EIRGRID_2015 Functional Document Template (21

WFPS Active Power Control Test 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 template 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](mailto:generator_testing@eirgrid.com).

Where a site consists of two separate controllable WFPS with a single connection point, this may impact on the test procedure outlined below.

The WFPS representative shall coordinate testing. On the day of testing, suitably qualified technical personnel may be needed at the wind farm to assist in undertaking the tests. Such personnel shall have the ability to fully understand the function of the wind farm and its relationship to the network to which the wind farm is connected. Furthermore, such personnel shall have the ability to set up the control system of the wind farm so as to enable Grid Code compliance test to be correctly undertaken. In addition, the function of the technical personnel is to liaise with NCC.

The availability of personnel at NCC will be necessary in order to initiate the necessary instructions for the test. NCC shall determine if network conditions allow the testing to proceed.

All wind turbines shall be available. If on the day of the testing all wind turbines are not available, then the test may proceed where one wind turbine is unavailable for a wind farm of registered capacity of up to 75 MW, if that turbine makes up <20% of Registered Capacity, or two wind turbines are unavailable for a wind farm of registered capacity in excess of 75 MW. Wind conditions need to be sufficient and at a relatively constant level in order adequately perform the test. The required wind capacity for this test is detailed in section 7.4.

For all of test steps, if the change in Target MW is <15 MW, the wait time shall be 1 minute. If the change in Target MW is > 15 MW, the wait time shall be at least 2 minutes. As these larger changes in MW will have bigger impact on the transmission system, the WFPS may be required to wait for longer than this before carrying out a setpoint change. During the test, if the WFPS output is fluctuating or has not stabilised at the “Target MW”, the wait time shall be extended as appropriate. WFPS shall adjust the timing of the steps as required in order to align with this.

Following testing, the following shall be submitted to [generator\_testing@eirgrid.com](mailto: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

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 Test Coordinator and contact number: | WFPS to Specify |
| WFPS Address | WFPS to Specify |
| Associated 110 kV Station | WFPS to Specify |
| WFPS connection point | WFPS to Specify  (*i.e.* T121 in XXXkV Distribution or Transmission 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 |

|  |  |
| --- | --- |
| **Available Active Power** | The amount of **Active Power** that the **Controllable PPM** could produce based on current resource conditions. The **Available Active Power** shall only differ from the actual **Active Power** if the **Controllable PPM** has been curtailed, constrained or is operating in a restrictive **Frequency Response** mode |

**PPM 1.5.2 ACTIVE POWER MANAGEMENT**

A **PPM Control System** shall be installed by the **Controllable PPM** to allow for the provision of **Active Power Control** and **Frequency** **Response** from the **Controllable PPM**. The **PPM Control System** and **Frequency Response System** shall provide the functionality as specified in this section PPM1.5.2.

**PPM** **1.5.2.1 Active Power Control**

The **PPM Control System** shall be capable of operating each **Generation Unit** at a reduced level if the **Controllable PPM’s Active Power** output has been restricted by the **TSO**. In this **Active Power Control Mode**, the  **PPM Control System** shall be capable of receiving an on-line **Active Power Control Set-point** sent by the **TSO** and shall commence implementation of the set-point within 10 seconds of receipt of the signal from the **TSO**. The rate of change of output to achieve the **Active Power Control Set-point** should be the **Active** **Power Control Set-Point Ramp Rate** setting of the **PPM Control System**, as advised by the TSO, as per PPM1.5.4. The **TSO** acknowledges that if the **Active Power** output of the  **Controllable PPM** is initially less than the **Design Minimum Operating Level**, and if the **Controllable PPM** is expected to increase its **Active Power** output, then it may not be able to achieve the specified ramp rate at first, due to **Generation Units** going through a start-up sequence. In such a case, **Generation Units** shall start up as quickly as the technology allows, and in any case, not longer than three minutes from the time the **Active Power Control Set-point** was received.

**PPM 1.5.4 RAMP RATES**

**PPM** **1.5.4.1** The **PPM** **Control System** shall be capable of controlling the ramp rate of its **Active Power** output. There shall be three ramp rate capabilities, designated **Resource Following Ramp Rate**, **Active** **Power Control Set-Point Ramp Rate**, and **Frequency Response Ramp Rate**. The **PPM** **Control System** shall operate the ramp rates with the following order of priority (high to low): **Frequency Response Ramp Rate**; **Active** **Power Control Set-Point Ramp Rate**; **Resource Following Ramp Rate**. The **Resource Following Ramp Rate** shall be used during **Start-Up**, normal operation, and **Shutdown**. The **TSO** shall specify the **Resource Following Ramp Rate** and the **Active** **Power Control Set-Point Ramp Rate** in percentage of **Registered Capacity** per minute. The **Frequency Response Ramp Rate** shall be the maximum possible ramp rate of the **Controllable PPM** agreed with the **TSO** and with the characteristics as set out in PPM 1.5.3.1**.** The **TSO** acknowledges that rapidly changing resource availability may cause temporary deviations from the ramp rate settings of the **Controllable PPM**, but these deviations should not be allowed to exceed 3% of **Registered Capacity**.

**PPM** **1.5.4.2** It shall be possible to vary the **Resource Following Ramp Rate** and the **Active** **Power Control Set-Point Ramp Rate** each independently over a range between 1% and 100% of **Registered Capacity** per minute.

# Site Safety requirements

The following is required for the EirGrid 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, 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 Test

The purpose of this test is to demonstrate the Active Power Control functions of the WFCS, including ramp rates applied during shutdown and start-up; and to demonstrate DMOL of the WFPS.

## Pass Criteria

The following is the pass criteria for the test. Any subsequent report for this test shall be assessed against each of these criteria. It is accepted that adherence to ramp rates may not be possible while operating below DMOL.

| **Criteria** |
| --- |
| **Active Power Control** |
| Active Power Output is limited to the MEC of the WFPS |
| WFCS receives all online Active Power Control Set-points, commences implementation of all set-points within 10 seconds of receipt and provides the correct set-point feedback |
| When APC is ON, WFPS regulates its active power output to within the greater of ±0.5 MW or ±3% of Registered Capacity of the Active Power Control Set-point |
| WFCS operates each WTG at a reduced level while operating at a reduced output, greater than DMOL |
| All WTGs start-up in less than 3 minutes of receipt of set-point, when dispatched up from 0 MW |
| WFCS does not respond to any set-points sent while Active Power Control is OFF |
| **Ramp Rates** |
| Rate of change of output is equal to the Active Power Control Set-point Ramp Rate when ramping to Active Power Control Set-points greater than or equal to DMOL, with temporary deviations not exceeding ±3% of Registered Capacity |
| WFPS output ramps to AAP at the Wind Following Ramp Rate when Active Power Control is turned OFF (unless acting under Frequency Response Ramp Rate) |
| Rate of change of output when ramping up due to increase in wind speed is no greater than Wind Following Ramp Rate |
| Rate of change of output is equal to Wind Following Ramp Rate on shutdown and on start-up |
| Demonstration that the Wind Following Ramp Rate and Active Power Control Set-point Ramp Rate can each be set independently over a range between 1% and 100% of Registered Capacity per minute |
| **DMOL** |
| DMOL is in line with declared value and no greater than 12% of Registered Capacity |
| **Available Active Power** |
| AAP is limited to the MEC of the WFPS |
| AAP signal is a measure of the active power the WFPS is capable of delivering |
| AAP signal is independent of the active power output when under curtailment or dispatch |
| % Mechanical availability signals are correct under dispatch and shutdown |

## Instrumentation and onsite data trending

All of the following trends shall be recorded by the WFPS during the test. Failure to provide any of these trends shall result in test cancellation.

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Data Trending and Recording** | **Resolution** | **Check On Day Of Test** |
| 1 | Available active power from the prevailing wind in MW, derived by algorithm in the WFCS (*Figure WFPS1.3, Point Y – preferably point Z if available*) | WFPS to Specify (≥10 Hz) | Yes / No |
| 2 | Actual active power from the wind farm in MW (*Figure WFPS1.3, Point Y – preferably point Z if available*) | WFPS to Specify (≥10 Hz) | Yes / No |
| 3 | APC ON/OFF | WFPS to Specify (≥ 10 Hz) | Yes / No |
| 4 | APC set-point from NCC | WFPS to Specify (≥10 Hz) | Yes / No |
| 5 | Grid Frequency | WFPS to Specify (≥10 Hz) | Yes / No |
| 6 | Number of turbines online | WFPS to Specify (≥10 Hz) | Yes / No |
| 7 | Wind Farm Availability % | WFPS to Specify (≥10 Hz) | Yes / No |

## Initial Conditions

If “No” is answered to any of the following, contact NCC and agree next steps in advance of making any corrective actions.

|  |  |
| --- | --- |
| **Conditions** | **Check on day of test** |
| All WTGs are available, in line with requirements set out in section 2. | # Turbines Installed: \_\_\_\_  # Turbines Generating: \_\_\_\_  Wind Farm Availability signal in NCC \_\_\_\_\_% |
| Generated MW > 60% of Registered Capacity | Generated MW: \_\_\_\_ |
| Active Power Control Set-point Ramp Rate of 20% of Registered Capacity per minute is applied in the WFCS | Yes / No |
| Wind Following Ramp Rate of 20% of Registered Capacity per minute is applied in the WFCS | Yes / No |
| Where NCC has control of the reactive power, ensure WFPS is exporting close to 0 Mvar at the connection point by bringing kV set-point = system voltage in 1 kV steps. | Yes / No / N/A |
| If the WFPS has Emulated Inertia, note Emulated Inertia Status  Turn Emulated Inertia OFF | Pre-test status: ON / OFF / N/A  Emulated Inertia Status: \_\_\_\_ |

## Ramp Rate Calculations

|  |  |
| --- | --- |
| **Calculation** | **Value** |
| Active Power Control Set-point Ramp Rate of 20% of Registered Capacity per minute | \_\_\_\_ MW/min  (WFPS to specify calculation and formula used) |
| Wind Following Ramp Rate of 20% of Registered Capacity per minute | \_\_\_\_ MW/min  (WFPS to specify calculation and formula used) |
| If WTGs are out of service, will the WFPS ramp at a reduced ramp rate? | \_\_\_\_ MW/min  (WFPS to specify calculation and formula used) |

## Ramp Rate Settings

|  |  |  |
| --- | --- | --- |
| **Mode** | **Rate** | **Priority** |
| Frequency Response | As fast as technically possible. 60% of its expected Active Power response within 5 seconds 100% of its expected Active Power response within 15 seconds. | 1 |
| Active Power Dispatch | 20% of Registered Capacity per Minute | 2 |
| Wind Following | 20% of Registered Capacity per Minute | 3 |

# Test Steps

## Demonstration of Limiters

The ability of the WFCS to limit the output of the WFPS (and the AAP) to MEC is demonstrated by temporarily setting the limit to a lower value so that its operation can be seen.

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Action** | **Time** | **Comments** |
| 1 | WFPS begins data recording for all trends noted in Section 7.3, above |  | Operator Name \_\_\_\_\_\_\_\_\_\_\_\_  Date \_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | WFPS requests permission from NCC to proceed with the Ramp Rate Settings test and confirms the following with NCC:   1. AAP of the WFPS 2. MW output of the WFPS 3. APC is OFF 4. Frequency Response is OFF 5. Frequency Response is in Curve 1 |  | 1. \_\_\_\_ MW 2. \_\_\_\_ MW 3. Status \_\_\_\_ 4. Status \_\_\_\_ 5. Curve \_\_\_\_ |
| 3 | WFPS sets the Exported MW limiter to [insert 40% of Registered Capacity] MW and waits until the limit has been achieved |  | \_\_\_\_ MW |
| 4 | WFPS restores the limit to that noted in section 4, above. |  | \_\_\_\_ MW |
| 5 | WFPS sets the AAP limit to [insert 40% of Registered Capacity] MW and waits until the limit has been achieved |  | \_\_\_\_ MW |
| 6 | WFPS restores the AAP limit to that noted in section 4, above. |  | \_\_\_\_ MW |
| 7 | WFPS informs NCC that the Demonstration of Limiters test is complete. If further testing is not being completed, go to Section 8.5 Return to Standard Settings |  |  |
| Note any issues or deviations from test procedure  For example changes in step size, duration, test operators, parameter changes on site  Mark as “No Comment” if test proceeded as per procedure. | |  | |

## Ramp Rate Settings

Both Active Power Control Set-point Ramp Rate and Wind Following Ramp Rate are adjusted between 1% and 100% of Registered Capacity per minute, with ramps carried out at each ramp rate.

| **Step No.** | **Action** | **Time** | **Comments** |
| --- | --- | --- | --- |
| 1 | WFPS begins data recording for all trends noted in Section 7.3, above |  | Operator Name \_\_\_\_\_\_\_\_\_\_\_\_  Date \_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | WFPS requests permission from NCC to proceed with the Ramp Rate Settings test and confirms the following with NCC:   1. AAP of the WFPS 2. MW output of the WFPS 3. APC is OFF 4. Frequency Response is OFF 5. Frequency Response is in Curve 1 |  | 1. \_\_\_\_ MW 2. \_\_\_\_ MW 3. Status \_\_\_\_ 4. Status \_\_\_\_ 5. Curve \_\_\_\_ |
| 4 | WFPS requests NCC to turn APC ON and issue a set-point of [insert 30% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 5 | WFPS sets the Active Power Control Set-point Ramp Rate to 1% of Registered Capacity per minute confirms the following to NCC:   1. Active Power Control Set-point Ramp Rate is now 1% of Registered Capacity per minute |  | \_\_\_\_ MW/min |
| 6 | WFPS requests NCC to issue a set-point of [insert 35% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | WFPS shall ramp to the new set-point over 5 minutes  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 7 | WFPS sets the Active Power Control Set-point Ramp Rate to 100% of Registered Capacity per minute confirms the following to NCC:   1. Active Power Control Set-point Ramp Rate is now 100% of Registered Capacity per minute |  | \_\_\_\_ MW/min |
| 8 | WFPS requests NCC to issue a set-point of [insert 20% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | WFPS shall ramp to the new set-point over 9 seconds  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 9 | WFPS sets the Active Power Control Set-point Ramp Rate to 20% of Registered Capacity per minute confirms the following to NCC:   1. Active Power Control Set-point Ramp Rate is now 20% of Registered Capacity per minute |  | \_\_\_\_ MW/min |
| 10 | WFPS requests NCC to issue a set-point of [insert 35% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 11 | WFPS sets the Wind Following Ramp Rate to 40% of Registered Capacity per minute confirms the following to NCC:   1. Wind Following Ramp Rate is now 40% of Registered Capacity per minute |  | \_\_\_\_ MW/min |
| 12 | WFPS requests NCC to turn APC OFF **(via SLD)** and waits until 3 minutes after the MW output has reached AAP |  | WFPS shall ramp at Wind Following Ramp Rate  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 13 | WFPS requests NCC to turn APC ON **(via SLD)** and waits until 3 minutes after the MW set-point has been achieved |  | WFPS shall ramp at Active Power Control Set-point Ramp Rate  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 14 | WFPS requests NCC to issue a set-point of [insert 100% of Registered Capacity] MW then turn APC OFF **(via SLD)** and waits until 3 minutes after the MW output has reached AAP |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 15 | WFPS sets the Wind Following Ramp Rate to 20% of Registered Capacity per minute confirms the following to NCC:   1. Wind Following Ramp Rate is now 20% of Registered Capacity per minute |  | \_\_\_\_ MW/min |
| 16 | WFPS ends data recording |  |  |
| 17 | WFPS informs NCC that the Ramp Rate Settings test is complete. If further testing is not being completed, go to Section 8.5 Return to Standard Settings |  |  |
| Note any issues or deviations from test procedure  For example changes in step size, duration, test operators, parameter changes on site  Mark as “No Comment” if test proceeded as per procedure. | |  | |

## Active Power Control

Various set-points are issued to the WFPS to demonstrate that it ramps correctly to all set-points, maintains all set-points, and does not follow set-points when APC is off.

| **Step No.** | **Action** | **Time** | **Comments** |
| --- | --- | --- | --- |
| 1 | WFPS begins data recording for all trends noted in Section 7.3, above |  | Operator Name \_\_\_\_\_\_\_\_\_\_\_\_  Date \_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | WFPS requests permission from NCC to proceed with the Active Power Control test and confirms the following with NCC:   1. APC is OFF 2. AAP of the WFPS 3. MW output of the WFPS 4. Frequency Response is OFF 5. Frequency Response is in Curve 1 |  | 1. Status \_\_\_\_ 2. \_\_\_\_ MW 3. \_\_\_\_ MW 4. Status \_\_\_\_ 5. Curve \_\_\_\_ |
| 3 | WFPS requests NCC to turn APC ON and issue a set-point of [insert 50% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 4 | WFPS requests NCC to issue a set-point of [insert DMOL] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 5 | WFPS requests NCC to turn APC OFF **(via SLD)** and waits until 3 minutes after the MW output has reached AAP |  | WFPS shall ramp at Wind Following Ramp Rate  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 6 | WFPS requests NCC to issue a set-point of [insert 40% of Registered Capacity] MW **(via SLD)** |  | WFPS shall not respond to this set-point  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 7 | WFPS requests NCC to turn APC ON **(via SLD)** and waits until 3 minutes after the set-point has been achieved |  | WFPS shall ramp to DMOL at Active Power Control Set-point Ramp Rate  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 8 | WFPS requests NCC to issue a set-point of [insert 30% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 9 | WFPS requests NCC to issue a set-point of 1 MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 10 | WFPS requests NCC to issue a set-point of 0 MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 11 | WFPS requests NCC to issue a set-point of [insert DMOL] MW and waits until all WTGs have started up |  | All WTGs shall start up for set-point ≥ DMOL.  AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 12 | WFPS requests NCC to issue a set-point of [insert 60% of Registered Capacity] MW and waits until 3 minutes after the set-point has been achieved |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW |
| 13 | WFPS requests NCC to issue a set-point of [insert 100% of Registered Capacity] MW and then turn APC OFF. |  | AAP =\_\_\_\_ MW  MW Output =\_\_\_\_ MW  APC Status: \_\_\_\_ |
| 14 | WFPS waits until 3 minutes after the MW output has reached AAP and then ends data recording |  |  |
| 15 | WFPS informs NCC that the Active Power Control test is complete. If further testing is not being completed, go to Section 8.5 Return to Standard Settings |  |  |
| Note any issues or deviations from test procedure  For example changes in step size, duration, test operators, parameter changes on site  Mark as “No Comment” if test proceeded as per procedure. | |  | |

## Shutdown and Start-up

The WFPS is shut down and started up locally to demonstrate that WFPS maintains the Wind Following Ramp Rate during these modes of operation.

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Action** | **Time** | **Comments** |
| 1 | WFPS begins data recording for all trends noted in Section 7.3, above |  | Operator Name \_\_\_\_\_\_\_\_\_\_\_\_  Date \_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | WFPS requests permission from NCC to proceed with the Shutdown and Start-up test and confirms the following with NCC:   1. AAP of the WFPS 2. MW output of the WFPS 3. APC is OFF 4. Frequency Response is OFF 5. Frequency Response is in Curve 1 |  | 1. \_\_\_\_ MW 2. \_\_\_\_ MW 3. Status \_\_\_\_ 4. Status \_\_\_\_ 5. Curve \_\_\_\_ |
| 3 | WFPS shuts down the WFPS locally, as if for an outage and waits until 2 minutes after all WTGs are offline |  | WFPS shall ramp at Wind Following Ramp Rate  AAP and MW output should reduce to zero as turbines shut down  # turbines online \_\_\_\_ |
| 4 | WFPS starts up all WTGs and waits until 3 minutes after MW output has reached AAP |  | WFPS shall ramp at Wind Following Ramp Rate when MW > DMOL  # turbines online \_\_\_\_ |
| 5 | WFPS ends data recording |  |  |
| 6 | WFPS informs NCC that the Shutdown and Start-up test is complete. If further testing is not being completed, go to Section 8.5 Return to Standard Settings |  |  |
|  | Note any issues or deviations from test procedure  For example changes in step size, duration, test operators, parameter changes on site  Mark as “No Comment” if test proceeded as per procedure. |  | |

## Return to Standard Settings

The WFPS settings are returned to standard following completion of the Active Power Control Test.

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Action** | **Time** | **Comments** |
|  |  |  | Operator Name \_\_\_\_\_\_\_\_\_\_\_\_  Date \_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 | WFPS confirms the following with NCC:   1. AAP of the WFPS 2. MW output of the WFPS 3. APC is OFF 4. APC Set-point = [insert 100% of Registered Capacity] MW 5. Frequency Response is ON 6. Frequency Response is in Curve 1 7. Frequency Droop Setting is 4% 8. WFCS frequency reference is system frequency 9. Emulated inertia Status is returned to pre-test status as noted in Section 6.4 |  | 1. \_\_\_\_ MW 2. \_\_\_\_ MW 3. Status \_\_\_\_ 4. \_\_\_\_ MW 5. Status \_\_\_\_ 6. Curve \_\_\_\_ 7. \_\_\_\_% 8. Frequency Reference \_\_\_\_\_\_\_\_\_\_ 9. EI Status |
| 2 | WFPS informs NCC that Active Power Control testing is complete |  |  |
| Note any issues or deviations from test procedure  For example changes in step size, duration, test operators, parameter changes on site  Mark as “No Comment” if test proceeded as per procedure | |  | |

## 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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. <http://www.eirgridgroup.com/library> [↑](#footnote-ref-1)