

# DISTRIBUTION CODE MODIFICATION PROPOSAL FORM

<b>Modification Proposal submitted By:</b>  Tony Hearne	<b>DATE OF SUBMISSION OF PROPOSAL:</b> 29.10.2020	<b>Modification Proposal Number:</b> <i>(to be assigned by Review Panel Secretary)</i>  <b>#49</b>
<b>CONTACT DETAILS FOR MODIFICATION PROPOSAL ORIGINATOR: (IF NOT DISTRIBUTION CODE REVIEW PANEL</b>		
<b>NAME:</b> Tony Hearne		<b>TELEPHONE NUMBER:</b> <b>087 2238855</b>
<b>E-MAIL ADDRESS:</b>	tony.hearne@esb.ie	
<b>MODIFICATION PROPOSAL TITLE:</b>	Housekeeping corrections/clarifications to V7 relating to reactive power	
<b>DISTRIBUTION CODE SECTION(S) AFFECTED BY PROPOSAL</b>		
DCC11.5.1 DCC11.5.3.1 DCC11.5.3.2 DCC11.5.3.3 DCC11.6.2.3		
<b>MODIFICATION PROPOSAL DESCRIPTION</b> <i>(Clearly state the desired amendment and all text changes. Attach further information if necessary)</i>		
1. DCC11.5.1		
Existing text:		
<b>DCC11.5 REACTIVE POWER REQUIREMENTS</b>		
<b>DCC11.5.1 Power Factor Range</b>		
Proposed text:		
<b>DCC11.5 REACTIVE POWER REQUIREMENTS</b>		
<b>DCC11.5.1 Power Factor Range</b>		
<u>For avoidance of doubt, at power levels of less than 12% of <b>Registered Capacity</b>, the <b>Reactive Power</b> at the <b>Connection Point</b> can vary up to a maximum of 12% of – the <b>Registered Capacity</b> value, expressed in MVar [importing VAr]. This power factor range is illustrated in Figures 17 and 18.</u>		

2. DCC 11.5.3.1:

Existing text:

**DCC11.5.3.1 Voltage Control Mode**

Following a **Step Change** in voltage, type C & D **PPMs** shall be capable of;

- Achieving 90% of the change in **Reactive Power** output within a time of 1 second.
- Settle at the value specified by the slope within 5 seconds with a steady-state reactive tolerance no greater than 5% of the maximum **Reactive Power**.

Proposed Text:

**DCC11.5.3.1 Voltage Control Mode**

For avoidance of doubt, implementation of voltage control mode with voltage-reference set-points issued by ESNB via SCADA, is only mandated for topology 2 connections. For other topologies, operation at fixed power factors or power factor ranges appropriate to the topology, as specified above or in the Connection Agreement, shall apply.

However the requirement, per Article 21.3.d(vi) of RfG to have the capability to operate on a voltage droop applies to Types C and D PPMs , irrespective of topology.

If operating in Voltage Control Mode, then, Ffollowing a **Step Change** in voltage, type C & D **PPMs** shall be capable of;

- Achieving 90% of the change in **Reactive Power** output within a time of 1 second.
- Settle at the value specified by the slope within 5 seconds with a steady-state reactive tolerance no greater than 5% of the maximum **Reactive Power**.

3. DCC11.5.3.2

Existing text:

**DCC11.5.3.2 Power Factor Control Mode**

For the purpose of power factor control mode, type C & D **PPMs** shall be capable of controlling the power factor at the **Connection Point** within the required **Reactive Power** range with a target power factor in steps no greater than 0.01. The target power factor value and its tolerance are specified in Table 17.

**Table 1**

<b>Parameter</b>	<b>Value</b>	<b>Type Applicability</b>
Target power factor	Site-specific	C and D <b>PPMs</b>
Tolerance	0.5%	

Proposed text:

**DCC11.5.3.2 Power Factor Control Mode**

For the purpose of power factor control mode, type C & D **PPMs** shall be capable of controlling the power factor at the **Connection Point** within the required **Reactive Power** range that is appropriate to the topology of the connection, with a target power factor (as may be specified in the Connection Agreement), in steps no greater than 0.01. The target power factor value and its tolerance are specified in Table 17.

For avoidance of doubt, implementation of Power Factor Mode, with remotely issued set-points is only mandated for topology 2 connections. For other topologies, operation at fixed power

factors or power factor ranges appropriate to the topology, as specified above or in the Connection Agreement, shall apply.

**Table 17**

<b>Parameter</b>	<b>Value</b>	<b>Type Applicability</b>
Target power factor	Site-specific	C and D <b>PPMs</b>
Tolerance	0.5%	C and D <b>PPMs</b>

4. DCC11.5.3.3

Existing text:

**DCC11.5.3.3 Reactive Power Mode**

For the purpose of reactive power control mode, the power park module shall be capable of setting the reactive power setpoint anywhere in the reactive power range, specified in DCC11.5.2, with setting steps no greater than 5 MVar or 5 % (whichever is smaller) of full reactive power, controlling the reactive power at the connection point to an accuracy within plus or minus 5 MVar or plus or minus 5 % (whichever is smaller) of the full reactive power;

**Reactive Power** requirements are determined by local factors and depend highly on the subset of generators and loads connected to local transmission/distribution system and the supplementary **Reactive Power** consumption of overhead lines and cables. To meet the local needs in terms of **Reactive Power** requirement in power factor control mode the target power factor shall be site-specific.

Proposed text

**DCC11.5.3.3 Reactive Power Mode**

For the purpose of reactive power control mode, ~~the~~ power park modules of topology 2, shall be capable of setting the reactive power setpoint anywhere in the reactive power specified in DCC11.5.2, with setting steps no greater than 5 MVar or 5 % (whichever is smaller) of full reactive power, controlling the reactive power at the connection point to an accuracy within plus or minus 5 MVar or plus or minus 5 % (whichever is smaller) of the full reactive power;

~~Reactive Power requirements are determined by local factors and depend highly on the subset of generators and loads connected to local transmission/distribution system and the supplementary Reactive Power consumption of overhead lines and cables. To meet the local needs in terms of Reactive Power requirement in power factor control mode the target power factor shall be site-specific.~~

**5. DCC11.6.2.3**

Existing text:

**DCC11.6.2.3 Voltage Control**

For DSO topology 1 **Controllable PPM's** irrespective of **Registered Capacity** and DSO topology **Controllable PPM's** with **Registered Capacity**  $\geq 5\text{MW}$ , under steady state conditions, the **Voltage Regulation System** shall be capable of implementing the following **Reactive Power** control modes which shall be available to the **DSO** or **TSO** as agreed by **DSO** and **TSO**:

Proposed modified text:

**DCC11.6.2.3 Voltage Control**

For DSO topology 1 **Controllable PPM's** irrespective of **Registered Capacity** and DSO topology **2** **Controllable PPM's** with **Registered Capacity**  $\geq 5\text{MW}$ , under steady state conditions, the **Voltage Regulation System** shall be capable of implementing the following **Reactive Power** control modes which shall be available to the **DSO** or **TSO** as agreed by **DSO** and **TSO**:

**MODIFICATION PROPOSAL JUSTIFICATION** (Clearly state the reason for the modification. Attach further information if necessary)

**1. DCC 11.5.3.1**

This is a mandatory RfG requirement that was called out in the joint EirGrid-ESBN proposals for the non-exhaustive parameters for RfG in May 2018 and subsequently approved by CRU. Whilst the application of some other provisions to specific topologies was explicitly called out in this document, this was not the case for this clause. In terms of responses received in the consultation relating to the treatment of this clause, there was only one and it was in agreement with the proposal. See below.

## 2. DCC11.5.3.2

Clarifying text to convey the new parameters in the context of different topologies.

### 5.2.2.5 Reactive Power Control Modes for PPMs

#### 5.2.2.5.1 Article 21.3.d (iv) - Voltage Control Mode

#### Non-Exhaustive Parameter Selection

#### Applies to Type C and D PPMs

#### Requirement

Following a step change in voltage, the power park module shall be capable of achieving 90% of the change in reactive power output within a time  $t_1$  and must settle at the value specified by the slope within a time  $t_2$  with a steady-state reactive tolerance no greater than 5% of the maximum reactive power.

#### Proposal

The proposed times are listed in Table 37.

Parameter	Parameter in RfG	Proposal	Article Number	Type Applicability	Justification Code
$t_1$ = time within which 90% of the change in reactive power is reached	1 – 5 sec	1	21.3.d.(iv)	C and D PPMs	1
$t_2$ = time within which 100% of the change in reactive power is reached	5 – 60 sec	5	21.3.d.(iv)	C and D PPMs	3

Table 37: Parameters for Voltage Control Mode

#### Justification

The time  $t_1$  within which 90% of the change in reactive power is reached is set to 1 second as per the current requirements in WFPS1.6.2.4 of the Grid Code

The time  $t_2$  to achieve 100% of the change in reactive power is set to 5 seconds. This is a new requirement that is not currently set in the Grid Code.

## 3. DCC11.5.3.3

It was stated at many forums during the conduct of the RfG non-exhaustive parameter consultations that the spirit and intent from the RfG non-exhaustive parameter consultation was that unless RfG forced us to do so, RfG adoption would not be used as a means to introduce more onerous requirements.

In this case, what RfG prescribed were inner and outer boxes on the P-Q plane, that the Relevant System Operator had to

stay within. As is shown in the slides below, all the existing requirements did so. DCC11.5.3 was, therefore only intended to apply to what is now called topology 2.

Furthermore, the joint EirGrid-ESBN proposals for the non-exhaustive parameters for RfG in May 2018 and subsequently approved by CRU, how these requirements were to be applied accross the various topologies, was explicitly called out. See below.

**Proposal PPMs connected at a voltage level < 110 kV**

The reactive power requirements for wind generators in the existing Distribution Code are consistent with the P-Q inner and outer envelopes stipulated by RfG and **hence no change is required**. This is depicted diagrammatically in Figure 6 below. For consistency, these diagrams are shown in a tabular format in the following pages.

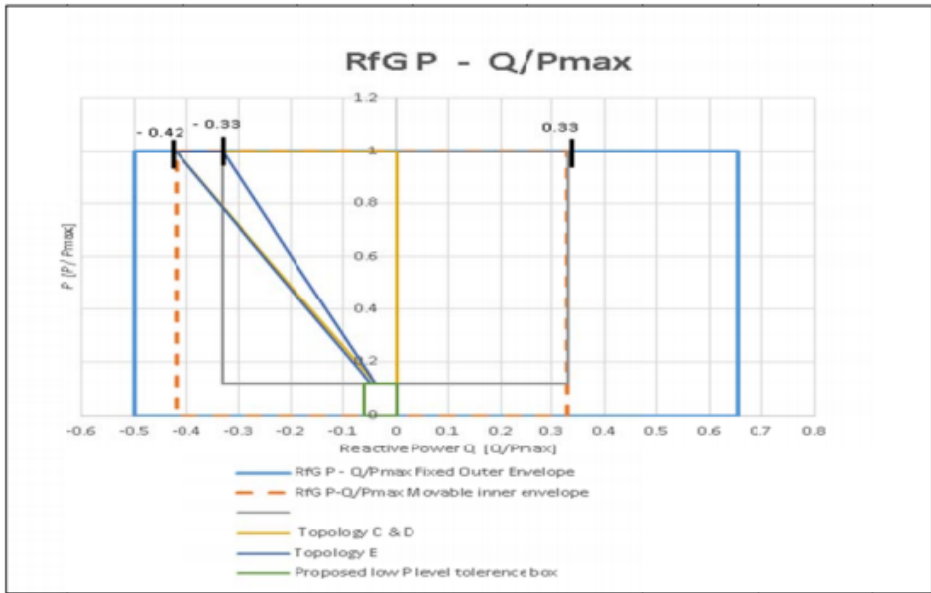


Figure 6: Reactive power capability of PPM connected to distribution system

Table 31 lists the parameters which describe the P-Q/P<sub>max</sub>-profile for PPMs connected at a voltage level <110 kV and in Topology 2.

Connection Voltage	Parameter	Parameter in RfG	Proposal	Article Number	Type Applicability	Justification Code
Connection voltages at 10 kV, 20 kV or 38 kV.	P <sub>min</sub>	0.0 p.u.	0.12 p.u.	21.3.c (ii)	C and D PPM	1
	P <sub>max</sub>	1.0 p.u.	1.0 p.u.	21.3.c (ii)	C and D PPM	1
	Q <sub>min</sub> /P <sub>max</sub> (lead)	-0.5 p.u.	-0.33 p.u.	21.3.c (ii)	C and D PPM	1
	Q <sub>max</sub> /P <sub>max</sub> (lag)	0.65 p.u.	0.33 p.u.	21.3.c (ii)	C and D PPM	1

Table 31: P-Q/P<sub>max</sub>-profile below Maximum Capacity PPMs: connection @ <110 kV & in Topology 2

Table 32 lists the parameters which describe the P-Q/P<sub>max</sub>-profile for PPMs connected at a voltage level <110 kV and in Topologies 3 and 4.

Connection Voltage	Parameter	Parameter in RfG	Proposal	Article Number	Type Applicability	Justification Code
Connection voltages at 10 kV, 20 kV or 38 kV.	P <sub>min</sub>	0.0 p.u.	0.12 p.u.	21.3.c (ii)	C and D PPM	1
	P <sub>max</sub>	1.0 p.u.	1.0 p.u.	21.3.c (ii)	C and D PPM	1
	Q <sub>min</sub> /P <sub>max</sub> (lead)	-0.5 p.u.	Power factor range from 0.92 [-0.42 Q / Pmax] to unity [0 Q/Pmax]	21.3.c (ii)	C and D PPM	1
	Q <sub>max</sub> /P <sub>max</sub> (lag)	0.65 p.u.	Power factor range from 0.92 [-0.42 Q / Pmax] to unity [0 Q/Pmax]	21.3.c (ii)	C and D PPM	1

Table 32: P-Q/P<sub>max</sub>-profile below Maximum Capacity PPMs connection @ <110 kV & Topologies 3 & 4

Table 33 lists the parameters which describe the P-Q/P<sub>max</sub>-profile for PPMs connected at a voltage level <110 kV and in Topology 5.

Connection Voltage	Parameter	Parameter in RfG	Proposal	Article Number	Type Applicability	Justification Code
Connection voltages at 10 kV, 20 kV or 38 kV.	P <sub>min</sub>	0.0 p.u.	0.12 p.u.	21.3.c (ii)	C and D PPM	1
	P <sub>max</sub>	1.0 p.u.	1.0 p.u.	21.3.c (ii)	C and D PPM	1
	Q <sub>min</sub> /P <sub>max</sub> (lead)	-0.5 p.u.	Power factor range from 0.92 [-0.42 Q / Pmax] to 0.95 [-0.33 Q/Pmax]	21.3.c (ii)	C and D PPM	1
	Q <sub>max</sub> /P <sub>max</sub> (lag)	0.65 p.u.	Power factor range from 0.92 [-0.42 Q / Pmax] to 0.95 [-0.33 Q/Pmax]	21.3.c (ii)	C and D PPM	1

Table 33: P-Q/P<sub>max</sub>-profile below Maximum Capacity for PPMs: connection @ <110 kV & Topology 5

**Justification: PPMs connected at a voltage level <110 kV**

Proposal is as per current Distribution Code requirements.

**4. DCC11.6.2.3**

This is simply correction of a typographical error in which, during the change of text from “Types” to Topologies, the numeral 2 was inadvertently omitted from the text.

**5. DCC11.5.1**

This is text which was inadvertently omitted in the change from V6 to V7.

**IMPLICATIONS OF NOT IMPLEMENTING THIS MODIFICATION**

1. Retention of identified typographical error
2. Non-compliance with RfG.
3. Lack of clarity to readers.
4. Rectify un-intended over-reach of RfG
5. Retention of identified typographical error

**PLEASE SUBMIT MODIFICATION PROPOSALS TO THE PANEL SECRETARY BY E-MAIL TO: [DISTCODEPANEL@ESB.IE](mailto:DISTCODEPANEL@ESB.IE)**