CUSC Modification Proposal Form	At what stage is this document in the process?
# CMP326: ## Mod Title: Introducing a 'Turbine Availability Factor' for use in Frequency Response Capacity Calculation for Power Park Modules (PPMs)	01 Proposal Form 02 Workgroup Consultation 03 Workgroup Report 04 Code Administrator Consultation 05 Draft CUSC Modification Report 06 Final CUSC Modification Report

Purpose of Modification: To introduce a 'Turbine Availability Factor' into the CUSC to enable accurate calculation by the NGESO Control Centre and consequently accurate settlement of the Frequency Response capability of PPMs when some of the turbines on site are unavailable.

The Proposer recommends that this modification should be:

- assessed by a Workgroup

This modification was raised 4 October 2019 and will be presented by the Proposer to the Panel on *25 October 2019*. The Panel will consider the Proposer's recommendation and determine the appropriate route.

High Impact: None

Medium Impact:

National Grid Electricity System Operator

Low Impact:

Power Park Module Generators

Contents

Timetable

The Code Administrator recommends the following timetable: *To be updated by the Code Administrator following first Workgroup meeting*

Initial consideration by Workgroup	dd month year
Workgroup Consultation issued to the Industry	dd month year
Modification concluded by Workgroup	dd month year
Workgroup Report presented to Panel	dd month year
Code Administration Consultation Report issued to the Industry	dd month year
Draft Final Modification Report presented to Panel	dd month year
Modification Panel decision	dd month year
Final Modification Report issued the Authority	dd month year
Decision implemented in CUSC	dd month year

Any questions?

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Proposer Details

Details of Proposer: (Organisation Name)	National Grid Electricity System Operator
Capacity in which the CUSC Modification Proposal is being proposed: (i.e. CUSC Party, BSC Party or "National Consumer Council")	CUSC Party
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Eleanor Horn NGESO 07966 186088 Eleanor.horn@nationalgrideso.com
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Attachments (Yes/No): **If Yes, Title and No. of pages of each Attachment:**	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	
Grid Code	
STC	
Other	

This Modification will have no further impact on core industry documentation.

1 Summary

Defect

Under CUSC Section 4 Power Stations can be instructed to provide "Mode A Frequency Response" in accordance with the terms of the relevant Mandatory Services Agreement (MSA). The current calculation methods which determine the holding payments for Primary, Secondary and High Frequency Response can overestimate the response capability of Power Park Modules when some turbines on the site are unavailable.

The CUSC needs to reflect the true and accurate response capability of PPMs when some turbines on the site are unavailable to provide response.

What

Sites may be instructed for Mode A Response when one or more Power Park Units on the site are, for whatever reason, unavailable to provide response capability.

In such situations and at applicable points of de-load the true response capability of the site at this given time may be less than the level reported in the Frequency Response Capability Data tables (contained in the MSA).

The CUSC does not currently account for such situations and as a result overestimates the response capability of the affected sites in the calculation of the Holding Payment for Primary, Secondary and High Frequency Response.

CUSC 4.1.3 needs to be updated to reflect an accurate assessment of response capability that captures the situations identified in the defect. This could take the form of a cap to the MW capability for use in the calculation of holding payments. When the relevant operational situation is encountered, the cap will constrain the level of Primary, Secondary or High response to be included in the holding payment calculation.

Why

This change will enable the accurate and true reflection of the response capability of Intermittent Generation sites when facing different weather conditions. It will mean that BSUoS payers will be paying for the actual holding capability of the site in a range of operating conditions. It will mean that the NGESO control centre can develop accurate merit orders to make commercially better decisions on which sites to instruct for Mandatory Frequency Response (MFR).

How

The true response capability of the site can be reflected in the holding payment by designing a cap on response depending on the number of turbines in service in a range of operating conditions.

Some examples of how a MW cap could work using a vignette with a range of operating conditions is contained below:

A Power Station has a Registered Capacity of 100MW and is comprised of 20 Power Park Units (turbines) with a capacity of 5MW each. The Transmission Entry Capacity (TEC) of the site is 100MW. The SEL for this particular site is 10MW.

The maximum response capabilities at the optimum level of de-load for each service are:
Primary = 20MW
Secondary = 30MW
High = 20MW

(a) The site is instructed for response and BOA'd down to 50MW. PA indicates the site could provide 100MW if operating under normal conditions, all of the turbines are available.

The primary response capability P_{MW} should be calculated through the following means:

$$P_{MW} = \frac{current\ MEL}{Registered\ Capacity}\ x\ response\ capability$$

$$P_{MW} = \frac{100}{100}\ x\ 20 = 20MW$$

Where response capability is measured from the Frequency Response Capability Data tables using the given de-load point.

This example shows no change from the existing calculation method as the site is operating at maximum capability with all turbines available.
The other frequency response service capabilities should be calculated using the same methodology.

(b) The site is instructed for response and BOA'd down to 50MW. PA (as adjusted for turbine availability) indicates the site could provide 75MW if operating under normal conditions. Five of the site's 20 turbines are unavailable and so the current MEL submitted by the wind farm operator = 75MW.

The primary response capability P_{MW} should be calculated through the following means:

$$P_{MW} = \frac{75}{100}\ x\ 20 = 15MW$$

The primary response capability should be included in the holding payment calculation as 15MW. This is to represent the fact that without all turbines in service the site may be unable to ramp as quickly as when all are in service from the BOA'd position. The same ramping speed as the original 20MW was calculated from with the remaining turbines on a per turbine basis only allows the site to offer 15MW.
The other frequency response service capabilities should be calculated using the same methodology.

(c) The site is instructed for response and BOA'd down to 25MW. PA (as adjusted for turbine availability) indicates the site could provide 50MW if operating under normal conditions. 18 of the 20 turbines are available.

The calculation of response should be as follows:

- **Primary**:

$$P_{CAP} = \frac{90}{100} x\ 20 = 18MW$$

The level of primary response the site can provide is measured under CMP314 (approved by the Authority in August 2019 with an implementation date of 1st April 2020) from different de-load positions calculated using the PA signal. The capability expected at 25MW of de-load in this scenario is 20MW however the Pcap is 18MW. Therefore:

$$P_{MW} = 18MW$$

The MW cap based on 18/20 turbines being in service is in force here.

- **Secondary**:

$$S_{CAP} = \frac{90}{100} x\ 30 = 27MW$$

The level of secondary response the site can provide is measured under CMP314 from different de-load positions calculated using the PA signal. The maximum capability for secondary in this vignette is 30MW.

$$S_{MW} = PA - BOA'd\ position = 50 - 25 = 25MW$$

The cap isn't a delimiting factor for Secondary response here so the de-load is calculated as normal.

$$S_{MW} = 25MW$$

- **High**:

$$H_{CAP} = \frac{90}{100} x\ 20 = 18MW$$

The level of high response the site can provide is measured under CMP314 from different de-load positions calculated using the PA signal. The maximum capability for high in this vignette is 20MW.

$$H_{MW} = 18MW$$

2 Governance

Justification for Normal Procedures

The system changes for the NGESO PA integration project will go-live 1st April 2020. It would be convenient if this modification could be implemented at the same time however if this is not possible this will not delay the Go-Live. This is due to the system change relevant to a response capability MW cap being rolled out but not activated until

an implementation date as agreed through the CUSC change process is determined. The ESO would prefer to provide a wholesale transition to using PA in settlement for frequency response for PPMs therefore the ESO would like to request that the modification is reasonably highly prioritised by the CUSC panel.

Requested Next Steps

This modification should:

- be assessed by a Workgroup for a short period

3 Why Change?

This change will enable the accurate and true reflection of the response capability of Intermittent Generation sites when facing different weather conditions. It will mean that BSUoS payers will be paying for the actual holding capability of the site in a range of operating conditions. It will mean that the NGESO control centre can develop accurate merit orders to make commercially better decisions on which sites to instruct for Mandatory Frequency Response (MFR).

4 Code Specific Matters

Technical Skillsets

Basic knowledge of Frequency Response settlement and CUSC section 4.

Reference Documents

See attached draft legal text

See attached relevant page of the draft Strathclyde University report *Recommendation for the Evaluation of Wind Farm Power Available Signal Accuracy* p23 Version 2.3

5 Solution

To introduce a cap onto the MW variable within the Holding Payment calculation within CUSC 4.1.3.9 to ensure that the true and accurate response capability of the Power Station is reflected in the calculation.

The cap should reflect a reduced capability to ramp from various de-loaded positions which will depend on the proportion of unavailable turbines.

A suggested method of calculating the cap is included below:

Primary Frequency Response

The cap could be calculated as follows:

$$P_{CAP} = \frac{Current\ MEL}{Registered\ Capacity}\ x\ Response\ Capability_P$$

Where $Response\ Capability_P$ is that found in the Frequency Response Capability Data tables in the Mandatory Service Agreement for Primary Frequency Response at the applicable level of de-load. The level expressed in MW for Primary Response Capability as used in the Holding Payment calculation should never exceed the level of the Primary Response Cap.

$$P_{CAP} \geq P_{MW}$$

Secondary Frequency Response

The cap could be calculated as follows:

$$S_{CAP} = \frac{Current\ MEL}{Registered\ Capacity}\ x\ Response\ Capability_S$$

Where $Response\ Capability_S$ is that found in the Frequency Response Capability Data tables in the Mandatory Service Agreement for Secondary Frequency Response at the applicable level of de-load. The level expressed in MW for Secondary Response Capability as used in the Holding Payment calculation should never exceed the level of the Secondary Response Cap.

$$S_{CAP} \geq S_{MW}$$

For avoidance of doubt, $Response\ Capability_S$ may be different from or equal to $Response\ Capability_P$.

High Frequency Response

The cap could be calculated as follows:

$$H_{CAP} = \frac{Current\ MEL}{Registered\ Capacity}\ x\ Response\ Capability_H$$

Where $Response\ Capability_H$ is that found in the Frequency Response Capability Data tables in the Mandatory Service Agreement for Secondary Frequency Response at the applicable level of de-load. The level expressed in MW for Secondary Response Capability as used in the Holding Payment calculation should never exceed the level of the Secondary Response Cap.

$$H_{CAP} \geq H_{MW}$$

6 Impacts & Other Considerations

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

This modification impacts the NGESO Power Available project and in particular the ASB settlements system that is being upgraded to settle MFR based on the PA signal as part of Phase 2a of the PA project.

Consumer Impacts

The NGESO control room will have better visibility and there will be a better alignment of commercial incentives to promote greater usage of PPMs for Mandatory Frequency Response (MFR). There will be consequently be more options available to Control Room operators to enable lower cost instruction of MFR. This should provide consumer value. This modification proposal in particular will ensure that holding payments for MFR are paid which are an accurate and true reflection of the capability of the site under all operating conditions.

7 Relevant Objectives

Mandatory for the Proposer to complete. Please delete the CUSC Objectives that is not applicable.

Impact of the modification on the Applicable CUSC Objectives (Standard):	
Relevant Objective	Identified impact
(a) The efficient discharge by the Licensee of the obligations imposed on it by the Act and the Transmission Licence;	Positive
(b) Facilitating effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the sale, distribution and purchase of electricity;	None
(c) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency *; and	None
(d) Promoting efficiency in the implementation and administration of the CUSC arrangements.	None
*Objective (c) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).	

The implementation of a cap on the maximum response capability for PPMs based on the turbine availability and operating conditions will support the efficient discharge of the C16 license conditions providing more accurate information to enable greater efficiency in the actions to be taken to balance the system.

It should support the work on-going within the ESO to open up the MFR market more fully to Intermittent Generation providers whilst ensuring that the payments made are fully reflective of the true capability of the site. This should support the ESO in increasing competition in the procurement of certain balancing services whilst remaining cognisant of the interests of current and future electricity consumers in GB.

8 Implementation

Depending on when a decision on this modification is received from the Authority the implementation timescales should either align with the rollout of Phase 2a of the Power Available project (1st April 2020) or be implemented at such a time as the IT changes to enable the correct calculations can be activated.

9 Legal Text

See attached word file

Text Commentary

The draft legal text provides instruction within CUSC Section 4.1.3.9 *Calculation of Holding Payment* to derive a cap on Primary, Secondary and High capability depending on the proportion of turbines which are available for response. The cap is then applied to

Proposer's Recommendation to Panel

Panel is asked to:

- Refer this proposal to a Workgroup for assessment.

