RfG

Trip to House Load

[Insert Unit Name]

[Insert Three Letter Code]

Version 0.1



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1. **Document VERSION HISTORY**

|  |
| --- |
| **Document Revsion History** |
| **Revision**  | **Date** | **Comment** | **Name** | **Company** |
| 0.1 | Xx/xx/xxxx | XX | User | User |
|  |  |  |  |  |
| 1.0 | Xx/xx/xxxx | Revised to Major version for onsite testing and signoff | User | SONI |

1. **Introduction**

The Unit must submit the latest version of this test procedure as published on the SONI website[[1]](#footnote-1).

All yellow sections must be filled in before the test procedure will be approved. All grey sections must be filled in during testing. If any test requirements or steps are unclear, or if there is an issue with meeting any requirements or carrying out any steps, please contact Generator\_Testing@soni.ltd.uk

On the day of testing, suitably qualified technical personnel are required on site to assist in undertaking the tests. The personnel shall have the ability to:

1. Set up and disconnect the control system and instrumentation as required;
2. Ability to fully understand the Unit’s function and its relationship to the System;
3. Liaise with Castlereagh House Control Centre (CHCC) as required;
4. Mitigate issues arising during the test and report on system incidents.

The availability of personnel at CHCC will be necessary in order to initiate the necessary instructions for the test. CHCC will determine:

1. If network conditions allow the testing to proceed.
2. Which tests will be carried out?
3. When the tests will be carried out.

On completion of this test, the following shall be submitted to Generator\_Testing@soni.ltd.uk

|  |  |
| --- | --- |
| **Submission** | **Timeline** |
| A scanned copy of the test procedure, as completed and signed on site on the day of testing | 1 working day |
| Test data in CSV or Excel format | 1 working day |
| Test report | 10 working days |

**Note:**

**The NI Power System is a live, dynamic, constantly changing system on which major changes or disturbances can occur without warning. All testing has the potential to impact the NI Power System and must be treated as such.**

**Prior to testing taking place SONI Control Room must be informed as soon as practically possible. SONI Control Room Staff reserve the right to suspend any testing if it may have a detrimental impact on the NI Power System and/or prevailing system conditions call for it.**

**Tests must be undertaken in accordance with this procedure however should a test in the procedure:**

* **have potential for a detrimental impact on the NI Power System,**
* **result in damage to the Generator’s and/or TO’s Plant and Apparatus,**
* **does not adequately demonstrate Generator Plant performance,**

**an equivalent test procedure or demonstration of Generating Unit capability[[2]](#footnote-2) agreed between SONI and the Generator may be undertaken to validate Grid Code compliance.**

# Abbreviations

CHCC Castlereagh House Control Centre

MEC Maximum Export Capacity

MVAr Mega Volt Ampere – reactive

MW Mega Watt

TSO Transmission System Operator

# Unit DATA

|  |  |
| --- | --- |
| Unit Test Coordinator | Unit to Specify Name, Company and contact details. |
| Unit name | Unit to Specify |
| Associated 110 kV Station | Unit to Specify |
| Unit connection point | Unit to Specify |
| Unit connection voltage (kV) | Unit to Specify |
| Unit Fuel Type:  | Primary Fuel / Secondary Fuel  |
| Registered Capacity (MW) | Unit to Specify |
| House Load (MW) | Unit to Specify |
| Contracted MEC (MW) | Unit to Specify |

# SONI Grid Code references

OC7.5.4 With regard to quick re-synchronisation capability:

(a) in case of disconnection of the **Generating Unit** from the network, the **Generating Unit** shall be capable of quick re-synchronisation in line with the protection strategy agreed between the **TSO** in corordination with the **DNO** and **Generator**;

(b) a **Generating Unit** with a minimum re-synchronisation time greater than 15 minutes after its disconnection from any external power supply must be designed to trip house load from any operating point on its **Reactive Power** capability. In this case, the identification of house load operation must not be based solely on the **TSO’s** switchgear position signals;

(c) **Generating Units** shall be capable of continuing operation for a minimum of 4 hours following tripping to house load, irrespective of any auxiliary connection to the external network.

**Glossary:**

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
| **Distribution Network Owner (DNO)** | NIE acting in its capacity as owner of the **Distribution System**. |
| **Generating Unit** | Other than in the case of **Wind Farm Power Stations**, a turbine generator within a **Power Station**, together with all **Plant** and **Apparatus** at that **Power Station** up to the high voltage bushings at the **Generator Transformer** which relate exclusively to the operation of that turbine generator (which in the case of a steam turbine will include the boiler and heat exchanger and in the case of a gas turbine will include the gas generator/combustion turbine). In the case of **Power Park Modules,** a generator within a **Power Park Module**, together with all **Plant** and **Apparatus** (including any step-up transformer) which relates exclusively to the operation of that generator. It will be either a **Synchronous Generating Unit** or a **Non-Synchronous Generating Unit**. |
| **Generator** | A **Power Station** or person who generates electricity under a **Licence** or exemption under the **Order** and who is subject to the **Grid Code** either by virtue of a **Licence** or exemption or pursuant to any agreement with the **TSO** or otherwise. |
| **Reactive Power** or **Mvar** | The product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof, i.e.: 1000 var = 1 kvar 1000 kvar = 1 Mvar |
| **Transmission System Operator (TSO)** | The holder of the **Licence** granted pursuant to Article 10(1)(b) of the **Electricity (Northern Ireland) Order 1992** to operate a **Transmission System**. |

# site Safety requirements

The following is required for the SONI witness to attend site:

|  |  |
| --- | --- |
| Personal Protective Equipment Requirements1. Site Safety boots
2. Hard Hat with chin strap
3. Hi Vis
4. Arc Resistive clothing
5. Safety Glasses
6. Gloves
 | 1. Yes / No
2. Yes / No
3. Yes / No
4. Yes / No
5. Yes / No
6. Yes / No
 |
| Site Induction requirements | Yes / No (If Yes, Unit to specify how and when the induction must carried out) |
| Any further information | Unit to specify |

# Test Descriptions and Pre Conditions

## Purpose of the Test

The purpose of this test is to demonstrate that following a full load rejection the Unit can either

1. resynchronise to the system (via the generator circuit breaker) within 15 minutes

**or**

1. trip to house load operation and resynchronise to the system (via the connection point circuit breaker) following a period of time.

This test is normally carried out in conjunction with Test – Operation of auxiliaries at high and low frequency limits. A separate test procedure and report is required for this..

This test is to be performed on primary and secondary fuels.

## Pass Criteria

1. Following a full load rejection the Unit successfully resynchronises to the system within 15 minutes.

**or**

1. The Unit successfully transitions from Full Load to House Load operation and does not trip.
	1. The Unit remains in continuous operation for four hour supplying the plant auxiliaries whilst disconnected from the Grid.
	2. The unit must be capable of resynchronising without any activation of electrical or mechanical protection during the test.

**and**

1. All unit parameters (bearing vibration and temperature limits) must remain within limits.

## Instrumentation and Onsite Data Trending

All of the following trends and screenshots must be recorded by the Unit during the test. Failure to provide any of these trends will result in test cancellation.

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Data Trending and Recording** | **Resolution** | **Source** |
| 1 | Active power at Connection (MW) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 2 | Reactive power at Connection point (MW) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 3 | Active Power at Generator Terminals (MW) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 4 | Reactive Power at Generator Terminals (Mvar) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 5 | Generator Voltage (kV) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 6 | Turbine Speed (RPM) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 7 | Transformer Tap position | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 8 | Generator Field Voltage | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 9 | Generator Field Current | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 10 | Stator temperatures  | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 11 | Rotor Temperature  | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 12 | Turbine / Generator Vibration | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 13 | System Voltage  | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 14 | System Frequency | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 15 | Ambient Conditions:1. Temperature (ºC)
2. Pressure (mbar)
3. Humidity (%)
 | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 16 | Other signals as required by the unit or by Generator\_Testing@soni.ltd.uk | Unit to specify | Unit to specify |
| 17 | Alarm/Event page | Screenshot events for duration of the test.  |
| 18 | Screen Shots: 1. Generator Overview
2. Generator Electrical process
3. GT process
4. Generator temperature process
5. Electrical operation
 | Screenshots where information is not available through the trends above |
| 19 | EDIL instructions | Screenshot as logged during the test. |

## Initial Conditions

Should “No” be answered to any of the following, contact SONI Test Coordinator and agree next steps in advance of making any corrective actions.

|  |  |  |
| --- | --- | --- |
| **No.** | **Conditions** | **Check on day of test** |
| 1 | Test Profiles have been submitted and approved by neartime@soni.ltd.uk. | Yes/No |
| 2 | Unit Fuel Type: Primary Fuel / Secondary Fuel . | Yes/No |
| 3 | Frequency Response mode On | Yes/No |
| 4 | Excitation system in AVR mode | Yes/No |
| 5 | Unit is operating at full load in agreement with CHCC for **1 hour** before test or as required by the unit  | Yes/No |
| 6 | Normal start up support auxiliary systems are in service. | Yes/No |
| 7 | Required signals, as described in section 8.3 are available. | Yes/No |

# Test Steps

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Action** | **Time** | **Comment** |
| 1 | Unit begins data recording for all trends noted in Section 7.3. |  |  |
| 2 | Unit requests permission from CHCC to proceed and requests dispatch Instruction via EDIL to initiate the load rejection. |  |  |
| 3 | Whilst on the phone to CHCC, following a countdown, Unit disconnects from the Grid by opening High Voltage Circuit Breaker at XXXXXX substation |  | Circuit Breaker Identifier:\_\_\_\_\_\_ |
| 4 | Verify the Unit has stabilised at house load. |  |  |
| 5 | Maintain stable operation at house load for a period of at least 240 **minutes**. |  | Start time: \_\_\_\_\_\_. End time; \_\_\_\_\_\_\_.  |
| 6 | Unit requests permission from CHCC to synchronise (“HV circuit breaker close control to IPP signal” required) and requests dispatch Instruction via EDIL to minimum load. |  |  |
| 7 | Synchronise the Unit and load to minimum load. |  | Time to Synchronise: \_\_\_\_\_ minutes. Time from Synchronisation to Minimum load: \_\_\_\_\_.minutes. |
| 8 | Unit ends data recording. |  |  |
| 9 | Unit informs CHCC that test is complete. |  |  |

|  |
| --- |
| **Comments:**  |
| Unit Witness signoff that this test has been carried out according to the test procedure above.Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date / Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| SONI Witness signoff that this test has been carried out according to the test procedure above.Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date / Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. https://www.soni.ltd.uk/how-the-grid-works/grid-codes/ [↑](#footnote-ref-1)
2. For example simulation of the Generator performance characteristics under the test procedure [↑](#footnote-ref-2)