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| **Query Ref. No.** | **MANDATORY REACTIVE POWER (MRP)**  **FREQUENTLY ASKED QUESTIONS - (in no particular order)** |
| NESO has a licence obligation to manage Voltage on the GB Transmission System. Obligatory Reactive Power Service (ORPS) is a mandatory reactive power service required by generators to manage the voltage and is a condition of connection (though obligations in the Connection and Use of System Code (CUSC) and hence Grid Code) to the electricity transmission system.  ORPS is the provision of varying reactive power output. At any given output, generators may be instructed to produce or absorb reactive power to help manage system voltages close to its point of connection. All generators covered by the requirements of the Grid Code are required to have the capability to provide reactive power.  The Mandatory Service Agreement (MSA) sets out the basic requirements of a BMU for the provision, delivery and payment of mandatory reactive power (i.e. ORPS). | |
|  | ***How will our unit be instructed to provide ORPS?*** |
|  | ORPS instructions are generally issued via Electronic Despatch Logger (EDL) or could be issued by telephone. The instruction could be for a target voltage setpoint (either in kV or per unit) or for a target MVAr set point. This is described in more detail below.  The provider has an obligation to acknowledge (accept or reject) any ORPS instruction within two minutes of receipt. If not, NESO control engineers would call the User’s control point to discuss the reasons for this.  Note that if Electronic Despatch Logger (EDL) was unavailable, then NESO would revert to telephone instructions to the control point. |
|  | ***In what format will NESO issue the ORPS instruction?*** |
|  | We typically issue reactive power instructions to BMUs using the following approach:  **For synchronous generators**: MVAr instructions will be issued to a target MVAr setpoint (e.g., +100, -15 MVArs). These are open ended, and as the unit may drift, a new instruction may be necessary to keep them at the required level. Once the control room is happy for the instruction to end, and no further reactive power instruction applies, they may send an instruction to a zero MVAr setpoint.  ECC.6.3.8.3 provides more detail on the Performance Requirements for Type C and Type D Onshore Synchronous Power Generating Modules.  **For non-synchronous generators (e.g., batteries, windfarms)**: Voltage target setpoint instructions will be issued in % or p.u (e.g., 95% (0.95p.u) or 100% (1,0p.u) or 105% (1.05p.u), or to an absolute voltage target setpoint (e.g. 277 or 398 for 277kV and 398kV respectively).  ECC.6.3.8.4 provides more detail on the Performance Requirements for Type C and Type D Onshore Power Park Modules.  A BMU would only be operating in one control mode at a time, either Fixed MVAr or Voltage Setpoint.  These instructions are open-ended and will take effect until the next instruction is received. No change to the setpoint will be carried out unless instructed by NESO.  BC2. A.2.6 of the Grid Code provides further guidance on the different types of instruction. In all cases, the instruction will set a requirement which is to be met at the Grid Entry Point or User System Entry Point (if Embedded). |
|  | ***Is ORPS instructed via Electronic Despatch Logger (EDL) regardless of whether the project is transmission connected, or distribution connected?*** |
|  | If it is a BMU yes, though telephone can also be used, generally this would be as a backup. |
|  | ***Will the generator receive a voltage setpoint instruction or a reactive power instruction from NESO.*** |
|  | **For synchronous generators**: MVAr instructions will be issued to a target MVAr setpoint (e.g., +100, -15 MVArs). These are open ended, and as the unit may drift, a new instruction may be necessary to keep them at the required level. Once the control room is happy for the instruction to end, and no further reactive power instruction applies, they may send an instruction to a zero MVAr setpoint.  **For non-synchronous generators (e.g., batteries, windfarms)**: Voltage target setpoint instructions will be issued in % or p.u (e.g., 95% (0.95p.u) or 100% (1,0p.u) or 105% (1.05p.u), or to an absolute voltage target setpoint (e.g. 277 or 398 for 277kV and 398kV respectively).  Meaning that the voltage at the Grid Entry Point or User System Entry Point (if Embedded) is to be controlled, not reactive power. The Generator will receive a voltage setpoint instruction from the NESO. Not a reactive power instruction. In summary, we will instruct them to a Voltage Setpoint, which will relate to the Grid Entry Point or User System Entry Point. NESO wouldn’t provide a reactive power instruction. |
|  | ***Performance Requirements - The generic requirements for voltage control in respect of Non-Synchronous plants are set out in the Grid Code (ECC) with any site specific variations included in the Bilateral Agreement*** |
|  | Non-synchronous generators are required to meet the relevant reactive power capability requirements of ECC.6.3.2 of the Grid Code – probably ECC.6.3.2.4 in your case.   * Grid Code ECC.6.3.8.4 requires provision of a continuously acting automatic voltage controller which is stable at all operating points, with a Setpoint Voltage and Slope characteristic as illustrated in Figure ECC.A.7.2.2. The point of voltage control is the Grid Entry Point. * The Slope characteristic of the continuously acting automatic control system shall be adjustable over the range 2% to 7% and is normally set to 4% by default. We rarely change the slope and would give reasonable notice (days) in order to change it. |
|  | ***Who will be receiving the ORPS signals? Will they come via the Route to Market provider, or will it come directly to the BESS power plant controller (PPC)?*** |
|  | ORPS will generally be instructed via Electronic Despatch Logger (EDL) from NESO directly to the BMU. Telephone may be used as an alternative means of instruction although EDL is the preferred option. |
|  | ***Should BESS assets always run with Obligatory Reactive Power Service on? i.e. no requirement from NESO to instruct the asset.*** |
|  | It all depends which mode it is operating in but there would always need to be an instruction from NESO to set the required provision of reactive power. For BESS assets, we require the unit to operate in voltage control mode (via an instruction from Electronic Despatch Logger (EDL)), rather than MVArs. This voltage instruction is open ended and thus could be received at a point in the past and may be appropriate to remain unchanged. In voltage control mode, the plant will regulate its reactive power automatically to control system voltage at the Grid Entry Point and hence it should always operate in this mode. |
|  | ***How is mandatory reactive power service (i.e. ORPS) paid for?*** |
|  | Mandatory Reactive Power is paid via a fixed tariff – known as the Reactive default payment rate. Payment is based on metered output i.e. the MVAr delivered. The metered data output relates to the BMU having a Central Volume Allocation (CVA) registration. Rather than a Supplier Volume Allocation (SVA) registration.  Payment will be linked to the receipt of the Elexon **Central Data Collection Agent** (CDCA) file. These reactive values come in on the outstation ID and then based on the relevant Aggregation Methodology (as per the final MSA), these values are combined into the contracted unit and each reactive unit will receive payment if they have volumes on their outstation ID's.  The link below provides further detail on the tariff.  <https://www.neso.energy/data-portal/obligatory-reactive-power-service-orps-utilisation> |
|  | ***Is ORPS only paid on utilization? (i.e., when there is an instruction from NESO to deliver reactive power)*** |
|  | Unless otherwise agreed a BMU will be paid for its metered output. So, for example if a BMU is in target voltages mode and they are importing or exporting, the BMU will be paid, regardless of if their position is beneficial.  Further to the signing of the final MSA (i.e., the MSA based on Grid Code compliant tested data) payment for the service will start from the date that the reactive capability is agreed to be compliant from. |
|  | ***Is there any Active Network Management (ANM) system that will be setting the export limits (Upper and Lower) for the system?*** |
|  | There will be no NESO ANM system that will have any involvement in ORPS – implicitly the site load controller should automatically respond. ANM systems are typically installed by the TO/DNO in congested parts of the network to advance connections ahead of future reinforcement works being completed. As such, there are ANMs that exist in certain parts of the network. If an ANM system is required - it should have been included in the Connection Agreement Appendices. |
|  | ***Confirm the electrical point that Obligatory Reactive Power Service should be operated, if multiple BMU’s share 1 Point of Connection (PoC) (i.e. at BMU or PoC)*** |
|  | ORPS should be provided at the POC. Work is underway to establish a policy for managing sites with multiple BMUs at the same POC but the initial view is that one instruction is issued and the required reactive power is delivered across the multiple BMUs, as the control point deem most appropriate, to ensure that reactive power is delivered at the POC. Settlement would still be based on each BMU metered output. |
|  | ***What is the reactive power re-declaration process?*** |
|  | The reactive power re-declaration process is documented in Grid Code BC2 Appendix 3 (BC2.A.3.1). Basically, any deviation in capability away from the requirement would be formally advised through this process. The re-declaration process is solely to do with the capability relative to your Grid Code obligation. In other words, if your reactive capability reduced, but you were still comfortably able to meet the requirements of the Grid Code, then you wouldn’t need to re-declare.  If the reactive power capability did change, we would expect a phone call from the control point to advise the NESO of this. The re-declaration form can be sent through afterwards. The important point is about making NESO aware promptly. |
|  | ***Would it ever be possible to build the Reactive Power response into our site controller without needing to rely on Electronic Despatch Logging (EDL) . This would help us future proof the site and make us less dependent on changing Electronic Data Transfer (EDT) /EDL providers.?*** |
|  | In general, the answer is no as the primary method in which instructions are issued is via EDL. Although telephony can be used this not the preferred option. The generator would need to be able to receive either target voltage instructions (which is the default) or Target MVAr instructions, the latter only being available if agreed with the NESO in the Connection Agreement. This process is essential for the NESO in managing the system.  Reactive despatch is key to system security and needs to be available in real time the current medium is Electronic Despatch Logging (EDL). They still need Electronic Despatch Logging (EDL) whoever is their ‘provider’ for their MW BOA despatch - any generator must be able to do both. |
|  | ***Per the payment formula in CUSC Schedule 3 Appendix 1, if there is a Reactive Dispatch Network Restriction, does it mean the utilization payment becomes ‘zero’? (Because we cannot deliver the service due to the restriction)?*** |
|  | For ORPS, as the Generator would have an MSA for reactive power, they would receive payment for the capability they demonstrate. In other words, as it’s a mandatory service they must demonstrate their capability, but they only get paid on what they deliver, if instructed to 0 they get 0 etc. n target voltage mode, as their output varies, they will get paid on their output about above 0, either way (negative or positive). |
|  | ***In the case of embedded generators, the reactive power capability may be limited to restrictions introduced by the relevant Distribution Network Operator (DNO). In such cases, would the NESO control room ever instruct embedded generators for ORPS? If yes, then how would the NESO instruction take precedence over a DNO instruction? Or would the control room liaise with DNO in such cases?*** |
|  | Distribution Network Operator (DNOs) normally have them setup so they don’t have to think about instructing them, in fact a lot are setup in fixed power factor (non BMU).  For BMUs, where NESO can instruct them, there would be a conversation with the DNO first. At some sites where we have been instructing for a long time the DNOs are happy, provided the output is limited, so as to not cause a problem. For example if we went to maximum MVArs and then tripped it could cause quite a disturbance on the LV network.  From a Grid Code perspective the DNO restriction is covered in the CC.A.7 and ECC.A.7 which states in the case of *CC.A.7.2.1 The Company requires that the continuously acting automatic voltage control system for the Onshore Non-Synchronous Generating Unit, Onshore DC Converter or Onshore Power Park Module or OTSDUW Plant and Apparatus shall meet the following functional performance specification.*  If a Network Operator has confirmed to The Company that its network to which an Embedded Onshore Non-Synchronous Generating Unit, Onshore DC Converter, Onshore Power Park Module or OTSDUW Plant and Apparatus is connected is restricted such that the full reactive range under the steady state voltage control requirements (CC.A.7.2.2) cannot be utilised, The Company may specify in the Bilateral Agreement alternative limits to the steady state voltage control range that reflect these restrictions. Where the Network Operator subsequently notifies The Company that such restriction has been removed, The Company may propose a Modification to the Bilateral Agreement (in accordance with the CUSC contract) to remove the alternative limits such that the continuously acting automatic voltage control system meets the following functional performance specification. All other requirements of the voltage control system will remain as in this Appendix*.* |
|  | ***How do DNOs notify NESO of a Reactive Dispatch Network Restriction?*** |
|  | Where there is a Network Restriction DNOs need to notify NESO under the Grid Code – See OC2.4.1.3.2, OC2.4.1.3.3(c) and BC1.6 and ECC.A.7.2.1 |
|  | ***How can BESS operators verify that such a restriction is in place?*** |
|  | As embedded generators maintain target volts agreed by the DNO (and that target never changes) they do not need to worry about it, however it is likely to cause unexpected effects with the AVC. The DNO should tell NESO under Grid Code Clause ECC.A.7.2.1 which would include embedded BESS Plants. |