Ameren Illinois Requirements for DER Interconnection Application One-Line Diagrams and Site Plans: Remotely Located Generation (RLG, also referred to as Community Solar)

Requirements Applicable to Both One-Line and Site Plan Documents

Title Block Requirements

1. Developer name and contact information
2. Consulting engineering firm (if applicable) and contact information
3. Project name
4. GPS coordinates (Latitude/longitude)
5. Site address
    a. Provide if available at time of application. If not available, update documents with 911 address once known.
6. Revision number and revision date

Other Required Information

1. Total DC rating (kW)
2. Inverter quantity, rated AC output, and model number
3. Total AC rating of generation system
4. Export limit of DER system
    a. KVA
    b. KW
    c. kVar
5. Total AC rating of energy storage system (ESS) if applicable
    a. kW
    b. kWh

One-line Diagram Requirements:

General Requirements:

1. Total AC and DC system size must be clearly indicated.
2. These requirements are in force for any RLG DER project.
3. One-line diagram must be computer drawn. Hand drawn documents will not be accepted.
4. For three-phase projects, the diagram must be a single-line schematic of the system.
    a. Single phase projects must also utilize a one-line format (i.e., a 2-line diagram is not required).
5. The diagram must provide the level of detail as noted in the "Items to be Included" section.
6. Block diagrams will not be accepted. A block diagram in this context refers to a one-line diagram where devices and connections are not clearly indicated and are only depicted

by lines connecting boxes. All devices on one-line diagrams must clearly indicate the type of device and the location of all electrical connections to the device.

Specific Items to be Included on RLG One-lines:

Ameren Illinois Equipment Shown in the Following Order

1. The proposed Ameren Illinois PCC facilities must be identified and shown in the following order:
    a. Utility source
        i. Indicate utility source voltage, as indicated on the Hosting Capacity Map or Pre-application Report.
        ii. For 15 kV and less, Ameren Illinois should be installing a set of 600 A solid blades at the tap. Developer doesn't necessarily need to show this. Ameren Illinois must have a means to isolate the ITR without removing PG clamps.
    b. Utility recloser
    c. Overhead utility primary revenue metering
        i. Contact Ameren Illinois Metering Engineering for developers requesting underground delivery.
        ii. Placarding must be present on the meter pole (PCC). The following information applies to placarding, but is not required to be shown on the one-line:
            1. Must be minimum 5"x7", two or three ply, engraved phenolic, white letters on red background
            2. Must not be attached directly to pole – Adhere to a flat galvanized steel, stainless steel, or aluminum plate at least 3/16" thick. The plate shall be lagged to the pole, and it would be preferred to have sufficient surface area to mount all placards applicable to the pole on one plate.
            3. Placard must read: "CAUTION: MULTIPLE SOURCES OF POWER - LOCKABLE AC GENERATION SOURCE DISCONNECT AVAILABLE FOR ISOLATION FROM UTILITY"
            4. Install Site Map Placard – may need to be larger than 5" x 7"
2. Point of Common Coupling: (PCC, i.e. change of ownership) is at utility primary revenue metering pole load side (inverter facing) dead-ends. Show as dashed line and ownership on each side of line. Developer brings their overhead primary conductor to the PCC.
3. Reference Point of Applicability (RPA) – Per Section 4.2 of IEEE 1547-2018 – Practically, this location is as near as possible to the utility revenue meter. Potentially, this could be located at the customer's electronic recloser relay or slightly downstream into the developer's system, possibly at a customer-owned production meter.

Developer Equipment Shown in the Following Order

4. Lockable Group-Operated Air-Break (GOAB) Switch
    a. Must be load-break rated
    b. Equipotential grounding platform installed below switch handle and below grade.

c. Placarding
d. Informational notes relevant to GOAB (not required on one-line, but required for DER sites):
    i. Tap connects grounding platform to pole ground with #2 Cu & split bolts. Platform is then covered in CA6 (AKA 1"-) tamped limestone rock 4 ft radius around pole. Take pictures before covering. Flexible braid strap extends from #2 Cu pole ground and then connects to switch vertical control rod.
    ii. Placards
        1. Must be minimum 5"x7", two or three ply, engraved phenolic, white letters on red background
        2. Must not be attached directly to pole – Adhere to a flat galvanized steel, stainless steel, or aluminum plate at least 3/16" thick. The plate shall be lagged to the pole, and it would be preferred to have sufficient surface area to mount all placards applicable to the pole on one plate.
        3. Placard must read "**CAUTION: MULTIPLE SOURCES OF POWER - LOCKABLE AC GENERATION SOURCE DISCONNECT**."
        4. Install Site Map Placard – may need to be larger than 5" x 7". Site map placard must indicate to a first responder how to de-energize all parallel generation sources and should include considerations related to nearby co-located sites that utilize a separate disconnect switch.
    iii. Developer installs keyed padlock & provides key for Ameren Illinois key box. The Ameren Illinois key box is provided by Ameren Illinois and mounted to the GOAB switch pole by the developer. The key box will be secured with an Ameren Illinois padlock.

5. Optional equipment between GOAB and electronic recloser
    a. Lightning arresters – not fused
    b. Potential Transformers – typically fused at 1A or less
        i. Could be on developer side of switch on GOAB pole
        ii. Is ratio correct for the circuit voltage?
        iii. Show secondary output to relay
    c. Control Power Transformer (CPT) for relay – typically fused at 1A or less
        i. Mounted on Electronic Recloser Pole and connected to utility facing side to power relay even when recloser is open
        ii. Some reclosers have the CPT integral to the housing
    d. Developer CTs not allowed to be installed on utility facing side of electronic recloser.
6. Electronic recloser is required for all RLG DER interconnections
    a. Relay settings should be provided for Ameren Illinois System Protection's review. At minimum IEEE relay element numbers (i.e. 50, 51, 27, 59, 59N, 81, etc.) should be present with the initial application. Specific protection settings can be added to a chart in the one-line and submitted after the Interconnection Agreement (IA) is signed.
7. Customer-owned production metering (optional)

a. PT and CT ratios must be suitable for the site's nominal primary voltage and rated primary current
b. CTs could be on a separate pole from PTs. In this scenario, the fused PT rack would be between the GOAB switch and electronic recloser, with the non-fused CTs on the inverter facing side of the recloser. (non-standard)

8. Primary riser(s)
    a. Conduit must extend minimum of 18 ft above ground-line. Use Sch 80 for first 10 ft section.
    b. Primary Underground Riser & Elbow Arrester Ratings
        i. 4.16/2.40 kV system – 2.55kV MCOV, 3kV duty cycle
            1. May consider using 7.65kV MCOV, 9kV duty cycle since cable must be 15kV class and transformer will have dual voltage primary.
        ii. 12.47/7.2 kV system – 7.65kV MCOV, 9kV duty cycle
        iii. 13.2/7.62 kV system – 8.4kV MCOV, 10kV duty cycle
        iv. 34.5 kV – 29kV MCOV, 36kV duty cycle
        v. 69 kV – 57kV MCOV, 72Kv duty cycle
9. Primary cable voltage class, size, and shield – all segments
    a. 5 kV – Interconnection to 4.16/2.4 kV circuits must use 15kV class cable and all other equipment must be 15kV rated.
    b. 15 kV – Must use concentric neutral for transformer grounded-wye high side connection. Tape shields are not adequate to carry the neutral, effectively making a grounded-wye high side a floating-wye, which is not acceptable.
10. Transformer(s)
    a. kVA rating
    b. Transformer % impedance
    c. X/R (if available)
    d. Primary & secondary voltage ratings
        i. For interconnections to 4.16/2.4 kV circuits, transformer primary must be 12.47/7.2 x 4.16/2.4 kV. This transformer will have a switch that allows for compatibility with a 12.47/7.2 kV system.
    e. Connection Type – latest Ameren Illinois Distributed Energy Resources Interconnection Policy Public Facing Guide
11. Service conductors (secondary voltage)
    a. From padmount transformer to secondary voltage switchgear
    b. Number of runs, three phases & neutral (no equipment grounding conductor on this segment), Cu or Al, MCM of Conductor
12. Switchgear
    a. Secondary Voltage (i.e. less than 1000 V)
    b. Primary Voltage (i.e. greater than or equal to 1000 V, when applicable)
    c. Main Breaker Ratings and Trip Settings
13. Inverters
    a. Manufacturer & Model Number
    b. Total Quantity
    c. Individual & Total System kW Rating (AC)
    d. Individual & Total System kW Rating (DC)
    e. Inverter AC output voltage
14. Panels

a. Manufacturer & Model Number
b. Total Quantity of Panels
c. Individual & Total System kW Rating (DC)

15. Energy Storage System (when applicable)
    a. For DC-coupled system (i.e. ESS connects to the same DC bus on the inverters as the generation source), indicate whether inverters are 2 Quadrant or 4 Quadrant
        i. A 2 Quadrant inverter is an inverter that has hardware that is only capable of charging from renewable sources. Provide documentation from the manufacturer.
        ii. A 4 Quadrant inverter is an inverter that has hardware that is capable of charging from renewable sources or the utility grid. Provide documentation from the manufacturer.
    b. AC-coupled ESS systems typically interconnect through dedicated inverters, rather than sharing common inverters with the generation source.
        i. AC output voltage of ESS inverters should be indicated on the one-line.
16. Customer owned, supplemental reactive power devices
    a. The location of supplemental, reactive power devices.
    b. Reactive power device ratings at nominal voltage.
17. If the system is capable of forming a microgrid:
    a. The microgrid interrupting device (MID) must be clearly indicated.
    b. Any additional transfer switches and any other automatic standby generators must be shown
18. If the system contains an export limiting control such as a Power Control System (PCS) with the intent of limiting the export level of the DER system:
    a. The export limiting controller or PCS must be shown. Indicate any certifications for the export controller or PCS (i.e.: UL 3141.)
    b. The metering or instrument transformers that provide voltage and current data to the export controller or PCS must be shown and indicated as such.
    c. All voltage / current input signal wiring related to the export control system must be shown and all communication pathways from the export controller to the controlled inverters must be shown.
    d. The AC export limit of the system must be clearly indicated on the one-line.
    e. Include a table of hierarchy that identifies the export limiting functions and their order of precedence. This includes the hierarchy of logic in the controller and any fall back or fail-safe controls that are in place to ensure that the export limit is not exceeded if the controller fails.
19. If the system contains a Power Plant Control system (PPC) for the purpose of managing the DER plant behavior at the point of interconnection:
    a. All 34 kV and 69 kV connected DER systems must utilize a PPC to ensure the RPA is as close to the PCC as practicable.
    b. The PPC controller must be shown.
    c. The metering or instrument transformers that provide voltage and current data to the PPC must be shown and indicated as such.
    d. All voltage / current input signal wiring to the PPC must be shown and all communication pathways from the PPC to the controlled inverters must be shown.

Site Plan Requirements:

General Requirements:

1. Site plans are required for all RLG DER interconnection projects.
2. All site plans must be computer drawn. No hand drawn documents will be accepted.
3. All site plans must provide the level of detail as noted in the "Items to be Included" section, including dimensions from proposed structures to existing points of reference.

Specific Items to be Included on RLG Site Plans:

1. The location of all new and existing structures with an indication of each one (new / existing).
    a. Depict each pole and specify equipment to be installed on each pole.
    b. Minimum Pole Height & Class
        i. 15 kV and less – 40 ft class 3
        ii. 34 kV and 69 kV – 60 ft class 1 (suggest class H2 based upon present Ameren Illinois construction standards)
    c. Developer's GOAB and electronic recloser should be as close as practically possible to the PCC while allowing adequate spacing between poles, and must be readily accessible to the utility (Ref. 2023 NEC 235.405) .
    d. Ameren Illinois equipment must be truck accessible.
    e. Site Map Placard to be installed on fence gate. Placarding should include site name and emergency contact information
2. The location of proposed Ameren Illinois PCC facilities at the property line.
3. Customer owned substation (when applicable)
4. Site access details including entrance drives, parking lots, etc.
5. The proposed location of the Ameren Illinois facilities to be constructed on the property.
6. The proposed location of the DER and electric service facilities, including:
    a. Solar panels or energy source location
        i. Specific location of solar panels or energy sources is required; the site plan cannot simply depict the location of the fence line. Co-located applications should clearly indicate the location of panels or energy sources for each separate application.
    b. Inverter location(s)
7. Additional requirements:
    a. Property boundaries
    b. North arrow
    c. Scale of the drawing
    d. Setbacks and clearances from property lines and existing structures