

**Grid Code
Modification Recommendation Form**



Title of Recommended Proposal:

MPID 317 Signals and Indications required from Users (formerly Digital Signal Lists)

Date:	20/11/2024
Recommended at GCRP Meeting No.:	The revised modification was presented at the Ireland GCRP Meeting dated 24 September 2024.
Grid Code Version:	14.2
Grid Code Section(s) Impacted by Recommended Proposal:	<ul style="list-style-type: none">• CC.12.2, CC.12.6• PPM1.7.1.1.1, PPM1.7.1.1.2, PPM1.7.1.2.1, PPM1.7.1.2.2.1, PPM1.7.1.2.3, PPM1.7.1.3.1, PPM1.7.1.3.2.1, PPM1.7.1.3.3, PPM1.7.1.3.5, PPM1.7.1.4, PPM1.7.1.5, PPM1.7.1.6, PPM1.7.2.2, PPM1.7.2.4, PPM1.7.2.6.1, PPM1.7.4.1• Definition: TSO Telecommunication Interface Cabinet

The Reason for the Recommended Modification:

Traditionally, signals and indications required to be provided by Transmission System Users were in analogue format. However, digital interface has now come into use in some User locations, with the intention to roll out digital interface to more locations pending successful commissioning. Where the Grid Code is best placed to capture the requirements around what signals and indications are to be provided by Users, there are relevant specifications and signal lists that are best placed to capture the nuances regarding how and where such signals and indications are to be provided. Accordingly, the modification proposal brought to the March 2024 GCRP suggested removing or modifying text in Grid Code clauses that specify how and where certain signals and indications are to be provided.

This modification proposal was not recommended to the CRU at the March 2024 GCRP as further engagement was required between the TSO and GCRP members regarding the wording of certain proposed changes. This revised modification proposal now incorporates Demand Side Unit specific wording, and the removal of the word "functional" from the term "functional specifications", to prevent ambiguity, and was presented at the GCRP meeting on 24 September 2024.

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

On the 20 March 2024 the modification proposal was presented at the EirGrid GCRP, but at that time it was not recommended for submission to the CRU as further engagement was required around the wording of certain proposed changes, as detailed above.

The Grid Code team engaged with the relevant GCRP members to develop text for a revised modification proposal. This agreed revision was presented at the EirGrid GCRP meeting on 24 September 2024, and was recommended for submission to the CRU.

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

No objections were raised by the GCRP members at the EirGrid GCRP meeting on 24 September 2024.

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

The EirGrid GCRP recommended that the revised proposed modification be submitted to the CRU for final review. No further actions were raised at the EirGrid GCRP.

A Table Outlining the Proposed Changes:

Clause	Red Line Version Text <i>Deleted text in strike-through red font and new text highlighted in blue font</i>	Green Line Version Text
CC.12.2	Signals and indications required to be provided by Users will include but shall not be limited to the following: (a) LV switchgear positions pertinent to the status of each Grid Connected Transformer through a set of two potential free auxiliary contacts (one contact normally open and one contact normally closed when circuit breaker is open) for each circuit breaker; (b) kV at transformer low Voltage terminals; and (c) a minimum of four sets of normally open potential free auxiliary contacts in each transformer LV bay for fault indication. Fault indication in each transformer LV bay. [...]	Signals and indications required to be provided by Users will include but shall not be limited to the following: (a) LV switchgear positions pertinent to the status of each Grid Connected Transformer; (b) kV at transformer low Voltage terminals; and (c) Fault indication in each transformer LV bay. [...]

<p>CC.12.6</p>	<p>Demand Side Unit Operators and Generator Aggregators shall provide the TSO the specification of the method of aggregation of SCADA from multiple sites. The minimum specifications shall be agreed with the TSO in advance and shall include:</p> <p>(a) signals from Demand Side Unit Operators, as specified in the relevant specifications and Demand Side Unit specific signal lists, shall be relayed to the TSO Telecommunication Interface Cabinet which reflect the Demand Side Unit MW Response to an accuracy of within 1 MW of the actual Demand Side Unit MW Response, shall be relayed to the TSO within 15 seconds of change occurring to the Demand Side Unit MW Response; and</p> <p>[...]</p>	<p>Demand Side Unit Operators and Generator Aggregators shall provide the TSO the specification of the method of aggregation of SCADA from multiple sites. The minimum specifications shall be agreed with the TSO in advance and shall include:</p> <p>(a) signals from Demand Side Unit Operators, as specified in the relevant specifications and Demand Side Unit specific signal lists, which reflect the Demand Side Unit MW Response to an accuracy of within 1 MW of the actual Demand Side Unit MW Response, shall be relayed to the TSO within 15 seconds of change occurring to the Demand Side Unit MW Response; and</p> <p>[...]</p>
<p>PPM1.7.1.1.1</p>	<p>Signals List #1</p> <p>The Controllable PPM, excluding Offshore PPMs, shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM: to the TSO as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Active Power output (MW) at the lower voltage side of the Grid Connected Transformer;</p> <p>(b) Reactive Power output/demand (+/-Mvar) at the lower voltage side of the Grid Connected Transformer;</p> <p>(c) Voltage (in kV) at the lower voltage side of the Grid Connected Transformer;</p> <p>(d) Available Active Power (MW) at the lower voltage side of the Grid Connected Transformer (including separate signals for export and import from Controllable PPMs consisting of ESPSs);</p> <p>(e) Grid Connected Transformer tap positions;</p> <p>(f)</p> <ol style="list-style-type: none"> i. Power Factor control mode status feedback (ON/OFF); ii. Power Factor set-point feedback (degrees) iii. Reactive Power control code status feedback (ON/OFF); iv. Reactive Power set-point feedback (Mvar); 	<p>Signals List #1</p> <p>The Controllable PPM, excluding Offshore PPMs, shall make the following signals available to the TSO as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Active Power output (MW) at the lower voltage side of the Grid Connected Transformer;</p> <p>(b) Reactive Power output/demand (+/-Mvar) at the lower voltage side of the Grid Connected Transformer;</p> <p>(c) Voltage (in kV) at the lower voltage side of the Grid Connected Transformer;</p> <p>(d) Available Active Power (MW) at the lower voltage side of the Grid Connected Transformer (including separate signals for export and import from Controllable PPMs consisting of ESPSs);</p> <p>(e) Grid Connected Transformer tap positions;</p> <p>(f)</p> <ol style="list-style-type: none"> i. Power Factor control mode status feedback (ON/OFF); ii. Power Factor set-point feedback (degrees) iii. Reactive Power control code status feedback (ON/OFF); iv. Reactive Power set-point feedback (Mvar); v. Voltage Regulation control mode status feedback (ON/OFF)

	<p>v. Voltage Regulation control mode status feedback (ON/OFF)</p> <p>vi. Voltage Regulation Set-point feedback (kV);</p> <p>(g) On/off status indications for all Reactive Power devices exceeding 5 Mvar¹;</p> <p>(h) Circuit-breaker and disconnect position indication shall be required. These may include indications from circuit-breakers on individual Generation Unit circuits. Signals from individual Generation Unit circuit-breakers shall not be required. The actual circuit-breaker and disconnect signals required shall be specified by the TSO at least 120 Business Days prior to the Controllable PPM's scheduled Operational Date;</p> <p>(i) A minimum of four sets of normally open potential free auxiliary contacts in each Grid Connected Transformer lower voltage bay for fault indications; Fault indication in each Grid Connected Transformer lower voltage bay; and</p> <p>(j) On/off status of TSO remote control enable switch, which disables the ability of the TSO to send commands to the Controllable PPM.</p> <p>For the Controllable PPM's where the Connection Point is at the HV side of the Grid Connected Transformer, signals a), b) and c) above will also be required from the HV side of the Grid Connected Transformer.</p>	<p>vi. Voltage Regulation Set-point feedback (kV);</p> <p>(g) On/off status indications for all Reactive Power devices exceeding 5 Mvar¹;</p> <p>(h) Circuit-breaker and disconnect position indication shall be required. These may include indications from circuit-breakers on individual Generation Unit circuits. Signals from individual Generation Unit circuit-breakers shall not be required. The actual circuit-breaker and disconnect signals required shall be specified by the TSO at least 120 Business Days prior to the Controllable PPM's scheduled Operational Date;</p> <p>(i) Fault indication in each Grid Connected Transformer lower voltage bay; and</p> <p>(j) On/off status of TSO remote control enable switch, which disables the ability of the TSO to send commands to the Controllable PPM.</p> <p>For the Controllable PPM's where the Connection Point is at the HV side of the Grid Connected Transformer, signals a), b) and c) above will also be required from the HV side of the Grid Connected Transformer.</p>
<p>PPM1.7.1.1.2</p>	<p>The Offshore PPM shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Offshore PPM to the TSO as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Active Power output (MW) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(b) Reactive Power output/demand (+/-Mvar) at the lower voltage side of the Offshore Connection Transformer;</p>	<p>The Offshore PPM shall make the following signals available to the TSO as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Active Power output (MW) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(b) Reactive Power output/demand (+/-Mvar) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(c) Voltage (in kV) at the lower voltage side of the Offshore Connection Transformer;</p>

¹ Typically the position indication from capacitor/ SVC circuit breakers

	<p>(c) Voltage (in kV) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(d) Available Active Power (MW) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(e) On/off status indications for all Reactive Power devices exceeding 5 Mvar²;</p> <p>(f) Circuit-breaker and disconnect position indication shall be required. These may include indications from circuit-breakers on individual Generation Unit circuits. Signals from individual Generation Unit circuit-breakers shall not be required. The actual circuit-breaker and disconnect signals required shall be specified by the TSO at least 120 Business Days prior to the Offshore PPM's scheduled Operational Date;</p> <p>(g) Fault indications for the Offshore Connection Transformer lower voltage bay; and</p> <p>(h) On/off status of TSO remote control enable switch, which disables the ability of the TSO to send commands to the Offshore PPM.</p>	<p>(d) Available Active Power (MW) at the lower voltage side of the Offshore Connection Transformer;</p> <p>(e) On/off status indications for all Reactive Power devices exceeding 5 Mvar²;</p> <p>(f) Circuit-breaker and disconnect position indication shall be required. These may include indications from circuit-breakers on individual Generation Unit circuits. Signals from individual Generation Unit circuit-breakers shall not be required. The actual circuit-breaker and disconnect signals required shall be specified by the TSO at least 120 Business Days prior to the Offshore PPM's scheduled Operational Date;</p> <p>(g) Fault indications for the Offshore Connection Transformer lower voltage bay; and</p> <p>(h) On/off status of TSO remote control enable switch, which disables the ability of the TSO to send commands to the Offshore PPM.</p>
PPM1.7.1.2.1	<p>Wind-powered Controllable PPMs comprising of Wind Turbine Generators with a MEC in excess of 10 MW shall make the following meteorological data signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Wind speed (at hub height or as agreed with the TSO) - measurand signal;</p> <p>(b) Wind direction (at hub height or as agreed with the TSO) - measurand signal;</p> <p>(c) Air temperature- measurand signal;</p> <p>(d) Air pressure- measurand signal.</p>	<p>Wind-powered Controllable PPMs comprising of Wind Turbine Generators with a MEC in excess of 10 MW shall make the following meteorological data signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>(e) Wind speed (at hub height or as agreed with the TSO) - measurand signal;</p> <p>(f) Wind direction (at hub height or as agreed with the TSO) - measurand signal;</p> <p>(g) Air temperature- measurand signal;</p> <p>(h) Air pressure- measurand signal.</p>
PPM1.7.1.2.2.1	<p>Solar-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following meteorological data signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p>	<p>Solar-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following meteorological data signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Global Horizontal Irradiance (GHI) - measurand signal;</p>

² Typically the position indication from capacitor/ SVC circuit breakers

	<ul style="list-style-type: none"> (a) Global Horizontal Irradiance (GHI) - measurand signal; (b) Diffused Horizontal Irradiance (DHI) - measurand signal; (c) Direct Normal Irradiance (DNI) (required for solar tracking panels only) - measurand signal; (d) Air temperature - measurand signal; (e) Back panel temperature - measurand signal; (f) Wind speed - measurand signal; (g) Wind direction - measurand signal; (h) Precipitation – measurand signal; (i) Air pressure - measurand signal. 	<ul style="list-style-type: none"> (b) Diffused Horizontal Irradiance (DHI) - measurand signal; (c) Direct Normal Irradiance (DNI) (required for solar tracking panels only) - measurand signal; (d) Air temperature - measurand signal; (e) Back panel temperature - measurand signal; (f) Wind speed - measurand signal; (g) Wind direction - measurand signal; (h) Precipitation – measurand signal; (i) Air pressure - measurand signal.
PPM1.7.1.2.3	<p>Controllable PPMs, in excess of 5 MW, with the exception of wind-powered and solar-powered Controllable PPMs, shall make relevant meteorological data signals available, which may include but are not limited to solar irradiance and tidal streams, at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as agreed with the TSO and specified in the relevant specifications and site-specific signal lists.</p> <p>The actual signals required shall be specified by the TSO at least 120 Business Days prior to the Controllable PPM's scheduled Operational Date.</p>	<p>Controllable PPMs, in excess of 5 MW, with the exception of wind-powered and solar-powered Controllable PPMs, shall make relevant meteorological data signals available, which may include but are not limited to solar irradiance and tidal streams, as agreed with the TSO and specified in the relevant specifications and site-specific signal lists.</p> <p>The actual signals required shall be specified by the TSO at least 120 Business Days prior to the Controllable PPM's scheduled Operational Date.</p>
PPM1.7.1.3.1	<p>Wind-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p> <ul style="list-style-type: none"> a) Wind-powered Controllable PPM Availability (0-100 % signal); b) Percentage of WTG shutdown due to high wind-speed conditions (0-100 %); c) Percentage of WTG not generating due low wind-speed shutdown (0-100 %). 	<p>Wind-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p> <ul style="list-style-type: none"> a) Wind-powered Controllable PPM Availability (0-100 % signal); b) Percentage of WTG shutdown due to high wind-speed conditions (0-100 %); c) Percentage of WTG not generating due low wind-speed shutdown (0-100 %).
PPM1.7.1.3.2.1	<p>Solar-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that</p>	<p>Solar-powered Controllable PPMs with a MEC in excess of 10 MW shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p>

	<p>Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p> <p>(a) Solar-powered Controllable PPM Availability (0-100 % signal).</p>	<p>(a) Solar-powered Controllable PPM Availability (0-100 % signal).</p>
PPM1.7.1.3.3	<p>Controllable PPMs, with a MEC in excess of 5 MW, with the exception of wind-powered and solar-powered Controllable PPMs, shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that wind-powered Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p> <p>a) Controllable PPM Availability (0-100 % signal);</p> <p>b) Percentage of Generation Unit shutdown due to high resource conditions (0-100 %);</p> <p>c) Percentage of Generation Unit not generating due to low resource conditions (0-100 %).</p>	<p>Controllable PPMs, with a MEC in excess of 5 MW, with the exception of wind-powered and solar-powered Controllable PPMs, shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>a) Controllable PPM Availability (0-100 % signal);</p> <p>b) Percentage of Generation Unit shutdown due to high resource conditions (0-100 %);</p> <p>c) Percentage of Generation Unit not generating due to low resource conditions (0-100 %).</p>
PPM1.7.1.3.5	<p>The Controllable PPM consisting of ESPSs shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM: as specified in the relevant specifications and site-specific signal lists:</p> <p>a). ESPS available export capacity (+MWh)</p> <p>b). ESPS available import capacity (-MWh)</p>	<p>The Controllable PPM consisting of ESPSs shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>a). ESPS available export capacity (+MWh)</p> <p>b). ESPS available import capacity (-MWh)</p>
PPM1.7.1.4	<p>Signals List #4</p> <p>The Controllable PPM shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p> <p>a) Active Power Control Set-point feedback (MW);</p> <p>b) Active Power Control status feedback (ON/OFF).</p>	<p>Signals List #4</p> <p>The Controllable PPM shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>c) Active Power Control Set-point feedback (MW);</p> <p>d) Active Power Control status feedback (ON/OFF).</p>
PPM1.7.1.5	<p>Signals List #5</p> <p>The Controllable PPM shall make the following signals available at the designated TSO Telecommunication Interface Cabinet for that Controllable PPM as specified in the relevant specifications and site-specific signal lists:</p>	<p>Signals List #5</p> <p>The Controllable PPM shall make the following signals available as specified in the relevant specifications and site-specific signal lists:</p> <p>a) Frequency Response Curve (i.e. <i>Power-Frequency Response Curve 1 or 2 or Mode (1 to 5)</i>);</p>

	<p>a) Frequency Response Curve (i.e. <i>Power-Frequency Response Curve 1 or 2 or Mode (1 to 5)</i>);</p> <p>b) Frequency Response System status feedback (ON/OFF);</p> <p>c) Frequency Response System Governor Droop feedback (%) (for a Controllable PPM consisting of ESPSs, c) is not applicable).</p>	<p>b) Frequency Response System status feedback (ON/OFF);</p> <p>c) Frequency Response System Governor Droop feedback (%) (for a Controllable PPM consisting of ESPSs, c) is not applicable).</p>
PPM1.7.1.6	<p>Time Delays and Data Quality</p> <p>Digital signal changes from the Controllable PPM shall be relayed to the TSO Telecommunication Interface Cabinet, as per the relevant specifications and site-specific signal lists, within 1 second of the associated change of state event. Analogue signal changes shall be relayed within 5 seconds and with an error of 0.5% or less, with the exception of the Meteorological Data required as per PPM1.7.1.2, which shall be updated within 5 seconds and shall be accurate at least 97.5% of the time over a rolling 12-month period.</p>	<p>Time Delays and Data Quality</p> <p>Digital signal changes from the Controllable PPM shall be relayed to the TSO, as per the relevant specifications and site-specific signal lists, within 1 second of the associated change of state event. Analogue signal changes shall be relayed within 5 seconds and with an error of 0.5% or less, with the exception of the Meteorological Data required as per PPM1.7.1.2, which shall be updated within 5 seconds and shall be accurate at least 97.5% of the time over a rolling 12-month period.</p>
PPM1.7.2.2	<p>Active Power Control</p> <p>An Active Power Control Set-point signal shall be sent by the TSO to the PPM Control System. This set-point shall define the maximum Active Power output permitted from the Controllable PPM. The PPM Control System shall be capable of receiving this signal and acting accordingly to achieve the desired change in Active Power output. This signal shall be in the form of a single analogue value and a strobe pulse to enable, as specified in the relevant specifications and site-specific signal lists.</p> <p>The Controllable PPM is required to make it possible for the TSO to remotely enable/ disable the Active Power Control function in the PPM Control System. The associated status indication is described in PPM1.7.1.4.</p>	<p>Active Power Control</p> <p>An Active Power Control Set-point signal shall be sent by the TSO to the PPM Control System. This set-point shall define the maximum Active Power output permitted from the Controllable PPM. The PPM Control System shall be capable of receiving this signal and acting accordingly to achieve the desired change in Active Power output. This signal shall be in the form as specified in the relevant specifications and site-specific signal lists.</p> <p>The Controllable PPM is required to make it possible for the TSO to remotely enable/ disable the Active Power Control function in the PPM Control System. The associated status indication is described in PPM1.7.1.4.</p>
PPM1.7.2.4	<p>Voltage Regulation</p> <p>The following signals shall allow the TSO to select Reactive Power control mode and send Reactive Power control set-points to the Voltage Regulation System. Set-point signals shall be in the form of a single analogue value and a strobe pulse to enable, as specified in the relevant specifications and site-specific signal lists.</p> <ul style="list-style-type: none"> • Power Factor control mode with Power Factor set-point (PF set-point) 	<p>Voltage Regulation</p> <p>The following signals shall allow the TSO to select Reactive Power control mode and send Reactive Power control set-points to the Voltage Regulation System. Set-point signals shall be in the form as specified in the relevant specifications and site-specific signal lists.</p> <ul style="list-style-type: none"> • Power Factor control mode with Power Factor set-point (PF set-point) • Reactive Power control mode with Reactive Power set-point (Q set-point)

	<ul style="list-style-type: none"> • Reactive Power control mode with Reactive Power set-point (Q set-point) • Automatic Voltage Regulation control mode with Voltage Regulation Set-point (kV set-point) 	<ul style="list-style-type: none"> • Automatic Voltage Regulation control mode with Voltage Regulation Set-point (kV set-point)
PPM1.7.2.6.1	Digital output commands from the TSO-Telecommunication Interface Cabinet shall be relayed to the Controllable PPM equipment within 1 second. Set-point output signals shall be relayed within 5 seconds and with an error of 0.5% or less.	Digital output commands from the TSO shall be relayed to the Controllable PPM equipment within 1 second. Set-point output signals shall be relayed within 5 seconds and with an error of 0.5% or less.
PPM1.7.4.1	The location of the TSO-Telecommunication Interface Cabinet telecommunication interface equipment shall be agreed between the TSO and the Controllable PPM at least 120 Business Days prior to the Controllable PPM's scheduled Operational Date early in the design stage post connection offer acceptance. A standard interface for signals will be made available to the Controllable PPM by the TSO .	The location of the TSO telecommunication interface equipment shall be agreed between the TSO and the Controllable PPM early in the design stage post connection offer acceptance. A standard interface for signals will be made available to the Controllable PPM by the TSO .
Definition: TSO Telecommunication Interface Cabinet	The physical interface point between the TSO's telecommunications equipment and the Controllable PPM's control equipment.	