Grid Code Review Panel Paper – pp10_31

Limiting the impact of network restrictions upon the provision of reactive power

Paper by National Grid

1. Executive Summary

The implementation of CAP169 Working Group Alternative Amendment 3, and its consequential Grid Code modification E/09, prohibited National Grid from instructing embedded generators which are under a network restriction, to provide reactive services. This had the effect of preventing National Grid from despatching those generators whose reactive capability range was only marginally less than the obligations specified in the Grid Code. This Amendment Proposal seeks to limit the impact of the network restriction on embedded generators by only excluding those generators which cannot be despatched to zero Mvars (unity power factor). For network restricted generators who can achieve unity power factor, these will continue to be remunerated in proportion to their metered Mvar output.

2. Background and Description of Defect

CAP169 Working Group Alternative Amendment 3 (WGAA3), and the associated Grid Code modification E/09, was implemented in March 2010. One of the features of this proposal meant that a zero payment would be made where a DNO network restriction was in place that prevented an embedded generator from providing a reactive service in accordance with an instruction from National Grid. In the Ofgem CAP169 decision letter, one of the contributing reasons for the approval of WGAA3 was that under the other alternatives, National Grid may not be able to instruct such generators to 0 Mvar, and therefore reactive payments would be made even if the reactive services were not aiding system operation. These costs would then ultimately fall to consumers which would not be economical. However, the approval of WGAA3 also impacted embedded generators which could be dispatched to zero but could not provide the full Mvar range as specified in the Grid Code, due to the DNO network restriction.

Currently the Grid Code definition for generator reactive despatch network restriction means that any generator that cannot meet the full reactive range is subject to a network restriction. This includes generators which cannot reach the extremities of the range, i.e. they may only be able to provide 90% of the specified range. As a consequence, National Grid cannot despatch such generators for reactive power, limiting the overall number of generators that can be despatched.

The result of this is that some embedded generators are prevented from providing a reactive service to National Grid within the range the DNO network can accommodate, which may be just short of the Grid Code defined range. This has a consequential effect on maintaining the integrity of the transmission system and could be seen as inefficient as a generator may have the ability to provide a reactive service but is not permitted due to the DNO network restriction.

This Amendment Proposal seeks to limit the definition of a network restriction to only those instances where National Grid cannot despatch generators to 0Mvar. In other words, the network restriction would only apply where National Grid cannot despatch the generator to 0 Mvar. The reason being that Mvar production from these

generators could contribute to ineffective balancing actions being forced which would increase system costs to other users. This Amendment Proposal would have the advantage of increasing the pool of generators that National Grid could despatch and allow remuneration for the provision of the reactive services.

It is worth noting that the Authority decision letter for CAP169 dated 21 December 2009 stated that "a case may be made that some remuneration is appropriate for the provision of a restricted service," for example the payment for the provision of dynamic benefit, from generators that can not be despatched. However, the development of such a payment is believed to be out of scope for this Amendment Proposal as this would be better placed under the scheduled future wider review of reactive provision. Currently, in terms of payment for the provision of reactive services, this would be proportionate to the metered output of the reactive service provided thereby allowing a zero amount to be paid to those generators who are at zero Mvars.

2.0 Description of proposed mod

The provision of reactive power to National Grid is set out under the Grid Code which states the reactive range that generators have to provide. This reactive range states that a generator must be capable of supplying rated output (MW) between the limits of 0.85 power factor lagging and 0.95 leading. There is also an obligation on all Large Power Stations to have the capability to provide reactive power, as detailed in Mandatory Service Agreements (MSAs) but this excludes those with a range below 15Mvar. However, the implementation of CAP169 allowed generators with a range below 15Mvar to request a Mandatory Services Agreement (MSA) to be in place to allow for National Grid to facilitate appropriate remuneration for the provision of reactive services.

A Mandatory Services Agreement (MSA) is an agreement between National Grid and a generator to govern the provision of and payment for mandatory ancillary services, which includes the provision of reactive power.

For embedded generators, some may be under a Distribution Network Operator (DNO) restriction which means that they cannot provide the reactive power range specified in the Grid Code.

A Reactive Despatch Network Restriction is defined in the Grid Code as follows:

> "restriction placed upon an **Embedded Generating Unit**, **Embedded Power Park Module** or **DC Converter** at an **Embedded DC Converter Station** by the **Network Operator** that prevents the **Generator** or **DC Converter Station** owner in question (as applicable) from complying with any **Reactive Despatch Instruction** with respect to that **Generating Unit**, **Power Park Module** or **DC Converter** at a **DC Converter Station**, whether to provide Mvars over the range referred to in CC 6.3.2 or otherwise."

In these circumstances, National Grid will not be able to despatch embedded generators under a DNO network restriction as defined in the Grid Code:

BC2.8.5

> "Where **NGET** has received notification pursuant to the **Grid Code** that a **Reactive Despatch Network Restriction** is in place with respect to any **Embedded Generating Unit**, **Embedded Power Park Module** or **DC Converter** at an **Embedded DC Converter Station**, then **NGET** will not issue any **Reactive Despatch Instruction** with respect to that **Generating Unit**, **Power Park Module** or
> **DC Converter** until such time as notification is given to **NGET** pursuant to the **Grid Code** that such **Reactive Despatch Network Restriction** is no longer affecting that **Generating Unit**, **Power Park Module** or **DC Converter**."

This particular clause was introduced by CAP169 which prevented such restricted embedded generators being despatched and therefore receiving payment. However, CAP169 did not address the full impact of such restrictions on embedded generators which had minor restrictions, thereby limiting the pool of providers that could provide reactive power.

The aim of this proposal is to address this issue and allow National Grid to despatch network restricted embedded generators providing that they can be despatched to 0 Mvars.

4.0 Assessment against Grid Code Objectives

National Grid considers that implementation of this Amendment Proposal would better facilitate the following Applicable Grid Code Objectives overall:

> *(i) to permit the development, maintenance and operation of an efficient, co-ordinated and economical system for the transmission of electricity;*
>
> *(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity) ; and*
>
> *(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole.*

The proposal ensures that National Grid can despatch Reactive Power from embedded generators that are deemed to have a network restriction in place but can be despatched to 0 Mvars and facilitate payment for this service, when required. This will increase the pool of potential providers of reactive power and result in increased stability and security of the electricity transmission system, thereby facilitating competition in the provision of reactive power.

The proposal will also ensure appropriate remuneration through ensuring payment is made only in instances where access to the service is available for the purposes of Transmission system operation, whilst no payment is made when restrictions on instruction to 0 Mvar are in place, thereby ensuring the system is operated and managed in the most economic and efficient manner.

5.0   Recommendations

National Grid recommends that this proposal should be developed further at the Balancing Services Standing Group (BSSG) and a draft Grid Code Consultation circulated around the Grid Code Review Panel (GCRP) for comment once the discussions at the BSSG have concluded.

Appendix A

There are two feasible options for changing the codes to implement this Amendment and the suggested changes to the legal text are shown below:

Option 1 (Grid Code only):

Change the Grid Code definition of reactive despatch network restriction to state that:

"restriction placed upon an **Embedded Generating Unit**, **Embedded Power Park Module** or **DC Converter** at an **Embedded DC Converter Station** by the **Network Operator** that prevents the **Generator** or **DC Converter Station** owner in question (as applicable) from complying with any **Reactive Despatch Instruction** to provide 0Mvar at the Commercial Boundary with respect to that **Generating Unit**, **Power Park Module** or **DC Converter** at a **DC Converter Station**, ~~whether to provide Mvars over the range referred to in CC 6.3.2 or otherwise.~~"

Option 2 (Grid Code and CUSC):

Change the definition of reactive despatch network restriction within section 11 of the CUSC to include the 0Mvar limit as above. This would also require a consequential Grid code change to BC2.8.5 [Where **NGET** has received notification pursuant to the **Grid Code** that a **Reactive Despatch Network Restriction** is in place as defined in the CUSC…]

<u>**CUSC – Section 11 (Definitions)**</u>

Reactive Despatch Instruction

Insert:
restriction placed upon an **Embedded Generating Unit**, **Embedded Power Park Module** or **DC Converter** at an **Embedded DC Converter Station** by the **Network Operator** that prevents the **Generator** or **DC Converter Station** owner in question (as applicable) from complying with any **Reactive Despatch Instruction** to provide 0Mvar at the Commercial Boundary with respect to that **Generating Unit**, **Power Park Module** or **DC Converter** at a **DC Converter Station.**

Delete:
~~As defined in the **Grid Code**~~

<u>**Grid Code**</u>

Where **NGET** has received notification pursuant to the **Grid Code** that a **Reactive Despatch Network Restriction** is in place as defined in the CUSC with respect to any **Embedded Generating Unit**, **Embedded Power Park Module** or **DC Converter** at an **Embedded DC Converter Station**, then **NGET** will not issue any **Reactive Despatch Instruction** with respect to that **Generating Unit**, **Power Park Module** or **DC Converter** until such time as notification is given to **NGET** pursuant to the **Grid Code** that such **Reactive Despatch Network Restriction** is no longer affecting that **Generating Unit**, **Power Park Module** or **DC Converter**."