Ameren Illinois DER Witness Test Criteria

Contents

Effective/Enforced to any applications received on/after 1/3/2023.

This Document will be sent automatically via PowerClerk to the developer/customer once effective

1 Purpose

The purpose of this document is to specify the requirements that an inverter-based DER installation must satisfy during the Witness Test in order to be approved for parallel operation with Ameren Illinois' distribution system at voltage levels of 69kV or below. The testing criteria outlined below ensure compliance with the Illinois Administrative Code Part 466/467, Ameren Illinois' DER Interconnection Policy, 2020 NEC 705.40 (loss of primary source) and 705.45 (unbalanced interconnections), and IEEE 1547 testing requirements to the extent allowed. It is not intended to be a statement of specific work practices. If at any point the tests outlined in the procedure cannot be completed safely or if the tests create undue risk of outage or disturbance to other Ameren Illinois customers then the test shall be halted until a safe method to obtain the relevant data can be determined.

2 Customer Requirements Prior to Witness Testing

The Customer shall meet all relevant requirements and provide all documents identified under the Illinois Administrative Code Part 466/467. This includes but is not limited to:

1. A final (as-built) detailed one-line diagram (not a simple block diagram) indicating the distributed generation facility, interconnection equipment, interconnection facilities, and metering equipment (computer-generated ones-lines are preferred, and all one-lines must be legible). This should be uploaded to PowerClerk in the "Construction Complete" form.
2. Component and wiring specifications for equipment identified in the one-line diagram.
3. For Level 2 and above interconnections, inverter settings must be uploaded to PowerClerk and be communicated in one of the following ways in order of preference:
    a. A report generated by the inverter that displays all relevant inverter settings
    b. A .csv file utilizing the common file format for DER settings exchange and storage, developed by the Electric Power Research Institute (EPRI). More information about this file format can be found at the following link: EPRI Product ID 3002025445
    c. Screen captures from the tool used to program the inverters depicting, at minimum, all of the required settings in the Ameren Illinois Smart Inverter Specification. The Smart Inverter Specification can be found in the Illinois Distributed Generation Rebate Application at this link. (Please note that the default values in the specification are only required for sites applying for a Smart Inverter Rebate, but that the set value for all settings listed must be included in this list of settings.)
    d. Other methods as mutually agreed upon by the customer/developer and Ameren Illinois
4. Proposed sequence of operations will be jointly determined between Ameren Illinois and customer.
    a. For Behind-The-Meter three-phase DER installations, the developer shall make provisions for and communicate their plan to Ameren Illinois for accomplishing the loss-of-phase portion of the witness test, preferably without interrupting the customer's load. Potential methods include:
        i. For AC Generation Source Disconnects that employ fuses for their overcurrent protective device (OCPD), the developer or their representative shall provide and have available a sufficient number of fuses sized smaller than the permanent fuses. These fuses should be sized at roughly 1/3 of the rated output of the system in order to induce melting that will open a single phase. This procedure will be repeated for each phase. The developer or

developer's representative is expected to provide and install/remove fuses and fuse adapters while wearing the appropriate PPE.

ii. For AC Generation Source Disconnects that employ a main breaker for their overcurrent protective device, a section of removable bus (or conductor) can be identified downstream (on the inverter side) of the main breaker. With the main breaker in the OFF position, a busbar section on a single phase is removed and temporarily replaced with a disconnecting means that meets or exceeds the rating of the busbar (alternatively all inverters can be temporarily programmed with an output restriction that would allow a lesser rated temporary disconnecting means to be used). Proper grounding shall be utilized. Once the temporary installation has been completed, the main breaker can then be turned ON and the temporary disconnect would be operated to simulate the loss-of-phase condition. Once completed, the temporary disconnect will be removed and the busbar replaced. This procedure shall be executed for each phase.

iii. Other methods not identified above may also be submitted for review.

iv. If no other methods of performing the loss-of-phase test are possible for a DER system, Ameren Illinois requires a signed attestation from the interconnection customer that confirms that the customer is aware of the requirement of a load outage to perform loss-of-phase testing on the DER system.

5. Submit pictures of signage and installed equipment that are appropriately dated to ease identification. These should be included in the as-built documents that are uploaded to PowerClerk. Dates shall chronologically identify the state of the equipment, which is important for installations that require follow-up witness testing.
6. Complete "Construction Complete" form in PowerClerk.
7. Notify Ameren Illinois Renewables of readiness for initial energization and/or witness testing.
8. *A three-line diagram showing current potential circuits for protective relays (where applicable*).*
9. *Relay tripping and control schematic diagram (where applicable*).*
10. *As-left protective relay settings and relay commissioning test records (where applicable*).*

Notes:

*This is required when the customer equipment includes protective relaying which requires coordination with or has an effect on the Ameren Illinois electric system.

**This list is not a comprehensive list of documents that must be provided as part of the application process. All interconnection documentation requirements outlined in the DER Checklist must still be satisfied as part of the application process.

3 Initial Energization

After fulfilling all requirements stated in section 2 above, if applicable, customer may request Ameren Illinois to schedule 'initial energization' during and leading up to the witness test for programing/testing the distributed generation facility. Ameren Illinois will allow initial energization during normal working hours except for safety and reliability reasons. The following switching procedure will be followed to ensure safe initial energization for:

A. Behind-The-Meter (BTM)

Once construction has been completed and the point of interconnection (POI) has been properly made, the customer will be allowed to turn the Lockable AC Generation Source Disconnect to the ON position, temporarily, for the purpose of programming/testing. However, each day after programming/testing is completed, the disconnect must be reset to the OFF position and must be left in the OFF position after all testing is complete, awaiting the witness test day.

B. Behind-The-Meter (BTM) with Energy Storage System (ESS)

The procedure for the BTM DER inverter would remain the same as above and the ESS system would also use the same procedure for programming/testing. However, the BTM with ESS system shall have one of three options to keep the customer's critical loads panel energized while awaiting the witness test with the Lockable AC Generation Source Disconnect and lockable ESS disconnect in the OFF position:

1. an external automatic transfer switch (ATS, this is the preferred option) that takes its primary supply from the utility grid
2. a manual double pole double throw switch which takes its primary supply from the utility grid
3. a mechanical interlock which takes its primary supply from the utility grid

C. Remotely Located Generation (RLG):

1. Customer's AC Generation Source Disconnect will start in the open position. On the day of initial energization, a qualified AIC representative must be on site to confirm this condition.
2. Ameren Illinois will remotely close the SCADA controlled switch to energize to the utility side of the Customer AC Generation Source Disconnect.
3. After confirming all equipment is ready to be safely energized, the customer or a representative of the customer will close the Customer AC Generation Source Disconnect.

4 On-site Testing

❖ Testing Conditions

- All inverters for the DER system must be in the normal operating mode and producing power during the test (no inverter is allowed to be disabled or switched off). The facility must be capable of producing at least 30% of the maximum AC output (if a derated inverter is used in the DER system, then the derated maximum output would be used to determine if the 30% threshold is met). If weather conditions at the time of testing do not allow the DER site to produce 30% of the maximum AC output, this limit can be reduced at the discretion of Ameren Illinois engineering. This reduction would apply to all references to the 30% limit below.
- No load banks are permitted during test

❖ Witness Test Criteria for All DER Interconnections

- Verification of operation of the Customer's AC Generation Source Disconnect.
    - When the Customer's AC Generation Source Disconnect is open, there shall be no voltage present on the side of the switch closest to the DER.
    - When the Customer's AC Generation Source Disconnect is closed, generator operation shall be verified. Customer shall provide a qualified representative to be on site with the appropriate personal protective equipment to operate the AC Generation Source Disconnect for all three-phase systems larger than 25kW.
    - The AC Generation Source Disconnect shall be demonstrated to be operable under a minimum of 30% of the DER's maximum rated output.

- Equipment sizing, electrical configuration, and facility layout must match the provided drawings and meet all interconnection facilities requirements.
    - Ameren Illinois may, but is not required to, identify wiring and electrical equipment practices that may raise safety and/or reliability concerns for Ameren Illinois and/or the customer on the customer's side of the point of interconnection. Ameren Illinois reserves the right to identify safety and/or reliability concerns prior to or during witness testing that could lead to the witness test being suspended or a delay in the issuance of permission to operate (PTO) until corrections are made. To the extent that Ameren Illinois does identify wiring and electrical equipment practices that may raise safety and/or reliability concerns for Ameren Illinois and/or the customer on the customer's side of the point of delivery, these identifications are not being made by certified inspection authorities and should be verified by a certified inspector and/or local governmental authorities where applicable.
- Verification that the DER detects the disconnection of all utility electrical phases and appropriately ceases to inject power within 2 seconds of the loss of utility source.
- Verification that the DER waits at least 300 seconds after healthy voltage is restored on all phases prior to resuming current injection following a loss of utility source.
- Verification that the DER complies with the required enter service ramp rate of no greater than 2% of nameplate capacity per second. For inverters incapable of a smooth, linear ramp function, a step function may be used such that the average increase in generation is less than or equal to 2% per second, provided that each step is no more than 20% of the DER's nameplate capacity spread across equal intervals over the same time period (no less than 50 seconds).
    - If a power quality meter is installed for the duration of the test (explained in the requirements below) the power quality meter shall be the source of verification for the ramp rate.

❖ Additional Witness Test Criteria for DER with Nameplate Capacity of 25kW and Greater

- In addition to all criteria above, verification that, for the loss of any one phase, the DER detects the conditions and appropriately ceases production of power on **all phases** within 2 seconds. For BTM DER, this will require the utilization of one of the testing provisions described in section 2.4 of this document. RLG DER can be tested for this condition utilizing equipment on the Ameren Illinois side of the meter. For RLG DER that is connected to a 34.5kV or 69kV line that does not utilize single-phase protective devices, a detailed review of the customer protective device settings may be utilized to ensure that the DER will meet this requirement in lieu of a loss-of-phase test to reduce disturbances to other customers fed from that circuit.
    - Where single phase inverters are utilized in a bank to create a three-phase DER system, the use of a relay controlled protective device will likely be required to satisfy this test condition.
- For Level 1s that generate up 50 kW but export no more than 25 kW, testing will need to be done on a day when the generator output, less the customer utilization load, is greater than 25 kW to ensure that the controlling mechanism is restricting generation output to the utility grid to no more than 25 kW.
- In addition to all criteria above, during the loss of phase test, the voltage on Ameren Illinois equipment shall not exceed 110% of the nominal circuit voltage for more than 5 seconds.

5 Permission to Operate

After on-site witness test and before a permanent Permission to Operate (PTO) is issued:

- The Customer's AC Generation Source Disconnect shall remain open until PTO is granted. At Ameren Illinois' discretion, if there is a SCADA controlled disconnect switch at the POI, the customer disconnect switch may remain closed after testing if on-site test results appeared to pass witness test criteria. In these cases, the SCADA controlled disconnect switch will be opened until PTO is granted. If a Power Quality meter is used as part of testing, the disconnect switch will remain open until the Power Quality data is analyzed. If the PQ data is acceptable then PTO will be issued. If a PQ meter is not utilized in the test, PTO may be issued at the completion of a successful test provided that all parties involved agree that all tests passed.
- Occasionally, and at Ameren Illinois' sole discretion, a conditional PTO maybe granted while Ameren Illinois is evaluating the Power Quality data. In such a scenario, the Customer's AC Generation Source Disconnect shall be closed to enable parallel operation. Conditional PTO will be communicated with the customer in a manner that provides a record of the issuance of conditional PTO such as an email. This permission may be revoked if the results of the analysis of the Power Quality Meter data do not meet the requirements stated in this document.

Signature and Customer Certification

I hereby certify that, to the best of my knowledge, information, and belief, I have reviewed and understood the requirements/expectations above.

Project Name and/or DER #: _____

Customer Signature: _____ Date: _____

Print Name: _____ Title: _____

Developer Signature: _____ Date: _____

Print Name: _____ Title: _____