Exhibit No. 1P

Ameren – Exhibit 1P
Ajay Arora
Direct Testimony
File No. EA-2022-0245

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MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. EA-2022-0245

DIRECT TESTIMONY

OF

AJAY K. ARORA
ON

BEHALF OF

UNION ELECTRIC COMPANY

D/B/A AMEREN MISSOURI

St. Louis, Missouri
July, 2022

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DIRECT TESTIMONY

OF

AJAY K. ARORA

FILE NO. ER-2022-0245

I. INTRODUCTION

Q. Please state your name and business address.

A. Ajay K. Arora, Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company"), One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. What is your position with Ameren Missouri?

A. I am a Vice President and the Chief Renewable Development Officer for Ameren Missouri.

Q. Please describe your educational background and employment experience.

A. I received my Bachelor of Science Degree in Chemical Engineering from Panjab University (India) in May 1992. I received my Master of Business Administration degree from Tulane University in May 1998. I joined former Ameren Corporation subsidiary, Ameren Energy, in June 1998 and held trading and structuring positions in Ameren Energy before supervising the group that priced structured energy products for former Ameren Corporation subsidiary Ameren Energy Marketing Company's wholesale and retail customers from 2002 to 2004. From 2004 to 2007, I was responsible for the analytical group supporting Ameren Missouri's transition into the Midwest Independent

Transmission System Operator, Inc. ("MISO"), including reviewing specific market design issues in MISO.[1] In 2007, I led the Ameren Missouri Regional Transmission Organization cost-benefit study that was filed with the Missouri Public Service Commission ("Commission") in File No. EO-2008-0134, and I assumed responsibility for the Quantitative Analysis, Integrated Resource Planning, Load Analysis, and Operations Analysis groups. In January 2008, as part of my role as Director of Corporate Planning, I assumed the additional responsibility for the Asset and Trading Optimization group supporting Ameren Missouri. In November 2011, I assumed additional responsibilities for the corporate Project Management Oversight and Market Risk Management groups. These groups oversee large utility capital projects and commodity risk management. In November 2014, I assumed responsibility for the Environmental Services department as Vice President of Environmental Services and Generation Resource Planning. The Environmental Services department develops environmental policy and provides environmental compliance support, which includes the areas of energy delivery, generation, and transmission. In March 2018, I assumed leadership responsibility for Ameren Missouri's entire non-nuclear generation operations and energy management function as Vice President of Power Operations and Energy Management. I assumed my current position as Vice President and Chief Renewable Development Officer in late 2020.

II. PURPOSE OF TESTIMONY AND SUMMARY

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my direct testimony is to support the Company's application for a Certificate of Convenience and Necessity ("CCN") for the Boomtown Solar Project

[1] MISO is now known as the Midcontinent Independent System Operator, Inc.

("the Project") that will support the Company's critical need to transition its generation fleet to clean energy resources, with significantly greater reliance on renewable energy resources and less reliance on the Company's aging coal-fired generation fleet. The criticality of this transition was most recently outlined in, and is supported by, the documents submitted with the Company's June 22, 2022, Notice of Change in Preferred Resource Plan (the "2022 Preferred Resource Plan").[2]

With respect to this particular Project, the Boomtown Solar Project would also initially be used in support of the proposed Renewable Solutions Program ("Renewable Solutions" or the "Program") for which approval is also sought in this docket. The Project is a competitive and cost-effective facility that will support Ameren Missouri's fleet transformation efforts with or without the proposed Program. However, as discussed in the direct testimony of Company witness Lindsey Forsberg, utilizing the Project in combination with the Program is highly likely to lower the costs and risks associated with the Project, to the benefit of all Ameren Missouri customers.

Q. Please briefly address the testimonies being provided by other Company witnesses in support of the CCN Application and request for Program approval.

A. As noted earlier, Company witness Forsberg is providing testimony outlining Program design and customer demand, and the combined economics of the Project and Program. Company witness Steve Wills, the Company's Director of Rates and Analysis, is providing testimony that addresses the rationale for pivoting to the Renewable Solutions Program from the previously approved Renewable Choice Program and explains

[2] Submitted in File No. EO-2022-0362.

the pricing structure for the Program as well as certain other key tariff provisions that govern how the Program will operate and customers will engage with it. Company witness Scott Wibbenmeyer, Director of Renewable and Technology Development, is submitting testimony to highlight key contractual agreements for Ameren Missouri to acquire the Project, and the Request for Proposals ("RFP") process through which the Project was vetted and ultimately selected by the Company. The Company is also submitting testimony from Company witness Matt Michels, Director of Corporate Analysis, in which he presents the analytical underpinnings of Ameren Missouri's need for a sustained and orderly transition to renewable generation resources, which I also address, and which is reflected in its 2022 Preferred Resource Plan, as earlier noted. Company witness Michels' direct testimony also addresses the Company's development, evaluation, and selection of that Resource Plan. Finally, Ameren Missouri Director of Regulatory Accounting Company witness Mitchell Lansford is providing testimony on the use of tax equity financing as a cost-effective means to finance the Project, and testimony on the appropriate regulatory accounting associated with the Project given that tax equity financing is being used.

Q. Please summarize the key conclusions in your testimony.

A. Like the Company's 2020 Preferred Resource Plan, the Company's recently filed 2022 Preferred Resource Plan reflects the fact that Ameren Missouri's coal-fired generation is approaching and will reach the end of its useful life over the next twenty years. Most of the Company's coal-fired generation is now expected to be retired by 2030. As witness Michels' direct testimony discusses, this fact, coupled with shorter lives of gas peaking capacity located in Illinois (driven by a new Illinois law), shows a clear need for the Company to start transitioning its generation to the least cost mix of generation

resources starting in the near term – and to sustain that transition consistently over time – to continue to maintain a reliable and resilient energy supply for its customers. New renewable generation is the most affordable energy resource to replace retiring coal-fired generation plants. Transitioning to new renewable generation resources also mitigates the ever-increasing risk of significant carbon regulation that could further increase costs and accelerate the retirement dates of the Company's remaining coal-fired generation and helps achieve the environmental benefits widely recognized as being associated with the decarbonization goals that give rise to the potential for these regulations. A sustained, gradual transition is the responsible approach because it ensures certainty of maintaining a reliable and resilient energy supply for our customers and reduces carbon emissions sooner. A planned and sustained transition that starts now also mitigates renewable project implementation risks, which are varied and significant. Near term renewable energy projects also enhance affordability to Ameren Missouri customers because of the significant federal tax credits available for these projects. Any plan that delays investment in new renewable generation would be irresponsible because it places the future reliability, resiliency, and affordability of our customers' energy supply at risk.

III. THE NEED FOR RENEWABLE RESOURCES

Q. The Company submitted a new Preferred Resource Plan on June 22, 2022, which reflects the Company's commitment to transitioning to renewable energy resources, and away from coal, over the planning horizon. Why was that Preferred Resource Plan selected?

A. Before I directly answer that question, it is important to keep in mind the context that led to the selection of the 2020 Preferred Resource Plan. The Preferred

Resource Plan in the Company's 2020 Triennial Integrated Resource Plan ("IRP") filing reflected a need for a gradual but sustained transition to renewable energy resources for the following reasons:

1. **Aging Coal Fleet -** Ameren Missouri will need energy and capacity resources to meet customer demand and reserve margin requirements as the coal-fired generation is retired at the end of its useful life.

2. **Low Cost, Emission-Free Energy** - Renewable resources represent the lowest cost as well as emission-free sources of replacement energy.

3. **Increasing Environmental Regulations** - The large-scale expansion of renewable resources provides significant risk mitigation to Ameren Missouri's portfolio, particularly with respect to potential for additional environmental regulations, changes in climate policy and carbon dioxide ("CO_2") prices, and other factors that may significantly affect the operating costs and benefits of its existing coal-fired resources.

4. **Reliability and Resilience** - Ameren Missouri's addition of new renewable resources during continued operation of existing resources is a prudent approach and ensures reliable, resilient and affordable energy for our customers during the transition.

5. **The Risk of Inaction** – Delaying the inevitable shift to renewables creates significant implementation risk. The transition will require a very large-scale expansion of renewable generation at the same time that other utilities and states are pursuing the same. A task of this magnitude must be implemented over time in order to be successful. This is the case since each renewable energy project takes 5 to 8 years to develop and construct, requires geographical diversity of projects for reliability and requires navigating several implementation risks, such as delays in the development or completion of projects, lost opportunities for more viable projects, and the potential for financing constraints and increases in financing costs.

6. **Opportunities for Tax Benefits** - Initiating renewable resource builds in the nearer term provides the opportunity to realize tax incentives for customers and thus lower the overall cost of adding needed renewables.

Those same six needs underlie the 2022 Preferred Resource Plan. In fact, the need to transition has gained further urgency since 2020 given the accelerated retirement dates

for gas peaking capacity located in Illinois, the retirement of the Rush Island Energy Center, the increasing sentiment supporting decarbonization, the prospect of carbon regulation, and the significant implementation and financing risks associated with attempting to build large quantities of renewables within a compressed timeframe. Consultant Roland Berger assessed and quantified many of these implementation and financing risks, which I will discuss later in my testimony.

In summary, the 2022 Preferred Resource Plan was selected because a gradual, sustained transition to renewable energy is more cost-effective and practical than waiting until there is an actual capacity need and ensures the Company can continue to deliver sufficient quantities of reliable, affordable energy to customers, as they have come to expect from Ameren Missouri, while meeting many of those customers' expectations for that energy to be ever cleaner. It does this through a combination of staged renewable resource additions, coal-fired resource retirements, and new dispatchable generation and battery storage additions.

Company witness Michels' direct testimony primarily addresses the first three of the six reasons above for the selection of the 2022 Preferred Resource Plan, and I will primarily address the last three of these six reasons in my testimony below.

Q. Did the 2022 Preferred Plan impact the scope of new renewable generation for the transition?

A. It did not change the overall need for 5,400 megawatts ("MW") of new renewable generation by 2039. It did change slightly the pace and timing of the implementation in order to provide more stability and flexibility in project implementation,

and to ensure that resources, including batteries later in the implementation timeline, are added as and when they are needed to ensure reliable system operations.

Q. Witness Michels' direct testimony discusses the Company's evaluation of the energy it needs to serve its customers and explains how the 2022 Preferred Resource Plan addresses that need. You noted above that the "addition of new renewable resources during continued operation of existing resources is a prudent approach and ensures reliable, resilient and affordable energy for our customers." Why are renewables the answer to this need?

A. The addition of significant renewable generation, in combination with adding combined cycle natural gas generation after the Sioux Energy Center retires and battery storage to pair with the renewable generation, reflects the most economical portfolio of resource additions to ensure a reliable and resilient energy supply for our customers. As Company witness Michels' direct testimony shows (see Figure 2), renewable energy resources are the cheapest among the candidate replacement energy resources that are available. This was a key consideration in the Company's decision to adopt the 2022 Preferred Resource Plan.

Q. Has the Company quantified the benefits to customers of a gradual, sustained, and well-planned transition to new energy resources versus adding new generation only at the point in time when it needs capacity to meet a planning reserve margin?

A. Yes. Company witness Michels addresses the quantification in detail in his direct testimony. In summary, before selecting the 2022 Preferred Resource Plan, the Company examined various alternatives, including focusing on two plans labelled by Company

witness Michels' direct testimony as a Renewables for Capacity Need Plan and a Renewable Transition Plan. The latter reflects a gradual, sustained transition to clean energy versus the former, which only adds renewable generation when the Company has a need for additional capacity. As part of the analysis, the Company asked Roland Berger to quantify the impact of risks arising from a delay in the transition to renewable resources – risks of inaction. In addition to the fact that adding capacity only when needed would be infeasible from an implementation perspective, as I address later in my direct testimony, the comparison of the two plans showed that the Renewable Transition plan's net present value of revenue requirement ("NPVRR") is $632 million[3] less, and results in lower risk to customers, than the Renewables for Capacity Need plan. I will expand on the reasons why this is so later in my testimony.

Q. As you contemplate the various reasons that led the Company to select the 2022 Preferred Resource Plan, are there additional factors that indicate that a transition to renewable generation sources is inevitable?

A. It is becoming increasingly clear for a variety of reasons that it is necessary to transition the Company's generation fleet towards cleaner renewable resources. We recognize that replacing the existing, primarily fossil fuel based generation fleet with a largely renewable fleet is a significant transformation that will fundamentally change the way we operate, and the way we serve our customers. But the Company is undertaking this transition because it is clearly in the best interest of our customers, our investors, and the communities we serve. First, we know that the existing fleet is aging and will need to be replaced within our planning horizon. We know that there is in fact, increasing strong

[3] On a net present value basis over the next 20 years in the probability weighted average case.

demand from many of our customers and our investors for this transition to take place with renewable resources to achieve environmental and sustainability goals. And these customers and investors are eager for the transition now, to contribute to the achievement of a significant decarbonization of the economy. This is evidenced by the increasing number of customers, including many of the biggest and most sophisticated energy consumers on the system, that are looking to their utilities – to Ameren Missouri – to help them achieve their own renewable and environmental goals. It is also evidenced by growing trends of Environmental, Social, and Governance ("ESG") investors that are demanding the companies they invest in to reduce their carbon footprints and develop plans to enhance the sustainability of their operations, and report on those plans transparently. Typically, in the regulatory setting, the interests of customers and investors can have elements that, at least on the surface, appear to conflict. But where there is a significant level of obvious alignment of interest between large segments of the customer and investor populations, as here in the desire for cleaner renewable energy, the public interest is clearly served by advancing that interest. Moreover, as shown by Company witness Michels' direct testimony, transitioning now rather than waiting results in significantly lower present value of revenue requirements for all customers.

The Company is not alone in observing, and responding to, these forces. Utilities and states across the country are adopting goals and policies to transition toward renewables, decarbonize their generation fleets, and increase the sustainability of their operations. This dynamic of utilities and states all trying to transition their fleets at the same time, competing for the same renewable sites, and the same capital, makes it all the more urgent to begin the transition soon, as I will discuss below. Anyone that closely

monitors developments, trends, and sentiments related to the energy industry clearly understands that the decarbonization of the energy system, largely through a transition to renewables, is inevitable, and it is happening. The question is not whether we should transition, but how the transition can best be achieved to maximize the benefits, both economic and environmental, for customers.

IV. RELIABIITY AND RESILIENCY OF ENERGY SUPPLY

Q. Please explain how a planned, staged, and gradual transition to renewable energy provides greater certainty of maintaining a reliable energy supply for customers.

A. Ameren Missouri customers are accustomed to a high level of reliability and resiliency in their energy supply. To continue to provide that kind of reliable service depends on having a reliable source of power during every hour of every day, especially in periods of extreme weather, which we can all see are occurring with greater frequency and intensity.

Ensuring a continued reliable source of energy and capacity will require a planned and staged transition to renewable energy to ensure the Company gains critical operational experience with renewable resources concurrently with the ongoing retirement of its coal fleet, as well as retirement of some of its gas peaking capacity due to the new Illinois law I mentioned earlier. It would be extremely risky to add renewable resources only once a capacity need exists without having first gained substantial experience operating a large renewable generation portfolio in an environment where intermittent resources are playing a larger and larger role – including throughout the MISO footprint. Without that experience, Ameren Missouri risks being unable to reliably manage and operate its

renewable generation fleet, and unable to fully understand the backup resource needs that may be required to ensure a reliable supply. As such, absent a gradual and sustained transition it would be challenging to know if the Company is adding too much or too little new renewable generation to reliably meet our customers' energy needs. Transitioning to renewable energy while our coal-fired generation is still in operation through the end of its useful life will allow us to gain this necessary experience and ensure more affordable and reliable service to customers.

Q. Could you please be more specific regarding the experience Ameren Missouri seeks to gain?

A. Yes. By adding new renewable energy in a staged and continuous manner while a significant portion of Ameren Missouri's existing generation fleet remains online, the Company will gain invaluable experience in two areas:

1) The ability to assess when and to what extent renewable energy is truly available over a wide range of weather conditions, which is dependent in large part on the location of the renewable resource, and
2) An understanding of how the existing Ameren Missouri generation fleet may need to be dispatched differently than historical dispatch patterns to provide critical back-up generation during hours that intermittent renewable generation is not available.

By understanding the operational aspects of renewable energy under different weather conditions over a long period, the Company can also determine the optimal amount of renewable capacity needed to ensure a secure energy supply, ensuring we are not adding too much or too little new renewable energy generation. The Company may also learn how

to increase generation through planned and preventative maintenance approaches, and how to optimize equipment selection based on project site characteristics. Said simply, by adding new renewable generation while the Company's coal-fired generation is still operational, Ameren Missouri can learn how to optimally operate its generation fleet in a high renewables future without putting system reliability at risk.

Q. Earlier you mentioned geographical diversity. Can you please elaborate on how geographical diversity is related to providing a reliable and resilient energy supply?

A. Yes. An important factor to ensure long-term system reliability and resiliency is to pursue a geographically diverse portfolio of renewable energy resources to ensure energy is always available to meet our customers' needs, even during peak energy time periods. Since solar and wind generation are dependent on weather conditions which vary by geographical location, a regionally diverse renewable resource portfolio will be more reliable under varying weather conditions. As discussed later in my testimony, over time, as ideal project sites are developed and land availability declines, it will become more challenging to achieve a regionally diverse portfolio of projects. This is another key reason the Company needs to start its transition to clean energy now and sustain it.

Q. If coal-fired energy is providing the reliability for meeting the energy needs of Ameren Missouri customers, why not continue to run the Company's coal plants instead of adding new renewable generation?

A. While in theory Ameren Missouri could continue to invest capital in and provide greater maintenance for coal-fired generation to extend its life beyond what is typically expected, experience across the country demonstrates that coal-fired plants (like

any mechanical apparatus) cannot cost-effectively and safely live forever. By the time the last of our coal units retire, as outlined in the current Preferred Resource Plan, that unit will be almost 70 years old and is already about 50 years old today. When Sioux retires in 2030, it will be more than 60 years old. The simple fact is that the cost per megawatt-hour ("MWh") for generation from coal-fired units will likely continue to increase over time due to increases in operations and ongoing maintenance costs, until reaching a point where the generation is no longer cost-effective. In addition, it is possible that current and future environmental regulations will continue to increase the cost of operating coal plants, independent of the aging of the equipment. Conversely, the cost of new renewable energy is now affordable, and current and future environmental and climate policy changes are likely to make renewable energy even more affordable as compared to aging coal plants. Replacing coal-fired energy with renewable energy and other low emitting and dispatchable resources is a cost-effective solution that also mitigates the financial risk of additional environmental regulations and the aging of the Company's existing coal-fired generation.

V. RISK OF INACTION: RENEWABLE PROJECT IMPLEMENTATION

Q. Why are the risks related to project implementation a key reason for the Company to pursue a gradual, sustained transition to clean energy?

A. Renewable energy development is a difficult, lengthy process with successful projects taking five to eight years to reach commercial operation. With each stage of the project lifecycle there is a risk that the project can be delayed, and at times cancelled altogether. The most significant implementation risks are likely to emerge in siting the project location, completing extensive transmission studies, evaluating

transmission upgrade costs and completion schedules, completing environmental studies, conservation plans, and compliance requirements, acquiring real estate, obtaining local county permits and community support, qualifying for federal tax credits, evaluating technology options, obtaining financing, receiving regulatory approvals, and designing, engineering, and finally constructing, commissioning, and testing of the new renewable energy center. A challenge, delay, or misguided decision can delay and potentially terminate the project. Given the number of renewable energy projects that are needed for a successful transition combined with the length and potential risks within the full lifecycle, it would be impractical, and frankly, irresponsible for the Company to continue to take a "capacity when needed" approach – as there is never a guarantee that each renewable energy project being pursued will come to fruition. We must start and sustain the transition to account for any potential delays.

Q. At a high level, what are the key project implementation risks associated with Ameren Missouri's planned renewable energy expansion?

A. The key project implementation risks include the following:

- Land (i.e., renewable site) availability
- Project permitting and construction
- Supply chain constraints
- Transmission interconnection
- Technology costs
- Financing costs
- Financing constraints

Q. Please explain why the availability of land for renewable siting is a key project implementation risk.

A. One of the most critical reasons for Ameren Missouri to pursue a gradual, sustained transition that starts immediately is to ensure the Company can acquire the best available project sites in our region. The lengthy development, permitting, regulatory approval and construction cycle challenges described above, along with the myriad of development risks involved to successfully develop a good renewable energy project site, means that the best renewable energy sites are the first to be developed. Ameren Missouri is now also in competition with large technology firms from outside its service territory who are purchasing renewable energy projects in and around Missouri and Illinois for their announced sustainability goals and are equally as eager to find the best available project sites. An ideal project site will feature good renewable resource, favorable topography, good community relations, and minimal environmental risk. This means that as the availability of suitable land declines, both the cost of the planned facility and the risks of not being able to obtain necessary permissions or not being able to construct the project at all are likely to increase.

Q. Please explain why project permitting is a key project implementation risk.

A. Placing a renewable energy project into service requires a series of preceding permits – these include but are not limited to environmental, construction, county, state, federal and other governmental permits. These activities require a great deal of lead time and if not obtained, could delay project construction, or even terminate a project. For example, to obtain the appropriate environmental permits, we must first

complete several environmental studies to determine and mitigate any potential adverse impacts to the environment (e.g., water, land, natural habitat, etc.). These studies can take years to complete as they require extensive data collection and analysis. In some cases, the studies might indicate a fatal flaw in the project site. A fatal flaw would result in a change in project site – making it important to pursue a pipeline of potentially suitable projects simultaneously to pivot to a more suitable project site from an environmental permitting perspective.

Prior to starting construction, local and county permits might be required. If there is a delay in receiving these permits, the construction schedule can be put at risk. A delay in schedule can jeopardize the in-service date, ultimately impacting the Company's ability to receive federal tax incentives or at times, preventing project implementation altogether. Building community support and engaging with key stakeholders early in the project development lifecycle will allow the Company to quickly identify potential delays and adjust accordingly.

But navigating these permitting issues takes a great deal of time and navigating them simultaneously with the large number of projects that would be needed all at once if we wait to add renewable capacity when the capacity need is here would be extremely difficult, if not completely impractical.

Q. Please explain the implementation challenges associated with constructing projects.

A. Once all necessary environmental and local government permits have been received, projects must be designed, engineered, and then constructed in a manner to provide at least 30 years of reliable energy. The design and engineering phase typically

takes about a year. While recently performing due diligence on a solar project in an advanced stage of development (land acquisition, permitting and environmental assessment were all completed), Ameren Missouri discovered that the project was sited on land above a historical mine that potentially may be unsuitable for construction. Ameren Missouri had to place the project on hold until suitable geotechnical due diligence could be completed to ensure that the project can be constructed and operated in a reliable manner.

The construction phase itself for solar and wind projects can take one to two years to complete. During this time there is heavy construction traffic on smaller local county roads that can be subject to weather delays. The supply chain for solar and wind generation is global and there are numerous opportunities for delays in manufacturing, shipment, and delivery. As with any large construction projects, actual construction may face challenges from an electric and mechanical component perspective, and therefore testing of the final project after completion of construction is critical. For the High Prairie and Atchison Renewable Energy Centers, the Company experienced several months of delay before achieving successful testing and commissioning and ultimately bringing the projects online.

Q. Please explain why supply chain constraints are a key project implementation risk.

A. Supply chain constraints can occur due to labor shortages, political upheaval (globally or otherwise), commodity supply and price changes, transportation challenges, or quality control issues. Challenges in the supply chain can lead to project delays, cost increases, or ultimately an inability to construct a project at all. Since supply

chain problems can meaningfully disrupt the timing and costs of renewable energy projects, it is important to have a long implementation timeframe to maintain flexibility in the generation transition.

Q. Practically speaking, how does proceeding with the pace and timing of the transition reflected in the 2022 Preferred Resource Plan mitigate supply chain risks?

A. By developing long-term strategic partnerships with key renewable equipment manufacturers, we ensure a greater certainty of supply. But to develop such strategic partnerships, we need a long-term and defined transition plan with a known stream of projects for which equipment can be acquired in a timely manner. The same dynamic exists when we have ongoing relationships with national renewable energy developers, so they can plan ahead for completing projects in a timely manner.

Given the 5- to 8-year life cycle for successful renewable energy project development, such partnerships are much more difficult to develop if a transition plan is not defined at least 10 years in advance to ensure certainty of equipment supply.

Q. Please explain why transmission interconnection is a key project implementation risk.

A. Transmission interconnection and upgrade costs remain one of the most important aspects and, it is fair to say, challenging aspects, of renewable energy development. This includes the challenge of navigating MISO's Generator Interconnection Queue. Large, utility scale renewable energy projects must go through a transmission interconnection queue to determine the timing and cost of transmission upgrades that may be required for interconnection. This is not only challenging, but time-consuming. In

MISO, generator interconnection at the transmission level is a three-phase process that can generally take up to three years to complete. The transmission upgrade costs are a function of the number of projects in the queue, and the location and size of the projects. Generally, projects that are earlier in a queue can interconnect at a lower cost. It is also important to note that after Phase 2, a non-refundable 20% payment is due for expected transmission upgrades for a renewable energy project. As such, only the best projects with the most favorable locations and queue positions make it to the final Phase 3. Other projects are rejected due to high transmission costs in Phase 2, or at times even in Phase 3, as cost estimates can change throughout the process until it is clear which projects will proceed to construction.

At any point in the process, projects that the Company may be relying on could be terminated due to exorbitant interconnection costs, forcing the Company to start the 3-year cycle once again. Over the last ten years, less than half of the projects that enter the MISO Generator Interconnection Queue make it to start of construction. Ameren Missouri has first-hand experience with projects in which a great deal of time and effort was expended only to see the project fail due to no fault of the Company. The Brickyard Hills wind project, for which the Commission granted Ameren Missouri a CCN in 2019 and which had likely been under development for approximately 10 years, ultimately had to be terminated due to unacceptably high transmission costs. As future queues get more and more constrained with new renewable energy projects, new transmission buildout will be needed. However, building new transmission lines to interconnect new renewable energy projects is generally a 6- to 10-year endeavor, if not longer. Although ideally transmission buildout will keep pace with renewable energy project buildout, projects later in the queue

may have significantly higher transmission interconnection costs or may not be able to operate at full output. This poses a real risk caused by delay because the energy from the generation we will ultimately place in service may be more costly or less reliable.

Q. How can you best manage this problem?

A. First and foremost, by proceeding with the transition now and then sustaining it. Second, by acting on good projects when they are available. The Company needs to maintain a renewable project pipeline with at least twice the number of projects needed for the inevitable transition to renewable energy. To have a pipeline of twice the number of projects needed for our generation transition, we need to constantly be looking for – and acting on – good renewable projects in Missouri and surrounding states. Without a large pipeline and a phased approach, we are likely to face delays in project interconnection to the grid, significantly higher costs, or both, thus rendering our generation transition less reliable and more costly than it would have been had we obtained good project earlier in the transition process.

Q. Please explain why technology costs are a key project implementation risk.

A. Although Ameren Missouri hopes that renewable technology costs will ultimately decline, the last year served as a reminder that these continued cost declines are far from a guarantee. It is tempting to point to possible declining cost curve forecasts for wind and solar and recommend the Company wait until such declines materialize before proceeding with renewable development. But it is critical to remember that forecasted declines are not certain. Waiting for costs to decline is also a risky approach, because if

those declines do not materialize customers could be exposed to higher costs for less ideal sites later.

Q. Please explain why financing costs are a key project implementation risk.

A. As I mentioned previously, investors are increasingly focused on concerted efforts by utility companies to transition their portfolios to cleaner and more sustainable resources as they make decisions about which companies to invest in and what kind of return on investment they expect based on their assessment of risk. This increased focus is expected to result in differences in cost of capital between those utilities that are making concerted and consistent efforts to transition their portfolios and those that are not.

Q. Please explain why financing constraints are a key project implementation risk.

A. Deferring implementation of renewable resources may require that Ameren Missouri invest huge amounts of capital in a short period of time, risking substantial deterioration to our credit metrics and impairment of our ability to cost-effectively and timely finance investments in the renewable generation we need when we need it. Starting to transition earlier therefore reduces the expected financing costs associated with the renewable resources the Company needs to add.

Q. Has Ameren Missouri performed any analysis with respect to financing constraints?

A. Yes. As part of the selection of our 2022 Preferred Resource Plan, we looked explicitly at certain credit metrics that may have an influence on Ameren Missouri's ability to raise capital to fund investments for our customers. More specifically, we

analyzed and summarized the resultant credit metrics from our IRP risk analysis for plans that include different paths for the expansion of renewable resources in our portfolio. The table below shows the minimum single year credit metrics for two plans compared to Ameren Missouri's target credit metrics. The first metric is the ratio of funds from operations to total debt (FFO/Debt), and the second is the ratio of funds from operations to interest expense (FFO Interest Coverage). The two plans are the aforementioned Renewable Transition Plan and the Renewables for Capacity Need Plan.

	FFO/Debt	FFO Interest Coverage
Target Metrics	25%	6.3
Renewables for Capacity Need	20%	6.2
Renewable Transition	24%	6.6

As the table shows, the Renewables for Capacity Need Plan results in substantially lower minimum values for both FFO/Debt and FFO Interest Coverage than does the Renewable Transition Plan, particularly with respect to FFO/Debt. While these minimum annual values do not necessarily mean that a particular plan may result in significant challenges for raising capital, it does highlight the relative risk of plans that rely on short periods of heavy investment, like the Renewables for Capacity Need Plan, compared to plans that spread out major investments in renewable resources, like the Renewable Transition Plan.

Q. Practically speaking, what do you mean when you refer to raising the relative risk when there are short periods of elevated investment?

A. Assuming we can get access to sufficient capital, I am referring to the risk that projects may cost more because less favorable credit metrics generally lead to higher

capital costs. And this would on be on top of the financing cost risk analyzed by Roland Berger (discussed below), which considered increased financing costs for entities that are not showing a clear and demonstrable commitment to moving to renewable generation as compared to those who are. We can avoid these concerns if we avoid waiting until there is imminent need for capacity to begin the transition.

Q. The 2022 Preferred Resource Plan filing in File No. EO-2022-0326 included an analysis from Roland Berger – which you earlier referred to – of several risks Roland Berger quantified associated with pursuing a Renewables for Capacity Need approach instead of the Renewable Transition approach reflected in the Preferred Resource Plan. Please summarize Roland Berger's findings.

A. Table 1 below summarizes the Roland Berger's key findings, including the increases in the net present value of revenue requirement over the study period if each analyzed risk was realized and a Renewables for Capacity Need approach were taken.

Table 1. Risk Variables Impacting Ameren Missouri's Alternative Wait to Build When Needed Plan

Risk Variable	Description	Change in PVRR v. Only Build When Capacity is Needed
Land availability	Continued renewable build out will make "good land" scarcer over time, limiting capacity factors for wind	$ 247 million
Wind equipment Cost	Wind equipment cost declines and performance improvements may be less pronounced than NREL ATB assumes	$ 122 million
Solar equipment cost	Onshoring of solar PV equipment manufacturing as consequence of trade relations with China may result in higher costs	$ 59 million
Financing Costs	Fossil-heavy generation portfolios likely to have higher financing costs than cleaner and less carbon-intensive portfolios due to less willingness of investors to provide capital to utilities with more carbon-intensive generation portfolios	$ 292 million

Tax Credits	Extension of ITC and PTC per the proposal in the Build Back Better plan done through separate congressional action	$ 339 million

Q. Which of these risks relate specifically to the Boomtown Solar Project?

A. In some ways they all do because our planned transition is staged intentionally to follow the wind facilities constructed a couple of years ago with some early solar projects like Boomtown, followed by more wind additions, and then followed by more solar and energy storage additions. But the most salient of these risks for the Boomtown Solar Project are the last three: solar equipment costs, financing costs, and tax credits. Land availability is also a factor given the need to locate near sufficient transmission.

Q. Given that this case involves a solar project, please address the solar equipment cost risk.

A. Roland Berger assessed the potential cost impact of onshoring solar equipment manufacturing to the United States as a means to avoid ongoing geopolitical challenges in the solar supply chain and the recent U.S. Department of Commerce investigation into potential tariff circumvention for panel imports from Southeast Asia. Roland Berger estimates that if some solar onshoring were to occur, a possibility that appears increasingly likely, it would take approximately 10 years for the new onshore supply chain to be fully functioning. Any solar projects built prior to the completion of significant onshoring would benefit from lower imported materials costs. Based on Roland Berger's assessment, starting Ameren Missouri's transition to clean energy now and sustaining it at the pace and timing called for by the 2022 Preferred Resource Plan will reduce costs to customers by $59 million in NPVRR if solar onshoring were to occur as compared with waiting until there is a capacity need to build renewables. This is just one

example of how uncertainty in renewable supply chains can be mitigated by proceeding with a sustained transition approach over time.

Q. How does a delay in transitioning the portfolio relate to available tax credits?

A. There are two aspects to the tax credit issue. First, under current law we can take advantage of the 30% Investment Tax Credit ("ITC") applicable to solar facilities by constructing the Boomtown Project on-time, which substantially lowers its cost to customers. Specifically, completing the project on time to receive the ITC at 30% lowers the base case net present value of revenue requirement for Boomtown by ***_____***.

Second, while predicting whether and to what extent changes in federal tax policy will occur is impossible, if there is an extension of federal tax credits potentially similar to what was called for in the Build Back Better plan and the Company followed the Renewables for Capacity Need Plan versus the Renewables Transition Plan, it would lose out on those tax credits for projects that would have been completed between 2026 and 2036. Roland Berger quantified the value of those lost tax credits to be $339 million on a net present value basis.

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Q. You have discussed the various implementation risks – land availability, permitting and construction, supply chain constraints, transmission interconnection, technology costs, financing costs, and other risks addressed by Roland Berger. In practical terms, what does the existence of those risks mean for Ameren Missouri and its inevitable need to add significant quantities of renewables during the planning horizon?

A. Consider what it will take to put the required renewable generation capacity in place. To have the energy it needs, the Company requires 2,800 MW of new renewable energy projects in place by 2030, which will take the place of the approximately 2,700 MW of coal-fired generation capacity and 500 MW of gas-fired peaking generation that will be retired by 2030. As I noted, project development often takes 5 to 8 years, so we are already in the development window and need to be building now and on an ongoing basis to meet that need. To put numbers to it, while renewable energy projects are constructed in varying sizes, assuming each renewable energy project by 2030 has an average size of 200 MW, the Company needs approximately 14 new renewable energy projects to replace the retirement of three retiring coal-fired energy centers as well as the gas-fired generation in just the next eight years. By 2040, the Company may need up to an additional 16 new projects to replace all 5,400 MW of existing coal-fired generation capacity and 1,800 MW of gas-fired generation capacity that will retire between now and then. When I think about the difficulty of developing renewable generation and the associated implementation risks, waiting to start Ameren Missouri's transition frankly worries me a great deal in terms of our ability to cost-effectively get the generation we need when we need it, and to do so while maintaining system reliability. There is no question in my mind that the project

implementation risks I have discussed increase as the number of new renewable energy projects that the Company has to complete in a short time increases. The bottom line is that it is simply not practical to implement a reliable transition unless it is done in a planned, gradual, and staged manner that allows for the time and flexibility to mitigate and manage various project implementation risks. And if we do not do that, as I also discussed earlier, we forgo valuable operational experience that can be gained by transitioning sooner and in a sustained manner.

Q. You have outlined many reasons why the Company has determined that it is in everyone's interest to implement the 2022 Preferred Resource Plan which reflects the Renewable Transition Plan you have discussed in your testimony. What do you say to those who suggest we should let our coal plants run through the end of their useful lives, see what our needs are at that point, and then respond with renewables as needed later?

A. As discussed throughout my testimony, taking such an approach is in my view irresponsible, and I would add that doing nothing also has a cost – a significant one at that. Inaction, in fact, carries more risks than the carefully planned and staged transition reflected in the Company's Preferred Resource Plan. Other utilities and independent energy providers are investing in renewables now. They are acquiring the best land for wind and solar generation. They are managing the construction and financing risks that come with a large-scale transition. If Ameren Missouri sits back and waits, the highest quality and lowest cost project sites will already be developed by others, and the Company will be subject to higher financing costs from unhappy investors unhappy and frustrated customers unable to meet their decarbonization goals. A carefully planned and staged transition helps

to manage the myriad risks that are inherent in such a complex and large-scale undertaking. A wait, see, and hope-we-can-execute-when-needed approach, in the face of the myriad challenges posed by renewable generation development, is impractical and irresponsible.

Q. In summary, what is your recommendation to the Commission in this case?

A. I recommend the Commission approve a CCN for the Boomtown Solar Project because it is a cost-effective and needed renewable addition to the Company's generation portfolio, as I have discussed in detail in my testimony and as discussed in the direct testimony of Company witness Forsberg. I also recommend that the Commission approve the Renewable Solutions Program which will be supported by the facility, because as Company witness Forsberg also discusses, the Program is both highly likely to reduce any risks associated with the facility and meets an important need for the subscribing customers.

Q. Does this conclude your direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Union Electric Company d/b/a Ameren Missouri for Approval of a Subscription-Based Renewable Energy Program	)))	File No.: EA-2022-0245

AFFIDAVIT OF AJAY K. ARORA

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

Ajay K. Arora, being first duly sworn on his oath, states:

My name is Ajay K. Arora, and hereby declare on oath that I am of sound mind and lawful age; that I have prepared the foregoing *Direct Testimony*; and further, under the penalty of perjury, that the same is true and correct to the best of my knowledge and belief.

\s\ Ajay K. Arora
Ajay K. Arora

Sworn to me this 14th day of July, 2022.