

Exhibit No.:
Issue(s): RES compliance, economics
Witness:
Type of Exhibit: Direct Testimony
Sponsoring Party: Union Electric Company
File No.: EA-2022-0244
Date Testimony Prepared: July 7, 2022

MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. EA-2022-0244

DIRECT TESTIMONY

OF

LINDSEY FORSBERG

ON

BEHALF OF

UNION ELECTRIC COMPANY

D/B/A AMEREN MISSOURI

****DENOTES CONFIDENTIAL INFORMATION****

*****DENOTES HIGHLY CONFIDENTIAL INFORMATION*****

**St. Louis, Missouri
July 2022**

P

TABLE OF CONTENTS

I. INTRODUCTION1

II. THE NEED FOR RENEWABLE RESOURCES.....3

III. PROJECT ECONOMICS9

A. Modeling and Assumptions.....9

B. Analysis Results.....13

IV. CONCLUSION14

DIRECT TESTIMONY

OF

LINDSEY FORSBERG

FILE NO. EA-2022-0244

I. INTRODUCTION

1

2 **Q. Please state your name and business address.**

3 A. Lindsey Forsberg, One Ameren Plaza, 1901 Chouteau Avenue, St. Louis,
4 Missouri 63103.

5 **Q. What is your position with Ameren Missouri?**

6 A. I am a Strategy Consultant, Renewable Energy Development for Union
7 Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or the "Company").

8 **Q. Please describe your educational and professional background.**

9 A. I received a Bachelor of Science in Electrical Engineering from the
10 University of Notre Dame in 2014. After graduating, I joined a rotational program for
11 engineering graduates at Pacific Gas & Electric Company ("PG&E") within electric
12 operations. While at PG&E, I rotated through the Transmission System Planning,
13 Integrated Resource Planning – Renewable Integration, and Portfolio Management
14 departments, assisting on a variety of projects such as transmission-level load forecasting,
15 demand response program analysis, and resource adequacy filing preparation. In December
16 2015, I left PG&E to join ZOLA Electric as a Project Coordinator. ZOLA Electric designs,
17 manufactures, and distributes off-grid, pay-as-you-go solar home systems for the African
18 market. As a Project Coordinator, I supported the Hardware Development Team on design,

1 testing, and sourcing. I was later promoted to Engineering Project Manager, a role which
2 involved coordinating a product development team spread across three continents.

3 In June 2017, I left ZOLA Electric to pursue a Master of Science degree in Science,
4 Technology, and Environmental Policy at the University of Minnesota's Humphrey School
5 of Public Affairs. During the two-year graduate program, I worked as a Graduate Research
6 Assistant under Dr. Gabe Chan on research topics including community solar program
7 design, electric cooperative and municipal utility perceptions of distributed energy
8 resources, and gender-climate linkages. I also completed several internships and
9 fellowships while pursuing my graduate degree including work as a Policy & Market
10 Analysis intern with M.A. Mortenson Company, and as an Energy Policy Research Fellow
11 at Minnesota-based non-profit Fresh Energy.

12 After completing my graduate degree in May 2019, I relocated to St. Louis,
13 Missouri and started a fellowship through the U.S. Department of Energy's Solar Energy
14 Innovators Program. The fellowship program, which was recently expanded and rebranded
15 as the Clean Energy Innovators Fellowship, "funds recent graduates and energy
16 professionals to work with critical energy organizations to advance clean energy
17 solutions."¹ Ameren Missouri served as my host institution for the fellowship. In February
18 2021, I ended the fellowship and transitioned into a full-time role with Ameren Missouri
19 as a Senior Renewable Energy Analyst on the Energy Solutions team. Later that year, I
20 moved into an expanded role as a Strategy Consultant on Ameren Missouri's Renewable
21 Development team. In this role, I work jointly between Renewable Development and

¹ <https://www.energy.gov/eere/clean-energy-innovator-fellowship>

1 Electric Resource Planning to support Ameren Missouri's fleet transformation efforts
2 through project modeling, regulatory compliance and approvals, and strategy development.

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

4 A. The purpose of my direct testimony is to support Ameren Missouri's
5 application for a Certificate of Convenience and Necessity ("CCN") for the Huck Finn
6 Solar Project (the "Project"), which is being built to meet Ameren Missouri's compliance
7 obligations under the Missouri Renewable Energy Standard ("RES").

8 **Q. Please summarize the conclusions of your direct testimony.**

9 A. Starting in 2021, Ameren Missouri must have Renewable Energy Credits
10 ("RECs"²) equal to at least 15% of its retail load to satisfy its RES obligations. To meet
11 this compliance obligation over the next decade, there is a need for at least one additional
12 renewable energy resource. The 200 megawatt ("MW")-AC Huck Finn Solar Project,
13 located in Missouri, fulfills the remaining need and offsets the loss of RECs currently being
14 supplied by the Pioneer Prairie Wind Farm Power Purchase Agreement ("PPA"), which is
15 set to expire in August 2024. The proposed Project is a competitive, cost-effective option
16 to meet Ameren Missouri's remaining compliance need, while also contributing to Ameren
17 Missouri's overall generation fleet transformation. For these reasons, the Missouri Public
18 Service Commission ("Commission") should approve the Company's application for a
19 CCN for the Project.

20 **II. THE NEED FOR RENEWABLE RESOURCES**

21 **Q. Please briefly describe the Missouri RES and its requirements.**

² A REC is "a tradeable certificate of proof that one megawatt-hour of electricity has been generated from renewable energy source." RSMo. 393.1025(4).

1 A. The RES was passed by Missouri voters through a ballot initiative in 2008
2 and requires Missouri's investor-owned utilities to acquire renewable resources equal to
3 increasing percentages of their respective retail load. As noted, the requirement reached a
4 minimum of 15% of retail load in 2021. To meet that requirement, investor-owned utilities
5 must retire RECs equivalent to 15% of their retail load. At least 2% of the 15% requirement
6 must be met by solar RECs ("SRECs"), but SRECs can also be used to meet compliance
7 for any portion of the 15% above the required 2%. The RES includes a 1.25 times multiplier
8 for renewable energy generated within the state of Missouri to encourage in-state
9 development of renewable resources. So, for example, 1 megawatt-hour ("MWh") of
10 generation in Missouri results in 1.25 RECs for RES compliance purposes.

11 **Q. What is Ameren Missouri's need for renewable resources from 2021**
12 **onwards?**

13 A. To meet the 15% RES requirement, Ameren Missouri must retire
14 approximately ** _____ ** RECs each year. The exact number of RECs needed
15 for compliance in each year is dependent on Ameren Missouri's retail load.

16 **Q. Does Ameren Missouri already have renewable resources that can be**
17 **used to meet some of this need?**

18 A. Yes, Ameren Missouri has some of the resources it needs. Ameren Missouri
19 currently owns solar, hydroelectric, landfill gas, and wind resources that together meet a
20 large portion of the Company's RES compliance needs. In 2020 and 2021, Ameren
21 Missouri added two wind projects to its RES portfolio: the 300 MW Atchison Renewable
22 Energy Center and the 400 MW High Prairie Renewable Energy Center. ** _____

23 _____

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____ .**

9 **Q. How many RECs is the Project expected to produce annually?**

10 A. The Huck Finn Solar Project is expected to produce approximately
11 466,000 MWhs per year. Because the Project is located within the state of Missouri, the
12 expected output translates to approximately 583,000 compliance SRECs annually³. As
13 mentioned previously, SRECs can be used to fulfill the solar requirement or the broader
14 REC requirement of the RES.

15 **Q. Is it possible to exactly match renewable energy resource output with**
16 **RES compliance needs in each year?**

17 A. No. RES Compliance is complicated by two key uncertainties: retail load
18 and renewable resource output. Retail load is not static from year to year nor
19 deterministic in any given year, and although an unbiased forecast will predict retail load
20 correctly on average, retail load may be higher or lower than forecasted in any given
21 year. Moreover, annual renewable generation for solar, wind, and hydroelectric resources
22 is subject to year over year variation based on weather. Although the Company can

³ The output of a solar resource is expected to degrade over time. This estimate reflects expected year 1 production. The Project model reflects output degradation of 0.5% per year.

1 establish an expected or average generation level, the annual output of each facility will
2 vary.

3 **Q. How has Ameren Missouri considered the variation in annual**
4 **renewable energy resource output and retail load in selecting the Project for RES**
5 **Compliance?**

6 A. Ameren Missouri has assessed its compliance position under various
7 probability of exceedance level scenarios to evaluate the variation in renewable energy
8 resource output. Probability of exceedance levels ("p-levels") refer to the likelihood that
9 the output of the resource will be greater than a specified level of energy production in
10 any given year. A P-75 value indicates that in 75% of performance years, the output is
11 expected to be above the specified level. Likewise, a P-90 value indicates that in 90% of
12 performance years, resource output will be above the specified value. The lower the
13 specified level of energy production, the higher the likelihood that the output of the
14 resource will be greater than the specified level, and the higher the p-value. Past
15 compliance planning, as found in the Company's annual RES Compliance Plan, has
16 primarily focused on average or mean output values, which equate to P-50 probability of
17 exceedance.

18 Table 1 below highlights the difference in RECs that could be generated each year
19 if a resource performs at a P-50 level versus a P-99 level. Due to their large size
20 compared to other RES resources and therefore their significant impact on the
21 compliance position, Table 1 only shows the expected output of the Huck Finn Solar
22 Project, Atchison Renewable Energy Center, High Prairie Renewable Energy Center, and
23 Keokuk Hydroelectric Facility. As the table indicates, if just one of these four resources

1 performs below its average expected production, the compliance position could shift
2 dramatically.

3 **Table 1. Ameren Missouri RES resource output under P-50, P-99**

| Resource | P-50 Compliance RECs | P-99 Compliance RECs | Difference |
|-------------------|-------------------------|-------------------------|------------|
| Huck Finn Solar | 582,659 | 515,399 | 67,785 |
| High Prairie Wind | 1,689,000 | 1,311,000 | 378,000 |
| Atchison Wind | 1,374,500 | 1,083,000 | 291,500 |
| Keokuk Hydro | 928,634 | 707,537 | 221,097 |

4

5 In addition, Ameren Missouri's retail load fluctuates annually, potentially requiring
6 a higher or lower number of RECs as compared to the forecast. Historically within the RES
7 Compliance Planning process, the Company has both slightly over and slightly
8 underestimated the expected retail load in future years, as expected for an unbiased
9 forecast. In 2023, Ameren Missouri will update its load forecast for the 2023 Triennial
10 Integrated Resource Plan filing, which will inevitably lead to updates in the RES
11 Compliance planning process. It is possible, although too early in the process to say with
12 certainty, that variables like increasing extreme weather and the push to electrify
13 transportation and industry may lead to increases in the forecast for retail load beyond
14 currently forecasted levels.

15 Considering Ameren Missouri's existing RES compliance shortfall, the upcoming
16 expiration of the Pioneer Prairie PPA, and inherent volatility in both renewable resource
17 generation levels and actual retail load, the Huck Finn Solar Project is the appropriate size
18 to complement Ameren Missouri's existing renewable energy resources and to create a
19 reasonable expectation that the Company will have enough RECs to comply annually with
20 the RES over the next decade.

1 **Q. Does the Project completely fulfill Ameren Missouri's remaining RES**
2 **Compliance needs?**

3 A. The addition of the Huck Finn Solar Project is expected to fulfill the
4 Company's remaining RES compliance needs over a ten-year planning horizon. However,
5 as discussed above, the exact value of Ameren Missouri's retail load in future years is
6 uncertain, and the exact generation output for the renewable energy resources that make
7 up the Company's RES compliance portfolio will vary year over year. The size of the
8 Huck Finn Solar Project is expected to provide a small buffer against this dual
9 uncertainty in RES compliance planning. However, if load growth exceeds current
10 expectations, or if resource output is not within expected ranges from one or more of the
11 Company's RES compliance resources, additional resources may be needed in the near
12 term to meet compliance requirements. Ameren Missouri will continue to evaluate its
13 RES compliance portfolio annually and utilize spot market REC purchases as needed to
14 ensure annual compliance is met.

15 Beyond 2032, it is expected that increases in retail load combined with the loss of
16 customer-owned solar RECs between 2029 and 2033 will create a need for additional
17 compliance resources. Figure 1 illustrates Ameren Missouri's 20-year compliance
18 position under expected or average resource output, including the addition of the Huck
19 Finn Solar Project in late 2024.



1
2
3
4
5
6
7
8
9
10
11
12
13

Figure 1 (Confidential). Ameren Missouri 20-year RES compliance position

III. PROJECT ECONOMICS

A. Modeling and Assumptions

Q. Have you analyzed the economics of the Project?

A. Yes.

Q. What kind of analysis have you performed?

A. I evaluated the expected incremental net revenue requirement resulting from the Project, including consideration of both the costs and benefits associated with the resource. I did so using a spreadsheet model to account for all the costs and benefits of the Project that would be reflected in the Company's jurisdictional retail electric revenue requirement for ratemaking, including the impacts of tax equity financing.

Q. Please describe the basic operation of the spreadsheet model.

1 A. The model was developed specifically to evaluate the impact on incremental
2 net revenue requirement for a solar or wind project being pursued within a tax equity
3 partnership (discussed in Ameren Missouri witness Mitchell Lansford's direct testimony
4 for the Project). This proprietary spreadsheet model was co-developed by Ameren Missouri
5 and a leading tax equity advisory firm, CCA Group. Based on selected project and
6 transaction parameters, the spreadsheet model appropriately sizes the tax equity investment
7 and reflects how the costs and benefits of the tax equity partnership would flow through to
8 customers in the form of incremental offsets to the revenue requirement. As in Ameren
9 Missouri's more traditional project finance models, the tax equity model's revenue
10 requirement results can be understood as the sum of three basic components: 1) fixed asset
11 costs, 2) operating costs, and 3) market revenues.

12 **Fixed Asset Costs:** The fixed asset costs are determined by calculating the return
13 on net rate base in each year, the annual depreciation expense, and the net tax expense. Due
14 to the tax equity partnership, Ameren Missouri is expected to invest 60-67% of the total
15 project cost, with the tax equity partner contributing the remaining 33-40%. Therefore, the
16 allowed return, annual depreciation, and income tax expenses are lower than they would
17 be in the absence of the tax equity partnership. The Project base case is modeled at the
18 estimated cost of approximately *** _____ ***, but due to uncertainty in the solar
19 supply chain, the exact Project cost is not fixed.⁴ To account for the remaining uncertainty
20 in Project cost, a risk-adjusted case is also modeled to incorporate additional contingencies
21 into the expected Project cost. It is possible that the final Project cost will be above the
22 risk-adjusted level, or below the base case level, but the Project cost range captured

⁴ Company Witness Scott Wibbenmeyer provides additional details on current supply chain challenges in the solar industry and the pricing structure of the Build-Transfer Agreement used to acquire the Project.

1 between these two cases represents the Company's current best estimate of the expected
2 Project cost. The base case estimate includes costs associated with setting up the tax equity
3 partnership, internal development costs expected to be spent by Ameren Missouri to bring
4 the Project online, and upfront transmission interconnection costs determined through the
5 MISO generator interconnection process.

6 **Operating Costs:** The model includes estimates for ongoing operating costs for the
7 Project. Specifically modeled are ongoing operation and maintenance costs, real estate
8 costs to cover ongoing land lease payments for the Project, and ongoing transmission
9 interconnection costs (paid over the first 20 years of the Project life). The Huck Finn Solar
10 Project is located within the state of Missouri and is therefore exempt from state property
11 taxes under current law. However, the Project will make annual Payment In Lieu Of Taxes
12 ("PILOT") payments to Audrain and Ralls County, Missouri, which are also reflected as
13 ongoing costs in the model.

14 **Market Revenues:** Market revenues include both energy revenues and capacity
15 revenues. Energy revenues are determined by applying a range of power market price
16 estimates to the expected energy production of the Project. The range of power market
17 price estimates is taken from the Company's 2022 Change in Preferred Resource Plan
18 ("IRP"). Three scenarios from the Preferred Resource Plan analysis have been evaluated in
19 modeling the economics of the Project: 1) the probability-weighted-average ("PWA")
20 power price of the six scenarios modeled in the IRP, 2) the lowest price scenario from
21 among the six IRP scenarios, and 3) the highest price scenario from the IRP. The prices
22 applied to the solar generation have been adjusted for basis differences, to reflect the
23 locational marginal prices at the location of the Project, and for a solar profile, to reflect

1 the variability of the solar generation. Capacity revenues also reflect price estimates
2 developed within the Company's resource planning process. The expected capacity credit
3 in MISO is determined by applying the MISO solar capacity credit value of 50% to the
4 aggregate capacity of the Project of 200 MW-AC.

5 As detailed in Ameren Missouri witness Lansford's direct testimony, two nuances
6 of the tax equity partnership impact the market revenues estimated within the model. First,
7 the model assumes that the tax equity partner receives 20-30% of available project revenues
8 in the early years of the Project until the partner recoups their initial investment in the
9 Project⁵ and earns an expected return. This reduces the expected market revenues that will
10 flow through to Ameren Missouri customers in the early years of the Project. In addition,
11 the model reflects expected net revenues from the fifteen-year Contract for Differences
12 ("CfD") associated with the tax equity partnership.

13 **Q. Please describe the assumptions used for the modeling analysis.**

14 A. Highly Confidential Schedule LJF-D1 provides a summary of the
15 assumptions used for modeling the Project. Although many modeling assumptions impact
16 the overall economics, the following three assumptions have a meaningful impact on
17 incremental net revenue requirement: power market prices, capacity factor, and total
18 Project cost. Highly Confidential Schedule LJF-D1 and Confidential Schedule LJF-D2
19 provide details on the twelve scenarios constructed to capture uncertainties in those key
20 variables.

21

22

⁵As mentioned previously, this reduces the Company's investment and therefore the fixed costs of the Project that are reflected in the revenue requirement.

1 **B. Analysis Results**

2 **Q. Please summarize the results of your analysis of the Project.**

3 A. Table 2 below shows a summary of the analysis results for the Project under
4 twelve scenarios. These scenarios vary power market prices (Low, PWA, and High),
5 Project cost (Base and Risk-Adjusted), and capacity factor (P-50 and P-99)⁶. Under base
6 case conditions, the expected incremental net revenue requirement impact of the project is
7 approximately \$38.9 million NPV. As power market prices, project cost, and capacity
8 factor vary, the incremental net revenue requirement impact varies between \$(6.7) million
9 NPV on the low end and \$119.1 million NPV on the high end.

10 **Table 2. Huck Finn Solar NPVRR Impact Analysis**

| <i>NPVRR Impact of Project (\$MM)</i> | Base Cost and Capacity Factor | Risk Adj. Cost; Base Capacity Factor | Base Cost; Low Capacity Factor | Risk Adj. Cost; Low Capacity Factor |
|---------------------------------------|-------------------------------|--------------------------------------|--------------------------------|-------------------------------------|
| Low Price Scenario | 78.5 | 93.5 | 104.6 | 119.1 |
| PWA Price Scenario | 38.9 | 53.9 | 69.6 | 84.1 |
| High Price Scenario | (6.7) | 8.3 | 29.3 | 43.8 |

11

12 **Q. What do you conclude from the analysis results?**

13 A. Based on this analysis, I conclude that the Project is a competitive, cost-
14 effective option to meet Ameren Missouri's ongoing RES compliance needs. The expected
15 incremental net revenue requirement impact of \$38.9 million NPV is reasonable and
16 competitive based on current market conditions and other available projects, and in line
17 with expected resource costs detailed in the Company's 2022 Change in Preferred Resource
18 Plan.

⁶ Table 1 labels P-50 output as "capacity factor" and P-99 output as "low capacity factor"

1 **Q. The RES states that the cost of compliance must not exceed a 1% retail**
2 **rate impact over a ten-year period. Did you complete an analysis to assess the impact**
3 **of the addition of the Project on average retail rates?**

4 A. Yes, I performed an analysis to evaluate the Project under the RES
5 requirement of a maximum 1% impact on average rates over a ten-year period, using the
6 same model used for our 2021 RES Compliance filing and adjusting the assumptions
7 slightly to match those used for evaluating the Project. To be conservative, the RES
8 Compliance Model does not reflect the use of tax equity financing. My analysis shows that
9 the Company expects the impact of RES compliance to remain well below the 1% limit.

10 **IV. CONCLUSION**

11 **Q. Please summarize your findings and conclusions.**

12 A. Ameren Missouri has a need for at least one additional renewable resource
13 to meet its obligations under the Missouri RES over the next decade. The Huck Finn Solar
14 Project represents a competitive, cost-effective option that is necessary for meeting this
15 need. The Project is appropriately sized at 200 MW-AC, which eliminates Ameren
16 Missouri's small existing RES compliance shortfall, makes up for the loss of the Pioneer
17 Prairie PPA in 2024, and helps mitigate ongoing uncertainty in both renewable resource
18 generation levels and actual retail load. The Project is also located in the state of Missouri,
19 making it eligible for the in-state multiplier of 1.25 and further increasing the value of the
20 project for Ameren Missouri customers. Even with the addition of the Huck Finn Solar
21 Project, Ameren Missouri's RES compliance portfolio retail rate impact remains well
22 below 1% over the ten-year planning horizon and helps contribute to the Company's overall
23 generation fleet transformation efforts.

1 **Q. What action do you recommend the Commission take in this case?**

2 A. I recommend that the Commission grant the Company's request for a CCN
3 for the construction of the Huck Finn Solar Project to support Ameren Missouri's
4 compliance with its obligations under the RES using Missouri renewable resources.

5 **Q. Does this conclude your direct testimony?**

6 A. Yes, it does.