

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS**

No. 18-23
Effective: July 15, 2008
Revised:
Page: 1 of 14
Contact: John R. Kennedy

KEY BULLETIN POINTS: THIS GUIDE OUTLINES MINIMUM REQUIREMENTS FOR CONNECTION OF CUSTOMER-OWNED EMERGENCY AND STANDBY GENERATORS (ESG) TO THE GEORGIA POWER COMPANY (GPC) DISTRIBUTION SYSTEM. THESE GENERATORS ARE INTENDED TO SUPPLY THE CUSTOMER LOAD AND NOT ALLOWED TO EXPORT POWER TO THE GPC DISTRIBUTION SYSTEM.

TABLE OF CONTENTS

1.0 INTRODUCTION2

1.1 PURPOSE2

1.2 DEVIATION2

1.3 SAFETY2

2.0 DEFINITIONS3

3.0 GPC DISTRIBUTION SYSTEM3

3.1 RADIAL DISTRIBUTION SERVICE.....4

3.2 NETWORK UNDERGROUND SERVICE4

4.0 INTERTIE PROTECTION REQUIREMENTS.....4

4.1 DISCONNECT DEVICE4

4.2 OPEN TRANSITION TRANSFER.....4

4.3 CLOSED TRANSITION TRANSFER5

5.0 ESG OWNER RESPONSIBILITIES6

6.0 APPLICATION7

7.0 ESG FACILITY INSPECTION AND TEST7

8.0 OPERATING GUIDELINES.....7

9.0 REFERENCES8

10.0 ATTACHMENTS.....8

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS****No. 18-23**
Effective: July 15, 2008
Revised:
Page: 2 of 14
Contact: John R. Kennedy**1.0 INTRODUCTION**

Any Georgia Power Company Customer desiring to own, install and operate an emergency or standby generator must meet the technical specifications and requirements of this bulletin. Once approved, Georgia Power Company (hereafter referred to as GPC) may disconnect service to the customer consistent with prudent Utility Practice and in its sole discretion, if the Customer (hereafter referred to as ESG Owner) departs from the technical specifications and requirements of this bulletin.

1.1 PURPOSE

This bulletin provides the minimum intertie protection requirements, application process, and procedure for connection and safe operation of a customer-owned emergency or standby generator (ESG). **These generators are primarily intended to provide an alternate source of electrical power to all or part of the customer's load in the event the electric utility power source fails. They sometimes can be used for peak shaving. They are not allowed to export power to the electric utility system.**

Requirements for customer-owned generators that are intended to export power to the electric utility system are not addressed by this document. The Southern Company Document entitled Parallel Operation of Generation on the Distribution System covers generators that export power to the GPC distribution system.

This bulletin does not provide information regarding the protection of the ESG. GPC cannot assume any responsibility for protection of the ESG facility and equipment. The ESG owner is solely responsible for protecting his facility and equipment from the effects of power system disturbances originating internal or external to the ESG facility. **GPC feeders reclose after trip operation to restore service to customers without checking feeder voltage.** Reclosing that takes place with the generator **still connected to the system** poses severe risk to the generator. The generator must also be protected from the possibility of GPC feeder being single-phase, when normally it is three-phase.

1.2 DEVIATION

Deviation from this bulletin can only be made with the consent of the GPC Manager of Distribution Reliability Engineering or an appointed representative.

1.3 SAFETY

The requirements of this bulletin are intended to achieve the following:

- Insure the safety of the general public and GPC personnel
- Minimize possible damage to the property of the general public, GPC, and GPC customers
- Minimize adverse operating conditions on the GPC Distribution System
- Permit safe operation of customer-owned ESG.

In order to achieve these goals, intertie protection devices (relays, power circuit breakers, etc) may be required to ensure prompt disconnection of the ESG from the GPC Distribution System. The protective devices required depend primarily on the power source transfer scheme selected by the ESG owner. These schemes include:

- Closed Transition Transfer (CTT)
- Open Transition Transfer (OTT)

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS****No. 18-23**
Effective: July 15, 2008
Revised:
Page: 3 of 14
Contact: John R. Kennedy**2.0 DEFINITIONS**

Closed Transition Transfer – A mode of power source transfer in which the emergency or standby power source is connected before the electric utility power source is disconnected or vice versa; thus allowing both sources to momentarily operate in parallel to prevent power interruption to the customer's load. This system is typically referred to as "make-before-break". It requires the two sources to be synchronized prior to closing the paralleling device.

Electric Utility Power Source – Source of electric energy supplied by Georgia Power Company; for purpose of this document, this source is considered the normal power source.

Emergency Power Source – A reserve source of electric energy that automatically provides electric power within a specified time (typically 10 seconds or less) to some or all of the customer's load upon failure or outage of the electric utility power source.

Network Distribution System – An electrical distribution system that has more than one path of power flow to the load.

Open Transition Transfer – A mode of power source transfer in which the electric utility power source is disconnected before the emergency or standby power source is connected or vice versa; thus allowing a short power interruption to the customer's load. This scheme is typically referred to as "break-before-make".

Peak Shaving – The practice of selectively dropping electric loads or generating on-site electricity during periods of peak electric demand to reduce electric utility costs.

Radial Distribution System – An electrical distribution system that has only one path of power flow to the load.

Synchronization – The act of verifying the voltage magnitude, phase angle, and frequency of the two alternating current sources are within allowable limits prior to paralleling the two sources.

Standby Power Source – A reserve source of electric energy that provides electric power within a specified time (typically 60 seconds or less) to some or the entire customer's load upon failure or outage of the Electric utility Power Source.

Utility Relay – Relay that:

- Meets or exceeds IEEE Std C37.90 (IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus)
- Can be removed and replaced, tested and maintained without disturbing other protection and control devices
- Provide positive indication of trip operation

3.0 GPC DISTRIBUTION SYSTEM

The GPC Distribution System includes the following types:

- Three-phase, 60 Hz, 4-wire, multi-grounded neutral system supplying radial distribution feeders
- Three-phase, 60 Hz, 3-wire system supplying network underground feeders

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS****No. 18-23**
Effective: July 15, 2008
Revised:
Page: 4 of 14
Contact: John R. Kennedy**3.1 RADIAL DISTRIBUTION SERVICE**

Service transformers supplied by radial distribution feeders will either be pole or pad mounted. For either case, the three-phase transformers will, in most cases, be two winding connected grounded wye primary – grounded wye secondary.

3.2 NETWORK UNDERGROUND SERVICE

Service transformers supplied by network underground (NU) feeders are installed in vaults. The transformers are two-winding, typically connected delta primary – grounded wye secondary. To provide the high level of service reliability required of network underground service, a group of transformers are connected in parallel on the secondary side to form a secondary network grid. A different feeder serves each transformer. All feeders supplying the network grid usually originate from the same substation.

A network protector is connected between each transformer and the secondary network grid. This device performs the following functions:

- It automatically isolates faults in the primary feeder or network transformers after a predetermined time delay upon sensing reverse power or current flow equivalent to the transformer core loss.
- It automatically closes its breaker upon sensing proper voltage conditions across the open breaker contacts.

Network protectors do not check the frequency of the voltage waveforms prior to closing and are, therefore, not suitable for paralleling two alternating current (AC) sources. Therefore, NU customers wishing to install ESG must ensure that the ESG output is precisely controlled to prevent export of power during closed transition transfer operation especially during periods of light load on the secondary network grid. Failure to do so could cause network protectors to open. A subsequent reclose operation with the ESG source on the secondary side and the electric utility source on the primary side of the open network protector could result in catastrophic failure of the network protector.

4.0 INTERTIE PROTECTION REQUIREMENTS

Intertie protection requirements depend on the power source transfer system selected by the ESG Owner and the type and size of generation.

4.1 DISCONNECT DEVICE

Regardless of the power source transfer scheme selected, the ESG Owner is required to install a disconnect device between the GPC system and the ESG. The device shall:

- Provide a visible air gap between the ESG and the GPC system.
- Be readily accessible to GPC personnel.
- Have provisions for padlocking and application of safety grounds on the GPC side.

The disconnect device can be a visible-break disconnect switch or a drawout power circuit breaker that meets all of the above requirements.

4.2 OPEN TRANSITION TRANSFER

For OTT scheme that meets the definition of Section 2.0, the ESG Owner is not required to provide intertie protection. **To be accepted by GPC, this transfer scheme must use mechanical**

<p>INTERCONNECTION REQUIREMENTS FOR EMERGENCY AND STANDBY [NON-EXPORT] GENERATORS</p>	<p>No. 18-23 Effective: July 15, 2008 Revised: Page: 5 of 14 Contact: John R. Kennedy</p>
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interlocking of the switching devices to prevent inadvertent paralleling of the two sources due to failure of the switching device(s).

4.3 CLOSED TRANSITION TRANSFER

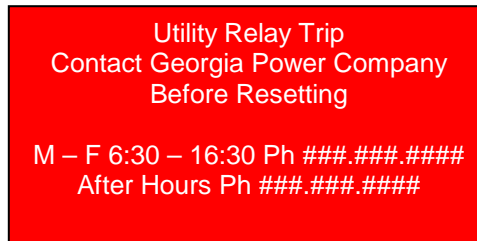
CTT schemes involve momentary paralleling of the GPC System with the ESG. When operating in parallel with the GPC System, the ESG can be a source of fault current to faults on the GPC System. Also, parallel operation can cause undesired power flow from the ESG to the GPC System under certain loading conditions within the ESG facility. For these reasons, the ESG Owner is required to provide intertie protection (including relays, power circuit breakers and instrument transformers).

4.3.1 INTERTIE PROTECTION

Minimum protection requirement to prevent undesired export of power to GPC shall include:

- Sensitive directional power (32) relay with trip direction towards GPC that can be set to detect 2% of the power rating of the GPC service transformer
- Timing (62) relay which supervises the 32 relay
- Manual reset, lockout (86) relay

These must be utility-grade and are required for each intertie breaker. Each lockout relay must be wired to trip the circuit breaker directly (with no indication lights, etc, in the trip path) and block its closing. When the lockout relay trips the breaker, the Customer shall not reset the lockout relay until instructed to do so by the GPC Distribution Control Center or their appointed representative. Each lockout relay must be clearly marked with the following illustration:



GPC will provide the appropriate telephone numbers to use on this illustration prior to the customer's completion of facility design.

The intertie protection relay system must be mounted together and installed separate from other controls for each intertie breaker. The intertie protection functions can be provided by discrete electromechanical relays or a multifunction solid-state (or microprocessor-based) relay package.

4.3.2 MULTI-FUNCTION SOLID STATE RELAY PACKAGE

Customers proposing to use a multi-function, solid-state relay for each intertie protection shall:

- Program all applicable intertie protection functions to trip via a dedicated output contact; this output cannot be used by any non-intertie protection function.
- Wire the dedicated intertie trip output contact to operate the intertie lockout (86) relay.
- Program the relay to display a trip target for each intertie protection function.
- Monitor the power failure output contact of the solid-state relay.

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS****No. 18-23**
Effective: July 15, 2008
Revised:
Page: 6 of 14
Contact: John R. Kennedy

- Trigger an event report on activation of this output for post-trip analysis. Event report must be made available to the Electric Utility upon request.

4.3.3 CURRENT TRANSFORMERS

Current transformers (CT), which supply the intertie relays, shall have a relay accuracy of C200 or better and meet requirements of ANS/IEEE Std C57.13 (IEEE Standard Requirements for Instrument Transformers). The secondary circuits for the CTs shall be continuous and be dedicated for intertie protection. Test switches (like the ABB Type FT-1 Switches) with make-before-break current short circuit feature can be installed in these circuits to facilitate relay system testing and maintenance.

Selector switches for panel ammeter application and auxiliary CTs must not be installed in these circuits.

4.3.4 VOLTAGE TRANSFORMERS

Voltage transformers (VT) which supply the intertie relays shall have a thermal burden rating of 75VA or better and meet requirements of ANS/IEEE Std C57.13 (IEEE Standard Requirements for Instrument Transformers).

4.3.5 INTERTIE BREAKER CONTROLS

The control power source used for starting the ESG must be used for tripping each intertie breaker.

4.3.6 DUAL GPC SERVICE

Customers with more than one GPC source serving their facilities shall provide open transition transfer between the intertie (or incoming or service entrance) breakers to prevent tying the GPC sources together on the customer side. This bulletin assumes one GPC source can carry the total ESG facility load. If a customer requires uninterrupted transfer between sources, protection requirements for closed-transition transfer shall apply.

5.0 ESG OWNER RESPONSIBILITIES

The ESG Owner is responsible for:

- Informing GPC of intent to install and operate an ESG by completely filling in the Attached Application and submitting all required documentation to GPC for review.
- Designing, installing, commissioning and maintaining all equipment and facilities including the intertie protection devices.
- Calculating settings of all intertie protective relays and submitting to GPC for review and acceptance.
- Notifying GPC of any changes to intertie protection devices.
- Ensuring **ESG facility** equipment is adequately protected
- Synchronizing the ESG to the GPC System if Owner chooses a CTT scheme.
- Complying with all applicable Federal, State and Local electrical and safety codes and regulations.
- Periodically maintaining and testing all intertie protection devices.
- Keeping copies of all maintenance test reports on file for GPC review, if required.
- Notifying GPC of change in ownership of ESG facility within 30 calendar days of effective date of ownership change.
- Withdrawing drawout breakers to provide GPC with visible air-gap, if disconnect device is a drawout breaker.

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS****No. 18-23**
Effective: July 15, 2008
Revised:
Page: 7 of 14
Contact: John R. Kennedy

- **The cost of** all facility (including system protection) upgrades/modifications to GPC Distribution System for ESG with CTT scheme.

6.0 APPLICATION

A GPC Customer who wishes to own, install and operate an ESG is required to complete the Application attached to this document. Completed application must be sent to the GPC Account Manager assigned to the Customer including the following documents:

- Required Technical Data Form that is attached to this document.
- A detailed one-line electrical diagram of the proposed facility.
- All applicable elementary diagrams.
- Specifications and Details of All Generators, Generator Transformers, Intertie & Generator Circuit Breakers, Intertie Protective Relays, Current Transformers and Voltage Transformers and any other major equipment.

GPC Distribution Reliability Engineering and Distribution Planning will review all documents submitted and provide recommended intertie protection requirements to the GPC Account Manager for transmittal to the Customer. The Customer is advised to not purchase any equipment until after the review has been completed. The review may identify modifications to the GPC facilities serving the Customer. The Customer shall be responsible to pay the total cost for the modifications.

7.0 ESG FACILITY INSPECTION AND TEST

ESG Facilities that choose to employ CTT scheme with the electric utility source shall not be permitted to operate until operational testing of the CTT scheme has been inspected and witnessed by GPC. Prior to doing this activity, GPC requires that the ESG Owner completes the attached Checklist and submits to his GPC Account Manager for review by GPC Distribution Reliability Engineering. Upon completion of the review, GPC Distribution Reliability Engineering will schedule an inspection date with the Customer. The inspection shall include, but not be limited to, verification of the proper operation of the intertie protection scheme, including trip testing of the breakers by the intertie protective relays under real system conditions.

Once all requirements are met, the ESG owner shall be granted approval for operation of the generating equipment in parallel with the GPC system. Neither the inspection nor the granting of approval to operate shall serve to relieve the ESG owner of any liability for injury, death or damage attributable to the negligence of the owner.

8.0 OPERATING GUIDELINES

The ESG owner shall operate the generating equipment within the guidelines of this document. GPC reserves the right to disconnect service to the ESG Facility for any of the following reasons:

- A GPC system emergency.
- Departure of ESG Owner from the technical specifications and requirements of this bulletin, including resetting the intertie protection lockout relay without explicit instruction to do so by GPC.
- Personal safety is threatened.

Failure of GPC to disconnect service to ESG Facility shall not serve to relieve the ESG owner of any liability for injury, death or damage attributable to the negligence of the ESG owner.

**INTERCONNECTION REQUIREMENTS FOR
EMERGENCY AND STANDBY [NON-EXPORT]
GENERATORS**

No. 18-23
Effective: July 15, 2008
Revised:
Page: 8 of 14
Contact: John R. Kennedy

9.0 REFERENCES

ANSI C2, National Electrical Safety Code.

NFPA 70, National Electrical Code.

NFPA 110, Standard for Emergency and Standby Power Systems.

ANSI/IEEE Std 446, Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications

ANSI/IEEE C37.90, IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

ANSI/IEEE C37.95, Guide for Protective Relaying of Utility-Consumer Interconnections

ANSI/IEEE Std 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

Distribution Bulletin No. 18-8, Georgia Power Company Interconnection Requirements and Parallel Operation of Non-Utility Generation (Revised 1997 by GPC Transmission Protection & Control)

10.0 ATTACHMENTS

- Application for Emergency and Standby Generation Installation & Operation
- Emergency and Standby Generation Inspection and Test Acceptance Checklist
- Statement of Responsibility for Operation of Emergency and Standby Generation on the Georgia Power Company Distribution System

Approved: _____
Tami M. Barron
General Manager, Distribution Operations & Services

REQUIRED TECHNICAL DATA

(This page may be copied for additional generators if they have different electrical characteristics.)

SYNCHRONOUS GENERATOR

Qty To Install: _____ **Manufacturer:** _____ **Model No.:** _____

Phase: _____ **Frequency:** _____ Hz **Speed:** _____ RPM **Poles:** _____

Output Rating: _____ KV **_____ KW** **_____ %** **_____ A**
Voltage Real Power Power Factor Current

Reactance: _____ % **_____ %** **_____ %** **_____ KVA**
Subtransient (X_d'') Transient (X_d') Synchronous (X_d) Base Power

Resistance: _____ % **_____ %** **_____ KVA**
Positive-Sequence (R_1) Negative-Sequence (R_2) Base Power

Energy Source: _____
Specify Type (Solar, Wind, Hydro, Diesel, Natural Gas, Fuel Oil, etc)

Prime Mover: _____
Specify Type (Fuel Cell, Reciprocating Engine, Gas-, Steam-, Micro-, Wind-Turbine, PV Array, etc)

INDUCTION GENERATOR

Qty To Install: _____ **Manufacturer:** _____ **Model No.:** _____

Phase: _____ **Frequency:** _____ Hz **Design Letter:** _____ **Frame Size:** _____

Output Voltage: _____ KV **Motoring Power:** _____ KW **Exciting Current:** _____ A

Reactive Power Required: _____ KVAR **_____ KVAR**
No-Load Full Load

Stator Impedance: _____ Ohms **_____ Ohms**
Resistance (R_s) Reactance (X_s)

Rotor Impedance: _____ Ohms **_____ Ohms**
Resistance (R_s) Reactance (X_s)

Magnetizing Reactance (X_m): _____ Ohms **Short Circuit Reactance (X_d''):** _____ Ohms

Energy Source: _____
Specify Type (Solar, Wind, Hydro, Diesel, Natural Gas, Fuel Oil, etc)

Prime Mover: _____
Specify Type (Fuel Cell, Reciprocating Engine, Gas-, Steam-, Micro-, Wind-Turbine, PV Array, etc)

INVERTER

Qty To Install: _____ **Manufacturer:** _____ **Model No.:** _____

Type: _____ **Commutation:** _____
Specify (Ferro-resonant, Step, PWM, etc) Specify (Line/Utility-interactive or Self-Commutated)

Output Rating: _____ KV **_____ A** **_____ %**
Voltage Current Power Factor

Harmonic Distortion: _____ % **_____ %**
Maximum Single Harmonic Distortion Maximum Total Harmonic Distortion

Is Inverter Listed with the Underwriters Laboratories for use as a Power Source Converter? Yes No

GENERATOR TRANSFORMER

Qty To Install: _____ Manufacturer: _____ Model No.: _____

Interrupting Medium: _____ Dielectric Medium: _____

Power Rating: _____ KVA _____ KVA _____ KVA _____ °C
Primary Secondary Tertiary Temperature RiseWinding Connections: _____
Primary Secondary TertiaryPositive Sequence Impedance: _____ % _____ % _____ KVA
Resistance (R_{T1}) Reactance (X_{T1}) Base PowerZero Sequence Impedance: _____ % _____ % _____ KVA
Resistance (R_{T0}) Reactance (X_{T0}) Base PowerNeutral Grounding Resistance: _____ Ω _____ Ω _____ Ω
Primary Secondary Tertiary**INTERTIE BREAKER**

Qty To Install: _____ Manufacturer: _____ Date Manufactured: _____

Phase: _____ Frequency: _____ Hz Voltage Rating: _____ KV _____ kV
Maximum Impulse Withstand (BIL)Current Rating: _____ A _____ KA Control Voltage: _____ V _____ V
Continuous Interrupting Trip Circuit Close CircuitClosing Energy Source: _____
Specify (Spring, Motor, Hydraulic, Pneumatic, etc)Tripping Energy Source: _____
Specify (Spring, Motor, Hydraulic, Pneumatic, etc)

Rated Interrupting Time: _____ cycles

CURRENT TRANSFORMER – INTERTIE PROTECTIONRatio: _____ : 5A Class: C _____ Taps: _____
X1-X2 X2-X3 X3-X4 X4-X5



Emergency and Standby Generation Facility Inspection and Test Acceptance Checklist

The following checklist helps Georgia Power Company determine whether all intertie protection requirements are fully satisfied. The Customer shall provide a signed copy to his GPC Account Manager at least six weeks prior to the commissioning date of the ESG facility. After GPC completes its review, the Customer will be contacted to schedule a date for final inspection and testing. Georgia Power Company will witness the operation of the intertie protection and control scheme.

1. Did you provide a disconnect switch or drawout breaker between the electric utility source and your generator? **Yes** **No**
2. Does the disconnect switch or drawout breaker have provisions for Georgia Power to install a padlock when the switch is in the open position or the breaker is in the disconnect position? **Yes** **No**
3. Are the intertie protective relays installed and were they tested? **Yes** **No**
4. Did you provide utility grade intertie relays? **Yes** **No**
5. Is the control power for the intertie relays provided by the control power source for your generator? **Yes** **No**
6. All required intertie protection function for each incoming breaker trips via a lockout relay (type 86). The lockout relay in turn trips its associated intertie breaker and blocks all closing and reclosing of its intertie breaker. **True** **False**
7. Are the intertie protection functions provided by a multi-function, solid-state/microprocessor-based relay? **Yes** **No**
 - a. If yes, do all functions trip via one dedicated output contact? **Yes** **No**
 - b. Is the relay power supply failure output contact monitored? **Yes** **No**
8. Does any other (non-intertie) relay trip via the intertie lockout relay 86 mentioned above. **Yes** **No**
9. Are the current circuits connected to the intertie relays continuous and do not have ammeter selector switches? **Yes** **No**
10. Are the intertie relays for each intertie breaker mounted separately and delineated from other relays in the same panel? **Yes** **No**
11. Is the lockout relay 86 for each intertie breaker mounted with a tag that reads "Utility Relay Trip" and the correct phone number inscribed on this tag? **Yes** **No**
12. Current transformers supplying the intertie relays have an accuracy class of C200 or better. Accuracy class is _____.
13. Voltage transformers supplying the intertie relays have accuracy of _____, ratio of _____ V and thermal burden of _____ VA.
14. The reverse power relay pickup is set no greater than 0.02 Amperes (secondary) at rated voltage.
 - a. Setting is _____ Amperes secondary.
 - b. Reverse power pickup is set to _____ kW primary.
 - c. The reverse power timer is set to 2 seconds or below. Setting is _____ seconds.
13. The directional overcurrent (with trip direction towards GPC) has a minimum setting of 0.75 Amperes with a continuous rating of 5 Amperes. A fast inverse time delay curve is required.
 - a. Directional Phase Overcurrent pickup setting is _____ Amperes primary.
 - b. Directional Phase Overcurrent time dial setting is _____.

- c. Directional Phase Overcurrent Curve selected is _____.
- d. Directional Ground Overcurrent pickup setting is _____.
- e. Directional Ground Overcurrent time dial setting is _____.
- f. Directional Ground Overcurrent Curve selected is _____.

14. The Over / Under voltage relay settings are provided below.

- a. Under voltage setting is _____ V secondary with time delay of _____ seconds.
- b. Over voltage setting is _____ V secondary with time delay is _____ seconds.

15. The Over / Under frequency relays settings are provided below.

- c. Under frequency setting is _____ Hz with time delay of _____ seconds.
- d. Over frequency Setting is _____ Hz with time delay is _____ seconds.

16. Please provide three possible dates for the final inspection and commissioning test:

- a. Date #1 _____ Time: _____
- b. Date #2 _____ Time: _____
- c. Date #3 _____ Time: _____

I certify that the information provided is true to the best of my knowledge and belief.

Print Name

Signature

Date



Statement of Responsibility for Operation of Emergency or Standby Generation on the Georgia Power Company Distribution System

As a Georgia Power Company Customer with an Emergency or Standby Generator (ESG), I confirm that I have read and am in agreement with the requirements and responsibilities set forth in Georgia Power Company's Distribution Bulletin **18-23**. I understand and agree that I shall not allow the operation of my generator(s) to have a negative impact on the safe and reliable operation of the Georgia Power Company system or the level of service to other Georgia Power Company customers.

I accept the responsibility for the periodic calibration and operational testing of all Intertie Protective Relaying systems required by Georgia Power Company in Distribution Bulletin **18-23**. I agree that in order to monitor compliance, Georgia Power Company retains the right to review the test and maintenance records for the Intertie Protective Relaying.

I understand that Georgia Power Company is not responsible for the protection, operation, or maintenance of my generator(s) and I hereby release Georgia Power Company from any such liability.

I agree to report any change in the ownership or operator of this ESG to Georgia Power Company in writing, within 30 days of such change. I agree to submit any change in the scope of the ESG installation (such as adding additional generators), which could affect the compliance of Distribution Bulletin **18-23**, to Georgia Power Company for review.

In the event of non-compliance of these responsibilities, I understand that Georgia Power Company may elect to disconnect service to the ESG Facility, until such time as compliance is achieved. I understand and agree that Georgia Power Company accepts no liability for consequences associated with a non-compliance disconnect, and I hereby release Georgia Power Company from any such liability.

ESG Facility Legal Name: _____

Address: _____

Generator(s) Identification: _____

ESG Owner: _____

ESG Operator: _____

Operator Signature: _____

Date: _____

Address any changes involving this ESG installation to:

Supv. Distribution Reliability Engineering
Georgia Power Company
Bin 20034
241 Ralph McGill Blvd NE
Atlanta, GA 30308