

# Witness Testing Guide

## Why do we need to complete Witness Testing?

When an application to connect electricity generation is received, design work is carried out to ensure that the local network can accept the electricity generated, and continue to operate within the required legal limits. The first priority when operating an electrical distribution network is to ensure that it is operated safely. However, sometimes the generator or network may operate abnormally causing faults. When this happens we can't allow the generator to continue to back feed a fault and/or create an island network which poses further risk. Therefore it is essential to ensure loss of mains protection, where the generator will automatically disconnect protecting staff and assets.

'Witness testing' is where we, Electricity North West, the network operator for the North West, attend the site of your generator to witness your commissioning engineer test the protection systems associated with your generator and ensure they operate correctly.

## What do we do during Witness Testing?

We attend the site to ensure that the equipment meets the required specifications for disconnecting a generator from the local distribution network in the event of abnormal operation. There are a number of tests that must be completed, and these can vary depending on the following: -

- The size of the generation (capacity)
- The type of the generation (solar, wind etc.)
- The type of equipment being used (whether it has been type tested)
- Previous experience with an installer or a certain type of equipment

This guide explains why we need to witness test equipment, which is being connected to our network. It includes what we do, when we complete the testing, and what you can do to help this process run smoothly.



# Principle Systems

There is a guidance document produced by the Energy Networks Association (ENA), which is called G99. This document provides the engineering recommendations for connecting electricity generation. We operate to the requirements of this G99 document and it is recommended that any installer connecting a generator is fully acquainted with this document.

Under G99 the process for witness testing depends on the nature of the system. The following principle systems will be detailed throughout this guide.

1. Type-tested systems (no G99 relay required)
2. Non type-tested systems (G99 relay required)
3. Short-term parallel systems (G99 relay required)

**Type A:** Greater than 50kW and less than 1MW- ENWL don't witness test G99 Type Tested Inverters up to 200kW (Except; if G99 Relay incorporated or G100 Scheme/Reverse Power Relay required/or failsafe installed for Non Type Tested).

**Type B:** Over 1MW to 10MW - Witness Test all systems.

**Type C:** Over 10MW to 50MW- Witness Test all systems.

**Type D:** 50MW or more or over 110kV - Witness Test all systems.

	Single premises Up to and including 16 A per phase	Multiple premises Up to and including 16 A per phase	Fast Track SGI 1	Fast Track SGI 2	Fast Track SGI 3	Less than 50kW	Greater than 50kW & less than 1MW (Type A)	1MW to less than 10MW (Type B)	10MW to <50MW (Type C) Greater than or equal to	Greater than or equal to 50MW or >110kV (Type D)
Applicable Standard	G98	G98	G99	G99	G99	G99	G99	G99	G99	G99
Application		Form A	Form A1-2	Form A1-2	Form A1-2	Form A1-1	Standard Application Form	Standard Application Form	Standard Application Form	Standard Application Form
G99 compliance							G99 type test certificate (if applicable)	G99 type test certificate (if applicable)	G99 type test certificate (if applicable)	G99 type test certificate (if applicable)
Notification	Form B	Form B	Form A3-3	Form A3-2 + SLD	Form A3-2 + SLD	Form A3-1 + SLD	Form A3-1 + SLD			
Evidence	If fully type tested but not registered with the ENA-Form C	If fully type tested but not registered with the ENA-Form C	Must be Type Tested	Must be Type Tested	Must be Type Tested	If not type tested-Form A2-1 Synchronous <50kW Or Form A2-3 Inverter connected	If not type tested-Form A2-2 synchronous OR Form A2-3 inverter connected	PGMD Form B2-1	PGMD Form C2-1	PGMD Form C2-1
Compliance & commissioning checks						Form A2-4 if the interface protection is not type tested or for other site compliance tests	Form A2-4 if the interface protection is not type tested or for other site compliance tests	Form B2-2 if the interface protection is not type tested or for other site compliance tests	Form C2-2 if the interface protections is not type tested or for other site compliance tests	Form C2-2 if the interface protections is not type tested or for other site compliance tests
G100				G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited	G100/2 form C compliance documents if export is limited
Installation								Form B3	Form C3	Form C3
EON, ION, FON								FON Types B-D: FON obtained during Compliance testing & commissioning	FON Types B-D: FON obtained during Compliance testing & commissioning	ION, EON, FON For Type D only: ION & EON obtained during Energisation Planning phase

# Type-tested systems



## What is a type-tested system?

A type-tested system is one which has been approved by the Energy Networks Association (ENA) and which they have issued a certificate to the manufacturer to confirm conformity of the type-tested system requirements.

An example of this would be a 200kW solar Photovoltaic (PV) system using type-tested inverters <50kW.

## Why do we witness test?

It is our responsibility as a Distribution Network Operator (DNO) to ensure that electricity generation connected to our network and the associated protection system meets the requirements of G99.

For type-tested systems we have an “approved list” of installers. We will add installers to this list once we have witnessed a sample of their installations to our approval.

Under G99 we are required to witness test all generators connected at high voltage (HV) and above.

Please note that if the generating system includes a device limiting export capacity we will attend in person. We always reserve the right to witness test any site.

## How do we carry out a witness test?

Once you accept your quote, our connections delivery team will contact you to arrange the witness test.

As a customer you must complete appendix A3-1 of the G99 document and comply with the requirements of G99 testing that relate to schematics and labelling etc. Witness testing for type-tested systems is based on this document. As an installer it is your responsibility to ensure that G99 protection settings have been set up on the type-tested equipment.

Schematics/single line diagrams and appropriate labelling should be displayed at both the point of connection to the network (which is often the customer’s main board) and the location of the installation. The schematic should be relevant to the site and not simply a typical system. If the system changes, you should inform ENWL as a further witness test may be required and you should also update the schematic diagram at the point of connection.

### **IMPORTANT: Labelling**

All of the following must be included:-

1. Dual/multi supply labels
2. The inverter and associated isolators/Miniature Circuit Breaker (MCB) clearly labelled
3. PV on roof labels (where applicable)
4. DC and AC live cable labels

All isolators should be lockable for safety when working on the generation system.

# Non type-tested systems



## What is a non type-tested system?

A non type-tested system uses non type-tested factory approved equipment (as defined in G99) which means a G99 relay must be used.

Some examples of this would be the following:-

- A Hydro, Wind and Solar PV system using non type-tested inverters with a G99/3 protection relay
- A CHP System
- An Anaerobic Digester with a gas engine
- A diesel engine

Occasionally type-tested equipment can be used as part of a non type-tested system and therefore still requires a witness test as a G99 relay would be in use. Any additional equipment in the install (e.g. inverter) containing G99 protection should be set to mirror the settings applied in the G99 relay.

## Why do we witness test?

It is our responsibility as a Distribution Network Operator (DNO) to ensure that electricity generation connected to our network is safe and the associated protection system meets the requirements of G99. All non type-tested systems need to be witness tested however this can be at our discretion at Low Voltage.

## How do carry out a witness test?

Once you accept your quote, our connections delivery team will contact you to arrange the witness test.

An ENWL engineer will witness the customers/installers appointed commissioning engineer perform the G99 test in accordance with appendix A2-4 of G99. In addition further tests will need to be performed and witnessed such as the following:-

- Proving the timing of the generation circuit breaker/contactors
- Dynamic loss of mains response
- Loss of control/auxiliary supply to G99 equipment response

In addition to the tests specified above you must complete appendix A3-1 of the G99 document and comply with the requirements of G99 testing that relate to schematics and labelling etc.

Schematics/single line diagrams and appropriate labelling should be displayed at both the point of connection to the network (which is often the customer's main board) and the location of the installation. The schematic should be relevant to the site and not simply a typical system. If the system changes, you should inform ENWL as a further witness test may be required and you should also update the schematic diagram at the point of connection.

### **IMPORTANT:** Labelling

All of the following must be included:-

1. Dual/multi supply labels
2. The inverter and associated isolators/Miniature Circuit Breaker (MCB) clearly labelled
3. PV on roof labels (where applicable)
4. DC and AC live cable labels

All isolators should be lockable for safety when working on the generation system.

# Infrequent Short-term parallel Systems



## What is an Infrequent Short-term parallel System?

A short-term parallel system is one that uses non type-tested factory-approved equipment (as defined in section 7.3 of G99). G99 states that the system is allowed to run in parallel with the Network for a maximum period of 5 minutes per calendar month and no more frequently than once a week. A common example of this is a back-up diesel generator system.

## Why do we witness test?

It is our responsibility as a Distribution Network Operator (DNO) to ensure that electricity generation connected to our network is safe and the associated protection system meets the requirements of G99. All infrequent short-term parallel non type-tested systems need to be witness tested however this can be at our discretion at Low Voltage.

## How do we carry out a witness test?

An ENWL Engineer will witness the customers/installers appointed commissioning engineer perform the G99 tests in accordance with the settings in section 10.6.7.2 on page 109 of G99. In addition further tests will need to be performed and witnessed such as:

- Prove the timing of the generation circuit breaker/contactors
- Dynamic loss of mains response
- Loss of control/auxiliary supply to G99 equipment response
- Maximum parallel timing test

In addition to the tests specified above you must complete appendix A3-1 the G99 document and comply with the requirements of G99 testing that relate to schematics and labelling etc.

Schematics/single line diagrams and appropriate labelling should be displayed at both the point of connection to the network (which is often the customer's main board) and the location of the installation. The schematic should be relevant to the site and not simply a typical system. If the system changes, you should inform ENWL as a further witness test may be required and you should also update the schematic diagram at the point of connection.

### **IMPORTANT: Labelling**

All of the following must be included:-

5. Dual/multi supply labels
6. The inverter and associated isolators/Miniature Circuit Breaker (MCB) clearly labelled
7. PV on roof labels (where applicable)
8. DC and AC live cable labels

All isolators should be lockable for safety when working on the generation system.