a need for capacity. The findings indicate that that staging the renewable additions was expected to be less costly for customers, taking into account the risks associated with market price uncertainty. The findings also show that there may be challenges in terms of financing a large renewable buildout over a short period. It should be noted that while the analysis was based on the same resource cost assumptions regardless of the magnitude of resources additions in each year, it is entirely plausible and perhaps inevitable that costs could increase as the result of pursuing a large number of projects over a short period. See the results of the risk analysis in IRP Chapters 9 and 10 for more. Also see "Practical Considerations for Large-Scale Renewable Expansion" in the IRP Chapter 10 discussion reproduced in Appendix A for a discussion of financing considerations.

4. **The Company considered the risks that its existing fleet of resources continues to face.** While the Company stands by all the elements of its preferred resource plan, it also recognizes that the planning environment is ever changing and planning is never done. It must therefore consider possibilities that were not considered to be probable when the Company prepared its assumptions and conducted the IRP analysis, but which may materialize as the planning landscape changes. Such possibilities include the potential for additional significant changes in energy and environmental policy, particularly those that could cause further acceleration of the retirement of coal-fired generation. Because such decisions carry the potential for drastic and rapid changes to the portfolio, the need for replacement sources of energy is itself uncertain. Staging the addition of renewable resources provide Ameren Missouri, and ultimately its customers, with a measure of risk mitigation. See "Risk Mitigation Benefits of Renewable Expansion" in the IRP Chapter 10 discussion reproduced in Appendix A.
5. **The Company considered the growing demand for renewable resources, including increasing public support for policies that transition the nation to cleaner and more sustainable sources.** Customers are increasingly interested in getting their electricity from cleaner energy sources. At the same time, there is strong support for policies that promote the transition to cleaner energy sooner. Importantly, such policies are currently a major focus of efforts by the majority in both houses of Congress. While the Company cannot predict exactly when or in what form such policies might be passed into law, it is clear the desire for such policies remains strong. See "Customer and Policy Drivers of the Need for Renewable Resources" in the IRP Chapter 10 discussion reproduced in Appendix A. Also see the below discussion regarding specific consideration of Clean Energy Standard policies considered at the federal level.

This thorough and deliberate thought process has led the Company to conclude that a long-term sustained buildout of renewable resources is in the best interests of its customers, the environment, and the communities it serves.

Consideration of Federal and State Clean Energy Policies

Since the filing of the 2020 IRP, a number of proposals have been introduced in the current Congress that are focused on the transition of the power sector to address risks of climate change. Among these, several are based on a clean energy standard (CES) approach that requires greater and greater levels of clean energy production as a share of retail electric sales. In that respect, a CES is very much like a renewable energy standard (RES) of the kind passed by Missouri voters in 2008. The proposals for a federal CES target a high percentage of clean energy (wind, solar, hydro, nuclear, and natural gas to different extents depending on the specific proposal) at some time in the future, with the most prominent proposals seeking to reach 100 percent clean energy by as early as 2035. Whether Congress will pass such proposals remains to be seen. However, CES policies enjoy broad support from environmental advocacy groups and

industry organizations alike, including many electric utility companies. At the state level, clean energy advocates continue to look for opportunities to increase the requirements of the Missouri RES. This would likewise necessitate the addition of new renewable generation resources, potentially over a relatively short period.

Customer Risks Associated With Portfolio Transition

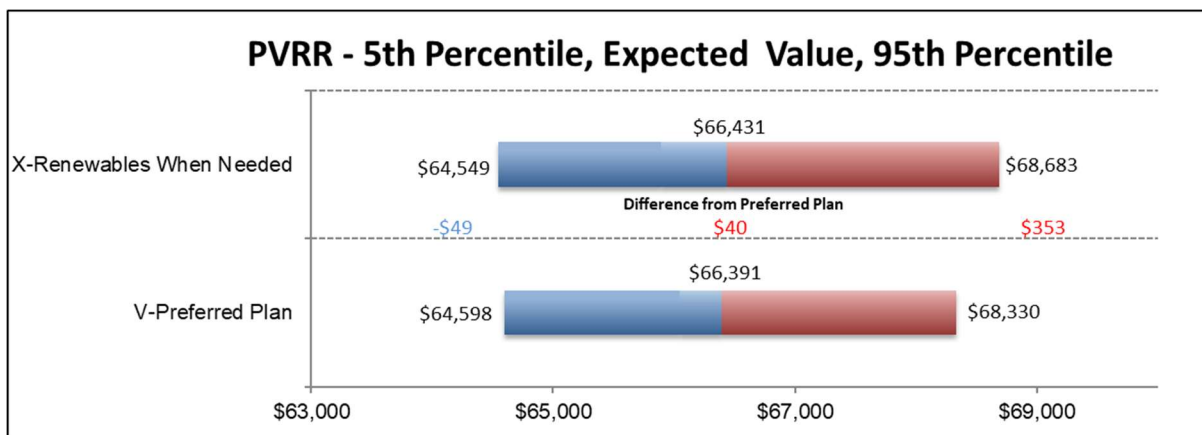
A key element of our IRP process is the assessment of risks that could affect the costs of resource decisions for customers. Ameren Missouri analyzes such risks in accordance with the Commission's IRP rules, specifically the risk analysis provisions set forth in 20 CSR 4240-22.060, and describe the assumptions, analytical approach and results of this analysis in Chapters 9 and 10 of the 2020 IRP filing. As mentioned previously, that analysis showed that customers are expected to realize cost savings over the planning horizon as a result of the steady deployment of renewable resources. The procurement of energy from MISO to serve customers is subject to the same kind of price risk faced by our generation resources. The Company's portfolio of generation resources therefore also serves as a hedge against the price risk exposure faced by the load. In that light, the deployment of renewable resources as represented in the preferred plan provides significant risk mitigation for customers that comes not only with no additional cost, but an expectation of savings. These results are discussed in more depth later in this section.

The 2020 IRP risk analysis considered a number of variables, or uncertain factors, which might have a significant impact on the performance of the various alternative resource plans the Company evaluated. The Company considers both dependent and independent uncertain factors. Dependent uncertain factors are those that exhibit a strong interdependent relationship with other uncertain factors. These generally include variables that have a direct bearing on the market price of power – natural gas prices, prices on carbon emissions, and the growth of demand across the market. Independent uncertain factors are those that do not exhibit a strong interdependence with other uncertain factors. These generally include financing costs (interest and equity returns), capital costs for new resources, resource operating characteristics (e.g., forced outage rates, variable O&M expense), DSM costs and energy savings, and prices for non-carbon emissions (e.g., SO₂, NO_x).

Of the uncertain factors evaluated, several were found to be critical to the comparative evaluation of alternative resource plans. They include dependent uncertain factors – natural gas prices and carbon emission prices – that together define nine scenarios for power market prices. They also include two independent uncertain factors - load growth and DSM program costs. For more on the testing and selection of critical uncertain factors, see Chapter 9 of our 2020 IRP. Also note that while capital costs for new resources ("Project Costs") and financing costs (interest and equity returns) were not determined to be critical uncertain factors, the sensitivity analyses used to make those determinations is included in the 2020 IRP filing and is useful in our discussion of customer risks here.

Market Risk

The risk with the greatest potential for affecting the performance of plans with respect to the renewable resource expansion is market risk, the risk associated with the prices at which power generated by these resources is expected to be sold into the market as well as the risk associated with prices at which power is expected to be purchased from the market to serve customers' load. The 2020 IRP risk analysis provides direct insight into the potential magnitude of this risk by comparing the range of results for two different plans – one that includes the planned renewable transition (defined in our 2020 IRP as Plan V) and one that assumes renewable resources are only added at the time of an expected need for capacity (Plan X). The chart below shows the range of outcomes for customer costs (expressed as the present value of revenue requirements, or PVRR) across the full range of risks evaluated in the 2020 IRP analysis, including nine market price scenarios, for these two plans. While these risk analysis results also include risks associated with DSM costs and load growth, the differences in results between the two plans are entirely driven by market risk because the load and DSM levels are the same for both plans.



As the chart shows, the range of costs for Plan X is wider than that for Plan V, with the primary difference on the high end of the ranges. On the high end, Plan X results in PVRR that is \$353 million greater than that for Plan V. Likewise, the expected value PVRR for Plan X are \$40 million greater than that for Plan V. Finally, on the low end Plan X results in PVRR that is \$49 million lower than that for Plan V. Taken together, these results show that Plan V – the Company’s preferred plan – provides material market risk mitigation on the high end while exhibiting relatively modest differences in market risk on the low end relative to Plan X.

It is important to note that while this market risk mitigation value alone may not be highly compelling, it is compelling when considered in the context of not only the implementation risk mitigation value of Plan V described earlier, but also risks associated with climate and environmental policy. As mentioned previously, implementation risks include risks associated with project development and negotiation, permitting, regulatory approval, transmission interconnection, and availability of labor, materials and equipment at reasonable prices. If Plan

V resulted in increased market risk relative to Plan X, it would be necessary to quantify the value of mitigation it provides for these policy and implementation risks and then compare that to the increased market risk to determine whether it is justified. Instead, in addition to providing mitigation for these policy and implementation risks, Plan V also provides mitigation for the market risk.

While there are never guarantees as to the market benefits of any of the resources in the portfolio (new or existing, renewable or non-renewable), the Company must plan to meet its customers' electric energy needs under the kind of uncertainty that is recognized in the planning framework embodied in the Commission's IRP rules. As mentioned previously, the Company must also recognize that its obligation to serve its customers is likewise subject to market risk because it must purchase from the market to meet its customers' energy needs. The ability to generate electricity and sell it into the market provides a hedge against the Company's customer load obligation. Renewable resources in particular, provide a zero-carbon hedge against that obligation, and they benefit from policies that penalize carbon-based generation through either an implicit or an explicit price on carbon emissions.

Financing Cost Risk

As part of the 2020 IRP risk analysis, the Company evaluated financing costs as a candidate uncertain factor and found that it was not critical to the relative performance of alternative resource plans. The Company performs this analysis by evaluating the impact of a range of assumptions for a combination of interest rate and allowed equity returns. It does not consider potential variations in equity cost due to portfolio composition. While such plan-to-plan differences in financing costs are not explicitly included in the risk analysis, the Company does include an assessment of various credit metrics that may have an impact on its ability to finance the investments that are needed to serve customers. That analysis is included in the IRP excerpt in Appendix A and shows that the Company may face greater challenges in financing Plan X than for the preferred plan -- Plan V.

The Company also includes qualitative consideration of investor sentiment when selecting the preferred resource plan. Investors are increasingly focused on environmental, social and governance considerations when making investment decisions – an approach known as ESG investing. This approach by many investors places an increased focus on risks associated with fossil-fueled resources (primarily coal-fired generation) and utility plans to transition to cleaner energy sources. Companies that are viewed as lagging in their progress and plans for portfolio transition may have more limited access to sources of equity investment than companies that are making clear progress and have explicit plans to continue making progress. This in turn could result in demands for higher equity returns for investors, translating into higher financing costs in the revenue requirements upon which customer rates are ultimately set.

To assess the potential impact on customer costs, the Company evaluated the sensitivity of Plan X to a change in the cost of equity. For every ten basis points increase in required equity return, the cost to customers for Plan X increases by \$127 million. While it is difficult to predict the magnitude of the premium investors may require if Ameren Missouri is not viewed as making sufficient progress in its transition to cleaner energy sources, it is clear that even small changes could have a material adverse impact on customer costs.

In addition to equity cost risks, it is also important to keep in mind expectations regarding debt interest rates. Ameren Missouri's customers have benefitted significantly from a period of relatively low interest rates as the Company continues to make investments to serve its customers' energy needs. The 2020 IRP analysis reflects an expectation that interest rates will be higher in the future. Executing on the planned transition will allow Ameren Missouri and its customers to benefit further from relatively low interest rates in the earlier years of the transition. In effect, customers will benefit from a common approach used in investing – dollar cost averaging. To quantify the potential impact of higher future interest rates to customer cost, the Company evaluated the impact of a one percentage point increase in interest rates in 2040 on renewable investments made in Plan X. This sensitivity results in an increase in PVRR of approximately \$80 million. While one cannot predict with any certainty what the impact of rising interest rates will be on the cost to customers of new investments in renewable resources, the Company does expect interest rates to rise from where they have been in recent years and that a methodical plan to invest in renewables will result in long-term savings.

Shareholder Risks Associated With Portfolio Transition

IRP risk analysis is focused on risks from a customer perspective. Investor risks are considered in the assessment of plans through the financial and regulatory risk objective includes in the Company's scorecard evaluation of alternative resource plans using both quantitative and qualitative factors. These factors include quantification and comparison of free cash flows and qualitative assessments of risks associated with financing and recovery of potential stranded costs. To provide more direct quantification of shareholder risks associated with the planned portfolio transition, the Company can consider categories of risks to return of and return on the investment by shareholders. Key categories of such risks are:

- Project Management Risk - the risk of mismanagement of project execution resulting in disallowances from rate recovery
- Retail Sales Risk – the risk that retail sales through which investment returns are realized do not materialize as expected
- Regulatory Risk – the risk that inefficiencies in the regulatory and ratemaking processes will prevent full realization of expected and/or allowed rates of return

This risk can be quantified in general by considering the capital revenue requirements associated with the investments. The PVRR for the investment component of the planned renewable

transition is approximately \$5 billion. A recovery loss of 2-5% of this revenue requirement would be \$100-250 million.

For additional context, the first year revenue requirement for the capital costs of a wind project with a 30-year economic life is approximately 13% of the initial investment, and the average annual capital revenue requirement over the life of the wind project is approximately 8% of the initial investment. This indicates that even small delays in the recovery of new wind resource investments could have significant impacts on investor returns even absent the other risks described above. The same would be true for solar resource investments. While shareholder risks cannot be more specifically defined or estimated with any degree of confidence, the analysis presented here provides an indication of the potential magnitude of the collective range of risks to shareholders that can be compared to the customer risks described earlier in this document.

Conclusion

The assessment of risks presented here must be considered as representative as of a point in time and as a framework that can be used for future such assessments that may be appropriate as conditions and assumptions change. One of the hallmarks of Ameren Missouri's approach to integrated resource planning is the priority placed on flexibility that allows it to adjust to changing conditions. Should the Company find that key assumptions that affect the performance of its portfolio or particular resources in it have significantly changed, it can consider appropriate adjustments to its plans. In the meantime, the Company has an obligation to its customers, investors and communities to proceed thoughtfully with the inevitable transition to cleaner sources of energy.