MODIFICATION RECOMMENDATION FORM

MPID 245 Frequency Response Housekeeping Modification

RECOMMENDATION TO CER BY EIRGRID OF MODIFICATION TO GRID CODE.

ABSTRACT / TITLE OF MODIFICATION	Frequency Response Housekeeping Modification
MODIFICATION NUMBER	MPID 245
RECOMMENDED AT GCRP MEETING NUMBER	GCRP #37
LIST OF GRID CODE SECTION(S) AFFECTED BY PROPOSED MODIFICATION:	WFPS1.5.3.1, WFPS1.5.3.2 and WFPS1.5.3.7
CURRENT GRID CODE VERSION :	5
MODIFICATION DESCRIPTION Overview **THE REASON FOR THE RECOMMENDED MODIFICATION**	Following a review of the modifications approved for WFPS capabilities there were some queries from industry regarding interpretation of the new standards. A review of the clauses has highlighted a number of housekeeping items that require amendments. This modification recommendation deals with the clarification of Figure WFPS1.2 which illustrates the Power-Frequency response expected from a WFPS. The new diagram aims to clarify the interpretation of the new standards. In addition text modifications to the clause WFPS1.5.3.1, Table WFPS1.2 and WFPS1.5.3.7 are being recommended. Below please view the red-line version and the green-line version of the proposed changes to Grid Code version 5.

History of Progression through GCRPs, Working Group and/or Consultation	EirGrid presented the modification proposal MPID 245 to the Grid Code Review Panel members at a meeting held in the Clarion IFSC Hotel in Dublin on the 4th December 2013. MPID 245 was approved by participants subject to a satisfactory resolution of a clarification sought by Stephen Walsh (DSO representative). At the Grid Code Review Panel meeting held in the Radisson Blu Hotel in Belfast on the 12th February 2014 Stephen Walsh noted that he is satisfied with the discussions that took place with David Cashman (EirGrid) with respect to the clarification sought.
Summary Note of any Objections to the Recommended change from GCRP Members or Consultation Responses	No objections were raised. A clarification on the intention of the modification was sought by Stephen Walsh (DSO representative).
Outcome of any GCRP Meeting Actions Relating to the Recommended Modification	The clarification query was resolved through discussions between Stephen Walsh (DSO representative) and David Cashman (EirGrid). The TSO explained that the rationale behind the modification was to ensure consistency of frequency response between wind and conventional plant. Stephen Walsh has verified he is satisfied with the outcome of the discussion.
Implication of not implementing the Modification	The current diagram in Figure WFPS1.2 has caused confusion in the industry with the interpretation of the new WFPS standards for Power-Frequency response. This modification aims to update this figure with a view to removing any ambiguity.

RED-LINE VERSION

WFPS1.5.3 FREQUENCY RESPONSE

WFPS1.5.3.1 In **Wind Following Mode**, the **Frequency Response System** shall have the capabilities as displayed in the *Power-Frequency Response Curve* in *Figures WFPS1.2,* where the power and frequency ranges required for points A, B, C, D, E are defined below in *Table WFPS1.1 and Table WFPS1.2.* The **Frequency Response System** shall adjust the **Active Power** output of the **Controllable WFPS** according to a **Governor Droop**, settable by the **TSO** in a range from 2% to 10% and defaulting to 4%, when operating in the ranges outside the deadband range F_B-F_C in the Power-Frequency Response Curve. **Controllable WFPS Frequency Response** and **Governor Droop** shall be calculated with respect to **Registered Capacity**. ~~A **Controllable WFPS** can only give a low frequency response if the **Active Power Control Setpoint** is less than the **Available Active Power.**~~

WFPS1.5.3.2 When in **Active Power Control Mode,** the **Controllable WFPS** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in WFPS1.5.3.1 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO.**

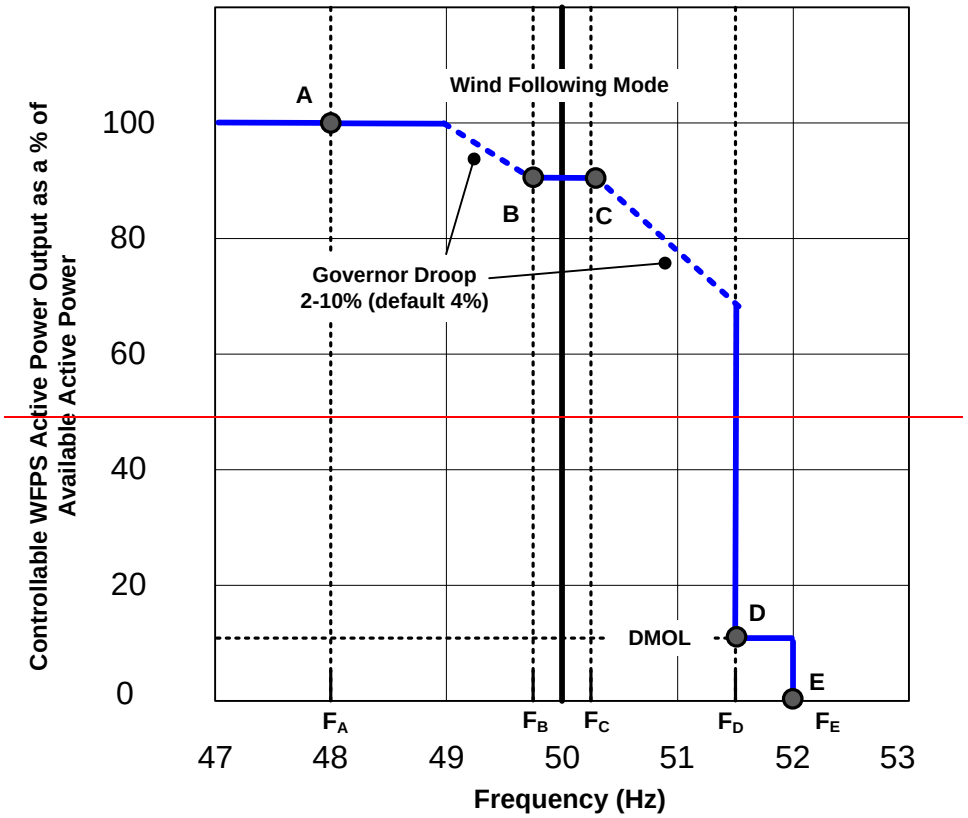

Figure WFPS1.2 – Example of Power-Frequency Response Curve for ***Wind Following Mode***

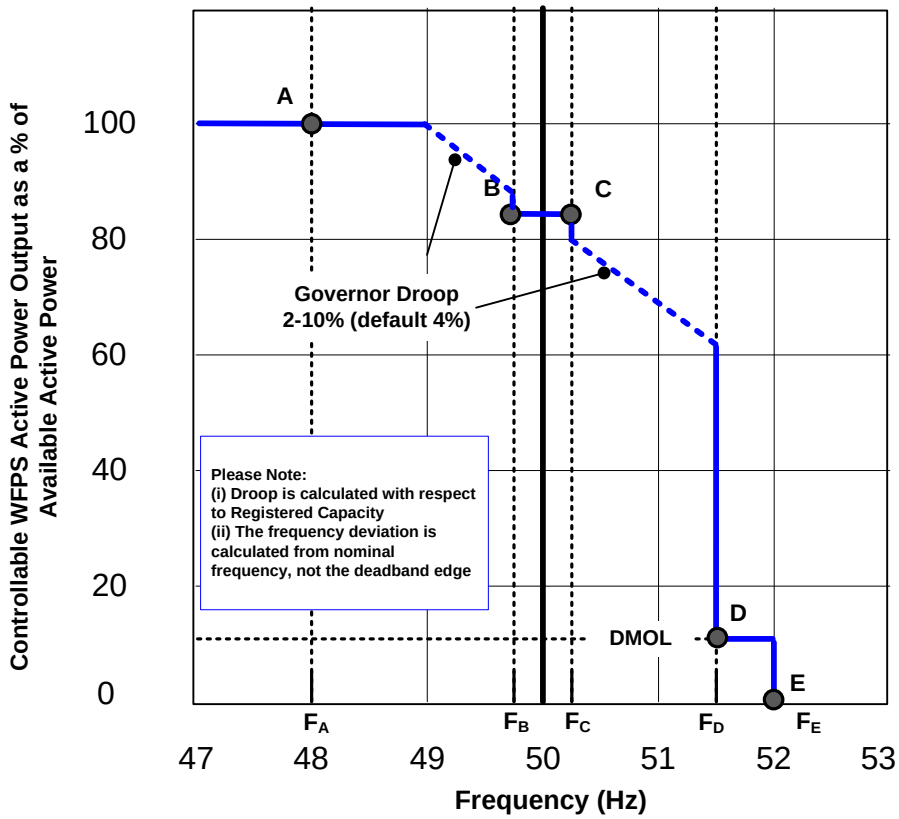

*Figure WFPS1.2 –Example of Power-Frequency Response Curve for **Wind Following Mode***

WFPS1.5.3.3 When acting to control **Transmission System Frequency**, the **Controllable WFPS** shall provide at least 60% of its expected additional **Active Power** response within 5 seconds, and 100% of its expected additional **Active Power** response within 15 seconds of the start of the **Transmission System Frequency** excursion outside the range F_B-F_C, or in the case of a **Controllable WFPS** in **Active Power Dispatch Mode**, when the **Transmission System Frequency** goes outside the deadband set out in WFPS1.5.3.2.

WFPS1.5.3.4 When the **Transmission System Frequency** is in the range F_C-F_D, the **Controllable WFPS** shall ensure that its **Active Power Output** does not increase beyond the **Active Power** value of the **Controllable WFPS** when the **Transmission System Frequency** first exceeded F_C, due to an increase in **Available Active Power** in that period.

WFPS1.5.3.5 If the **Frequency** drops below F_A, then the **Frequency Response System** shall act to maximise the **Active Power** output of the **Controllable WFPS**, irrespective of the **Governor Droop Setting**. If the **Frequency** rises above F_D, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable WFPS** to its **DMOL** value. If the **Frequency** rises above F_E, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable WFPS** to zero. Any **WTG** which has disconnected shall be brought back on load as fast as technically feasible, provided the **Transmission System Frequency** has fallen below 50.2 Hz.

WFPS1.5.3.6 Points 'A', 'B', 'C', 'D' and 'E' shall depend on a combination of the **Transmission System Frequency**, **Active Power** and **Active Power Control Set-point** settings. These settings may be different for each **Controllable WFPS** depending on system conditions and **Controllable WFPS** location. These settings are defined in *Table WFPS1.1* below.

Point	***Transmission System Frequency*** *(Hz)*	***Controllable WFPS Active Power*** *Output (% of **Available Active Power**)*
A	F_A	P_A
B	F_B	Minimum of : P_B or **Active Power Control Set-point** (converted to a % of **Available Active Power**)
C	F_C	Minimum of: P_C or **Active Power Control Set-point** (converted to a % of **Available Active Power**)
D	F_D	Minimum of: P_D **or** **Active Power Control Set-point** (converted to a % of **Available Active Power**)

E	F_E	P_E = 0 %

Table WFPS1.1: ***Transmission System Frequency*** *and %* ***Available Active Power*** *Settings for the Points 'A', 'B', 'C', 'D' and 'E' illustrated in Figure WFPS1.2*

Two settings for each of F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date** (refer to WFPS1.5.3.11 below). The **Controllable WFPS** shall be responsible for implementing the appropriate settings during **Commissioning**.

WFPS1.5.3.7 The table below, *Table WFPS1.2,* shows the **Transmission System Frequency** and **Active Power** ranges for F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E.

	Transmission System Frequency *(Hz)*		***Available Active Power*** *(%)*
			Registered Capacity ≥ 5 MW
F_A	*47.0-49.5*	P_A	*50-100*
F_B	*49.5-50*	P_B	*15-100*
F_C	*50-50.5*	P_C	
F_D	*50.5-52.0*	P_D	*15-100 but not less than* ***DMOL***
F_E		P_E	*0*

Table WFPS1.2: ***Transmission System Frequency*** *&* ***Active Power*** *ranges appropriate to Figure WFPS1.2.*

For the **Transmission System Frequency** values in *Table WFPS1.2* above, $F_A \leq F_B \leq F_C \leq F_D$ ~~$= F_E$.~~ $\leq F_E$.

GREEN-LINE VERSION

WFPS1.5.3 FREQUENCY RESPONSE

WFPS1.5.3.1 In **Wind Following Mode**, the **Frequency Response System** shall have the capabilities as displayed in the *Power-Frequency Response Curve* in *Figures WFPS1.2,* where the power and frequency ranges required for points A, B, C, D, E are defined below in *Table WFPS1.1 and Table WFPS1.2.* The **Frequency Response System** shall adjust the **Active Power** output of the **Controllable WFPS** according to a **Governor Droop**, settable by the **TSO** in a range from 2% to 10% and defaulting to 4%, when operating in the ranges outside the deadband range F_B-F_C in the Power-Frequency Response Curve.

Controllable WFPS Frequency Response and **Governor Droop** shall be calculated with respect to **Registered Capacity.**

WFPS1.5.3.2 When in **Active Power Control Mode,** the **Controllable WFPS** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in WFPS1.5.3.1 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO.**

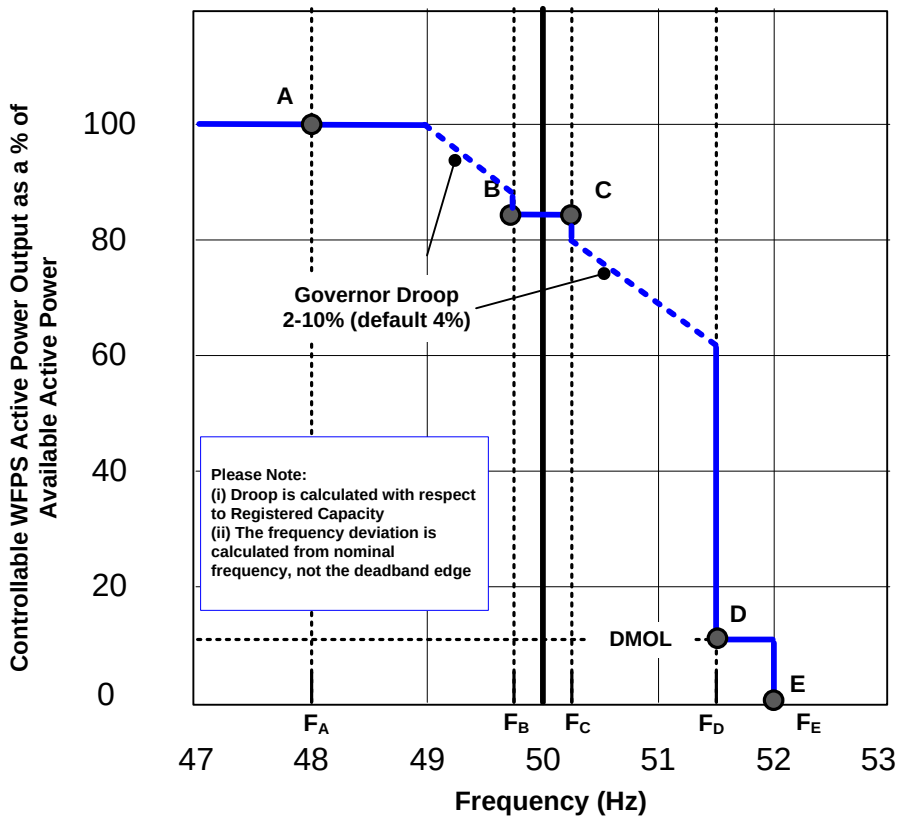

*Figure WFPS1.2 –Example of Power-Frequency Response Curve for **Wind Following Mode***

WFPS1.5.3.3 When acting to control **Transmission System Frequency**, the **Controllable WFPS** shall provide at least 60% of its expected additional **Active Power** response within 5 seconds, and 100% of its expected additional **Active Power** response within 15 seconds of the start of the **Transmission System Frequency** excursion outside the range F_B-F_C, or in the case of a **Controllable WFPS** in **Active Power Dispatch Mode**, when the **Transmission System Frequency** goes outside the deadband set out in WFPS1.5.3.2.

WFPS1.5.3.4 When the **Transmission System Frequency** is in the range F_C-F_D, the **Controllable WFPS** shall ensure that its **Active Power Output** does not increase beyond the **Active Power** value of the **Controllable WFPS** when the **Transmission System Frequency** first exceeded F_C, due to an increase in **Available Active Power** in that period.

WFPS1.5.3.5 If the **Frequency** drops below F_A, then the **Frequency Response System** shall act to maximise the **Active Power** output of the **Controllable WFPS**, irrespective of the **Governor Droop Setting**. If the **Frequency** rises above F_D, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable**

WFPS to its **DMOL** value. If the **Frequency** rises above F_E, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable WFPS** to zero. Any **WTG** which has disconnected shall be brought back on load as fast as technically feasible, provided the **Transmission System Frequency** has fallen below 50.2 Hz.

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Point	***Transmission System Frequency*** *(Hz)*	***Controllable WFPS Active Power*** *Output (% of* ***Available Active Power****)*
A	F_A	P_A
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C	F_C	Minimum of: P_C or **Active Power Control Set-point** (converted to a % of **Available Active Power**)
D	F_D	Minimum of: P_D **or** **Active Power Control Set-point** (converted to a % of **Available Active Power**)
E	F_E	P_E = 0 %

Table WFPS1.1: ***Transmission System Frequency*** *and %* ***Available Active Power*** *Settings for the Points 'A', 'B', 'C', 'D' and 'E' illustrated in Figure WFPS1.2*

Two settings for each of F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date** (refer to WFPS1.5.3.11 below). The **Controllable WFPS** shall be responsible for implementing the appropriate settings during **Commissioning**.

WFPS1.5.3.7 The table below, *Table WFPS1.2,* shows the **Transmission System Frequency** and **Active Power** ranges for F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E.

	Transmission System Frequency *(Hz)*		***Available Active Power*** *(%)*
			Registered Capacity ≥ 5 MW
F_A	*47.0-49.5*	P_A	*50-100*

F_B	*49.5-50*	***P_B***	
F_C	*50-50.5*	***P_C***	*15-100*
F_D		***P_D***	*15-100 but not less than* ***DMOL***
F_E	*50.5-52.0*	***P_E***	*0*

Table WFPS1.2: ***Transmission System Frequency*** *&* ***Active Power*** *ranges appropriate to Figure WFPS1.2.*

For the **Transmission System Frequency** values in *Table WFPS1.2* above, $F_A \leq F_B \leq F_C \leq F_D \leq F_E$.