New & Amended Definitions

Energy Storage Power Station (ESPS): A collection of one or more ~~storage devices~~ ESU(s) that can automatically act upon a remote signal from the TSO to change its Active Power output. ~~owned and/or operated by the same Generator, as a PPM or as part of a PPM.~~

Energy Storage Unit (ESU): A Generation Unit(s) using storage devices to generate and consume electricity as, or as part of, a PPM.

Active Power Control Set-Point Ramp Rate: The rate of increase or decrease of **Active Power Output** of a **PPM** in response to an **Active Power Dispatch Instruction** sent by the **TSO** via SCADA when the **PPM** is operating in an **Active Power** control mode. This ramp rate will be calculated by the **Generator** each time an **Active Power Dispatch Instruction** is sent by the **TSO** via SCADA based on the change in **Active Power** required and the ~~curtailment~~ time interval set point.

The **Active Power Dispatch Instruction** shall be any **MW** value in the range 0 **MW** to **Registered Capacity** of the **PPM**. The ~~curtailment~~ time interval set point shall be any value in the range 1 to 30 minutes, as specified by the **TSO** via SCADA.

Capacity Limited Ramp Rate*:* The rate of increase or decrease of **Active Power** of an **ESPS** in response to reaching the **Capacity Limit.**

Capacity Limit*:* The point calculated by the **PPM** control system where there is just enough energy storage or generation capacity, calculated in MWh, for the **ESPS** to change the **Active Power** to zero MW at the **Capacity Limited Ramp Rate**.

Reactive Power Control & Reactive Power Capability

New version of CC.S2.1.3.2 to apply to both existing PPMs and for ESPSs (non-RfG Generating Units)

A **PPM** shall continuously control voltage at the **Connection Point** within its **Reactive Power** capability limits. For **PPMs**, the minimum **Reactive Power** capability is defined in the characteristic below, within the voltage limits specified under CC5.4.

There are three **Voltage Control** modes:

(i) **Voltage Control** mode

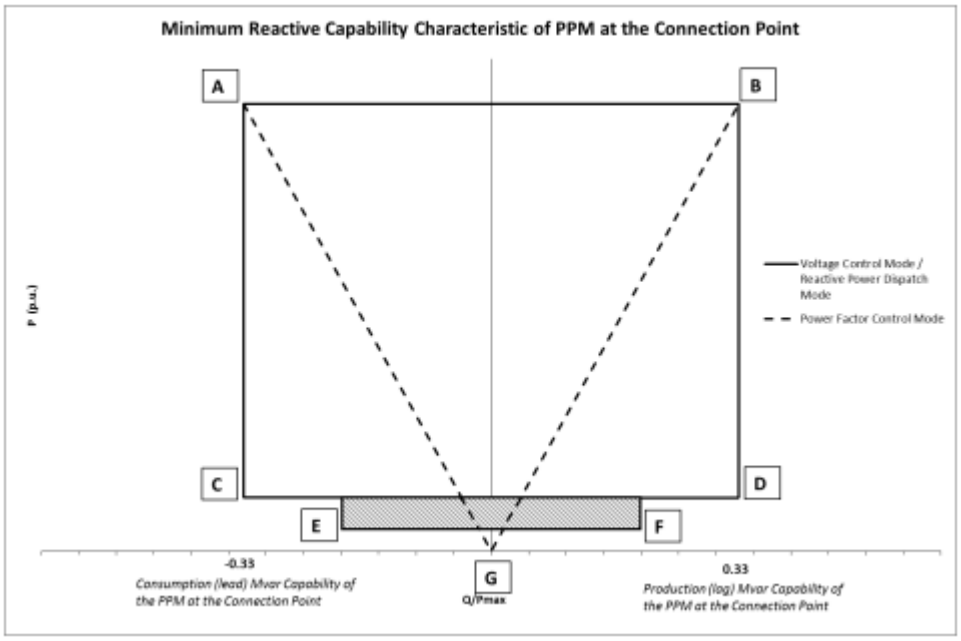
(ii) power factor control mode

(iii) Reactive Power Dispatch

Whilst the **PPM** with the exception of an **ESPS** is operating in **Voltage Control** mode the minimum reactive capability is defined by the envelope ABCDEF in the **Voltage Control** characteristic shown below. Points E and F will be defined by the **Generator** six weeks prior to energisation and confirmed by the **TSO** through Compliance testing. Whilst the **PPM** with the exception of an **ESPS** is operating in power factor control mode the reactive capability is defined by the envelope AGB in the power factor control mode characteristic shown below. Whilst the **PPM** with the exception of an **ESPS** is operating in **Reactive Power Dispatch** control mode, the **PPM**, as a minimum, must be capable of exporting or importing **Mvars** within the envelope ABCDEF.

For the avoidance of doubt, all measurements refer to the **Connection Point**.

PPMs with the exception of an **ESPS** must be capable of responding to variations in the voltage of the **NI System** in accordance with the following diagram.



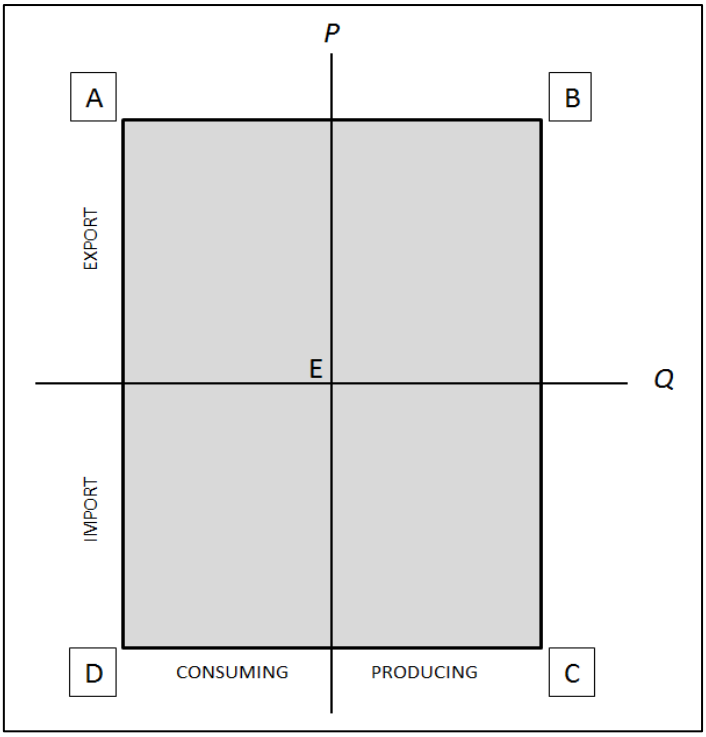
Point A	**Mvar** consumption (lead) capability of the **PPM** at **Registered Capacity** at the **Connection Point**
Point B	**Mvar** production (lag) capability of the **PPM** at **Registered Capacity** at the **Connection Point**
Point C	**Mvar** consumption (lead) capability of the **PPM** when **Output** is 12% of **Registered Capacity** at the **Connection Point**
Point D	**Mvar** production (lag) capability of the **PPM** when **Output** is 12% of **Registered Capacity** at the **Connection Point**
Point E	**Mvar** consumption (lead) capability when any of the **Generating Units** begins to export **Active Power** at the **Connection Point** (to be defined by **Generator**)
Point F	**Mvar** production (lag) capability when any of the **Generating Units** begins to export **Active Power** at the **Connection Point** (to be defined by **Generator**)

Diagram and Table showing the minimum Reactive Capability characteristic for non **ESPS PPMs**

Whilst the **PPM** consisting of an **ESPS** is operating in **Voltage Control** mode the minimum reactive capability is defined by the envelope ABCD in the **Voltage Control** characteristic shown below. Whilst the **PPM** consisting of an **ESPS** is operating in power factor control mode the reactive capability is enclosed by the envelope AEBA and DECD in the power factor control mode characteristic shown below. Whilst the **PPM** consisting of an **ESPS** is operating in **Reactive Power Dispatch** control mode, the **PPM**, as a minimum, must be capable of exporting or importing **Mvars** within the envelope ABCD.

For the avoidance of doubt, all measurements refer to the **Connection Point**.

PPMs consisting of **ESPSs** must be capable of responding to variations in the voltage of the **NI System** in accordance with the following diagram.



Point A	**Mvar** consumption (lead) capability of the **PPM** at **Registered Capacity** at the **Connection Point** and a Q/P ratio of -0.33 is equivalent to a leading power factor of -0.95.
Point B	**Mvar** production (lag) capability of the **PPM** at **Registered Capacity** at the **Connection Point** and a Q/P ratio of 0.33 is equivalent to a lagging power factor of 0.95
Point C	**Mvar** production (lag) capability of the **PPM** when **Output** is at **Maximum Import Capacity** (kW) and a Q capability equal to that of Point B at the **Connection Point**
Point D	**Mvar** consumption (lead) capability of the **PPM** when **Output** is at **Maximum Import Capacity** (kW) and a Q capability equal to that of Point A at the **Connection Point**
Point E	Is the intersection of the P and Q axes and represents zero active or reactive power flow.

Diagram and Table showing the minimum Reactive Capability characteristic for **ESPS PPMs**

All **PPMs** must be capable of responding to variations in the voltage of the **NI System** in accordance with CC5.4

Ramp Rates

New version of CC.S2.1.5 to apply to both existing PPMs and for ESPSs (non-RfG Generating Units) as indicated.

Ramp Rates

For PPMs with the exception of ESPSs:

(a) The **PPM** control system shall be capable of controlling the ramp rate of its **Active Power Output**. There shall be three ramp rate capabilities designated, **Resource Following Ramp Rate, Active Power Control Set-Point Ramp Rate** and **Frequency Response Ramp Rate**. The **PPM** control system shall operate the ramp rates with the following order of priority (high to low): **Frequency Response Ramp Rate; Active Power Control Set-Point Ramp Rate; Resource Following Ramp Rate**. It shall be possible to vary the **Resource Following Ramp Rate** over a range between 1% and 100% of **Registered Capacity** per minute. The ramp rate is the average rate of change in **Output** measured over any 10 minute period. The ramp rate averaged over 1 minute should not exceed 3 times the average ramp rate over 10 minutes.

(b) A **Controllable PPM** or a **Dispatchable PPM** shall have a ramp **Frequency** controller, which on **Start-Up** and during normal operation of any **Controllable PPM** or **Dispatchable PPM** shall only allow an increase in **Active Power Output** when the **System Frequency** is below a set value. This set value in the ramp **Frequency** controller should be capable of being set in the range 50.0 Hz to 52.0 Hz in steps of 0.1 Hz.

(c) During operation the **TSO** may send to the **Generator** a positive ramp blocking signal if the **NI System** would otherwise be at risk from excess **Frequency** movements. This signal is designed to restrain **PPMs** from ramping above the previous 10 minute average level at the time of receiving the signal. The **PPM** may continue to supply **Output** up to this level until the signal is removed. The **TSO** will remove the ramp blocking signal as soon as stable conditions on the **NI System** are restored, as determined by the **TSO**.

(d) Unless the **Controllable PPM** or **Dispatchable PPM** has a continually manned control point the **TSO** shall send SCADA signals indicating that a process of increasing/decreasing maximum **Output** is to be initiated and the time interval over which the increase/decrease of **Output** is to be achieved. A **Controllable PPM** or **Dispatchable PPM** receiving such a signal shall send a SCADA signal in response confirming that it has received the SCADA signal from the **TSO**. The increase/decrease in **Active Power Output** of the **Controllable PPM** or **Dispatchable PPM** shall be at the **Active Power Control Set-Point Ramp Rate**. For the avoidance of doubt nothing in this CC.S2.1.~~3.8~~5(d) shall be construed as requiring a **Controllable PPM** or **Dispatchable PPM** to operate beyond its technical limits.

(e) Upon removal of an **Active Power Dispatch Instruction** sent by the **TSO** via SCADA when the **PPM** is operating in an **Active Power** control mode and under normal operational conditions, the **PPM** shall ramp at the **Resource Following Ramp Rate**.

(f) The ramp rate requirements for **PPMs** need not be met in the case of the resource availability falling at a greater rate than that which would be required to control the **Output** to be within the ramp rate.

(g) In the absence of a **TSO Dispatch Instruction**, each **Generating Unit** comprising a **Controllable PPM** or **Dispatchable PPM** must operate as per the power curve submitted to

the **TSO** and remain connected to the **NI System** between the upper and lower limit of resource level needed for a **Generating Unit** to generate **Active Power**.

For PPMs consisting of ESPSs:

(h) The **PPM** control system shall be capable of controlling the ramp rate of its **Active Power**. There shall be three ramp rate capabilities designated, **Capacity Limited Ramp Rate, Active Power Control Set-Point Ramp Rate** and **Frequency Response Ramp Rate**. These ramp rates co-exist and the **PPM** control system shall operate the ramp rates with the following order of priority (high to low): **Capacity Limited Ramp Rate**; **Frequency Response Ramp Rate; Active Power Control Set-Point Ramp Rate**. It shall be possible to vary the **Capacity Limited Ramp Rate** between the following values. Minimum value shall be the lower of 10% **Registered Capacity** per minute or 5MW per minute. If 5MW is lower than 1% of **Registered Capacity**, then the minimum value shall be 1% of **Registered Capacity** per minute. Maximum value shall be 100% of **Registered Capacity** per minute. It shall be possible to vary the **Active Power Control Set-Point Ramp Rate** over a range between 1% and 100% of **Registered Capacity** per minute. The ramp rate is the average rate of change in **Active Power** measured over any 10 minute period. The ramp rate averaged over 1 minute should not exceed 3 times the average ramp rate over 10 minutes.

(i) Unless the **Controllable PPM** or **Dispatchable PPM** has a continually manned control point the **TSO** shall send SCADA signals indicating that a process of increasing/decreasing Active Power is to be initiated. A **Controllable PPM** or **Dispatchable PPM** receiving such a signal shall send a SCADA signal in response confirming that it has received the SCADA signal from the **TSO**. The increase/decrease in **Active Power Output** of the **Controllable PPM** or **Dispatchable PPM** shall be at the **Active Power Control Set-Point Ramp Rate**. For the avoidance of doubt nothing in this CC.S2.1.5(i) shall be construed as requiring a **Controllable PPM** or **Dispatchable PPM** to operate beyond its technical limits.

(j) The ramp rate requirements for **PPMs** need not be met in the case of the **ESPSs** import/export energy capacity becoming limited. Under these conditions the **ESPS** shall ramp at the **Capacity Limited Ramp Rate**.

For CC.S2 Part II see clause CC.S2.2.3.4 (please note that there are two clauses CC.S2.2.3.4! These edits are for the one labelled Ramp Rates), copied below for completeness

Ramp Rates

For PPMs with the exception of ESPSs:

(a) The **PPM** control system shall be capable of controlling the ramp rate of its **Active Power Output**. There shall be three ramp rate capabilities designated, **Resource Following Ramp Rate, Active Power Control Set-Point Ramp Rate** and **Frequency Response Ramp Rate**. The **PPM** control system shall operate the ramp rates with the following order of priority (high to low): **Frequency Response Ramp Rate; Active Power Control Set-Point Ramp Rate; Resource Following Ramp Rate**. It shall be possible to vary the **Resource Following Ramp Rate** over a range between 1% and 100% of **Registered Capacity** per minute. The ramp rate is the average rate of change in **Output** measured over any 10 minute period. The ramp rate averaged over 1 minute should not exceed 3 times the average ramp rate over 10 minutes.

(b) A **Controllable PPM** or a **Dispatchable PPM** shall have a ramp **Frequency** controller, which on **Start-Up** and during normal operation of any **Controllable PPM** or **Dispatchable PPM** shall only allow an increase in **Active Power Output** when the **System Frequency** is below a set value. This set value in the ramp **Frequency** controller should be capable of being set in the range 50.0 Hz to 52.0 Hz in steps of 0.1 Hz.

(c) During operation the **TSO** may send to the **Generator** a positive ramp blocking signal if the **NI System** would otherwise be at risk from excess **Frequency** movements. This signal is designed to restrain **PPMs** from ramping above the previous 10 minute average level at the time of receiving the signal. The **PPM** may continue to supply **Output** up to this level until the signal is removed. The **TSO** will remove the ramp blocking signal as soon as stable conditions on the **NI System** are restored, as determined by the **TSO**.

(d) Unless the **Controllable PPM** or **Dispatchable PPM** has a continually manned control point the **TSO** shall send SCADA signals indicating that a process of increasing/decreasing maximum **Output** is to be initiated and the time interval over which the increase/decrease of **Output** is to be achieved. A **Controllable PPM** or **Dispatchable PPM** receiving such a signal shall send a SCADA signal in response confirming that it has received the SCADA signal from the **TSO**. The increase/decrease in **Active Power Output** of the **Controllable PPM** or **Dispatchable PPM** shall be at the **Active Power Control Set-Point Ramp Rate**. For the avoidance of doubt nothing in this CC.S2.2.3.4(d) shall be construed as requiring a **Controllable PPM** or **Dispatchable PPM** to operate beyond its technical limits.

(e) Upon removal of an **Active Power Dispatch Instruction** sent by the **TSO** via SCADA when the **PPM** is operating in an **Active Power** control mode and under normal operational conditions, the **PPM** shall ramp at the **Resource Following Ramp Rate**.

(f) The ramp rate requirements for **PPMs** need not be met in the case of the resource availability falling at a greater rate than that which would be required to control the **Output** to be within the ramp rate.

(g) In the absence of a **TSO Dispatch Instruction**, each **Generating Unit** comprising a **Controllable PPM** or **Dispatchable PPM** must operate as per the power curve submitted to

the **TSO** and remain connected to the **NI System** between the upper and lower limit of resource level needed for a **Generating Unit** to generate **Active Power**.

For PPMs consisting of ESPSs:

(h) The **PPM** control system shall be capable of controlling the ramp rate of its **Active Power**. There shall be three ramp rate capabilities designated, **Capacity Limited Ramp Rate, Active Power Control Set-Point Ramp Rate** and **Frequency Response Ramp Rate**. These ramp rates co-exist and the **PPM** control system shall operate the ramp rates with the following order of priority (high to low): **Capacity Limited Ramp Rate**; **Frequency Response Ramp Rate; Active Power Control Set-Point Ramp Rate**. It shall be possible to vary the **Capacity Limited Ramp Rate** between the following values. Minimum value shall be the lower of 10% **Registered Capacity** per minute or 5MW per minute. If 5MW is lower than 1% of **Registered Capacity**, then the minimum value shall be 1% of **Registered Capacity** per minute. Maximum value shall be 100% of **Registered Capacity** per minute. It shall be possible to vary the **Active Power Control Set-Point Ramp Rate** over a range between 1% and 100% of **Registered Capacity** per minute. The ramp rate is the average rate of change in **Active Power** measured over any 10 minute period. The ramp rate averaged over 1 minute should not exceed 3 times the average ramp rate over 10 minutes.

(i) Unless the **Controllable PPM** or **Dispatchable PPM** has a continually manned control point the **TSO** shall send SCADA signals indicating that a process of increasing/decreasing Active Power is to be initiated. A **Controllable PPM** or **Dispatchable PPM** receiving such a signal shall send a SCADA signal in response confirming that it has received the SCADA signal from the **TSO**. The increase/decrease in **Active Power Output** of the **Controllable PPM** or **Dispatchable PPM** shall be at the **Active Power Control Set-Point Ramp Rate**. For the avoidance of doubt nothing in this CC.S2.2.3.4(i) shall be construed as requiring a **Controllable PPM** or **Dispatchable PPM** to operate beyond its technical limits.

(j) The ramp rate requirements for **PPMs** need not be met in the case of the **ESPSs** import/export energy capacity becoming limited. Under these conditions the **ESPS** shall ramp at the **Capacity Limited Ramp Rate**.

Frequency Response

CC.S2.1.7.2 requires minor edits for ESPS as Droop is not an applicable term and not to exclude import scenarios.

(a) Each **Controllable PPM** or **Dispatchable PPM** must be fitted with a **Fast Acting** proportional power governor to provide **Frequency Control** under normal operational conditions. This **Fast Acting** proportional governor should be equipped with controls which allow the droop or equivalent for **PPMs** consisting of **ESPSs** to be set independently in the range 2% to 20% above and below 50.0 Hz. A deadband within which no control will be exercised must be capable of being set with a lower limit between 49.0 Hz and 50.0 Hz in steps of 0.05 Hz and an upper limit between 50.0 Hz and 51.0 Hz in steps of 0.05 Hz. Whilst responding to **Frequency** excursions on the **System** the change in **Active Power** ~~**Output**~~ of the **Controllable PPM** or **Dispatchable PPM** shall be at the **Frequency Response Ramp Rate**. In addition a high **Frequency** trip facility must be provided capable of being set in the range 51.0 Hz to 52.0 Hz in steps of 0.1 Hz. Where a **Controllable PPM** or **Dispatchable PPM** becomes isolated from the rest of the **Transmission System** the **Controllable PPM** or **Dispatchable PPM** must immediately detect the condition and shut itself down.

(b) Under certain **System** conditions the **TSO** may require a **Controllable PPM** or a **Dispatchable PPM** to operate below its maximum instantaneous **Output** on a droop or equivalent for **PPMs** consisting of **ESPSs** setting to be set in the range 2% to 20%. In this mode of operation the **Controllable PPM** or **Dispatchable PPM** will be providing some of the **System** reserve. The **Controllable PPM** or **Dispatchable PPM** controller must be capable of being set to operate in a constrained manner within the range of at least 50% to 100% of maximum instantaneous **Output**.

[Schedule 2 Part II- *For CC.S2 Part II see clause CC.S2.2.5.2 as the same edits are required as same words are used…..]*

a) Each **Controllable PPM** or **Dispatchable PPM** must be fitted with a **Fast Acting** proportional power governor to provide **Frequency Control** under normal operational conditions. This **Fast Acting** proportional governor should be equipped with controls which allow the droop or equivalent for **PPMs** consisting of **ESPSs** to be set independently in the range 2% to 20% above and below 50.0 Hz. A deadband within which no control will be exercised must be capable of being set with a lower limit between 49.0 Hz and 50.0 Hz in steps of 0.05 Hz and an upper limit between 50.0 Hz and 51.0 Hz in steps of 0.05 Hz. Whilst responding to **Frequency** excursions on the **System** the change in **Active Power** ~~**Output**~~ of the **Controllable PPM** or **Dispatchable PPM** shall be as per the **Frequency Response Ramp Rate**. In addition a high **Frequency** trip facility must be provided capable of being set in the range 51.0 Hz to 52.0 Hz in steps of 0.1 Hz. Where a **Controllable PPM** or **Dispatchable PPM** becomes

isolated from the rest of the **Transmission System** the **Controllable PPM** or **Dispatchable PPM** must immediately detect the condition and shut itself down.

b) Under certain **System** conditions the **TSO** may require a **Controllable PPM** or a **Dispatchable PPM** to operate below its maximum instantaneous Output on a droop or equivalent for **PPMs** consisting of **ESPSs** setting to be set in the range 2% to 20%. In this mode of operation the **Controllable PPM** or **Dispatchable PPM** will be providing some of the **System** reserve. The **Controllable PPM** or **Dispatchable PPM** controller must be capable of being set to operate in a constrained manner within the range of at least 50% to 100% of maximum instantaneous **Output**.