

Rate of Change of Frequency Test Procedure

[unit name]

Version 1.1

1. **Document Revision History**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Comment** | **Name** | **Company** |
| 1.0 | 10/11/2016 | Revised to Major version for onsite testing and signoff |  | EirGrid |
| 1.1 | 02/03/2017 | NI test sequence revised to minimise ramping between load setpoints from one test to the next. NI signals list revised. |  | SONI |

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# Introduction

This procedure is developed for existing units completing RoCoF testing.

The Unit must submit the latest version of this test procedure as published on the EirGrid or SONI website[[1]](#footnote-1) 2.

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 or generation-outages@soni.ltd.uk, as appropriate:

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

CHCC Castlereagh House Control Centre

NCC National Control Centre

Mvar Mega Volt Ampere – reactive

MW Mega Watt

TSO Transmission System Operator

MEC Maximum Export Capacity

RPM Revolutions Per Minute

kV kilovolt

EDIL Electronic Dispatch Instruction Logger

POR Primary Operating Reserve

SOR Secondary Operating Reserve

TOR Tertiary Operating Reserve

ROCOF Rate of Change of Frequency

# Unit DATA

|  |  |
| --- | --- |
| Unit Test Coordinator | Unit to Specify |
| Unit name | Unit to Specify |
| Unit connection point | Unit to Specify |
| Unit connection voltage | Unit to Specify |
| Unit Fuel Type  | Primary Fuel / Secondary Fuel, Gas / Distillate. |
| Registered Capacity | Unit to Specify |
| Contracted MEC | Unit to Specify |
| Installed Plant | Unit to Specify |
| House Load (estimated) | Unit to Specify |
| Governor Droop Setting (expected) | Unit to Specify |

|  |  |
| --- | --- |
| % of Registered Capacity | MW |
| 25% | Unit to specify |

# Eirgrid Grid Code references

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

## Governor:

CC.7.3.7

Each **Generation Unit** must be fitted with a fast acting proportional turbine speed governor and unit load controller or equivalent control device to provide **Frequency** response under normal operating conditions in accordance with OC4. The governor must be designed and operated to the appropriate

(a) European Standards; or

(b) In the absence of a relevant European Standards, such other standard which is in common use within the European Union

as at the time when the installation of which it forms a part was designed. Normal governor regulation shall be between 3% and 5%.

## Rate of Change of Frequency

### Rate of Change of Frequency (existing Grid Code)

CC.7.3.1 The conditions specified in this section of the code apply to all **Generation Units** connected to or connecting to the **Transmission System**. Unless explicitly stated all conditions specified apply over the full operating capabilities of the **Generation Unit** at the **Connection Point**.

(d) remain synchronised to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second;

CC.7.3.7 Each **Generation Unit** must be fitted with a fast acting proportional turbine speed governor and unit load controller or equivalent control device to provide **Frequency** response under normal operating conditions in accordance with OC4. The governor must be designed and operated to the appropriate

(a) European Standards; or

(b) In the absence of a relevant European Standards, such other standard which is in common use within the European Union

as at the time when the installation of which it forms a part was designed. Normal governor regulation shall be between 3% and 5%.

### CER Decision Paper (14081)[[2]](#footnote-2)

*Section 3.3*

*5. New units: new units will be required to declare compliance (*with the 1 Hz per second ROCOF measured over 500 ms) *during the commissioning process.*

## Grid Code Definitions

**Governor Droop**

The percentage drop in the **Frequency** that would cause the **Generation Unit** under free governor action to change its output from zero to its full **Capacity**. In the case of a **Controllable WFPS**, it is the percentage drop in the **Frequency** that would cause the **Controllable WFPS** to increase its output from zero to its full **Registered Capacity**

**Registered Capacity**

The maximum **Capacity**, expressed in whole MW, that a **Generation Unit** can deliver on a sustained basis, without accelerated loss of equipment life, at the **Connection Point** which is under the dispatch (or control of a **Controllable WFPS**) of the **TSO**. This shall be the value at 10°C, 70 % relative humidity and 1013 hPa. The values of an **Interconnector’s Operating Characteristics** for operation of the **Interconnector** pursuant to the **Grid Code** registered under the **Connection Conditions**.

## Calculation of MW response and Governor Droop

$$ΔMW=\frac{\left(Δf\right)\left(Registered Capacity\right)}{\left(f\_{n} \right)\left(droop\right)}$$

ΔMW=Expected MW

Δf = frequency change in Hz

Registered Capacity = XXX MW (expected value)

Fn = 50 Hz

Droop = 0.04 (expected value)

# SONI Grid Code references

## Rate of Change of Frequency

### Rate of Change of Frequency (existing Grid Code)

CC8.8.3 Variations in **System Frequency**

The **DNO** shall provide in the **Distribution Code** that, apart from those circumstances set out in CC8.8.4, all **Independent Generating Plant** connected to the **Distribution** **System** with an **Output** of 100 kW or more shall stay connected and operate:

(a) continuously where the **System Frequency** varies within the range 49.5 to 52.0 Hz;

(b) for a period of up to one hour where the **System Frequency** varies within the range 48.0 to 49.5 Hz; and

(c) for a period of up to 5 minutes where the **System Frequency** varies within the range 47.0 to 48.0 Hz.

The **DNO** shall notify the **TSO** if an **Independent Generating Plant** above 100KW does not operate within the parameters set out above and, if required by the **TSO,** shall use reasonable endeavours to enforce the **Distribution Code** obligations on the **Independent Generating Plant**.

CC8.8.4 The requirements of CC8.8.3 do not apply where:

(a) the islanding protection has operated correctly, consistent with the settings agreed with the **DNO**;

(b) the **System Frequency** has changed at a rate greater than 0.5HZ/s; or

(c) there is manual intervention by the **Generator**.

### Proposed Modification (Regulatory approved with phased implementation)

CC5.3.2 In exceptional circumstances, **System Frequency** will rise to 52 Hz or fall to 47 Hz but sustained operation outside the range specified in the Electricity Supply Regulations (N.I.) 1991(as amended, updated or superseded) is not envisaged. **Users** should take these factors into account in the design of **Plant** and **Apparatus**.

CC5.3.3 In exceptional circumstances, **System Frequency** will vary causing a considerable **Rate of Change of Frequency**. Under such conditions, **Users** must ensure that their **Plant** and **Apparatus** remains **synchronised** to the **NI System** for a **Rate of Change** **of Frequency** up to and including 1 Hz per second as measured over a rolling 500 milliseconds period within the frequency range mentioned in CC5.3.2.

# 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
2. Yes
3. Yes
4. Yes
5. Yes
6. No
7. No
 |
| Site Induction requirements | Unit to Specify |
| Any further information | Unit to specify |

# Test Description and Pre Conditions

## Purpose

This purpose of this test is to verify that the governor reacts in a correct manner to a simulated ROCOF event.

This is achieved by injecting a simulated frequency into the governor and recording the Units response.

It is recommended that the governor is isolated from the system frequency in order to perform this test so that the natural variation in system frequency will not be a factor in the Units measured response. In order to accurately determine 100% of output the unit will run at base load for a period of time before the frequency injections begin.

This test is to be performed separately on each fuel or fuel mix that the Unit is capable of running on.

# Pass Criteria

## Ireland

The Unit must demonstrate for the following test cases that:

* The governor reacts in a correct manner to a simulated ROCOF event.
* The governor decrement rate is correctly implemented.
* The governor is continuously acting and responds with the required droop characteristic.
* The generator withstands large frequency disturbances, and high rates of change of frequency, without tripping.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Load Level** | **Frequency Injection****(for 22 min)** | **Estimated response with a 4 % droop** | **Hold Step for a minimum of** |
| 1 | Min load | -0.5Hz(ramp of 1Hz/sec) | +25% | 10 minutes |
| 2 | Min load | 0.5Hz(ramp of 1Hz/sec) | TBC | 10 minutes |
| 3 | 75% | -0.5Hz(ramp of 1Hz/sec) | +25% | 10 minutes |
| 4 | 75% | +0.5Hz(ramp of 1Hz/sec) | -25% | 10 minutes |
| 5 | 90% | -0.5Hz(ramp of 1Hz/sec) | +10% | 10 minutes |
| 6 | 100% | +0.5Hz(ramp of 1Hz/sec) | -25% | 10 minutes |

## Northern Ireland

**Criteria of Assessment:**

* The governor reacts in a correct manner to a simulated ROCOF event.
* The governor decrement rate is correctly implemented.
* The governor is continuously acting and responds with the required droop characteristic.
* The generator withstands large frequency disturbances, and high rates of change of frequency, without tripping.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Load Level** | **Frequency Injection** | **Estimated response with a 4 % droop** | **Hold Step for up to**  |
| 1 | 100% | -0.5Hz(ramp of 1Hz/sec) | 0% | 10 minutes |
| 2 | 100% | +0.5Hz(ramp of 1Hz/sec) | -25% | 10 minutes |
| 3 | 75% | +0.5Hz(ramp of 1Hz/sec) | -25% | 10 minutes |
| 4 | Min load | +0.5Hz(ramp of 1Hz/sec) | TBC | 10 minutes |
| 5 | Min load | -0.5Hz(ramp of 1Hz/sec) | +25% | 10 minutes |
| 6 | 75% | -0.5Hz(ramp of 1Hz/sec) | +25% | 10 minutes |
| 7 | 75% | -0.5Hz(ramp of 1Hz/sec)Hold for 1sec+1Hz(ramp of 1Hz/sec) | +25%-50% | 10 minutes |
| 8 | 75% | +0.5Hz(ramp of 1Hz/sec)Hold for 1sec-1Hz(ramp of 1Hz/sec) | -25%+50% | 10 minutes |

# Instrumentation and Onsite Data Trending

## Ireland requirements

## 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.** | **Signal Name** | **Sample Rate** | **Source** |
| 1 | Active Power at Connection Point (MW)  | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 2 | Reactive Power at Connection Point (Mvar) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 3 | Active Power at Generator (MW) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 4 | Reactive Power at Generator (Mvar) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 5 | Generator Circuit Breaker position (Open / Closed) | Unit to specify,  | Unit to specify |
| 6 | Generator Voltage (kV) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 7 | Turbine Speed (RPM) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 8 | Shaft Vibration (*µ*mp-p) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 9 | Blade Path Temperature (°C) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 10 | Bearing Metal Temperature (°C) | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 11 | Process variables e.g. Inlet Guide Vane position, Fuel Control Valve position etc. | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 12 | Other signals as required by the unit or by the TSO | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 13 | Alarm/Event page | Screenshot of alarms / events for duration of the test. |
| 14 | Generator Overview Screen | Screenshots may be required where test data/milestone/event is not available through the trends listed above. |
| 15 | EDIL instructions  | Screenshot as logged during the test. |

## Northern Ireland requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Signal Name** | **Sample Rate** | **Source** |
| 1 | Active Power at Connection Point (MW)  | Unit to Specify | Unit to Specify |
| 2 | Reactive Power at Connection Point (Mvar) | Unit to Specify | Unit to Specify |
| 3 | Active Power at Generator (MW) | Unit to Specify | Unit to Specify |
| 4 | Reactive Power at Generator (Mvar) | Unit to Specify | Unit to Specify |
| 5 | Stators currents (A) | Unit to Specify | Unit to Specify |
| 6 | Stator voltage (kV) | Unit to Specify | Unit to Specify |
| 7 | Excitation current (A) | Unit to Specify | Unit to Specify |
| 8 | Excitation voltage (V) | Unit to Specify | Unit to Specify |
| 9 | Turbine Speed (Hz) | Unit to Specify | Unit to Specify |
| 10 | PSS output (if applicable) | Unit to Specify | Unit to Specify |
| 11 | Exhaust temperature (0C) (if applicable) | Unit to Specify | Unit to Specify |
| 12 | Gas control valve position (%) (if applicable) | Unit to Specify | Unit to Specify |
| 13 | IGV angle (%) | Unit to Specify | Unit to Specify |
| 14 | Other signals as required by the unit or by the TSO | Unit to Specify | Unit to Specify |
| 15 | Alarm/Event page | Screenshot of alarms / events for duration of the test. |
| 16 | Generator Overview Screen | Screenshots may be required where test data/milestone/event is not available through the trends listed above. |
| 17 | EDIL instructions  | Screenshot as logged during the test. |

## Initial Conditions

Should “No” be answered to any of the following, contact the EirGrid 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 TSO Near Time |  |
| 2 | Unit Fuel Type: Primary Fuel / Secondary Fuel,. | Gas / Distillate / Coal / Oil  |
| 3 | Normal start up support auxiliary systems in service. |  |
| 4 | Required signals, as described in section 10 are available |  |

# Test Steps

The following test steps shall be ordered sequentially, to align with the agreed test profiles.

## Ireland

### Min load -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and requests the following: 1. Confirmation of Minimum Load of **XX MW**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | Minimum Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1Hz per second** and maintain the frequency injection for a minimum of **10 minutes** and note the completion time. |  | Completion time (t+10mins): \_\_\_\_. |
| 4 | Generator Test coordinator contacts NCC and request to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Test completed |  |  |

### Min load +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and requests the following: 1. Confirmation of Minimum Load of **XX MW**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | Minimum Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5Hz at a rate of 1Hz per second** and maintain the frequency injection for a minimum of **10 minutes** and note the completion time. |  | Completion time (t+10mins): \_\_\_\_. |
| 4 | Generator Test coordinator contacts NCC and1. requests to remove the frequency simulation to allow the unit return its pre injection load under governor action
2. Agree and coordinates details for next MW dispatch
 |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Test completed |  |  |

### 75% -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and requests the following: 1. Confirmation of **XX MW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5 Hz at a rate of 1 Hz per second** and maintain the frequency injection for a minimum of **10 minutes** |  | Completion time (t+10mins): \_\_\_\_ |
| 4 | Generator Test coordinator contacts NCC and request to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Step completed |  |  |

### 75% +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and requests the following: 1. Confirmation of **XX MW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5 Hz at a rate of 1 Hz per second** and maintain the frequency injection for a minimum of **10 minutes** |  | Completion time (t+10mins): \_\_\_\_ |
| 4 | Generator Test coordinator contacts NCC and1. requests to remove the frequency simulation to allow the unit return its pre injection load under governor action
2. Agree and coordinates details for next MW dispatch
 |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Step completed |  |  |

### 90% -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and requests the following: 1. Confirmation of **XX MW (90%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 90% Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for a minimum of **10 minutes** |  | Completion time (t+10mins): \_\_\_\_ |
| 4 | Generator Test coordinator contacts NCC and1. requests to remove the frequency simulation to allow the unit return its pre injection load under governor action
2. Agree and coordinates details for next MW dispatch
 |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Step completed |  |  |

### 100% +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts NCC and confirms the MW swing that will occur during the frequency injection |  | 100% Load: \_\_\_MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for a minimum of **10 minutes** |  | Completion time (t+10mins): \_\_\_\_ |
| 4 | Remove the frequency simulation and allow the unit to return its pre injection load under governor action |  |  |
| 5 | Stop data recording (as applicable) |  |  |
| 6 | Step completed |  |  |

## Northern Ireland

### Verification of Base Load. PSS to be switched on if required for testing.

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Request CHCC permission to1. Turn frequency response off
2. Turn PSS on if required
3. Issue an EDIL Dispatch Instruction to bring the unit to full output
 |  |  |
| 2 | Begin data recording of signals as set out in section 10 |  |  |
| 3 | When the Unit reaches full load record the Active Power Output at the connection point and maintain this output until the Unit has stabilised |  | Stable Full Load level  |
| 4 | Record the sustained Active Power Output level. This will constitute 100% of load for calculation of all but the minimum load test points to follow |  |  |
| 5 | Request CHCC permission to turn Frequency Response on  |  |  |

### 100% -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and confirms the MW swing that will occur during the frequency injection |  | 100% GT Load: MW |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action  |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

### 100% +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step**  | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and confirms the MW swing that will occur during the frequency injection  |  | 100% Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes**  |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action  |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

### 75% +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring the unit to **XX MW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% GT Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

### Min Load +0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring the unit to Minimum Load of **XX MW**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | GT Minimum Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes** |  | Start time \_\_\_\_Completion time \_\_\_\_ |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop data recording |  |  |
| 6 | Test completed |  |  |

### Min Load -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring the unit to Minimum Load of **XXMW**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | GT Minimum Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop data recording |  |  |
| 6 | Test completed |  |  |

### 75% -0.5 Hz Ramp at 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring the unit to **XXMW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% GT Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5Hz at a rate of 1 Hz per second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts NCC and1. requests to remove the frequency simulation to allow the unit return its pre injection load under governor action
2. Agree and coordinates details for next MW dispatch
 |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

### 75% -0.5 Hz ramp at 1 Hz/Second hold for 1 second +1 Hz ramp of 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring C30 to **XX MW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% GT Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of -0.5 Hz Ramp at 1 Hz/Second, hold for 1 second then +1 Hz ramp of 1 Hz/Second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

### 75% +0.5 Hz ramp at 1 Hz/Second hold for 1 second -1 Hz ramp of 1 Hz/Second

|  |  |  |  |
| --- | --- | --- | --- |
| **Step** | **Action** | **Event Time** | **Comment** |
| 1 | Generator control room contacts CHCC and requests the following: 1. Issue an EDIL Dispatch Instruction to bring C30 to **XX MW (75%)**
2. Confirmation of the MW swing that will occur during the frequency injection
 |  | 75% GT Load:  |
| 2 | Confirm data recording of signals as set out in section 10 |  |  |
| 3 | Inject **Ramp change of +0.5 Hz Ramp at 1 Hz/Second, hold for 1 second then -1 Hz ramp of 1 Hz/Second** and maintain the frequency injection for up to **10 minutes** |  | Start time Completion time  |
| 4 | Generator Test coordinator contacts CHCC and requests to remove the frequency simulation to allow the unit return its pre injection load under governor action |  |  |
| 5 | Stop recording |  |  |
| 6 | Step completed |  |  |

|  |
| --- |
| **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>

2 <http://www.soni.ltd.uk/media/documents/RoCoF%20Test%20Report%20Workbook.xlsx> [↑](#footnote-ref-1)
2. <http://www.cer.ie/docs/000260/CER14081%20ROCOF%20Decision%20Paper%20-%20FINAL%20FOR%20PUBLICATION.pdf> [↑](#footnote-ref-2)