

Exhibit No.:
Issue(s): *Neighborhood Solar*
In-service
Witness: *Max Young*
Sponsoring Party: *MoPSC Staff*
Type of Exhibit: *Direct Testimony*
Case No.: *ER-2024-0319*
Date Testimony Prepared: *December 3, 2024*

MISSOURI PUBLIC SERVICE COMMISSION

INDUSTRY ANALYSIS DIVISION

ENGINEERING ANALYSIS DEPARTMENT

DIRECT TESTIMONY

OF

MAX YOUNG

**UNION ELECTRIC COMPANY,
d/b/a Ameren Missouri**

CASE NO. ER-2024-0319

Jefferson City, Missouri
December 2024

1 A. In-service criteria are a set of operational tests or operational requirements
2 developed by Staff to determine whether a unit is “fully operational and used for service.”

3 Q. Where does the phrase “fully operational and used for service” come from?

4 A. The phrase comes from Section 393.135, RSMo. 2000, a statute that was
5 adopted by Initiative, Proposition No. 1, on November 2, 1976. Section 393.135, RSMo.,
6 provides as follows:

7 Any charge made or demanded by an electrical corporation for service, or in
8 connection therewith, which is based on the costs of construction in progress
9 upon any existing or new facility of the electrical corporation, or any other cost
10 associated with owning, operating, maintaining, or financing any property
11 before it is fully operational and used for service, is unjust and unreasonable,
12 and is prohibited. [Emphasis added.]

13 Q. What does it mean for a facility to be “fully operational and used for service”?

14 A. Staff considers a unit to be “fully operational and used for service” once all
15 major construction has been completed, the facility is placed into service in the manner that it
16 was intended, and the facility is operating as intended. Staff determines whether a new or
17 acquired unit is “fully operational and used for service” by evaluating the unit based on specific
18 criteria. The criteria may be different depending on the type of unit that is being evaluated. In
19 this case, Staff recommends the solar in-service criteria contained in Schedule MY-d2.

20 As part of determining if a facility is operating as intended Staff will review Capacity
21 test results. Additional details on solar capacity tests that Ameren Missouri and Staff has used
22 for solar facilities such as such as Ameren Missouri’s O’Fallon Renewable Energy Center can
23 be found in Schedule MY-d3. The solar in-service criteria proposed by Staff in this case are
24 comparable to the criteria used for other solar facilities, such as Ameren Missouri’s O’Fallon
25 Renewable Energy Center.

1 **FEE FEE RENEWABLE ENERGY CENTER**

2 Q. Please describe the project designated as the Fee Fee Renewable Energy Center.

3 A. The Fee Fee Renewable Energy Center is a 504 kW-AC solar project located at
4 the Maryland Heights Community Center. It was developed as part of Ameren Missouri's
5 Neighborhood Solar Program. Construction for the facility began in September 2022, and
6 became operational in April 2023.

7 Q. Has Staff evaluated Fee Fee Renewable Energy Center based on its
8 recommended in-service criteria?

9 A. Yes.

10 Q. What is your conclusion regarding in-service for the Fee Fee Renewable
11 Energy Center?

12 A. The Solar in-service criteria have been met for the Fee Fee Renewable Energy
13 Center. Staff recommends that the Commission find that the Fee Fee Renewable Energy Center
14 is fully operational and used for service as of April 24, 2023. Additional detail regarding Staff's
15 evaluation of each in-service criterion is included in schedule MY-d2.

16 **DELMAR RENEWABLE ENERGY CENTER**

17 Q. Please describe the project designated as the Delmar Renewable Energy Center.

18 A. The Delmar Renewable Energy Center is a 288 kW-AC solar project located at
19 Delmar DivINe in St. Louis' West End neighborhood. It was developed as part of Ameren
20 Missouri's Neighborhood Solar Program. Construction for the facility began in March 2023,
21 and became operational in July 2023.

22 Q. Has Staff evaluated Delmar Renewable Energy Center based on its
23 recommended in-service criteria?

1 A. Yes.

2 Q. What is your conclusion regarding in-service for the Delmar Renewable
3 Energy Center?

4 A. The Solar in-service criteria have been met for the Delmar Renewable
5 Energy Center. Staff recommends the Commission find the Delmar Renewable Energy Center
6 is fully operational and used for service as of July 28, 2023. Additional detail regarding Staff's
7 evaluation of each in-service criterion is included in schedule MY-d2.

8 **NORTH METRO RENEWABLE ENERGY CENTER**

9 Q. Please describe the project designated as the North Metro Renewable
10 Energy Center.

11 A. The North Metro Renewable Energy Center is a 192 kW-AC solar project
12 located near the North Metro Operating Center in St. Louis. It was developed as part of
13 Ameren Missouri's Neighborhood Solar Program. Construction for the facility began in
14 November 2022, and became operational in April 2023.

15 Q. Has Staff evaluated North Metro Renewable Energy Center based on its
16 recommended in-service criteria?

17 A. Yes.

18 Q. What is your conclusion regarding in-service for the North Metro Renewable
19 Energy Center?

20 A. The Solar in-service criteria have been met for the North Metro Renewable
21 Energy Center. Staff recommends the Commission find the North Metro Renewable Energy
22 Center is fully operational and used for service as of April 28, 2023. Additional detail regarding
23 Staff's evaluation of each in-service criterion is included in schedule MY-d2.

1 **HOUSE SPRINGS RENEWABLE ENERGY CENTER**

2 Q. Please describe the project designated as the House Springs Renewable
3 Energy Center.

4 A. The House Springs Renewable Energy Center is a 228 kW-AC solar project
5 located near Ameren Missouri's Jefferson District Operating Center in House Springs. It was
6 developed as part of Ameren Missouri's Neighborhood Solar Program. Construction for the
7 facility began in April 2023, and became operational in August 2023.

8 Q. Has Staff evaluated House Springs Renewable Energy Center based on its
9 recommended in-service criteria?

10 A. Yes.

11 Q. What is your conclusion regarding in-service for the House Springs Renewable
12 Energy Center?

13 A. The Solar in-service criteria have been met for the House Springs Renewable
14 Energy Center. Staff recommends the Commission find the House Springs Renewable Energy
15 Center is fully operational and used for service as of August 16, 2023. Additional detail
16 regarding Staff's evaluation of each in-service criterion is included in schedule MY-d2.

17 **CONCLUSION**

18 Q. What are Staff's recommendations with regard to in-service criteria for the
19 Ameren Missouri Neighborhood Solar Program?

20 A. Staff found each of the four solar projects—Fee Fee Renewable Energy Center,
21 Delmar Renewable Energy Center, North Metro Renewable Energy Center, and House Springs
22 Renewable Energy Center—to have successfully met the solar in-service criteria outlined by

Direct Testimony of
Max Young

1 Staff. Staff recommends the Commission find these four projects fully operational and used for
2 service as of their respective in-service dates in 2023.

3 Q. Does this conclude your direct testimony?

4 A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company)
d/b/a Ameren Missouri's Tariffs to Adjust)
Its Revenues for Electric Service) Case No. ER-2024-0319

AFFIDAVIT OF MAX YOUNG

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW MAX YOUNG and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Direct Testimony of Max Young*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

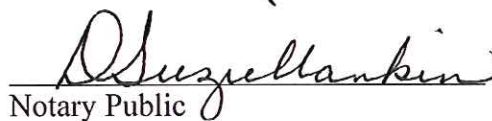


MAX YOUNG

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 25th day of November 2024.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: April 04, 2025
Commission Number: 12412070



Notary Public

Max Young

Present Position:

I am an Assistant Engineer in the Engineering Analysis Department, of the Industry Analysis Division of the Missouri Public Service Commission.

Educational Background and Work Experience:

I received my Bachelor of Science in Electrical Engineering from the University of Missouri in 2024. I have been employed by the commission since May 2024.

Case History:

Case Number	Utility	Type	Issue
EA-2024-0212	Ameren	Electric	Certificate of Public Convenience and Necessity

1. All major construction work is complete.

Construction of the Fee Fee Renewable Energy Center was completed and the facility became operational on April 18, 2023. Ameren Missouri has provided a letter from its contractor indicating that the facility was substantially completed as of May 18, 2023.¹

Construction of the Delmar Renewable Energy Center was completed and the facility became operational on July 28, 2023. Ameren Missouri has provided a letter from its contractor indicating that the facility was substantially completed as of September 19, 2023.²

Construction of the North Metro Renewable Energy Center was completed and the facility became operational on April 28, 2023. Ameren Missouri has provided a letter from its contractor indicating that the facility was substantially completed as of May 26, 2023.³

Construction of the House Springs Renewable Energy Center was completed and the facility became operational on August 16, 2023. Ameren Missouri has provided a letter from its contractor indicating that the facility was substantially completed as of September 19, 2023.⁴

Criterion 1 has been met.

2. All preoperational tests have been successfully completed.

Ameren Missouri provided the following documents in response to this requirement:

- J0TXT - Fee Fee Rd - Project Summary - CONF.pdf
- Ameren Fee Fee REC Prior to Substantial Completion MOP_20230427 - CONF.pdf
- Ameren Fee Fee REC TimeofEnergizationMOP_20230427 - CONF.pdf
- Ameren FeeFee REC PreEnergizationMOP_20230427 - CONF.pdf
- Ameren Fee Fee REC Capacity Report 20230501 - CONF.pdf
- Ameren Fee Fee (Neighborhood) Solar - Study Report - Rev 0.pdf
- Ameren Fee Fee Certificate Substantial Completion 20230523.pdf

- J0XCN - Delmar-Devine - Project Summary - CONF.pdf
- Ameren Delmar REC Capacity Test Report_20230801 - CONF.pdf

¹ Data Request 502, Ameren Fee Fee Certificate Substantial Completion 20230523.pdf

² Data Request 502, Ameren Neighborhood Solar Delmar Certificate Substantial Completion - 2023-09-19.pdf

³ Data Request 502, Ameren Neighborhood Solar North Metro Substantial Completion 2023-05-26.pdf

⁴ Data Request 502, Ameren Neighborhood Solar House Springs Certificate Substantial Completion - 09.19.2023.pdf

- Ameren Delmar REC_Pre-Energization MOP_20230804 - CONF.pdf
 - Ameren Delmar REC_Prior to Substantial Completion MOP_20230804 - CONF.pdf
 - Ameren Delmar REC_Time of Energization MOP_20230804 - CONF.pdf
 - Delmar REC - Generation Interconnection Study Report - Rev 1 - Addendum.pdf
 - Ameren Neighborhood Solar Delmar Certificate Substantial Completion - 2023-09-19.pdf
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- J0X9R - North Metro - Project Summary - CONF.pdf
 - Ameren NMREC PreEnergizationMOP_Completed_20230427 - CONF.pdf
 - Ameren NMREC Time of Energization MOP_Completed_20230428 - CONF.pdf
 - Ameren NMREC Capacity Test Report_20230508 - CONF.pdf
 - Ameren NMREC Prior to Substantial Completion MOP_Completed_20230508 - CONF.pdf
 - North Metro REC - Generation Interconnection Study Report - Rev 0.pdf
 - Ameren Neighborhood Solar North Metro Substantial Completion 2023-05-26.pdf
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- J0X9S - House Springs - Project Summary - CONF.pdf
 - Ameren House Springs REC_Pre-Energization MOP_20230806 - CONF.pdf
 - Ameren House Springs_Capacity Test Spreadsheet_20230821 - CONF.pdf
 - Ameren House Springs REC_Time of Energization MOP_20230822 - CONF.pdf
 - Ameren House Springs REC_Prior to Substantial Completion MOP_20230825 - CONF.pdf
 - House Springs REC - Generation Interconnection Study Report - Rev 0.pdf
 - Ameren Neighborhood Solar House Springs Certificate Substantial Completion - 09.19.2023.pdf

Criterion 2 has been met.

3. Facility successfully meets contract operational guarantees that are necessary for satisfactory completion of all other items in this list.

Ameren Missouri provided the capacity test procedures, capacity test data,⁵ and its executed contracts for the Fee Fee Renewable Energy Center.⁶ Staff reviewed these

⁵ Data Request 503, Fee Fee REC Capacity Data 4-19 through 4-24.xlsx and FFREC_Capacity Verification Datasheet_2023-4-24.xlsx

⁶ Data Request 500, Neighborhood Solar EPC Contract- Fee Fee CONF.pdf and Neighborhood Solar EPC Contract-Fee Fee- Amendment 1 CONF.pdf

documents and the only operational guarantee related to other items on the list is the satisfactory completion of the Capacity Test.

Ameren Missouri provided the capacity test procedures, capacity test data,⁷ and its executed contracts for the Delmar Renewable Energy Center.⁸ Staff reviewed these documents and the only operational guarantee related to other items on the list is the satisfactory completion of the Capacity Test.

Ameren Missouri provided the capacity test procedures, capacity test data,⁹ and its executed contracts for the North Metro Renewable Energy Center.¹⁰ Staff reviewed these documents and the only operational guarantee related to other items on the list is the satisfactory completion of the Capacity Test.

Ameren Missouri provided the capacity test procedures, capacity test data,¹¹ and its executed contracts for the House Springs Renewable Energy Center.¹² Staff reviewed these documents and the only operational guarantee related to other items on the list is the satisfactory completion of the Capacity Test.

Criterion 3 has been met.

4. Upon observation of the facility for 72 consecutive hours, the facility will have demonstrated that when sunlight was shining on it, during that period, it produced power in a standard operating mode.

Ameren Missouri provided the capacity test procedures and data¹³ from a capacity test of the Fee Fee Renewable Energy Center that was completed over a four-day period, April 19, 2023 through April 24, 2023. The data demonstrates that power was produced when sunlight was shining.

Ameren Missouri provided the capacity test procedures and data¹⁴ from a capacity test of the Delmar Renewable Energy Center that was completed over a four-day period, July

⁷ Data Request 503, Delmar REC Capacity Data 7-28 through 7-31.xlsx and DREC_Capacity Verification Datasheet_2023-7-31.xlsx

⁸ Data Request 500, Neighborhood Solar EPC Contract- North Metro, Delmar, House Springs- CONF.pdf

⁹ Data Request 503, North Metro REC Capacity Data 4-28 through 5-7.xlsx and NMEC_Capacity Verification Datasheet_2023-5-8.xlsx

¹⁰ Data Request 500, Neighborhood Solar EPC Contract- North Metro, Delmar, House Springs- CONF.pdf

¹¹ Data Request 503, House Springs REC Capacity Data 8-16 through 8-20.xlsx and HSREC_Capacity Verification Datasheet_2023-8-21.xlsx

¹² Data Request 500, Neighborhood Solar EPC Contract- North Metro, Delmar, House Springs- CONF.pdf

¹³ Data Request 503, Fee Fee REC Capacity Data 4-19 through 4-24.xlsx and FFREC_Capacity Verification Datasheet_2023-4-24.xlsx

¹⁴ Data Request 503, Delmar REC Capacity Data 7-28 through 7-31.xlsx and DREC_Capacity Verification Datasheet_2023-7-31.xlsx

28, 2023 through July 31, 2023. The data demonstrates that power was produced when sunlight was shining.

Ameren Missouri provided the capacity test procedures and data¹⁵ from a capacity test of the North Metro Renewable Energy Center that was completed over a ten-day period, April 29, 2023 through May 8, 2023. The data demonstrates that power was produced when sunlight was shining.

Ameren Missouri provided the capacity test procedures and data¹⁶ from a capacity test of the House Springs Renewable Energy Center that was completed over a six-day period, August 16, 2023 through August 21, 2023. The data demonstrates that power was produced when sunlight was shining.

Criterion 4 has been met.

5. Facility shall meet at least 95% of the guaranteed capacity (in MW AC) based on the Capacity Test Procedures provided in DR 504. The Capacity Test shall determine the facility's Corrected Capacity at the Design Point Conditions. Exact procedures are provided in MY-D3.

Ameren Missouri provided the procedures and data from a capacity test¹⁷ conducted over a four-day period, April 19, 2023 through April 24, 2023. After reviewing the test results, Staff confirmed that the Fee Fee Renewable Energy Center successfully achieved 95% of the guaranteed capacity requirement.

Ameren Missouri provided the procedures and data from a capacity test¹⁸ conducted over a four-day period, July 28, 2023 through July 31, 2023. After reviewing the test results, Staff confirmed that the Delmar Renewable Energy Center successfully achieved 95% of the guaranteed capacity requirement.

Ameren Missouri provided the procedures and data from a capacity test¹⁹ conducted over a ten-day period, April 29, 2023 through May 8, 2023. After reviewing the test results, Staff confirmed that the North Metro Renewable Energy Center successfully achieved 95% of the guaranteed capacity requirement.

¹⁵ Data Request 503, North Metro REC Capacity Data 4-28 through 5-7.xlsx and NMEC_Capacity Verification Datasheet_2023-5-8.xlsx

¹⁶ Data Request 503, House Springs REC Capacity Data 8-16 through 8-20.xlsx and HSREC_Capacity Verification Datasheet_2023-8-21.xlsx

¹⁷ Data Request 503, Fee Fee REC Capacity Data 4-19 through 4-24.xlsx and FFREC_Capacity Verification Datasheet_2023-4-24.xlsx

¹⁸ Data Request 503, Delmar REC Capacity Data 7-28 through 7-31.xlsx and DREC_Capacity Verification Datasheet_2023-7-31.xlsx

¹⁹ Data Request 503, North Metro REC Capacity Data 4-28 through 5-7.xlsx and NMEC_Capacity Verification Datasheet_2023-5-8.xlsx

Ameren Missouri provided the procedures and data from a capacity test²⁰ conducted over a six-day period, August 16, 2023 through August 21, 2023. After reviewing the test results, Staff confirmed that the Delmar Renewable Energy Center successfully achieved 95% of the guaranteed capacity requirement.

Criterion 5 has been met.

6. Sufficient transmission/distribution interconnection facilities shall exist for the total plant design net electrical capacity at the time the facility is declared fully operational and used for service.

Ameren Missouri provided a Generation Interconnection Study²¹ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the Fee Fee Renewable Energy Center.

Ameren Missouri provided a Generation Interconnection Study²² that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the Delmar Renewable Energy Center.

Ameren Missouri provided a Generation Interconnection Study²³ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the North Metro Renewable Energy Center.

Ameren Missouri provided a Generation Interconnection Study²⁴ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the House Springs Renewable Energy Center.

Criterion 6 has been met.

7. Sufficient transmission/distribution facilities shall exist for the total plant design net electrical capacity into the utility service territory at the time the facility is declared fully operational and used for service.

Ameren Missouri provided a Generation Interconnection Study²⁵ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the Fee Fee Renewable Energy Center.

²⁰ Data Request 503, House Springs REC Capacity Data 8-16 through 8-20.xlsx and HSREC_Capacity Verification Datasheet_2023-8-21.xlsx

²¹ Data Request 502, Ameren Fee Fee (Neighborhood) Solar - Study Report - Rev 0.pdf

²² Data Request 502, Delmar REC - Generation Interconnection Study Report - Rev 1 - Addendum.pdf

²³ Data Request 502, North Metro REC - Generation Interconnection Study Report - Rev 0.pdf

²⁴ Data Request 502, House Springs REC - Generation Interconnection Study Report - Rev 0.pdf

²⁵ Data Request 502, Ameren Fee Fee (Neighborhood) Solar - Study Report - Rev 0.pdf

Ameren Missouri provided a Generation Interconnection Study²⁶ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the Delmar Renewable Energy Center.

Ameren Missouri provided a Generation Interconnection Study²⁷ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the North Metro Renewable Energy Center.

Ameren Missouri provided a Generation Interconnection Study²⁸ that was performed to determine impacts on the Ameren Missouri Electric System resulting from the connection and operation of the House Springs Renewable Energy Center.

Criterion 7 has been met.

²⁶ Data Request 502, Delmar REC - Generation Interconnection Study Report - Rev 1 - Addendum.pdf

²⁷ Data Request 502, North Metro REC - Generation Interconnection Study Report - Rev 0.pdf

²⁸ Data Request 502, House Springs REC - Generation Interconnection Study Report - Rev 0.pdf

Facility or Solar Block Circuit shall meet at least 95% of the guaranteed capacity (in MW AC) based on the Capacity Test below. The Capacity Test shall determine the facility's Corrected Capacity at the Design Point Conditions.

Definitions:

“Block” means modules, wiring, combiner boxes, grounding wires, and other items electrically connected to the low DC side of a single inverter skid (inclusive), and racks, conduit, wiring, monitoring and other equipment electrically or mechanically attached to such items.

"Corrected Capacity" means the most recent actual tested Capacity, in MW-AC, corrected to Design Point Conditions (DPC) as described herein.

"Design Point Conditions" (DPC) means a set of ambient reference conditions, which include a solar irradiance of {1050 watts per square meter}*, module cell temperature of {forty-five degrees (45°)}* Celsius, atmospheric air mass of {1.5 or less and wind speed of one (1) meter per second}*.

"POA" means plan of array irradiance.

“Solar Block Circuit” means a Block or group of Blocks that are connected to an AC collection system feeder to the substation and components thereof and are capable of producing electricity separately from any other Solar Block Circuit.

The In-Service Capacity Test shall determine the Corrected Capacity at the Design Point Conditions, and shall be based on the relevant environmental conditions in the field at the time of such test, including field irradiance and temperature. The measured Capacity shall then be "corrected" to the Design Point Conditions and the resulting Corrected Capacity shall be compared to the Guaranteed Capacity as set forth herein.

The In-Service Capacity Test data shall consist of a minimum of fifty (50) 15-minute blocks of average Plane of Array (POA) Irradiance solar irradiance data, where POA is at least 500 W/m² for months March through October.

The Capacity Test shall consist of a minimum of fifty (50) 15-minute blocks of average Plane of Array Irradiance (POA) solar irradiance data where the POA is at least 500 W/m².

However, if any portion of the test falls within the months of November through February, and the test has been in progress for 30 calendar days without providing fifty (50) 15-minute blocks of data with a minimum POA of 500 W/m², data collected from November through February during the in-progress test with a minimum POA of 300 W/m² may be utilized to complete the test.

Calculations Procedures:

$$(1) T_{cell} = T_{module} + \{1.5\}$$

$$(2) W_{COR} = W_{meas} * (IRR_{DPC}/IRR) * (1/(1+TCOEFF (T_{cell}-TDPC)))$$

$$(3) W_{guar} = \frac{W_{COR}}{W_{GUAR}}$$

Where ...

- WMEAS = Measured AC capacity in [MW]
- WCOR = Corrected AC capacity at Design Point Condition (DPC) in [MW]
- IRRDPC = Direct normal irradiance at DPC {1050 W/M2}* in [W/m2]
- IRR = Measured irradiance in [W/m2]
- TCOEFF = Temperature at coefficient of maximum power of installed panel

$$\{(-0.00XX/^{\circ}C) [/^{\circ}C]\}$$

- Tmodule = Measured module temperature in [°C]
- Tcell = Measured module/backsheet temperature in [°C] + {1.5 correction factor [°C]}*
- TDPC = Temperature at DPC {(45°C)}*
- WGUAR = Guaranteed AC capacity of the system {(XXX.X MW-AC)} in

[MW]

*Note: Formula {constants} to be adjusted pursuant the final equipment selection and design