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## **Distributed Generators: Loss of Mains Protection change, away from Vector Shift (VS)**

National Grid, the electricity transmission system operator (the “TSO”), has informed us that in order to preserve the stability of the electricity system, loss of mains (LoM) protection settings on a limited volume of existing generators fitted with Vector Shift (“VS”) type protection must be changed immediately in targeted locations across the south of England. In order to encourage your support, the TSO and DNOs have agreed to the compensation proposal outlined below, subject to generating units meeting the relevant criteria.

### **Pre-Qualification Criteria**

- Is your distributed generation connected to Southern Electricity Power Distribution (SEPD) network?
- Is your distributed generation scheme sized at >1MW?
- Is your protection afforded by a discrete G59 relay which utilises Vector Shift as its loss of mains protection?

If so please read the proposal and respond as soon as possible, as you may be eligible for the compensation offered under the proposal; for which you will be required to transition from VS to High Setting RoCoF before 1 June 2018.

### **Background**

Under Engineering Recommendation G59, Issue 3, Amendment 2, September 2015, loss of mains protection systems which work on the principle of VS were deemed to provide adequate protection. However, under Engineering Recommendation G59, Issue 3, Amendment 3, February 2018, VS relays are no longer deemed adequate and can no longer be installed for generation plant commissioned after 1 February 2018. The alternative method suggested is Rate of Change of Frequency with settings of 1Hz/s and 0.5s time delay- (“High Setting RoCoF”).

While, at this stage, only generation plant commissioned after 1 February 2018 (or existing schemes undergoing material alterations) are required to adhere to the new standard, the TSO has identified the need to change the loss of mains protection systems fitted to generation plant in key areas of southern England immediately. The estimated requirement to reduce system risk to a satisfactory level is to reduce the amount of electricity generated where the method of loss of mains protection is VS by around 800 MW of capacity by 1 June 2018. This will significantly reduce the

risk to the wider system, the distribution system, and may also reduce the risk of nuisance tripping and unintended duty on each distributed generator.

## Proposal

In order to implement this risk reduction, we are inviting customers to make a permanent transition from VS to High Setting RoCoF, in consideration for which we will make the following payment to those customers who are selected:

- £4000 + VAT per generator where a relay change is required; or
- £2500 +VAT where only a settings change is required

Where required, the SEPD costs incurred for witness testing these changes will not be chargeable to the customer.

The payment for this transition will be made to you in arrears and will only be made once the changes are made and validated. In order to qualify for payment, your submission will be assessed against criteria which include typical MW output, lead time, cost and location. Payment will only be made to those who meet the assessment criteria and are selected for participation. Please see the **enclosed** Appendix for assessment criteria and further terms and conditions.

It is foreseeable that future standards may require existing generators to make the change from VS to High Setting RoCoF. The funding for such future changes is under discussion but it is not anticipated that an accelerated programme such as this will be offered in the future, nor is it guaranteed that funding for these changes will be made available. For further background information, please see the "Detailed Information" in the Appendix.

If you meet the pre-qualification criteria and wish to be considered for participation in this programme then please respond to this proposal by 9 May 2018. Responses must be sent via email to [paul.d.munday@sse.com](mailto:paul.d.munday@sse.com) with a signed and scanned copy of this letter, which includes the requested information. Your response must be accompanied with evidence of your existing settings. Upon receipt, we will be in contact by 14 May 2018 to request any further information and inform you of acceptance or otherwise.

Yours faithfully

Paul Munday  
Lead Commercial Contract Manager

*(To be completed by the applicant)*

I acknowledge and accept the terms of this letter and wish to be considered for participation.

In accordance with the terms of this letter, I offer to implement and maintain the change to my protection settings. In making this offer, I agree that in consideration for you making the compensation payment I am not permitted to revert to VS or any other settings (unless otherwise agreed with SEPD in accordance with EREC G59/3-3 Section 10.5.10).

The site details are as follows (if there are multiple relays please fill out separate table for each):

Item		Details
<b>Name of generator</b>		
<b>Site address</b>		
<b>Plant Capacity fitted on one relay VS MW</b>		
<b>MW output Sample Day/Time.</b>  <b>Where not commissioned or outage please state.</b>	Sun 08 May '16 at 12:00	
	Sun 29 May '16 at 13:00	
	Sun 03 Jul '16 at 13:30	
	Sun 07 Aug '16 at 13:30	
	Sun 25 Sep '16 at 13:00	
	Sun 26 Mar '17 at 12:00	
<b>Settings Change Fee/ Relay Change Fee Applicable</b>		
<b>Target date for change (no later than 1 June 2018)</b>		

\* noting requirements for supplementary information as detailed in ["Appendix: Further Terms"]

Signed: \_\_\_\_\_

Name: \_\_\_\_\_

Position: \_\_\_\_\_

For and on behalf of **[generator details]**

Date: \_\_\_\_\_ 2018

## Appendix

### Further Terms:

- To qualify for any payment the Generator must
  - Have had its proposal accepted by SEPD
  - Provide evidence of existing settings to SEPD (including type of relay, model and manufacturer) with the signed acceptance of the terms of this letter. This should be in the form of a copy of the site commissioning form or similar approved documentation
- Payment will be made in arrears to those customers that can evidence the High Setting RoCoF settings have been applied and successfully tested within the agreed timeframe.
- The only form of evidence that will be accepted for obtaining the payment will be a test certificate that clearly states the following:
  - site name;
  - location;
  - new RoCoF setting applied as per the EREC G59-3/3; and
  - date of the implementation which should be before 1 June 2018.
- Positive response to this letter does not either confirm or oblige your participation in the accelerated programme. Payments will only be made to those selected to proceed and will be made upon receipt of the required evidence, within the agreed timescale as stated above.
- SEPD reserves the right to audit the evidence provided and that the setting change has occurred.
- The settings change will need to be maintained over time, and the Generator may not revert to VS or any other settings (unless otherwise agreed with SEPD in accordance with EREC G59/3-3 Section 10.5.10).
- SEPD reserves the right to reject any offer that the generator makes in response to this letter at any time prior to acceptance at its absolute discretion
- SEPD accepts no liability for any loss or damage incurred in alterations made to the Generator's equipment or in operating its plant and equipment with the new RoCoF setting applied.

## Assessment Criteria

Topic	Criteria	What is valued
Effectiveness at diminishing risk	Location	The connection location of a unit impacts the “effectiveness”. More effective GSPs are valued higher for VS change. The higher the effectiveness the more likely a plant with Vector Shift is deemed to trip for key faults on the transmission system.
	Size	A combination of the MW capacity of the unit and the load factor during the risk period will be used to assess the effective capacity.
	Load factor during risk period [Average output over capacity]	The greater the expected load during risk periods-characterised by high regional PV output, the more effective a unit will be. This will be assessed based on the historic output during the half hours described below provided by the generator. For dates where plant was not yet operational or on outage please state.
Ease of changing	Cost	Lowest cost.
	Time	The ability to change the relays sooner is preferred.

## Detailed Information

Depending on the nature of faults, the national electricity system can be exposed to MW losses larger than planned for, due to simultaneous operation of VS protection across a geographic region.

The Energy Networks Association’s Engineering Recommendation G59, Issue 3, Amendment 3, February 2018, Clause 10.3.12, states that:

*“Investigations in early 2017 have shown that vector shift protection is susceptible to spurious operation during voltage disturbances caused by faults on the transmission system and is less effective at detecting islands on the Distribution System; therefore from 1 February 2018 no new vector shift protection relays can be installed. **Opportunities should be taken to reduce the system risk associated with vector shift protection and any material alteration to an existing installation should include removing vector shift protection and replacing with an alternative loss of mains protection, such as RoCoF, in accordance with section 10.5.7. Similarly from 1 February 2018, RoCoF protection applied via a multifunctional relay must not be replaced by a vector shift setting.**”* (Emphasis added.)

Future code changes could require this modification as part of a larger full national programme over a longer timescale. Discussions are currently underway to ascertain what a future national implementation programme would constitute. At this stage there is no agreement as to whether this national programme would be funded.

To incentivise generation plant owners to change their relay system to High Setting RoCoF we, along with the TSO, believe that it is appropriate to reimburse generation plant owners who participate in the Accelerated Programme and thereby remove VS proactively.

It should be noted that the simplicity of this conversion process will largely be dictated by the type of protection relays that you have installed at the generator. Some may require a simple setting adjustment while others will require an offsite upgrade or replacement. All works required in making the conversion will be at your own cost, and the payment is limited to that set out in this letter. The RoCoF settings required are those for “Generating Plant commissioned on or after 01/08/16”, as set out in the table below from Engineering Recommendation G59, Issue 3, Amendment 3, February 2018.

RoCoF settings for Power Stations ≥5MW				
Date of Commissioning		Small Power Stations		Medium Power Stations
		Asynchronous	Synchronous	
<b>Generating Plant</b> Commissioned before 01/08/14	Settings permitted until 01/08/16	Not to be less than $K2 \times 0.125 \text{ Hz/s}^\#$ and not to be greater than $1 \text{ Hz/s}^{\#}$ , time delay 0.5s	Not to be less than $K2 \times 0.125 \text{ Hz/s}^\#$ and not to be greater than $0.5 \text{ Hz/s}^{\# \Omega}$ , time delay 0.5s	Intertripping Expected
	Settings permitted on or after 01/08/16	$1 \text{ Hz/s}^{\#}$ , time delay 0.5s	$0.5 \text{ Hz/s}^{\# \Omega}$ , time delay 0.5s	Intertripping expected
<b>Generating Plant</b> commissioned between 01/08/14 and 31/07/16 inclusive		$1 \text{ Hz/s}^{\#}$ , time delay 0.5s	$0.5 \text{ Hz/s}^{\# \Omega}$ , time delay 0.5s	Intertripping expected
<b>Generating Plant</b> commissioned on or after 01/08/16		$1 \text{ Hz/s}^{\#}$ , time delay 0.5s	$1 \text{ Hz/s}^{\#}$ , time delay 0.5s	Intertripping expected

**Table 1** – RoCoF settings as recommended in paragraph 10.5.7.1 of the EREC G59-3/3

