

WFPS Site Survey Procedure

[Insert Windfarm Name]

Version 0.1

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# Document Version History

EirGrid template version 0.4, published 5th March 2019.

|  |
| --- |
| **Document Version History** |
| **Version** | **Date** | **Comment** |
| 0.1 | dd/mm/yyyy | First submission for review/approval |
|  |  |  |
|  |  |  |

# Introduction

**WFPS shall highlight any changes made to this document or approval will be void.**

The WFPS shall submit the latest version of this test procedure as published on the EirGrid website[[1]](#footnote-1).

All yellow sections shall be filled in before the test procedure shall be approved. All grey sections shall 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 shall be needed at the wind farm to demonstrate all the requirements in section 8.2.

All wind turbines shall be constructed. There is no required wind capacity for this test.

# Abbreviations

AAP Available Active Power

APC Active Power Control

DMOL Designed Minimum Operating Level

HV High Voltage

MEC Maximum Export Capacity

MW Mega Watt

NCC National Control Centre

PPM Power Park Module

SLD Single Line Diagram

TSO Transmission System Operator

WFCS Wind Farm Control System

WFPS Wind Farm Power Station

WTG Wind Turbine Generator

# WFPS Data

|  |  |
| --- | --- |
| WFPS Name | WFPS to Specify (name per connection agreement) |
| WFPS Site Contact | WFPS to Specify  |
| WFPS Location | WFPS to Specify  |
| WFPS GPS Coordinate of Site Entrance | WFPS to Specify |
| Associated 110 kV Station | WFPS to Specify |
| WFPS connection point | WFPS to Specify(*i.e.* T121 in XXX Transmission or XXX Distribution Station) |
| WFPS connection voltage | WFPS to Specify  |
| WFPS Connection Type  | WFPS to Specify(TSO, DSO Type A, DSO Type B, etc.) |
| Installed Turbine type, MW size and quantity | WFPS to Specify |
| Contracted MEC | WFPS to Specify  |
| Registered Capacity | WFPS to Specify |
| Limiter applied to Exported MW | WFPS to Specify |
| Limiter applied to AAP | WFPS to Specify |
| DMOL | WFPS to Specify  |
| RoCoF Capability | WFPS to Specify |

# Grid Code References

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

CC.7.2.5.1 **Generators** shall provide on-load tap-changing (OLTC) facilities for all **Generator Transformers**. **Demand Customers** are advised to provide on-load tap-changing (OLTC) facilities for all **Grid Connected Transformers**. All **Users** shall liaise with the **TSO** on the design specification for the performance of the tap-changing facility on **Grid Connected Transformers**.

**PPM1.5.1 Controllable PPMs** shall have the capability to:

a) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5 Hz to 50.5 Hz;

b) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.5 Hz to 52.0 Hz for a duration of 60 minutes;

c) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.0 Hz to 47.5 Hz for a duration of 20 seconds required each time the **Transmission System Frequency** is below 47.5 Hz;

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

**ROCOF 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.

**PPM1.6.1 TRANSMISSION SYSTEM VOLTAGE RANGE**

**Controllable PPMs**  shall remain continuously connected to the **Transmission System** at maximum **Available Active Power** or **Controlled Active Power** output for normal and disturbed system conditions and for step changes in **Transmission System Voltage** of up to 10 %. The following are the ranges which may arise during **Transmission System** disturbances or following transmission faults:

(a) 400 kV system: 350 kV to 420 kV;

(b) 220 kV system: 200 kV to 245 kV;

(c) 110 kV system: 99 kV to 123 kV.

PPM1.7.1.2.1 **Controllable WFPSs** with a **MEC** in excess of 10 MW shall make the following meteorological data signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

[Units, Range]

a) Wind speed (at hub height) - measurand signal; [m/s, 0-70]

b) Wind direction (at hub height) - measurand signal; [deg, 0-360]

c) Air temperature- measurand signal; [deg C, -40-70]

d) Air pressure- measurand signal. [mBar, 735-1060]

PPM1.7.1.3.1 **Controllable WFPSs** with a **MEC** in excess of 10 MW shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

a) **Controllable WFPS Availability** (0-100 % signal);

b) Percentage of **WTG** shutdown due to high wind-speed conditions (0-100 %);

c) Percentage of **WTG** not generating due low wind-speed shutdown (0-100 %).

# Site Safety requirements

The following is required for the EirGrid 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, WFPS to specify how and when the induction shall be carried out) |
| Any further information | WFPS to specify |

# Test Description and Pre Conditions

## Purpose of the Site Visit

The purpose of this site visit is to verify the installed plant and protection settings.

# Requirements

## Pre-Visit Requirements

The WFPS shall confirm the following information has been provided in Section 9.1:

|  |  |
| --- | --- |
| Directions to Site | WFPS to provide  |
| GPS Co-ordinates of the sub-station / WFPS entrance | WFPS to provide  |
| Site Layout diagram | WFPS to provide  |
| Compound and Substation Layout diagram | WFPS to provide |
| As Built Single Line Diagram | WFPS to provide and submit PDF to generator\_testing@eirgrid.com |
| Personnel on site will be able to demonstrate all the requirements in section 8.2. | WFPS to provide details of personnel in Section 9.1 |

## On Site Requirements

The information below shall be provided by the WFPS prior to the site survey, see Section 9. EirGrid representative shall confirm the information on site.

|  |  |  |
| --- | --- | --- |
| The number of turbines | WFPS to provide detail in Section 9.2 | EirGrid Confirmed on Site: Yes / No |
| Turbine type and name plate rating of each turbine | WFPS to provide detail in Section 9.2 | EirGrid Confirmed on Site: Yes / No |
| Turbine number and serial number of each turbine | WFPS to provide detail in Section 9.2 | EirGrid Confirmed on Site: Yes / No |
| Validate turbine locations against IPP site layout diagram | WFPS to provide site layout map in Section 9.1 | EirGrid Confirmed on Site: Yes / No |
| Turbine protection settings of a sample of the turbines  | WFPS to provide detail in Section 0 | EirGrid Confirmed on Site: Yes / No |
| Location and Height of Met Mast  | WFPS to provide detail in Section 9.4 | EirGrid Confirmed on Site: Yes / No |
| Data feed from Met Mast | WFPS to have access to Met Mast data feed during Site Survey and confirm data in Section 9.4 | EirGrid Confirmed Data: Yes / No |
| WTG Transformer Information | WFPS to provide detail in Section 0 | EirGrid Confirmed on Site: Yes / No |
| Grid Connected Transformer nameplate rating. | WFPS to provide detail in Section 9.6 | EirGrid Confirmed on Site: Yes / No |
| Name plate rating of auxiliary equipment required for Grid Code compliance e.g. STATCOM, Filter, Cap Bank, Diesel Generator  | WFPS to provide detail in Section 9.7 | EirGrid Confirmed on Site: Yes / No |
| High and Low Wind Speed Shutdown Settings | WFPS to provide detail in Section 9.8 | EirGrid Confirmed on Site: Yes / No |

EirGrid to confirm the above settings on the day of the survey and record photographic evidence where appropriate for below.

* Entrance to the Gate with any relevant details
* Landscape with turbines
* Substation and the Control room - satellite, RTU, protection cabinet, batteries, lamps, MIMIC panels, Nulec, switchgear etc.
* Grid Connected Transfomer
* Reactive Power Supplementary device (as applicable) – Picture of name plate rating
	+ STATCOM
	+ Capacitor Bank
	+ Filter
* Backup generator
* Met Mast
* Name Plate Rating for a Turbine
* Transformer tap position
* Other as required

## Comments & Signatures

|  |
| --- |
| **Comments:**  |
| WFPS Witness signoff that this test has been carried out according to the test procedure, above.Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| EirGrid Witness signoff that this test has been carried out according to the test procedure, above.Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

# Appendices

## Site Information

### Directions to Site

WFPS to provide directions here.

### GPS Coordinate of Site Entrance

WFPS to provide GPS coordinates of Site Entrance.

### Site Layout Diagram

WFPS to provide site layout diagram here.

### Compound and Substation Layout diagram

WFPS to provide compound and substation layout diagram here.

###  As Built Single Line Diagram

WFPS to provide as built single line diagram here and as separate attachment.

### Contact details for qualified personnel on-site

WFPS to provide contact details of qualified personnel involved in site survey

## Turbine Information

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Turbine Number** | **Turbine Type** | **Turbine Size** | **Serial Number** | **Hub Height** | **GPS Coordinates** |
| T1 |  |  |  |  |  |
| T2 |  |  |  |  |  |
|  |  |  |  |  |  |
| Tn-1 |  |  |  |  |  |
| Tn |  |  |  |  |  |

## Turbine Protection Settings

|  |  |  |
| --- | --- | --- |
| **Turbine Protection Setting** | **Recommended By EirGrid** | **Provided by WFPS** |
| T1 | T2 |  | Tn-1 | Tn |
| Underfrequency stage 1 Setpoint | f< | 47.5 Hz |  |  |  |  |  |
| Underfrequency stage 1 time delay  | t< | 3600 s |  |  |  |  |  |
| Underfrequency stage 2 Setpoint | f<< | 47.4 Hz |  |  |  |  |  |
| Underfrequency stage 2 time delay  | t<< | 20 s |  |  |  |  |  |
| Underfrequency stage 3 Setpoint | f<<< | 46.9 Hz |  |  |  |  |  |
| Underfrequency stage 3 time delay  | t<<< | 1 s |  |  |  |  |  |
|   |  |  |  |  |  |  |  |
| Overfrequency stage 1 Setpoint | f> | 52Hz |  |  |  |  |  |
| Overfrequency stage 1 time delay  | t> | 3600 s |  |  |  |  |  |
| Overfrequency stage 2 Setpoint | f>> | 52.1 Hz |  |  |  |  |  |
| Overfrequency stage 2 time delay  | t>> | 1 s |  |  |  |  |  |
|   |  |  |  |  |  |  |  |
| Rate of Change of Frequency setpoint | df/dt | Max |  |  |  |  |  |
| Rate of Change of Frequency delay | t | Max |  |  |  |  |  |
|   |  |  |  |  |  |  |  |
| Undervoltage stage 1 Setpoint | U< | 0.89 pu |  |  |  |  |  |
| Undervoltage stage 1 time delay  | t< | 3 s |  |  |  |  |  |
| Undervoltage stage 2 Setpoint | U<< | 0.14 pu |  |  |  |  |  |
| Undervoltage stage 2 time delay | t<< | 0.625 s |  |  |  |  |  |
|   |  |  |  |  |  |  |  |
| Overvoltage stage 1 Setpoint | U> | 1.11 pu |  |  |  |  |  |
| Overvoltage stage 1 time delay  | t> | 60 s |  |  |  |  |  |
| Overvoltage stage 2 Setpoint | U>> | 1.2 pu |  |  |  |  |  |
| Overvoltage stage 2 time delay  | t>> | 15 s |  |  |  |  |  |
|   |  |  |  |  |  |  |  |
| Fault Ride Through Lockout Events | N | N/A |  |  |  |  |  |
| Fault Ride Through Lockout Time Period (Specify if rolling time period) | t | N/A |  |  |  |  |  |

## Met Mast Information

|  |  |  |
| --- | --- | --- |
| **Met Mast Location** | WFPS to provide location on site map | EirGrid to confirm on site: Yes / No |
| **Met Mast Height** | WFPS to provide Met Mast height | EirGrid to confirm on site: Yes / No |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Source from WFPS** | **Readings in EMS (EirGrid)** | **Readings in WFPS Control System**  |
| Air Temperature |  |  |  |
| Air Pressure |  |  |  |
| Wind Direction |  |  |  |
| Wind Speed | Aggregated from the Nacelle and averaged. |  |  |

## WTG Transformer Information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Turbine Number** | **Tap No.**  | **Tap Voltage Setting** | **No of Taps** | **WFPS MV Voltage of radial Network**  |
| T1 |  |  |  | \_\_\_\_kV |
| T2 |  |  |  |
|  |  |  |  |
| Tn-1 |  |  |  |
| Tn |  |  |  |

## Grid Connected Transformer Information

WFPS to provide information on Grid Connected Transformer nameplate rating.

## Auxiliary Equipment required for Grid Code Compliance

WFPS to provide name plate rating of auxiliary equipment required for Grid Code compliance e.g. STATCOM, Filter, Cap Bank, Diesel Generator , as applicable

## High and Low Wind Speed Shutdown Settings

WFPS to provide information on High and Low Wind Speed Shutdown Settings

1. <http://www.eirgridgroup.com/library> [↑](#footnote-ref-1)
2. <http://www.cer.ie/docs/000260/CER14081%20ROCOF%20Decision%20Paper%20-%20FINAL%20FOR%20PUBLICATION.pdf> [↑](#footnote-ref-2)