CONFIDENTIAL FORM GC1

MODIFICATION PROPOSAL FORM

WFPS REACTIVE POWER

FORM GC1, PROPOSAL OF MODIFICATION TO GRID CODE.

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MODIFICATION PROPOSAL ORIGINATOR (CONTACT NAME)	David Cashman	**MODIFICATION PROPOSAL ORIGINATOR FAX NUMBER:**	
MODIFICATION PROPOSAL ORIGINATOR TELEPHONE NUMBER:	01-2370122	**DATE:**	08/10/2012
MODIFICATION PROPOSAL ORIGINATOR E-MAIL ADDRESS:	david.cashman@eirgrid.com	**MODIFICATION PROPOSAL NUMBER (EIRGRID USE ONLY)**	**MPID 228**

GRID CODE SECTION(S) AFFECTED BY PROPOSAL:	**WFPS1.6.3, WFPS1.6.3.3**
GRID CODE VERSION :	**4.0**
MODIFICATION PROPOSAL DESCRIPTION **(MUST CLEARLY STATE THE DESIRED AMENDMENT, ALL TEXT/FORMULA CHANGES TO THE GRID CODE. THE REQUIRED REASON FOR THE MODIFICATION MUST STATED. ATTACH ANY FURTHER INFORMATION IF NECESSARY.)**	**To amend WFPS1.6.3 to specify new reactive power specifications for Controllable WFPS connected to the transmission system. A reactive power range performance for power factor control mode is defined. Also a new reactive power range is defined for WFPS in voltage control or constant reactive power mode.** **Amended Text and Diagrams are shown below.**
IMPLICATION OF NOT IMPLEMENTING THE MODIFICATION	**Without improved reactive capabilities of WFPS there will be implications around system stability for higher penetrations of wind. Conventional generation will be displaced by wind generation leading to a reduction in reactive capability on the system. Without a revised specification for Controllable WFPS to provide reactive power there will likely be increased curtailment of WFPS.** **Localised voltage stability issues may also result on weaker areas of the system where large wind generation exists.**
Please submit the Modification Proposal by fax, post or electronically, using the information supplied above	
EIRGRID REVIEWER	

EIRGRID ASSESSMENT	

WFPS1.6.3 REACTIVE POWER CAPABILITY

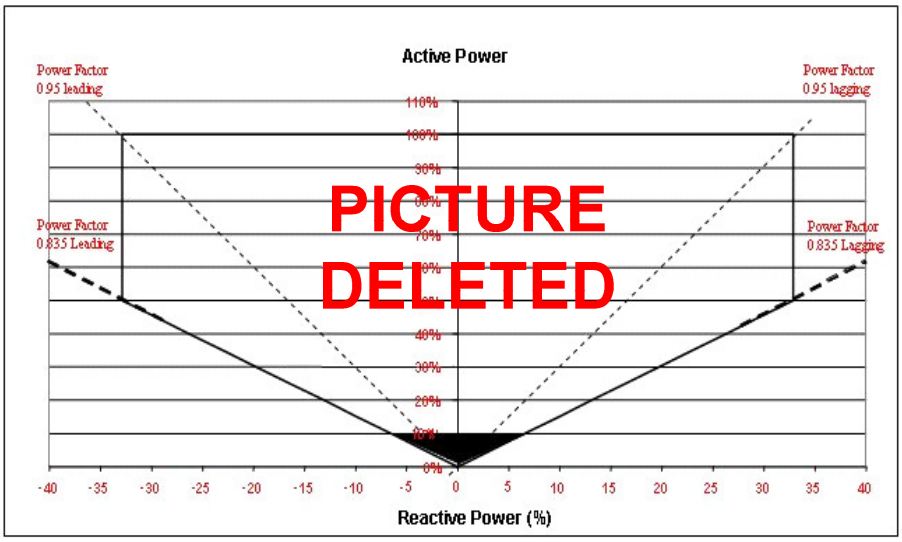
WFPS1.6.3.1 **Controllable WFPSs** operating in **Power Factor** control mode, Voltage Control Mode or Constant Reactive Power mode shall be at least capable of operating at any point within the P-Q capability ranges illustrated in *Figure WFPS1.4,* as measured at the **Connection Point**.

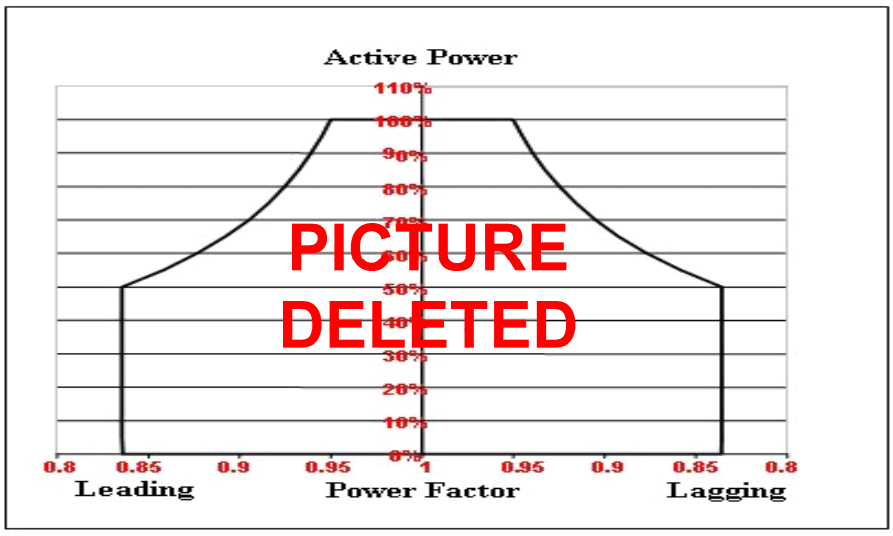
Referring to *Figure WFPS1.4:*
Point A represents the minimum Mvar absorption capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor leading;
Point B represents the minimum Mvar production capability of the **Controllable WFPS** at 100% **Registered 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 design reference voltage for the **Reactive Power** capability shall be the nominal voltage at point Y.~~

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





~~*Figure WFPS1.4 -* **Reactive Power** Capability of **Controllable WFPS**~~

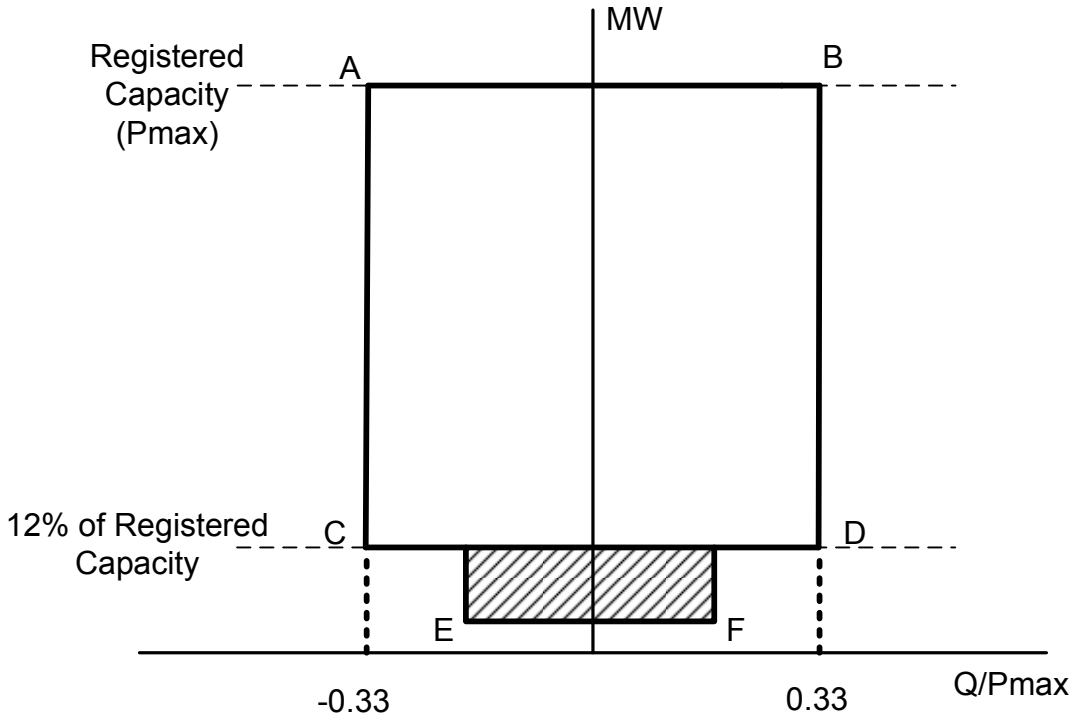


Figure WFPS1.4 – Minimum **Reactive Power** Capability of **Controllable WFPS**

WFPS 1.6.3.2 <No Changes to this section>

WFPS1.6.3.3 The total charging of the **Controllable WFPS** **Collector Network** during low load operation (below ~~10 %~~12%) shall be examined during the **TSO's Connection Offer** process. If during this examination it is identified that this charging may cause the voltage on the **Transmission System** to be outside the **Transmission System Voltage** ranges, as specified in WFPS1.6.1, then the **Reactive Power** requirements will need to be altered.

GLOSSARY DEFINITION:

COLLECTOR NETWORK: The network of cables and overhead lines within a **Controllable WFPS** used to convey electricity from individual **WTGs** to the **Connection Point.**