

**Grid Code
Modification
Recommendation Form**



Title of Recommended Proposal: Clarification
Modification on WFPS Voltage Control

MPID 270

Date:	05/04/2017								
Recommended at GCRP Meeting No.:	#1/2017 (31 January 2017)								
Grid Code Section(s) Impacted by Recommended Proposal:	<table border="1"> <thead> <tr> <th>Deleted Clauses</th> <th>Modified Clauses</th> </tr> </thead> <tbody> <tr> <td>WFPS1.6.2.5</td> <td>WFPS1.6.3.1</td> </tr> <tr> <td>Figure WFPS1.3</td> <td>Definition of Generator Transformer</td> </tr> <tr> <td>WFPS1.6.5.1</td> <td>Definition of Grid Connected Transformer</td> </tr> </tbody> </table>	Deleted Clauses	Modified Clauses	WFPS1.6.2.5	WFPS1.6.3.1	Figure WFPS1.3	Definition of Generator Transformer	WFPS1.6.5.1	Definition of Grid Connected Transformer
	Deleted Clauses	Modified Clauses							
	WFPS1.6.2.5	WFPS1.6.3.1							
	Figure WFPS1.3	Definition of Generator Transformer							
WFPS1.6.5.1	Definition of Grid Connected Transformer								

Grid Code Version: 6.0

The Reason for the Recommended Modification:

A modification specifying new Reactive Power requirements for WFPS, [MPID228](#), was approved by the CER, 26 February 2013. At that time, Figure WFPS1.3 was not updated to align with the revised text in section WFPS1.6.3.1.

At the GCRP meeting, 11 Oct 2016, a housekeeping modification was proposed to amend Figure WFPS1.3 to align it with the clause WFPS1.6.3.1. At this meeting it was noted that Figure WFPS1.3 can cause confusion in certain instances where the connection point is remote from the substation, i.e. where the connection point is not at the high voltage terminals of the grid connected transformer. It was proposed to put the housekeeping proposal on hold pending further examination by the TSO.

Following further examination the TSO proposed a clarification modification that removed Figure WFPS1.3 and any references to the diagram from the Grid Code. This removes uncertainty but will not remove the requirement for WFPS to be compliant at the connection point as per WFPS1.6.3.1.

WFPS 1.6.5.1 details a definition of grid connected transformers where the WFPS connection point is remote from the WFPS. This clarification should be included in the definition of Grid Connected Transformer.

WFPS 1.6.5.1 details a definition of generator transformer for WFPS. This clarification should be included in the definition of Generator Transformer.

History of Progression through GCRPs, Working Group and/or Consultation:

26 February 2013

[MPID 228](#) was approved by CER.

11 October 2016 – Ireland GCRP Meeting

At the meeting the TSO proposed amending Figure WFPS1.3 to align it with the clause WFPS1.6.3.1. Tony Hearne (DSO) recommended that Figure WFPS1.3 be removed from the Grid Code and the TSO undertook an action to review his recommendation.

31 January 2017 – GCRP Meeting

Following a review the TSO recommended:

- Removing Figure WFPS1.3 instead of implementing the previously proposed change to it.
- Adding new text to WFPS1.6.3.1 and removing references to Figure WFPS1.3 in the surrounding text.
- Removing WFPS1.6.5.1 and instead updating the definitions of Generator Transformer and Grid Connected Transformer.

There were no questions/objections raised at the meeting and the members recommended that the proposal be submitted to the CER for their approval.

Summary Note of any Objections to the Recommended Change from GCRP Members or Consultation Responses:

No objections raised by the GCRP Members.

Outcome of any GCRP Meeting Actions Relating to the Recommended Modification:

At the GCRP meeting that took place 11 October 2016, the TSO proposed to revise Figure WFPS1.3 to align it with the clause WFPS1.6.3.1. At this meeting Tony Hearne (DSO) proposed that Figure WFPS1.3 be removed from the Grid Code because the diagram doesn't cater for sites where the connection point is remote from the site. The TSO agreed to carry out a review. Following such a review a revised modification proposal was presented to the GCRP members on 31 January 2017. The TSO agreed with Tony Hearne's recommendation to remove the figure and further proposed to revise relevant Grid Code clauses to align with the removal of Figure WFPS1.3.

Red-line Version of Impacted Grid Code Section(s) - show recommended changes to text:

Deleted text in ~~strike-through red font~~ and new text highlighted in *blue font*

WFPS1.6.2 AUTOMATIC VOLTAGE REGULATION

~~WFPS1.6.2.5 Figure WFPS1.3 shows the relevant points appropriate to the Voltage Regulation System for a Controllable WFPS. X is the HV side of the WTG transformer, Y is the lower voltage side of the Grid Connected Transformer and Z is the Connection Point.~~

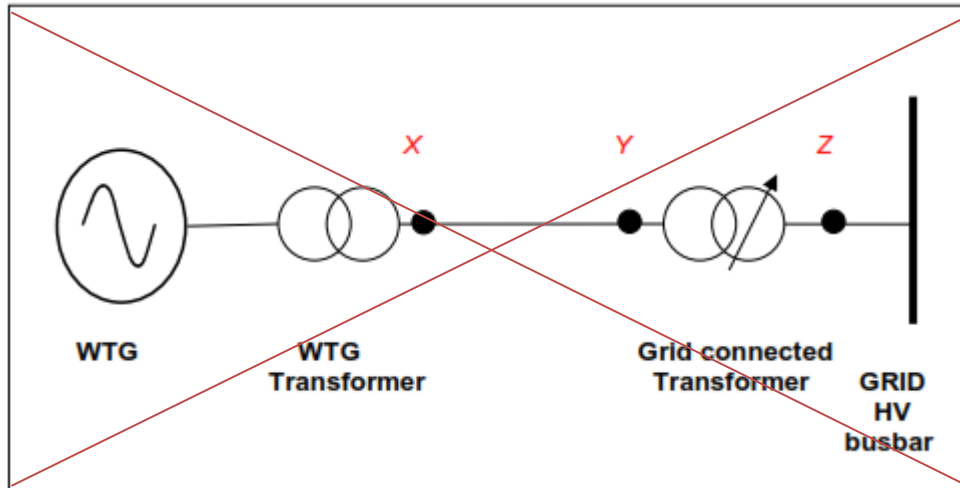


Figure WFPS1.3 – Locations for ~~Voltage Regulation~~ set point (Z) and the ~~Power Factor~~ range (Y). The HV side of the ~~WTG~~ transformer is (X)

WFPS1.6.3 REACTIVE POWER CAPABILITY

WFPS1.6.3.1 Controllable WFPSs operating in **Power Factor** control mode, **Voltage Control** mode or constant **Reactive Power** mode shall be at least capable of operating at any point within the P-Q capability ranges illustrated in *Figure WFPS1.4*, as measured at the **Connection Point** over the normal and disturbed **Transmission System Voltage** ranges specified in CC.8.3.2; **subject to the exception in WFPS1.6.3.2, where additional Reactive Power compensation may be utilised to compensate for the Reactive Power demand of the connection between the Connection Point and the Controllable WFPS.**

Referring to *Figure WFPS1.4*:

Point A represents the minimum Mvar absorption capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor leading;

Point B represents the minimum Mvar production capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor lagging;

Point C represents the minimum Mvar absorption capability of the **Controllable WFPS** at 12% **Registered Capacity** and is equivalent to the same **Mvar** as Point A;

Point D represents the minimum Mvar production capability of the **Controllable WFPS** at 12% **Registered Capacity** and is equivalent to the same **Mvar** as Point B;

Point E represents the minimum Mvar absorption capability of the **Controllable WFPS** at the cut-in speed of the individual **WTGs**;

Point F represents the minimum Mvar production capability of the **Controllable WFPS** at the cut-in speed of the individual **WTGs**;

The **TSO** accepts that the values of Points E and F may vary depending on the number of **WTGs** generating electricity in a low-wind scenario;

Figure WFPS1.4 represents the minimum expected **Reactive Power** capabilities of the **Controllable WFPS**. The **Controllable WFPS** is obliged to tell the **TSO/DSO** if it can exceed these capabilities, and submit the actual P-Q capability diagram based

upon the installed plant and **Collector Network** characteristics to the **TSO** during **Commissioning**.

The **Grid Connected Transformer** tap changing range must be capable of ensuring nominal voltage at ~~point Y~~ **the lower voltage side of the grid connected transformer**, for any **Voltage** at the **Connection Point (Point Z)** within the ranges specified in WFPS1.6.1.

WFPS1.6.5 CONTROLLABLE WFPS'S GRID CONNECTED TRANSFORMER

~~WFPS1.6.5.1 All relevant references in the **Grid Code to Generator Transformers** shall be interpreted to mean the **Controllable WFPS's Grid Connected Transformer** rather than the individual **WTG transformers**. For **Controllable WFPSs** where the **Connection Point** is remote from the **Controllable WFPS**, **Grid Connected Transformer** shall be interpreted to mean the **HV transformer located at the Controllable WFPS**.~~

WFPS1.6.5.21 **Controllable WFPSs** shall provide on-load tap-changing (OLTC) facilities for all **Grid Connected Transformers**. All **Controllable WFPSs** shall liaise with the **TSO** on the design specification for the performance of the tap-changing facility of the **Grid Connected Transformer**.

WFPS1.6.5.32 The **Controllable WFPS's Grid Connected Transformers** may be connected either:

- in delta on the lower voltage side and in star (with the star point or neutral brought out) on the HV side; or
- in star on both HV and lower voltage sides with a delta tertiary winding provided.

Definition of Generator Transformer

A transformer whose principal function is to provide the interconnection between the **Generation Unit** and the Network and to transform the **Generation Unit** voltage to the Network voltage. In the case of **Controllable WFPSs**, this shall be interpreted to mean the **Controllable WFPS's Grid Connected Transformer** rather than the individual **WTG transformers**.

Definition of Grid Connected Transformer

Any transformer directly connected to the **Transmission System**. In the case of **Controllable WFPSs** where the **Connection Point** is remote from the **Controllable WFPS**, this shall be interpreted to mean the HV transformer located at the **Controllable WFPS**.

Green-line Version of Impacted Grid Code Section(s) - show recommended final text:

WFPS1.6.3 REACTIVE POWER CAPABILITY

WFPS1.6.3.1 **Controllable WFPSs** operating in **Power Factor** control mode, **Voltage Control** mode or constant **Reactive Power** mode shall be at least capable of operating at any point within the P-Q capability ranges illustrated in *Figure WFPS1.4*, as measured at the **Connection Point** over the normal and disturbed **Transmission System Voltage** ranges specified in CC.8.3.2; subject to the exception in WFPS 1.6.3.2, where additional **Reactive Power** compensation may be utilised to compensate for the **Reactive**

Power demand of the connection between the **Connection Point** and the **Controllable WFPS**.

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Point A represents the minimum Mvar absorption capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor leading;

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Point C represents the minimum Mvar absorption capability of the **Controllable WFPS** at 12% **Registered Capacity** and is equivalent to the same **Mvar** as Point A;

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WFPS1.6.5.2 The **Controllable WFPS's Grid Connected Transformers** may be connected either:

- (a) in delta on the lower voltage side and in star (with the star point or neutral brought out) on the HV side; or
- (b) in star on both HV and lower voltage sides with a delta tertiary winding provided.

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