Distribution Test Policy

Georgia Power Company Distribution
Power Delivery Systems and Standards
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Contents

Overview of Witness Testing Requirements

Georgia Power Company (**"GPC"**) conducts live testing of Distributed Energy Resources (each a **"DER"**) that will operate in parallel with the GPC Distribution System (**"Witness Testing"**). This Witness Testing is called for in the applicable interconnection agreement (**"IA"**) between GPC and the DER owner (referenced here as **"Generator"**) and is required by the ***Southern Company Operation of Distributed Energy Resources (DER) in Parallel with the Distribution System Policy*** (**"Southern Company Policy"**) (incorporated by this reference), which policy is included in the technical requirements applicable to each DER (referenced here as **"Facility"**).

General requirements that apply to all Witness Testing are addressed here. Technology-specific and size-specific Witness Testing requirements are set out in Attachments as shown in the Table of Contents.

Facility Prerequisites

Before scheduling Witness Testing for a new Facility, all on-site Facility construction must be complete and the Facility must be synchronized, commissioned, and fully operational. **It is the responsibility of Generator to ensure that all Facility equipment works correctly before requesting a Witness Test.** If applicable, any other utility modifications also must be complete.

Before requesting Initial Synchronization (defined below), Generator must have timely submitted all required documents and data. The deadline for submission is the earlier of the date specified in: (i) the power purchase agreement (**"PPA"**), if applicable; or (ii) Section 8.6.2 of the Southern Company Policy. Generator must have timely submitted:

Applicable to all DERs:

- Final detailed one-line diagram for the Facility
- Mechanical Completion Certificate (if required by PPA)
- All other data required by Section 8.6 of the Southern Company Policy

Applicable to Solar Photovoltaic DERs:

- UL Authorization-to-Mark Letter from inverter manufacturer (proves that the inverters have been type-tested to meet UL-1741 and IEEE 1547 Standards)
- Make, model, serial number, firmware, and software revision number for each inverter
- Completed Pre-Witness Test Checklist (form attached as Attachment A, Appendix 1)
- Inverter Settings

Additionally, if required by the PPA, before GPC can schedule Initial Synchronization, GPC must have accepted the Final Facility Documents as complete and acknowledged mechanical completion of the Facility.

Initial Synchronization

After fulfilling all Facility Prerequisites described above, and, if applicable, by the Required Notice Date for Initial Synchronization set in the PPA, Generator must request GPC to schedule **"Initial Synchronization"** (or **"Initial Synch"**) (GPC's initial energization of its Interconnection Facilities to allow trial parallel operation of the Facility, including export of test electric energy to the GPC electric system). Generator must contact the designated GPC Representative at least ten (10) business days in advance to schedule Initial Synch. Following receipt of the request and GPC's completion of its Interconnection Facilities (as described in the applicable IA), and subject to successful interconnection protection demonstration and consent by GPC's Distribution Control Center (**"DCC"**), GPC and Generator will jointly determine the date for Initial Synch.

During the Initial Synch trial operation period, Generator will have the opportunity to commission and operate the Facility to prepare for Witness Testing. At its option, Generator, using its own AC disconnecting device, may safely disconnect (de-energize) and then re-connect (re-energize) during this trial operation phase. However, if Generator requires GPC to disconnect and re-energize, there will be an additional charge for the multiple site visits, which must be paid in advance as described in *De-Energization/Re-Energization Fee* section.

For reasons of safety, if the period of Initial Synchronization and trial operation exceeds seven (7) days, GPC reserves the right to temporarily disconnect the Facility and de-energize GPC's Interconnection Facilities. In that event, GPC reserves the right to determine when to reconnect the Facility and re-energize the Interconnection Facilities in order to proceed with Witness Testing. Advance payment would be required as provided in *De-Energization/Re-Energization Fee* section.

Scheduling of Witness Testing

GPC requires at least ten (10) business days advance notice (to the designated GPC Representative) to schedule Witness Testing, which typically will be done in conjunction with the scheduling of Initial Synch. GPC and Generator will select a date and time for the test. GPC will not schedule an initial Witness Test during December. Further details regarding required personnel are provided in the applicable Attachment.

If, as noted in the applicable Attachment, the Witness Testing requires appropriate weather conditions, Generator should pay attention to the weather forecast and postpone scheduled testing if needed. So long as Generator contacts (by phone and confirming email) the designated GPC Representative a minimum of 2 (two) business days prior to the scheduled start time to cancel testing due to weather concerns, there will be no test fee charge.

If Generator contacts (by phone and confirming email) the designated GPC Representative at least seven (7) business days prior to the scheduled start time to cancel testing for any other reason, there will be no test fee charge.

GPC reserves the right to cancel and re-schedule Witness Testing at any time. If GPC cancels for GPC's convenience, there will be no charge for the re-scheduled test.

GPC also reserves the right to cancel on the day of testing if Generator has not completed all installation, corrected faulty equipment, still needs to make changes, or is continuing to install equipment on the scheduled test day. The re-testing fee will apply and must be paid before the rescheduled test.

Witness Testing Fee

The Witness Testing fee is discussed in the applicable Attachment. If an additional day of testing or a re-test is required, GPC will coordinate the scheduling with Generator. Generator must pay an additional testing fee before GPC will schedule the additional Witness Testing. Billing and payment will be as described below in *De-Energization/Re-Energization Fee* section. Scenarios where an additional day of testing may be required, include, without limitation:

- Testing was not feasible on the originally scheduled day due to weather and there was no timely cancellation as noted above;
- Failure of the Facility to pass the tests; or
- Testing in follow-up to a provisional acceptance (described in the applicable Attachment).

De-Energization / Re-Energization Fee

If the Facility requires de-energization from the GPC electric system, or re-energization onto the system, additional fees will be required to cover the expense of the GPC resources performing the service. The cost for the initial energization of the Facility is included in the Installation Costs paid under the IA and is not subject to any additional fee.

If there is the need for a Facility de-energization/re-energization at any time, whether during Initial Synchronization/initial Witness Testing or otherwise during the term of the IA, GPC will determine the GPC resources needed to safely satisfy the request. Once the GPC resources are identified, GPC will determine the cost according to GPC accounting guidelines.

GPC will inform Generator of the applicable fee, by mail or email, with an attached bill from the GPC invoicing system. Generator must pay this bill, in full, before the de-energization/re-energization request can be fulfilled.

The invoice will identify acceptable forms of payment, which include wire transfer (GPC's preferred method) or cashier's check. If Generator desires to pay with a cashier's check, it must first make arrangements with the designated GPC representative. Payments submitted by regular check could cause delays in scheduling the desired service due to check processing times. GPC will not accept cash payment.

Facility Changes and Additional Witness Testing

As required by the IA and the Southern Company Policy, once a Facility has been successfully tested and interconnected, GPC must be notified in advance of any change desired in Facility design or equipment. GPC retains the right to determine whether the desired change is permitted and whether additional Witness Testing is required after the change. GPC also reserves the right to conduct periodic Witness Testing to confirm compliance with the IA and the Southern Company Policy.

GPC Contact Information

For any questions regarding Witness Testing or any Attachment regarding specific Guidelines, please contact GPC Distribution Reliability at G2GPCDISREL@southernco.com, Haile Gashaw at 404-608-5758, or Eric Mikell at 404-654-7563

Attachment A – Witness Testing Guidelines for Solar Facilities ≥ 250 kW

This is a general overview of the procedures for Witness Testing the interconnection of solar, inverter based DERs equal to or greater than 250 kW with the GPC Distribution System. Consistent with the Southern Company Policy, t**hese Guidelines do not apply to DERs with a point of interconnection ("POI") on a transmission line, at a substation, or on a direct dedicated feed into a substation.**

1.0 Scheduling Considerations

Testing for fixed axis solar facilities will be conducted between 10 a.m. and 3 p.m. Testing for tracking solar facilities will start at 9 a.m. and continue until 85% output is achieved or until GPC determines that 85% output cannot be achieved that day. For Generator-owned transformers, GPC also will need an additional hour on site before testing begins.

For a successful test, each individual inverter must achieve 85% of the maximum capable AC output, which requires appropriate weather conditions. Accordingly, Generator should pay attention to the weather forecast and postpone scheduled testing if needed. So long as Generator contacts (by phone and confirming email) the designated GPC Representative a minimum of 2 (two) business days prior to the scheduled start time to cancel testing due to weather concerns, there will be no test fee charge.

2.0 Witness Testing Fee

The Witness Testing fee for Solar Facilities ≥ 250 kW is $2,500 for testing performed on a weekday and $3,000 for weekend testing. The $2,500 weekday testing fee for the initial Witness Test is included in the Installation Costs paid under the IA. All additional testing and re-testing fees must be paid before GPC will conduct Witness Testing.

If an additional day of testing or a re-test is required, GPC will coordinate the scheduling with Generator. Generator must pay an additional testing fee ($2,500 or $3,000, as applicable) before GPC will schedule the additional Witness Testing. Billing and payment will be as described in *De-Energization/Re-Energization Fee*.

3.0 Inverter-Based DER Witness Testing

The following outlines the minimum test requirements. Testing requirements for additional relaying that may be required in some interconnections are not included in these Guidelines. Such requirements will be discussed with Generator's test engineer prior to Witness Testing. GPC also may perform other tests as GPC deems appropriate.

The Facility must pass all tests during Witness Testing. Failure of any one of the tests will result in failure of the Facility as a whole. Upon failure of any test, GPC personnel, in their discretion, may remain onsite to allow Generator an opportunity to correct the deficiency and GPC will then repeat the tests. All tests will be repeated after Generator has established that the cause of the previous failure has been corrected. GPC retains the right to determine whether testing will continue that same day.

The Facility is tested as a whole. If Generator wishes for an inverter or other piece of equipment to be excluded from the Witness Test, that inverter or equipment will be isolated and disconnected from both the

DC and AC side. In the case of an inverter, the serial number will be deleted in GPC records. If Generator later wishes to reconnect the inverter, the entire Facility will require new Witness Testing.

A change to the DC power source (e.g., changing out solar panels, DC fuses, or other DC-related protection or control equipment) that does not increase the maximum AC output of an inverter will not require a re-test.

In addition to other requirements in these Guidelines, all loads that are connected to the bus that the DER is connected to are required to be disconnected from the bus during the entire period of Witness Testing. This requirement applies to all Generator loads regardless of size, type, and application. It is Generator's responsibility to disconnect all local loads and be ready for the Witness Test before GPC testing personnel arrive for testing.

There are some periods during the year when 85% output from the Facility is not achievable, either due to panels installed at a fixed angle or fixed angle single East-West axis trackers not advantageous to the season in which it is being tested. The following provisions describe the process for granting a provisional acceptance until such time as an 85% maximum output test can be completed. A provisional acceptance is not guaranteed and is granted in the sole discretion of GPC

1) The testing must be performed on a clear sunny day, as determined in the sole discretion of the GPC test personnel on site.
2) The three-phase disconnect test will be done at the maximum achievable output of the Facility on that clear sunny day. This may require more than 3 sets of three-phase Witness Tests as the day progresses. The number of tests is based on the sole discretion of the GPC test personnel on site if, in the GPC test personnel's opinion, the previous measured maximum output has been exceeded as the day progresses. This increase typically results from tracker systems that have different maximum output peaks during the day. This may require testing to proceed until late in the day when the expected afternoon peak has passed.
3) Provisional acceptance requires that all equipment must be operational and in proper working order during the entire period of Witness Testing. If a tracker or inverter, etc., fails during the day, even for a short period, no provisional acceptance can be granted.
4) A Facility granted commercial operation authorization (**"COA"**) based on a provisional acceptance may operate for no longer than six months, after which the Facility will be disconnected if there has been no successful Witness Testing.
5) Provisional acceptance can be granted to a Facility only once.

Once a Facility has been successfully tested and interconnected, GPC must be notified in advance of any change desired, such as, for example, any change to the inverter control programming and set points. GPC retains the right to determine whether the desired change is permitted and whether additional Witness Testing is required after the change. If the requested change is permitted, GPC may require Generator to submit an updated Pre-Witness Test Checklist.

4.0 Personnel Required at Witness Testing

GPC Standard Manpower: Two-man GPC line crew plus a GPC Reliability Engineer. Functions:

GPC Switching Personnel: To operate GPC devices, if needed.

GPC Witness Test Personnel: To record and witness the test.

Generator Personnel:

Customer Settings Engineer: To adjust interconnection protection equipment, if needed.

Customer Test Engineer: To perform secondary injection testing on interconnection protection equipment, if needed.

Customer System Operator: To perform Generator switching of DC and AC systems, if needed.

Inverter Control Engineer: To adjust set points of the inverter, if needed.

Note - One person may fulfill multiple functions. Depending on the complexity of the Facility, some people or functions may not be required.

5.0 Transient Overvoltage Test

5.1 Overvoltage Test Operational Requirements

Upon de-energization by a three-phase disconnect device it is possible for an inverter-based DER device to produce a short duration overvoltage condition. The maximum limits for the allowed overvoltage are described below. Refer to Figure 1 for conditions (b) through (d).

a) The Facility must shut down within 120 cycles after the three-phase disconnect has been completed.
b) Maximum Root-Mean-Square (**"RMS"**) voltages produced by the Facility at the POI ranging from 1.1 pu to 1.2 pu must not exceed 60 cycles duration.
c) Maximum RMS voltages produced by the Facility at the POI ranging from 1.21 pu to 1.5 pu must not exceed 10 cycles duration.
d) Maximum RMS voltages produced by the Facility at the POI ranging from 1.51 pu to 2.0 pu must not exceed 3 cycles duration.
e) If any instantaneous peak voltages are produced in excess of 2 pu, they will be evaluated for acceptance based on the ITIC CBEMA curve.

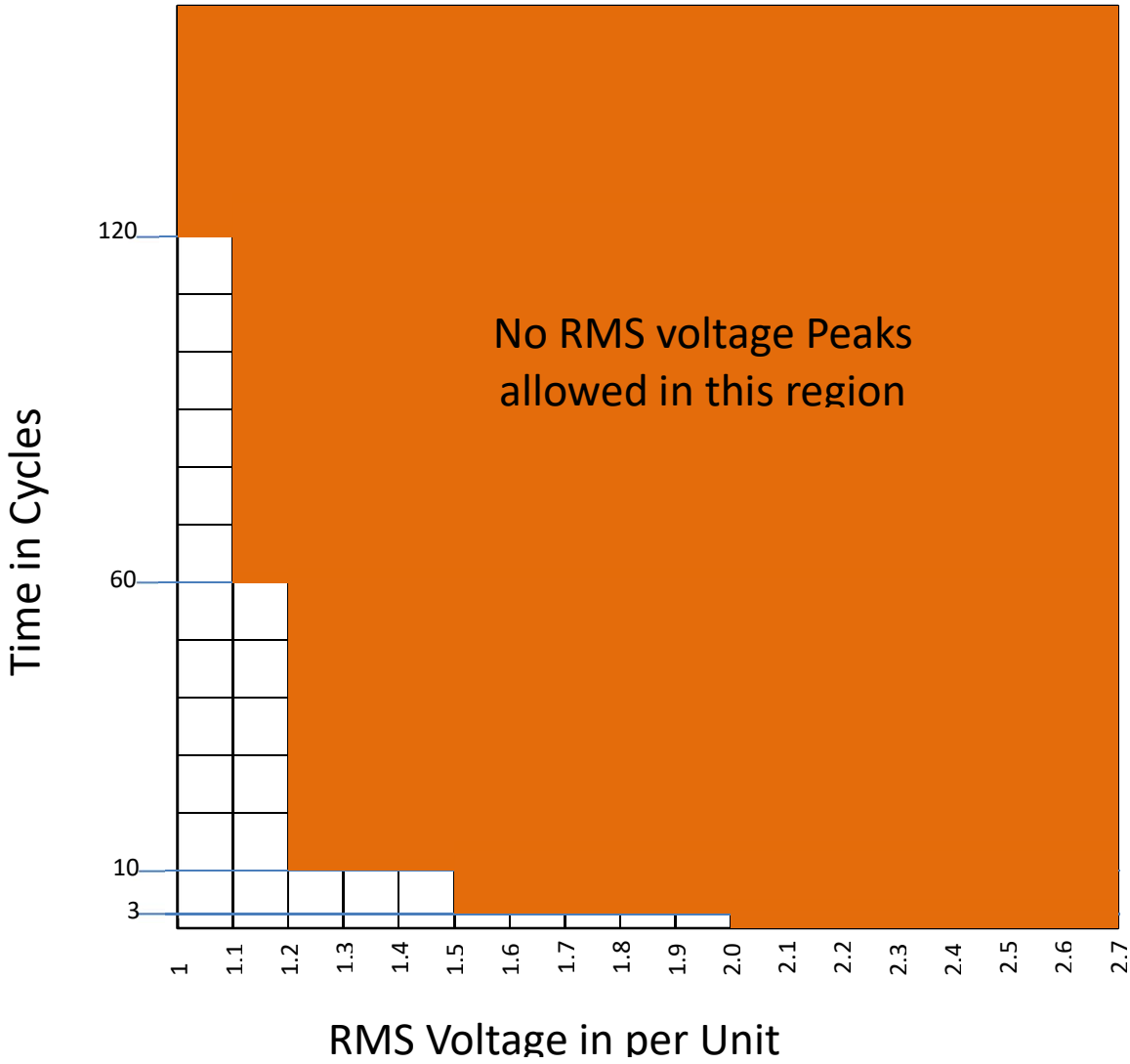

Figure 1 RMS Voltage Limits

5.2 Testing Configuration

a) A power recorder supplied and operated by GPC will be connected to monitor voltages at the POI.

b) A switch that disconnects all three phases will be opened on the GPC side of the POI.

5.3 Testing Conditions

a) During the three-phase disconnect test, the Facility must produce power in excess of 85% of the maximum AC output. If the Facility is not capable of producing 85% of the maximum AC output, the test will be rescheduled for another day at Generator's expense. All inverters must contribute 85% or more of the confirmed maximum output during the three-phase disconnect tests. Facilities with multiple inverters not only have to provide 85% of the confirmed Facility maximum output, but each inverter individually must also contribute 85% or more of its confirmed maximum output. This ensures against some inverters producing 100% output and others not producing 85% or more.

b) All inverters must be producing power (no inverter is allowed to be disabled or switched off).
c) No other load is permitted to remain on the inverter-based Facility after the three-phase disconnect occurs.

5.4 Testing Procedure

a) While recording the output of the Facility at the POI, open the three-phase disconnect switch and record and analyze the transient overvoltage amplitudes and durations.
b) The test will be repeated three (3) times and the Facility must pass each time.
c) Sometime after each three-phase disconnect, the three-phase disconnect switch will be closed for a very short time, opened again, and then closed once more. GPC will verify that the Facility does not start producing power until five minutes after the last energization.

6.0 Single Phase Disconnect Test

6.1 Single Phasing Operational Requirements

a) The Facility must shut down within two seconds after single phasing has been initiated.
b) The Facility must wait a minimum of five minutes before producing power again after the single-phase condition has been restored to three-phase service.

6.2 Testing Configuration

a) A voltage and current recorder, supplied and operated by GPC, will be connected to monitor the voltages at the POI.
b) A switch that disconnects a single phase will be opened on the GPC side of the POI.

6.3 Testing Conditions

a) All inverters must be in service and must produce power.

6.4 Testing Procedure

a) While recording the output of the Facility at the POI, open one phase on the utility side for more than two seconds and close it back in again.
b) Once all inverters have come back online, repeat the test for the next phase.
c) Do the same for the third phase.

7.0 Inverter Control Mode Test

7.1 DER Control Operational Requirements

a) The Facility must control the power factor to the pre-determined set point agreed to by GPC.
b) The Facility must not attempt to actively control the POI voltage.

7.2 Testing Configuration

a) The inverter-based Facility must be in the normal operating mode.

7.3 Testing Conditions

a) The Facility must produce power in excess of 20% of the DER rating for 30 minutes continuously during the test.

b) All inverters must be producing power during the test.

7.4 Testing Procedure

a) Record approximately 30 minutes of continuous Facility output for analysis.

8.0 DER Power Quality Test

8.1 DER Control Operational Requirements

a) The Facility's Total Demand Distortion (TDD) and Total Harmonic Distortion (THD) must stay within the allowable limits as stipulated in IEEE 1548 and IEEE 519.

b) Individual current and voltage harmonic distortions must meet the requirements set in IEEE 1547 and IEEE 519 for DERs.

8.2 Testing configuration

a) The Inverter based DER Facility will be in the normal operating mode.

8.3 Testing Conditions

a) The Facility must produce power in excess of 85% of the DER rating for at least 30 minutes continuously during the test.

b) For facilities with multiple inverters, individual inverters are required to producing power in excess of 85% of the individual inverter rating.

8.4 Testing Procedure

a) Record approximately 30 minutes of continuous DER Facility output in excess of 85% the maximum rating for analysis.

9.0 Equipment Information

Generator must supply the make, model, serial numbers, firmware, and software version number of each inverter by completing the Pre-Witness Test Checklist prior to requesting to be scheduled for Witness Testing. During Witness Testing, GPC may verify these numbers.

10.0 Test Results

Following Witness Test completion and GPC internal test results review, the designated GPC Representative will be notified whether the Facility passed or failed the Witness Test. The GPC Representative will then inform Generator of the results; no test report will be provided. If the Facility fails the Witness Test, and if requested, GPC Distribution Reliability will inform Generator regarding why the Facility failed and will provide more information on the nature of the failure.

If GPC has a third party perform the Witness Test, the results of the test will be communicated to the GPC Representative after the test results are reviewed and signed off by a GPC Distribution Reliability Engineer.

Appendix 1 – Solar PV Inverter Pre-Witness Test Checklist

Attachment A – Witness Testing Guidelines for Solar Facilities ≥ 250 kW

GPC-_____

Operating Parameters*				
Nominal Operating Voltage				
Operating Voltage Range				
Operating Frequency Range				
Operating Power Factor		Absorbing ☐	Injecting ☐	
Maximum DC Power (kW)				
Maximum AC Power per Inverter (kW)				
Total Maximum AC Power (kW)				
DG Reconnection Startup Time Delay (min)				
Generation Start-Up Ramp Rate (kW/Sec)				
Inverter Trip Parameters*	**Pickup**		**Time Delay**	
Over-Voltage 2 (OV2)				
Over-Voltage 1 (OV1)				
Under-Voltage 2 (UV2)				
Under-Voltage 1 (UV1)				
Over-Frequency (OF)				
Under-Frequency (UF)				
Ride-Through Options*				
Voltage Ride-Through Available	Yes ☐		No ☐	
Voltage Ride-Through	Enabled ☐		Disabled ☐	
Frequency Ride-Through Available	Yes ☐		No ☐	
Frequency Ride-Through	Enabled ☐		Disabled ☐	
Documentation				
Facility Interconnection One-Line Diagram	☐			
Serial Numbers of All Inverters	☐			
Firmware Version Number	☐			
Software Version Number	☐			

**** The Generator must set all inverters per Southern Company Policy and other project specific requirements.***

As a reminder, following submission of final paperwork in preparation for Witness Testing, Seller/Generator may not make any change to the Facility without first obtaining the express written consent of Georgia Power.

Submitted by Seller/Generator:

Seller/Generator Name: _____

Authorized Signature _____

Name Printed: _____

Title: _____

Date: _____

Attachment B – Witness Testing Guidelines for Solar Facilities < 250 kW

To be inserted