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

**Test 50 Test Procedure**

**Demonstration of Minimum Load / Generation**

**[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).

Minimum load testing can be carried out at the same time as start-up tests for Cold, Warm, Hot states. A separate test procedure shall be agreed for a start-up test.

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

HV High Voltage

MEC Maximum Export Capacity

MVAr Mega Volt Ampere – reactive

MW Mega Watt

MCR Maximum Continuous Rating / Registered Capacity

TSO Transmission System Operator

EDIL Electronic Dispatch Instruction Logger

RPM Revolutions per minute

# 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 | Unit to Specify |
| Unit Fuel Type:  | Primary Fuel / Secondary Fuel, Gas / Distillate. |
| Registered Capacity / Maximum Continuous Rating | Unit to Specify |
| Contracted MEC | Unit to Specify |
| Installed Plant | Unit to Specify |
| 50% of Registered Capacity35% of Registered Capacity40% of Maximum Continuous RatingSelect and delete other % calculations as appropriate. | Unit to Specify |
| Minimum Load | Unit to Specify |
| Minimum Generation | Unit to Specify |

**Emission Limit details**

|  |  |  |  |
| --- | --- | --- | --- |
| **Description** | **Min Value** | **Max Value** | **Licence Limit** |
| CO2 | XX mg/m3 | xxx mg/m3 | As applicable |
| O2 | XX % | xxx % | As applicable |
| CO | xxx mg/m3 | xxx mg/m3 | As applicable |
| SO2 | xxx mg/m3 | xxx mg/m3 | xxxx mg/m3 |
| NOx | xxxx mg/m3 | xxxx mg/m3 | xxxx mg/m3 |

# Eirgrid Grid Code references

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

CC7.3.1.1Each **Generation Unit,** shall, as a minimum, have the following capabilities:

(k) **Minimum Load** not greater than 50% of **Registered Capacity** for **CCGT Installations** and not greater than 35% of **Registered Capacity** for all other **Generation Units.** For **CCGT Installations** whilst operating in **Open Cycle Mode** as a result of combined cycle plant capability being unavailable, the **Minimum Load** of each **Combustion Turbine Unit** must be not greater than 35% of the **Registered Capacity** divided by the number of **Combustion Turbine Units**.

CC7.5.1.1Each **Interconnector,** shall have the following minimum capabilities, for the avoidance of doubt, additional performance capabilities are required from **OC4-System Services**:

(l) **Interconnector Minimum Load** not greater than the lesser of 3% of the **Interconnector Registered Capacity** or 50 **MW**

**Glossary:**

|  |  |
| --- | --- |
| **Minimum Load**  | Minimum **MW Output** a **Generator** can maintain on a continuous basis, whilst providing **System Services**.  |
| **Minimum Generation** | The minimum **MW Output** which a **Generating Unit** can generate continuously, registered with the **TSO** under SDC1 as a **Technical Parameter.**  |
| **Interconnector Minimum Import Load** | Minimum **MW** output an **Interconnector** can import continuously from a remote network while maintaining stability.  |
| **Interconnector Minimum Export Load** | Minimum **MW** output an **Interconnector** can export continuously to a remote network while maintaining stability.  |
| **Interconnector Minimum Load** | Absolute sum of the **Interconnector Minimum Export Load** and **Interconnector Minimum Import Load** representing the minimum range of bi-directional power transfer.  |
| **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 10ºC, 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.** |
| **Capacity** | The rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment. |

Delete references to Interconnector or Generator as appropriate.

# SONI Grid Code references

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

CC.S1.1.3.6 A Generating Unit must be capable of remaining Synchronised to the NI System at an Output which is no greater than the lower of 80 MW or 40% of maximum continuous rating.

**Glossary:**

|  |  |
| --- | --- |
| **Minimum Generation** | The minimum **MW Output** which a **Generating Unit** can generate continuously, registered with the **TSO** under SDC1 as a **Technical Parameter.**  |
| **Registered Capacity** | The normal **Full Load** capacity of a **Generating Unit** in **MW** measured as at the **Connection Point** and in relation to a **Wind Farm Power Station,** the normal **Full Load** capacity of the collection ofone or more wind turbines, each being a **Generating Unit,** in **MW** measured as at the **Connection Point** of the **Wind Farm Power Station.** |

# site Safety requirements

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

|  |  |
| --- | --- |
| Personal Protective Equipment Requirements:1. 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 Description and Pre Conditions

## Purpose

The purpose of this test is to determine the minimum MW output which the Unit can produce on a sustained basis. Sustained is the absolute maximum value achieved over the duration of the test.

## Pass Criteria

1. The unit operates at Minimum Load/Generation in accordance with normal operating conditions for a period of **[insert no of hours as agreed with TSO**] hours.
2. During operation at Minimum Load/Generation, the unit will maintain stable operation within the emissions, vibration and oil temperature limits.

**Ireland**

1. The sustained value is not greater than 50% of Registered Capacity for CCGT Installations and not greater than 35% of Registered Capacity for all other Generation Units.
2. The Sustained value is not greater than the lesser of 3% of the Interconnector Registered Capacity or 50 MW

Select 50% or 35% and delete references to Interconnector as appropriate.

**Northern Ireland**

1. Output which is no greater than the lower of 80 MW or 40% of maximum continuous rating.

Delete references to Ireland or Northern Ireland as appropriate.

## 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 | Generator Transformer Tap setting | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 8 | System Voltage  | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 9 | System Frequency | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 10 | Ambient Conditions:1. Temperature (ºC)
2. Pressure (mbar)
3. Humidity (%)
 | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 11 | Emissions Measurements:1. NOX (mg/Nm3)
2. SO2 (mg/Nm3)
3. CO2 (%)
4. O2 (mg/m3)
5. CO (mg/m3)
 | Unit to specify, 100ms or as agreed with TSO | Unit to specify |
| 12 | Other signals as required by the unit or by generator\_testing@eirgrid.com. | Unit to specify | Unit to specify |
| 13 | Alarm/Event page | Print out alarms / events for duration of the test.  |
| 14 | Generator Overview Screen | Print out at appropriate milestones during the test i.e. Before, during at regular intervals and after test from generator overview page on DCS |
| 15 | EDIL instructions | Print out as logged during the test. |

##  Initial Conditions and Calculations

Should “No” be answered to any of the following, contact generator\_testing@eirgrid.com 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 | Correction curves (Temperature, humidity, atmospheric pressure) have been provided to generator\_testing@eirgrid.com. | Yes/No |
| 4 | Frequency Response mode On / Off. | Yes/No |
| 5 | Unit is on load and stable in agreement with NCC/CHCC. | Yes/No |
| 6 | Normal start up support auxiliary systems are aligned and in service. | Yes/No |
| 7 | Required signals, as described in section 8.3 are available. | Yes/No |

|  |  |  |
| --- | --- | --- |
| **No.** | **Calculation** | **Calculated on day of test** |
| 1 | Declared availability on day of test. | \_\_\_MW |
| 2 | Corrected Registered Capacity. | \_\_\_MW |
| 3 | Corrected Minimum load. | \_\_\_MW |

# Test Steps

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Action** | **Time** | **Comment** |
| 1 | Unit operator begins data recording for all trends noted in Section 8.3. |  |  |
| 2 | Unit operator contacts NCC/CHCC and requests permission to begin test and a dispatch instruction to **Minimum Load** via EDIL. |  |  |
| 3 | Unit operator receives EDIL instruction and dispatches the Unit with a ramp rate at **XX MW** **per minute.** |  |  |
| 4 | After reaching minimum load and following a period of **XX minutes** where the unit has stabilised, the Unit operator records the Minimum load value. |  | Minimum Load \_\_\_\_\_MW.Corrected Minimum Load: \_\_\_\_MW. |
| 5 | The Unit Operator monitors that the unit remains at Minimum Load for a minimum of [insert no of hours as agreed with TSO] hours. |  |  |
| 6 | **XX minutes** after Minimum Load was achieved the Unit Operator records the maximum value sustained over this period. This is recorded as the Minimum Load. |  | Minimum Load \_\_\_\_\_MW.Corrected Minimum Load: \_\_\_\_MW. |
| 7 | **XX minutes** after Minimum Load was achieved the Unit Operator records the maximum value sustained over this period. This is recorded as the Minimum Load. |  | Minimum Load \_\_\_\_\_MW.Corrected Minimum Load: \_\_\_\_MW. |
| 8 | **XX minutes** after Minimum Load was achieved the Unit Operator records the maximum value sustained over this period. This is recorded as the Minimum Load. |  | Minimum Load \_\_\_\_\_MW.Corrected Minimum Load: \_\_\_\_MW. |
| 9 | **XX minutes** after Minimum Load was achieved the Unit Operator records the maximum value sustained over this period. This is recorded as the Minimum Load. |  | Minimum Load \_\_\_\_\_MW.Corrected Minimum Load: \_\_\_\_MW.. |
| 10 | Following **XX hours**, the Unit operator contacts NCC/CHCC and notifies them that the specified time period has completed.  |  |  |
| 11 | Unit operator follows NCC/CHCC instruction for **30 minutes** following time period at Minimum Load (Instruction may be Shutdown, Ramp up or maintain output). |  | Instruction from NCC/CHCC\_\_\_\_\_\_\_\_\_\_\_ |
| 12 | Unit operator ends data recording for all trends noted in Section 8.3. |  |  |

|  |
| --- |
| **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)