

# **TSO and DSO Protocol**

## **DSO WFPS Testing**

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## 1. List of abbreviations

DCC --- Distribution Control Centre  
DFL --- Dispatch Fail Lamp  
DFT --- Dispatch Fail Test  
DSO --- Distribution System Operator  
EGIP --- Embedded Generator Interface Protection  
EMS --- Energy Management System  
ESBN --- ESB Networks  
ESBTS --- ESB Telecoms Services  
NCC --- National Control Centre  
NOIS --- Network Operator Initiated Shutdown  
ORC --- Operational Readiness Confirmation  
OEM --- Original equipment manufacturer  
RoCoF --- Rate of Change of Frequency  
TSO --- Transmission System Operator  
WFPS --- Wind Farm Power Station's  
WTG --- Wind Turbine Generator

## 2. Purpose of this Document

This document sets out the agreed approach between the TSO and the DSO in relation to Distribution Code Compliance Testing process for Controllable Wind Farm Power Stations (WFPS) with a registered capacity of 5MW or more.

The involved stakeholders in this process are Distribution Control Centres (DCCs) on behalf of the DSO, ESB Networks and the generator testing team (sub team of System Support) within the TSO Operations, Planning and Innovation department, EirGrid.

It is the responsibility of the DSO Customer to carry out testing and to understand the process and the lead-times in achieving the commissioning milestones. To achieve this, a dedicated Generator test coordinator shall be appointed by the WFPS, who informs all DSO and TSO parties with commissioning schedules. If the WFPS is not familiar with any elements of the testing process then a meeting shall be requested by the customer with the DSO and TSO as appropriate. A WFPS may cancel scheduled testing at any point within the process but with the understanding that there are associated lead times for rescheduling. The WFPS is responsible for demonstrating compliance with the latest version of the Distribution Code. The WFPS is responsible for all WFPS resourcing elements.

The roles, responsibilities and associated timelines are highlighted as applicable for various milestones within the process.

The main points of contact during day to day activities are:

- ESB Network Distribution Control Centre – [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie)
- EirGrid System Support team (SS) – [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com), (01) 2370583.

The escalation points of contact are:

- DCC HV System Manager
- EirGrid S.S. Manager

All e-mail communication to or from the WFPS shall be submitted to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie)

On the day of testing Eirgrid (NCC, EMS team or Generator Testing) shall communicate directly with the customer to ensure the Distribution Code Test Procedure is followed accordingly. (Testing of reactive power control on type "B" WFPS is managed by the DSO)

### 3. *Pre-testing documentation requirements*

The following off load tests shall be completed throughout the process. These may be submitted in advance of energisation and updated accordingly with commissioned values and submitted as part of as-built information.

The Off-load tests are:

1. Information required to develop signal lists.
2. WFPS Commissioning Schedule provision and update.
3. Market Registration (as applicable, mandatory for units which are 10MW or more).
4. Dynamic Model provision.
5. Voltage Fault Ride Through study.
6. Confirmation of RoCoF capability.
7. Confirmation of Controller Settings (Frequency Response, Voltage Droop etc.)
8. Metering Registration.
9. 24 hour contacts.
10. Agreement and implementation of Protection Settings with TSO and DSO.
  - a. Turbine protection settings (TSO)
  - b. G10 protection setting (DSO)

Note: EGIP settings are issued and applied by the DSO within guidelines agreed between TSO and DSO. DSO forwards the applied settings to TSO under a separate process.

11. Signal lists and associated certificates (wiring, pre energisation, post energisation).
12. Notification of Study Status (issued by TSO).
13. As-built submission.

#### 3.1. Commissioning Schedule

**15 Business Days (BD) prior to energisation** (E-15) the WFPS submits a commissioning programme to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie)

This commissioning programme includes the following milestones:

- Wiring completion to the EirGrid Telecom Services Interface enclosure.
- Pre Energisation signals and controls test with ESBTS and EirGrid EMS.
- Energisation date as agreed with the DSO.
- Post Energisation signals and controls test with ESBTS and EirGrid EMS.
- Turbine installation programme highlighting when the last turbine is to be installed.
- Capacity Limits applied as applicable at 5MW and every 10MW thereafter.
- Dispatch testing programme coinciding with the turbine installation and capacity limits.
- Operational Readiness Confirmation (ORC) – not more than 30 Business Days after last turbine is installed.

The WFPS is responsible for updating and communicating the commissioning programmes to the DSO and TSO. Untimely requests for DSO and TSO testing resources or unavailability of WFPS resources will lead to delays in energisation.

Step	Responsibility	Description	Time
1	WFPS	Submits the commissioning schedule to TSO <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> .	15 BDs prior to energisation (E-15BD)
2	TSO and DSO	Review schedule and comment to WFPS on the proposed schedule	E-10BD
3	WFPS	Update schedule based on DSO and TSO feedback and resubmit.	E-5BD

## 4. Signals Commissioning

### 4.1. Development of a signal list

A TSO Remote Terminal Unit (RTU) is installed on the ESB Networks side of a WFPS with a registered capacity of  $\geq 5$  MW.

A Signal list and control system parameter specification is required to determine SCADA for the WFPS. This is issued to the WFPS **120 Business days (~6 months)** in advance of energisation. To facilitate this requirement, the WFPS owner or their agents shall provide the required information to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) via [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie) not less than **180 Business days (~9 months)** in advance of energisation. Eirgrid shall review this information and request any clarifications within 10 Business Days.

Step	Responsibility	Description	Time
1	DSO	DCC provide the required inputs to develop a signal list once the connection agreement is signed and customer installation details are received i.e. at least <b>180 BD</b> in advance of energisation (E) of the Wind farm connection.	<b>(180 BDs in advance of Energisation)</b> <b>(E-180 BD)</b>
2	DSO/TSO	DSO/TSO review submitted information for completeness and any queries to be raised within 10 BD.	
3	TSO	As part of the internal review process, Generator Testing issues a minor version of the Signal list for TSO RTU to the relevant DCC.  T= Time when all required information is submitted to develop signal list.	<b>T+10 BD</b>
4	DSO	DCC reviews draft signal list and returns as approved by DCC or provides additional signals/comment to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> within <b>5 Business Days (BD)</b> .*	<b>T+15BD</b>
5	TSO	Should there be no revisions required, Generator Testing issues major version within <b>5 BD</b> . If further revisions are required an additional <b>20 BD</b> timeline may apply.	<b>T+20BD</b>
6	DSO	DCC forward the approved signal list to the WFPS within <b>5BD</b> .	<b>T+25BD</b>

Step	Responsibility	Description	Time
7	WFPS	Should there be any alterations to the information provided (including revision of the SLD) the WFPS submits details of the alterations to DCC. The timelines above apply.	On request of change

Generic signal lists are agreed between EirGrid and ESB Networks and are published. No changes can be made to the agreed signals list without agreement of both the DCC HV System Manager and the EirGrid System Support Manager.

Changes to the Distribution Code may require updates to signal lists for all distribution connected WFPS. An agreed programme of signal list delivery shall be made between the DSO and TSO.

DSO shall issue a supplementary signal list for reactive power control at type “B” wind farms  $\geq 5\text{MW}$ . The reactive power control signals will be wired to the DSO RTU to allow reactive power control from DCC (via Nodal Controller)

#### 4.2. Information required from WFPS to develop signal lists

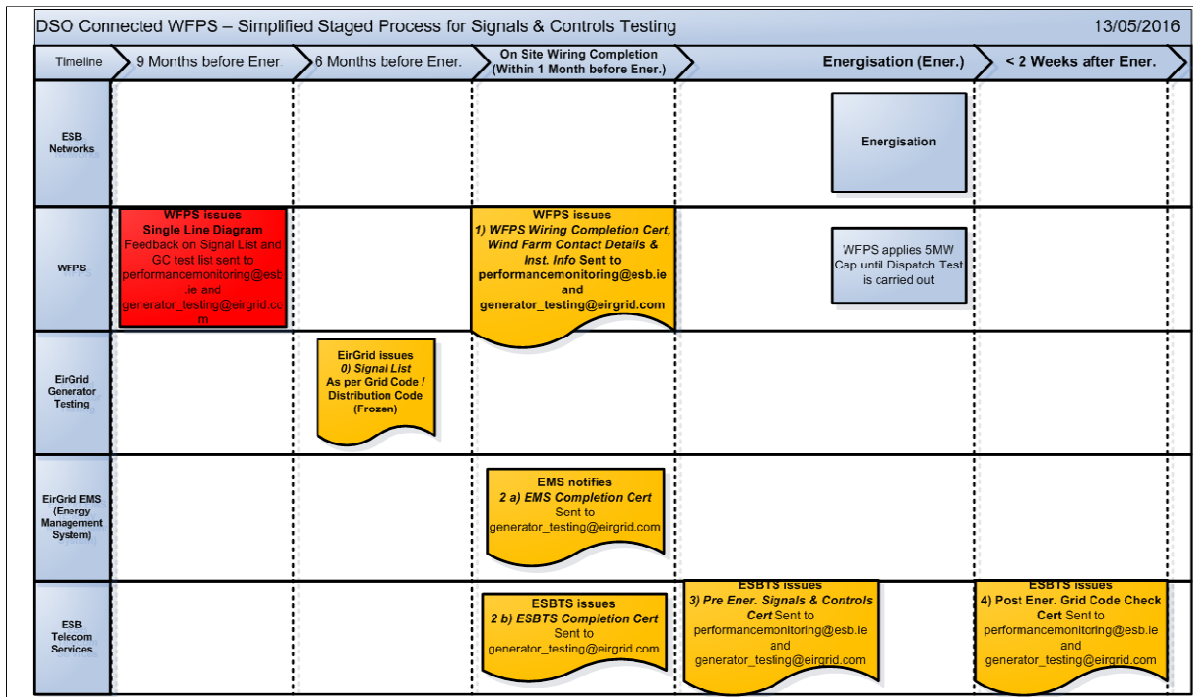
1. Name (including alternative names)
2. Connection Type as per the Distribution Code DCC11.1.4
3. Maximum Export Capacity
4. Installed Capacity (for Phase developments, i.e. MEC 20MW Phase 1, 10MW Q1 2014, Phase 2 additional 10MW Q2 2015 )
5. The number of Market Units for the WFPS (Phase 1 & 2 is one market unit or two separate market units, noting that if the WFPS consists of two market units then additional signals shall be required). As agreed with ESB Networks Generation Planning
6. Target Energisation Date
7. Single Line Diagram (Note that for changes in SLDs, the Signal list requirements may change, as built SLD's shall be submitted on completion of testing)
  - Revision Number
  - Ownership boundaries
  - HV CB positions (WFPS and ESB Networks as applicable)
  - MV CB positions
  - MV Feeders
8. Number of Met Masts on site - (if WFPS  $\geq 10\text{MW}$ )
9. Site Layout Diagram
10. Nearest 110kV Station - normal feeding arrangements for WFPS
11. Feeding HV Substation Name
12. Confirmation of DSO RTU for the WFPS
13. If there is no DSO RTU submission of DCC signals to be included within the DSO RTU (1-18).
14. Contact Details Project Manager, Electrical Contractor, Turbine Original Equipment Manufacturer (OEM).

### 4.3. Signal Commissioning and Certificate Process

On issuance of a major version of a signal list in Excel workbook format, a number of tabs ('certificates') within the workbook shall be printed, completed and signed by the identified parties. To expedite the process, on completion, the WFPS shall submit the following signed certificates sequentially to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and CC [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie)

- Wiring Completion.
- Pre Energisation signal and controls check.
- Post Energisation Signals and controls check.

The following simplified staged process exists for signals and controls testing. A detailed version of this process is available within the published signal list template.



### 4.4. ESB Telecoms Services (ESBTS) Installation of the TSO RTU

Timeline for TSO RTU installation:

- 1) **15 BD** notice required by ESBTS to schedule resources.
- 2) 1 week to install the RTU cabinet with integrated ETI and GPS clock, GPS clock antenna.
- 3) 1 week to pre commission the RTU referenced to frozen signal list with WFPS electrical and OEM contractors.
- 4) 1 week to install and commission the satellite link including antenna (if applicable).
- 5) 2 days to commission the fibre link (if applicable).
- 6) 1 week to commission the RTU with WFPS electrical and WTG contractors.

The RTU / ETIE should be installed on site not less than 20 Business Days prior to energisation.

### 4.5. Pre-Energisation Signals and Controls Test

This test takes place on request of the WFPS up to **20 Business Days** in advance of energisation. The test ensures that all signals are working end to end using simulated signals from the WFPS and are received at the National Control Centre (NCC). There is a requirement to have LV supplies available on site for the duration of the testing.

The WFPS emails a test request to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and CC [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie). EirGrid shall advise user of test date options and CC [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie).

The test requires tri-party signoff (ESBTS, EMS and the WFPS) and onsite presence of ESBTS, ESNB, the WFPS or agents of the WFPS (typically the electrical contractor and OEM SCADA personnel). WFPS SCADA personnel shall provide visual display of signals on site and avoid remote commissioning checks.

Untimely WFPS requests for EirGrid and ESB Networks resources and unavailability of Generator resources may delay completion of this milestone. The DCC coordinates availability of an ESB Networks operator on site, to test operation of ESB Networks equipment. **15BD** notice is required to schedule ESBTS resource and **10BD** is required to organise ESB Networks Operator Resource.

Site works associated with the RTU shall be completed and ready for commissioning in advance of energisation. This shall be per the completed pre-energisation signals and controls signoff sheet.

Step	Responsibility	Description	Typical Timeline (E = Energisation Date)
1	WFPS	WFPS submits commissioning programme to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> .	25 BDs prior to Energisation (E – 25BDs)
2	WFPS	WFPS submits to the DSO and TSO a signed Wiring Completion Certificate and Installation and contact details as specified within the frozen signal list.	E – 25 BDs
3	TSO	Generator Testing reviews dates and milestones. This commissioning programme is shared with ESBTS and EMS to highlight resource requirements. Potential conflicts highlighted and addressed to WFPS and DSO if required. A conference call may be arranged via DSO for any issues with the commissioning programme.	E- 20BD
4	WFPS	WFPS updates commissioning programme and requests for ESBTS resource and Pre-energisation signals testing to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a>	E- 20BD
5	TSO	Generator Testing confirms test date and contact details <b>3BD</b> in advance of the Pre-energisation signal and controls test to WFPS and DSO.	E- 8BD
6	WFPS, TSO & DSO	Pre-Energisation signals and controls testing (2 days where issues may need to be addressed on site immediately).	E- 5BD
7	WFPS	WFPS submits Pre-Energisation signals and controls certificate	E- 4BD
8	DSO	DCC confirm energisation of WFPS to TSO.	Energisation
9	WFPS	WFPS confirm to DCC and <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> that the capacity limit is applied at 5MW.	Energisation



#### 4.6. Post-Energisation Signals and Controls tests

Following energisation, the WFPS undergoes commissioning. For WFPSs ready to export, the WFPS confirms that a controller capacity limit is applied at 5MW. This shall remain in place until successful completion of the Post Energisation signals and controls check and a Dispatch Test report is issued by the TSO.

The post energisation signals and controls check is carried out with the same parties involved in the pre energisation signals and controls check. This test is to check all signals with real values (not simulated) from the control system.

The test requires tri-party signoff (ESBTS, EMS and the WFPS) and onsite presence of ESBTS, the WFPS Owner or agents of the WFPS (typically the electrical contractor and OEM SCADA personnel). WFPS SCADA personnel shall provide visual display of signals on site and avoid remote commissioning checks.

Untimely WFPS requests for EirGrid and ESB Networks resources, and unavailability of WFPS resources, delays completion of this milestone and the WFPS capacity limit remains at 5MW. The DSO coordinates availability of an ESB Networks operator on site to test operation of ESB Networks equipment. **15BD** notice is required to schedule ESBTS resource.

The test shall be completed when the WFPS is exporting and available to carry out control checks on equipment. Unsuitable wind conditions on the day may require this test to be rescheduled between EMS and the OEM. Signoff of the certificate shall not conclude until this check is complete.

Post Energisation signals and controls checks are also completed for a variety of reasons including performance monitoring issues software updates, hardware updates or faults that may develop. The WFPS shall request this in the normal manner Note that it takes **15BD** notice to schedule ESBTS resource.

Step	Responsibility	Description	Typical Timeline
1	WFPS	The WFPS updates the commissioning programme confirming request to <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> and <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> for ESBTS resources.	E- 15BD
2	DSO	Energisation	E
3	WFPS	The WFPS updates the commissioning programme confirming request to <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> and <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> for ESBTS resources. PET = date post energisation signals and control test is completed.	PET - 15BD
4	TSO	If testing date not already confirmed, Generator Testing shall confirm <b>3BD</b> in advance of the Post-energisation signal and controls test. TSO to confirm to WFPS and DSO if additional resources are required.	PET -3 BD
5	WFPS & TSO	Post Energisation Signals and controls check	PET
6	WFPS	WFPS submits Post Energisation Signals and controls check certificate and requests dispatch test as appropriate.	PET + 1BD

## 5. Compliance and Testing Programme – Operational Readiness Confirmation

### 5.1. Dispatch testing programme

WFPS requests all dispatch tests to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie). Upon request and thereafter, the WFPS shall ensure that there is no reason that the test cannot proceed. Dispatch testing does not proceed without completion of the milestone Post Energisation Signals and controls check.

Dispatch tests are remote tests carried out by the TSO to confirm if a WFPS meets with the controllability requirements<sup>1</sup> and if the WFPS can be allowed an increase in export MW capacity (cap lift). This test is dependent on wind conditions and on transmission and distribution system conditions. It is typically carried out over an hour depending on the size of the WFPS. In advance of testing, TSO confirm testing with DCC.

Unsuitable wind conditions may result in extended periods of no testing. Dispatch testing is carried out by NCC and is usually executed during normal business hours. There may be facility to execute testing outside these hours.

Following completion of a dispatch test a report is issued by Generator Testing within **10BD** confirming if the WFPS meets or does not meet with the controllability requirements.

Dispatch test reports shall document the following for a WFPS:

1. If controllability requirements are met.
2. What export MW capacity limit to be applied to the WFPS.
3. Permissible export capacity of the WFPS.
4. The controllability category that shall be applied to the WFPS (Category 1, 2, 3).
5. Deadline to achieve Operational Readiness Confirmation.
6. Deadline to achieve Operational Certificate Justification.

The target is to conclude the dispatch testing programme within **30 BD** after the installation of the last turbine. On successful completion of the Dispatch testing programme Eirgrid issue the DCC with an Operational Readiness Confirmation.

#### Dispatch testing program

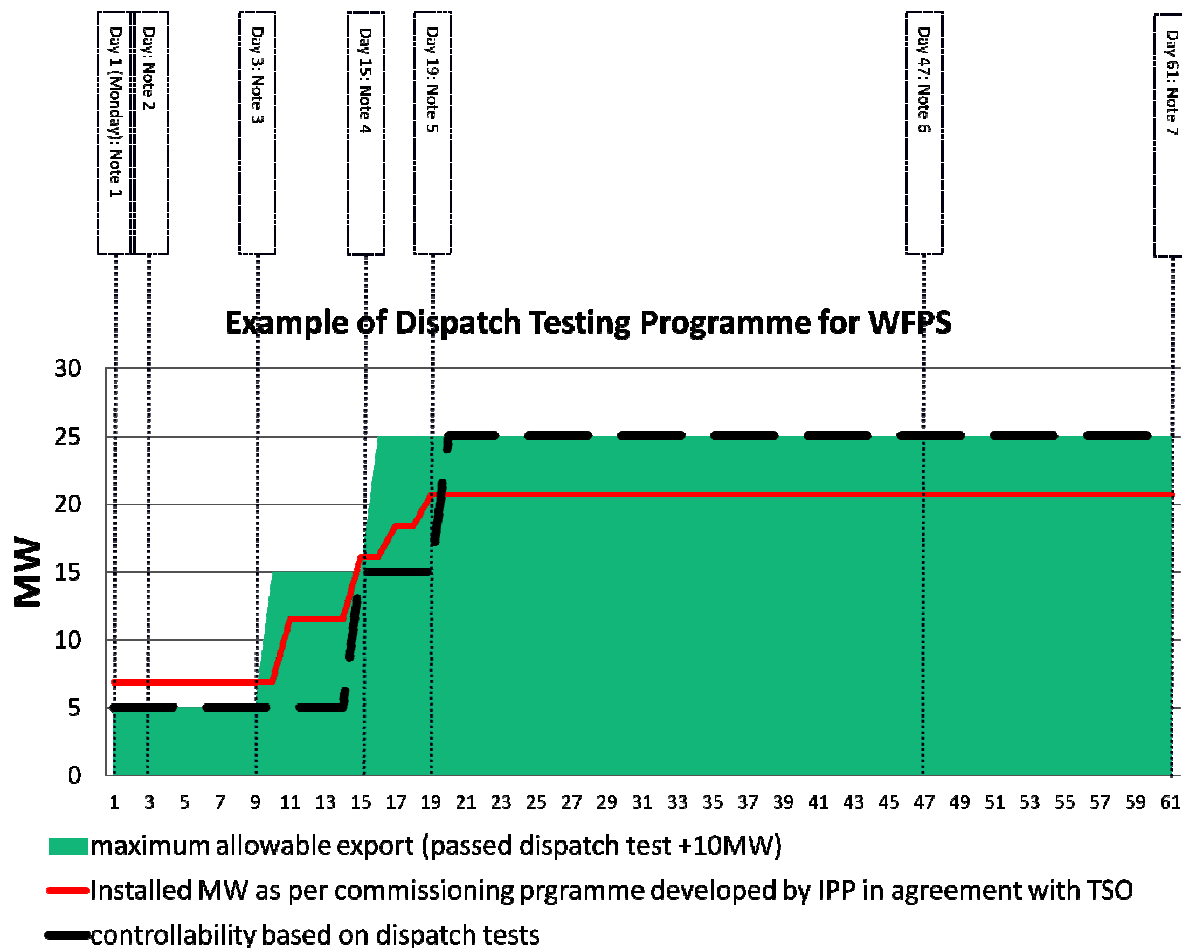
Step	Responsibility	Description	Typical Timeline
1	WFPS	Following completion of a post energisation signals and controls check, when the WFPS is ready and available to test, the WFPS submits a request for a dispatch test to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> .  This request shall include confirmation that the WFPS is ready and available to test.	Request Date
2	TSO	Within <b>10BD</b> of the request Generator Testing shall confirm to the WFPS and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> that the test will be carried out.	Request Date + 10 BD

<sup>1</sup> <http://www.eirgridgroup.com/site-files/library/EirGrid/Wind%20Farm%20Controllability%20Categorisation%20Policy.pdf>

Step	Responsibility	Description	Typical Timeline
3	TSO	Dispatch Test shall proceed if wind and system conditions are suitable.	<b>Confirmation + suitable system and wind conditions</b>
4	TSO	After completion of the Test, a test report is issued by Generator Testing to the WFPS and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a>	<b>Dispatch test completed DT + 10BD.</b>
5	WFPS	WFPS reads and responds to the report and implements actions which may require mitigating actions and correct implementation of control parameters. WFPS shall discuss with TSO or DSO as applicable if any clarifications on the report are required.	<b>Dispatch Test Report + 10BD</b>
6	WFPS	Submits new dispatch test request as appropriate. Steps 1 to 5 above shall apply.	<b>Per commissioning programme</b>

An example of dispatch testing programme for commissioning units is provided below.

### 5.2. Example of dispatch testing programme for a Commissioning WFPS



**Day 1: The WFPS is energised.** A capacity limit of 5MW is applied by the WFPS independent of Active Power Control System used by TSO. The installed capacity is 6.9MW (3x2.3MW).

**Day 3:** The WFPS has completed post energisation signals and controls check with the TSO and submitted test request for Day 9.

**Day 9: Dispatch Test no.1** carried out by TSO. Test demonstrates Active Power Control System working to control centre. TSO notifies Pass / Fail to WFPS who lifts the capacity limit to the next level (5MW + 10MW) or not.

**Day 15: Dispatch Test no.2** carried out by TSO. Test demonstrates Active Power Control System working to control centre. TSO notifies Pass / Fail to WFPS who lifts the capacity limit to the next level (15MW + 10MW) or not.

**Day 19: Last turbine installed.** A dispatch test may be carried out at this point should it be required. The WFPS has 6 Weeks (day 61) to complete final dispatch test and to have availability within the quality standard i.e. be compliant with Controllability Requirements and to move from Category (iii) to Category (ii).

**Day 47: This is the last day to demonstrate controllability** and be sure to have the WFPS moved from Category (iii) to Category (ii) respecting the standard lead-time of 10 Business days. Should the WFPS pass all requirements it receives Operational Readiness Confirmation.

**Day 61:** This is the last day of 6 Week Period to have WFPS moved to Category (ii). The unit will alternatively move to Category (i).

### 5.3. Operational Readiness Confirmation

Following completion of a successful dispatch test programme TSO shall issue Operational Readiness Confirmation.

WFPS that achieve Operational Readiness Confirmation standard are deemed to meet the controllability requirements and shall move from category 3 (commissioning units) to category 2 (Controllable units). WFPS confirmed with Operational Readiness Confirmation status and which are 10MW or more are required to register as a Variable Price Taker Generator (VPTG) within the market. The WFPS shall e-mail [registration@sem-o.com](mailto:registration@sem-o.com) regarding registration.

WFPS that do not achieve Operational Readiness Confirmation status or meet with the controllability requirements are moved from Category 3 to Category 1, (uncontrollable status) per the TSO controllability requirements<sup>2</sup>.

## 6. Compliance and Testing Programme – Operational Certificate Justification

### 6.1. WFPS Testing and Upgrades

It is advisable for WFPS to carry out an element of pre-testing in advance of Distribution Code testing. The level of testing shall be kept to a minimum in agreement with DCC and NCC so as to minimise impact on the system.

WFPS carrying out any testing, software upgrades shall seek approval from the NCC and DCC in advance. WFPS completes a Load Profile request form<sup>3</sup> and submits to [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie).

Whilst the TSO and DSO are flexible to accommodate a level of testing, open ended WFPS test requests shall be avoided. Test requests should not involve full Distribution Code compliance testing, rather the specific functional checks and MW and Mvar changes for the WFPS. All requests shall state the level of involvement required from NCC and the DCCs so that appropriate resources may be coordinated.

#### Internal Testing and Upgrades

Step	Responsibility	Description	Typical Timeline
1	WFPS	The WFPS submits a Load Profile Request Form to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> before 10am 2 BD before testing or upgrade is scheduled.	Request Date
2	TSO	Generator Testing approves or rejects the request within <b>2BD</b>	Request + 2BD
3	WFPS	The WFPS shall monitor wind conditions and inform the TSO and DSO at least <b>1 BD</b> in advance if the test is unlikely to proceed. WFPS shall update the Load Profile Request Form with the correct time and date and resubmit for approval.	Test Date - 1BD
4	WFPS	For approved requests: WFPS contacts DCC and NCC and requests permission to proceed with testing. (WFPS shall provide a brief description of the test plan).	Test Date

<sup>2</sup> <http://www.eirgridgroup.com/site-files/library/EirGrid/Wind%20Farm%20Controllability%20Categorisation%20Policy.pdf>

<sup>3</sup> [http://www.eirgridgroup.com/site-files/library/EirGrid/WFPS\\_LoadProfileRequestForm.xlsx](http://www.eirgridgroup.com/site-files/library/EirGrid/WFPS_LoadProfileRequestForm.xlsx)

Step	Responsibility	Description	Typical Timeline
5	WFPS	WFPS executes test per test plan. (Deviations of test plan on the day of test shall be agreed with NCC in advance).	Test Date
6	WFPS	WFPS contacts DCC and NCC and informs them that the test has been completed. The WFPS verifies that all signals and controls measures have been restored to normal.	Test Date

## 6.2. Test Procedures

The WFPS shall use a test procedure document that sets out the objectives and the requirements to prove compliance with the Distribution Code. Test procedure templates reviewed with industry are published<sup>4</sup>. If the testing templates do not suit the required testing, then the WFPS shall suggest an alternative for agreement with DSO and TSO.

Test procedure for NOIS testing shall be included in the WFPS test procedures. Test procedure for DFL will be issued by DSO.

### Test Procedure Approval

Step	Responsibility	Description	Typical Timeline
1	WFPS	WFPS completes & submits test procedure and confirms the latest testing templates have been used within the test request to TSO and DSO. WFPS confirms that all sections have been completed correctly & notes any changes or required changes to the template.  TPA= test procedure approval date	TPA>20BD > Proposed test date
2	TSO / DSO	TSO and DSO (as appropriate) review and approve test procedure or provide comments to the WFPS within 10BD and cc <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> / <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> .	TPA>10BD Proposed test date
3	WFPS	Update the test procedure with all comments and resubmit as appropriate. To minimise multiple revisions of the test procedure, the WFPS shall state within the resubmission that all comments are addressed. (If not all comments are addressed the WFPS shall seek clarification meeting with TSO and DSO).  Iterations in this process may delay the test date if the procedures are not agreed before the test date, and may require the WFPS to return to step 1.	As required before the test date.
4	TSO / DSO	Approve Test procedure for use at least 10 BD before testing.	TPA

## 6.3. Distribution Code Tests

WFPS which have achieved ORC and have approved test procedures can proceed with Distribution Code Compliance testing.

On-load Tests carried out on DSO WFPS are to ensure compliance with the latest version of the Distribution Code. On load testing can be broken down into the following categories.

<sup>4</sup> <http://www.eirgridgroup.com>

1. Active Power Control and Availability.
2. Frequency Response.
3. Ramp Rates and Start Up.
4. Power Factor test.
5. Reactive Power Capability (Type A and B only. Type B is tested by DSO).
6. Reactive Power Control (Type A and B only. Type B is tested by DSO).
7. Network Operator Initiated Shutdown (NOIS) or Dispatch Fail Test (DFT).

#### 6.4. EirGrid Testing Calendar & Notification Process

EirGrid use a calendar and notification list process. The calendar is available for WFPS who wish to schedule and coordinate testing as soon as possible after energisation. A WFPS may request a consecutive **2BD** within a week to carry out testing. A WFPS cannot block book the calendar. Calendar requests are booked for WFPS per day and are treated on first come first served basis.

The published Notification List process<sup>5</sup> is applied to WFPS that are energised to the distribution and transmission systems 9 months or more and do not have an Operational Certificate Justification. This process is in place to ensure that testing is offered to WFPS units.

#### 6.5. Distribution Code Testing

WFPS testing is scheduled in the testing calendar to take place between 9am and 5pm, Monday to Friday.

If WFPS cannot carry out scheduled testing due to resourcing issues, WFPS shall notify TSO and DSO to cancel testing at least 10BD in advance.

If suitable wind conditions prevail and the WFPS is ready to begin testing on time, testing of 1, 2, 3 & 4 of section 6.3, above, can be completed within **1BD**. If reactive power testing (tests 5 & 6 as for Type A and Type B) is required, testing can be completed within **2BD (for type B WFPS tests 5 & 6 shall be arranged with DSO)**.

For NOIS or DFL testing there is usually a requirement to have WFPS OEMs, WFPS Electrical Contractors, ESNB Operator and EirGrid witness on site. This test can be completed on low wind days, shortly after all WTGs are installed and typically before ORC. This test is typically carried out on the same day EirGrid carry out a site survey to verify installed capacity and verify the turbine protection settings are applied as agreed.

Step	Responsibility	Description	Typical Timeline
1	WFPS	Confirm availability in the testing calendar with <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and cc <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a>	<b>Proposed test date - 20BD</b>
2	WFPS	Send request for a Distribution Code testing to the TSO and DSO at least <b>20BD</b> in advance of the proposed test date. This shall be submitted before 9 months after energisation.	<b>Proposed test date - 20BD</b>
3	TSO	Generator Testing confirms test is scheduled within the calendar within <b>10BD</b> and cc <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a>	<b>Proposed test date - 10BD</b>
4	WFPS	WFPS confirms testing resources for the proposed test date and cancels testing if necessary.	<b>Test Date - 10BD</b>

<sup>5</sup> [www.eirgridgroup.com](http://www.eirgridgroup.com)

5	TSO	TSO monitors the TSO wind forecast and confirms if testing can proceed 5/3/1 BD in advance of the confirmed test date (accounting for 5 day forecast). The required start time and contact details shall be included in the confirmation.	<b>Test Date - 5/3/1D</b>
5	WFPS	WFPS monitors the wind forecast and confirms points of contact for the execution of testing of the WFPS.	<b>Test Date - 5/3/1D</b>
6	WFPS	WFPS confirms with NCC and DCC that testing can proceed. The WFPS begins testing on time.	<b>Test Date</b>
7	WFPS	WFPS executes test per the test procedure. The WFPS test coordinator fills in all steps within the test procedure.	<b>Test Date</b>
8	WFPS	WFPS confirms with NCC and DCC that testing has concluded.	<b>Test Date</b>

### 6.6. Post Testing Follow up

On conclusion of testing, it is important that the WFPS coordinator ensures that the WFPS Distribution Code testing project is brought to a speedy conclusion. This involves the following:

1. Submission of the documentation for testing, test data completed and signed test procedure and a test report.
2. Follow the steps in section 6.1 when mitigating issues identified; notify [generator\\_testing@eirgrid.com](mailto:generator_testing@eirgrid.com) and [performancemonitoring@esb.ie](mailto:performancemonitoring@esb.ie) that the issues are addressed; and follow the steps in sections 6.2 to 6.5 to carry out retesting.
3. Decision to submit derogation application.

#### Post Testing Follow up

Step	Responsibility	Description	Typical Timeline
1	WFPS	WFPS submits test data and signed and scanned test procedure to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a>	<b>Testing date + 1 BD</b>
2	WFPS	WFPS submits test report and As Built information (including model validation as required) <b>20BD</b> following test to <a href="mailto:generator_testing@eirgrid.com">generator_testing@eirgrid.com</a> and <a href="mailto:performancemonitoring@esb.ie">performancemonitoring@esb.ie</a> .  This date shall not be more than 20BD.	<b>Testing date + 20BD</b>
3	TSO / DSO	TSO / DSO (as appropriate) reviews the report for comment within <b>15BD</b>	<b>Testing date + 35BD</b>
4	TSO	If the test report is not approved, WFPS has the following options. <ol style="list-style-type: none"> <li>1. Update all comments and submit revision of the report which closes all open items. This shall be stated clearly within the response.</li> <li>2. Mitigate and retest.</li> <li>3. Submit derogation application.</li> </ol>	<b>TSO and DSO Feedback + 10BD</b>



## 6.7. Operational Certificate Justification

The DSO is responsible for the issuance of the Operational Certificate of Distribution connected customers.

The TSO process is deemed completed when all open tests, off load and on load, and As Built information has been received. This may include model validation.

When the TSO testing process is completed, and there is no open performance monitoring or testing queries with the WFPS, an Operational Certificate Justification is issued by the TSO to the DSO.

The Operational Certificate Justification may be conditional on temporary derogations. It is the responsibility of the WFPS to ensure that the conditions of the Operational Certificate Justification and the temporary derogations are met. This may involve further testing.

Additional connection agreement conditions (for example Capacity Test) that are not considered within the TSO process are considered by the DSO, in advance of issuance of an Operational Certificate.

WFPS that do not achieve Operational Certificate Justification per the Notification List Process<sup>6</sup> are moved from Category 2 to Category 1.

Step	Responsibility	Description	Typical Timeline
1	TSO	Issue Operational Certificate Justification to the DSO	<b>3BD</b>
2	DSO	Issue Operational Certificate or Operational Certificate Justification to WFPS	<b>10BD</b>

## 7. Derogations

Once a derogation application from the Distribution Code has been received, reviewed and deemed acceptable by DSO, the DSO will forward to the TSO ([GridCode@EirGrid.com](mailto:GridCode@EirGrid.com)) to afford the TSO the option of submitting a derogation assessment. TSO will inform DSO of its intention to submit a derogation assessment within **10 BD**. The DSO will forward both derogation assessments to the CER for decision.

## 8. Performance Monitoring<sup>78</sup>

A separate TSO and DSO protocol is published to ensure that the Grid Code and Distribution Code standards are maintained.

## 9. Connection Agreement Amendments

Revised connection agreements with changes to operational characteristics or registered data i.e. addition of turbines, require application of the testing process.

<sup>6</sup> <http://www.eirgridgroup.com/site-files/library/EirGrid/Wind%20Farm%20Controllability%20Categorisation%20Policy.pdf>

<sup>7</sup> <http://www.eirgridgroup.com/site-files/library/EirGrid/Windfarm-Performance-monitoring-process-October-2015.pdf>

<sup>8</sup> <http://www.esbnetworks.ie/docs/default-source/publications/windfarm-performance-monitoring-process.pdf>