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| --- |
| Template change control details |
| Version | Date | Changes |
| 0.1 | 05/06/2014 | First Draft for industry comment |

**Test 52 Test Procedure**

**Full Load Rejection followed by island mode operation**

**[Insert Unit Name] Unit (XX1)**



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# Document Revision History

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| --- | --- | --- | --- | --- |
| **Version** | **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 |  | EirGrid |

1. **Introduction**

The Unit must submit the latest version of this test procedure as published on the EirGrid or 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@eirgrid.com.

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 NCC/CHCC as required;
4. Mitigate issues arising during the test and report on system incidents.

The availability of personnel at NCC/CHCC will be necessary in order to initiate the necessary instructions for the test. NCC/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@eirgrid.com:

|  |  |
| --- | --- |
| **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 |

# Abbreviations

NCC National Control Centre

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 |
| Unit connection point | Unit to Specify |
| Unit connection voltage (kV) | Unit to Specify |
| Unit Fuel Type:  | Primary Fuel / Secondary Fuel, Gas / Distillate. |
| Registered Capacity (MW) | Unit to Specify |
| House Load (MW) | Unit to Specify |
| Contracted MEC (MW) | Unit to Specify |
| Installed Plant  | Unit to Specify |

# Eirgrid Grid Code references

|  |  |
| --- | --- |
| Grid Code Version:  | Unit to specify |

CC.7.3.2 Where start-up time of Generation Units exceeds thirty minutes, they shall be designed to have the capability, where supply from the Transmission System is lost, to reduce output to match house load and sustain operation (i.e. tripping to Auxiliaries).

CC.7.3.3 **Control Synchronising** shall be provided by **Generators** at circuit breakers identified by the **TSO**, which, depending on the **Plant** configuration may include:

(a) the **Generation Unit** circuit breaker;

(b) the **Generator Transformer LV** and **HV** circuit breakers;

The **TSO** will provide to the **Generator** signals from the **TSO** operated **Plant** and **Apparatus** as are required to facilitate synchronising on the **Generator Transformer HV** circuit breaker, in accordance with the relevant provisions of the **Connection Agreement**.

**Glossary:**

|  |  |
| --- | --- |
| **Auxiliaries**  | Any item of **Plant** and/or **Apparatus** not directly a part of the boiler plant or **Generating Unit**, but required for the boiler plant's or **Generating Unit's** functional operation. 'Auxiliary' shall be defined accordingly.  |
| **Auxiliary Load**  | The electrical **Demand** of the **Generation Unit’s Auxiliary Plant** required for the operation of the **Generation Unit**.  |
| **Auxiliary Plant**  | Any item of **Plant** and/or **Apparatus** not directly a part of the boiler plant or **Generation Unit**, but required for the boiler plant's or **Generation Unit's** functional operation.  |
| **Frequency**  | The number of alternating current cycles per second (expressed in Hertz) at which a **System** is running.  |
| **System**  | Any **User System** and/or the **Transmission System** as the case may be.  |
| **Transmission System**  | The **System** consisting (wholly or mainly) of high **Voltage** electric lines and cables operated by the **TSO** for the purposes of transmission of electricity from one **Power Station** to a sub-station or to another **Power Station** or between sub-stations or to or from any **External Interconnection** including any **Plant** and **Apparatus** and meters owned or operated by the **TSO** or **TAO** in connection with the transmission of electricity.  |

# SONI Grid Code references

|  |  |
| --- | --- |
| Grid Code Version:  | Unit to specify |

CC.S1.1.5.2 Where a **Generating Unit** or **Power Station** becomes isolated from the rest of the **Transmission System** but is still supplying **Customers**, the speed governor must also be able to contribute to controlling **NI System** **Frequency** to below 52 Hz. As stated in CC5.3.2, the **NI System Frequency** could rise to 52 Hz or fall to 47 Hz.

**Glossary:**

|  |  |
| --- | --- |
| **Customer** | A person to whom electrical power is provided (whether or not he is the same person as the person who provides the electrical power). |
| **NI System** | Together, the **Transmission System** and the **Distribution System.** |
| **Distribution System** | The electric lines within the Authorised Area, as defined in the licence held by the **DNO**, owned by the **Distribution Licensee** (but not, for the avoidance of doubt, any lines forming part of the transmission system or any **Interconnector**), and any other electric lines which the **Authority** may specify as forming part of the distribution system, together with (in each case) any **Plant** and **Apparatus** and/or meters owned or operated by the **DNO** used in connection with the distribution of electricity. |
| **Transmission System** | The **System** consisting (wholly or mainly) of high voltage electric lines and cables operated by the **TSO** for the purposes of transmission of electricity from one **Power Station** to a sub-station or to another **Power Station** or between sub-stations or to or from any **Interconnector** including any **Plant** and **Apparatus** and meters owned or operated by the **TSO** or **TO** in connection |

# site Safety requirements

The following is required for the EirGrid/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
7. Safe Pass
 | 1. Yes / No
2. Yes / No
3. Yes / No
4. Yes / No
5. Yes / No
6. Yes / No
7. 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 30 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 62 – Operation of auxiliaries at high and low frequency limits. A separate test procedure and report is required for Test 62.

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 30 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 one 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@eirgrid.com. | 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 EirGrid/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@eirgrid.com. | Yes/No |
| 2 | Unit Fuel Type: Primary Fuel / Secondary Fuel, Gas / Distillate.Interconnector operation direction: Import / Export.Delete references to Interconnector or Generator as appropriate. | 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 NCC 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 8.3. |  |  |
| 2 | Unit requests permission from NCC/CHCC to proceed and requests dispatch Instruction via EDIL to initiate the load rejection. |  |  |
| 3 | Whilst on the phone to NCC/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 **60 minutes**. |  | Start time: \_\_\_\_\_\_. End time; \_\_\_\_\_\_\_.  |
| 6 | Unit requests permission from NCC/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 NCC/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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| EirGrid/SONI Witness signoff that this test has been carried out according to the test procedure above.Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date / Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. <http://www.eirgrid.com/operations/gridcode/compliancetesting/cdgutestprocedures/#d.en.17699> [↑](#footnote-ref-1)