SEC
Smart Energy Code

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DP165
'ESME Voltage Accuracy'

Modification Report

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About this document

This document is a draft Modification Report. It currently sets out the background, issue, and progression timetable for this modification, along with any relevant discussions, views and conclusions. This document will be updated as this modification progresses.

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1. Summary

This proposal has been raised by Alan Creighton from Northern Powergrid.

Electricity Network Parties have a statutory obligation to ensure that the voltage supplied to consumers' premises from Low Voltage electricity networks is always between defined limits. They currently do this by making planning assumptions when Low Voltage networks are designed.

During the development of the smart metering Technical Specifications, Electricity Network Parties requested that the average Root Mean Square (RMS) voltage readings from Electricity Smart Metering Equipment (ESME) would be recorded with a mandated level of accuracy. Such a requirement is not currently codified in the Smart Metering Equipment Technical Specifications (SMETS) or the Great Britain Companion Specification (GBCS).

The uncertainty associated with the lack of a mandated accuracy level means that Electricity Network Parties must make conservative planning assumptions when designing and analysing performance of Low Voltage networks. This prevents them from realising the full benefits from the smart meter rollout.

2. Issue

What are the current arrangements?

What is average RMS voltage and what is it used for?

The RMS voltage value of an Alternating Current (AC) circuit represents an equivalent voltage of a Direct Current (DC) circuit. Under the Electricity Safety, Quality and Continuity Regulations (ESQCR) each property supplied from a Low Voltage electricity network must receive a voltage within the range of 230V +10% (253V) and 230V -6% (216.2V).

Currently Electricity Network Parties use planning assumptions when designing Low Voltage electricity networks to ensure that the voltage supplied to consumers is always within these statutory limits. One of the anticipated benefits associated with smart metering is that Electricity Network Parties should be able to use smart meter average RMS voltage data to enable them to design Low Voltage networks more efficiently, monitor the performance of Low Voltage networks, identify any problems, and help develop more efficient solutions.

Management of network voltage will be an increasingly important activity as a means of supporting the transition to meet the GB 2050 Net Zero target. This will see an increase in the uptake of Low Carbon Technologies (LCTs), particularly Electric Vehicles, heat pumps and distributed generation connected to Low Voltage networks. The connection of such Devices is expected to cause an increase in the number of power flow and voltage issues on Low Voltage networks. Accurate voltage and consumption data from smart meters will help to mitigate these issues.

How accurate are the RMS voltage readings from ESME?

Currently there is no mandated level of accuracy for voltage measurements from ESME. The British Electrotechnical and Allied Manufacturers' Association (BEAMA) has confirmed an 'indicative voltage accuracy' that an Electricity Network Party could assume is ±1%. However, this assumption is for all

ESME, and would not consider any differences between meters manufactured by different Manufacturers and different Device models made by the same Manufacturer.

Currently there is no requirement for a meter Manufacturer to share the results of any voltage measurement accuracy testing that it may carry out for each of their products.

How is the voltage accuracy of ESMEs tested?

There is currently no codified method for determining the accuracy of ESME voltage measurements. It is understood that the indicative voltage accuracy supplied by BEAMA is not based on an agreed testing methodology and each meter Manufacturer may have provided its view on their products using a differing methodology.

What is the issue?

There is an increase in the connection of LCTs to Low Voltage networks. This is only likely to grow as GB transitions to meet the 2050 Net Zero target.

The design and management of Low Voltage networks is becoming an increasingly important Electricity Network Party activity. Having increased visibility of network voltages, with a known level of accuracy from ESME, is a crucial element to Low Voltage network design and management. It is therefore important that an Electricity Network Party can access accurate voltage measurements, with a known degree of accuracy. This will enable them to better understand the level of network reinforcement required to help Great Britain meet its Net Zero targets.

Ofgem's upcoming review for electricity network price control RIIO (Revenue = Incentives + Innovation + Outputs) 2 will be used to set price controls for Electricity Network Parties. This performance-based framework seeks to put consumers at the heart of Electricity Network Parties' plans and to encourage longer-term thinking, greater innovation and more efficient delivery. Without a known level of accuracy for voltage measurements, Electricity Network Parties will need to make conservative assumptions which may lead to less efficient solutions being implemented.

What is the impact this is having?

Although the indicative voltage accuracy confirmation from BEAMA is helpful, there remains no mandated voltage accuracy requirement. It is anticipated that different ESME models have a varying level of voltage accuracy.

Network reinforcement is triggered when the voltage on the Low Voltage network approaches the statutory limits set out in the ESQCR, which are 230V +10% (253V) and -6% (216.2V). For example, if the network voltage is 252.5V reinforcement is not required, whereas if the network voltage is 253.5V reinforcement is required. This illustrates the need for accurate voltage measurements as a difference in network voltage of 1V could trigger the need for potentially expensive reinforcement, which may not necessarily be required. The nominal voltage at a customer's premise is 230V. BEAMA indicates that ESME have an accuracy of ±1% which corresponds to 2.3V.

Impact on consumers

Great Britain's electricity network is ultimately funded by consumers, and the cost savings that had been anticipated from the smart meter rollout may not be realised if Electricity Network Parties do not have access to accurate data to enable them to manage their networks as efficiently as possible.

3. Assessment of the proposal

Observations on the issue

Business case for Devices currently installed

During the Development Stage, the Smart Energy Code Administrator and Secretariat (SECAS) presented the Draft Proposal to the Technical Architecture and Business Architecture Sub-Committee (TABASC) for initial comments.

The TABASC agreed that the issue is clear, but the business case will need further investigation. This is due to the impact the modification may have on Devices already installed as this could lead to physical replacement due to non-compliance. This is similar to MP085A 'Synchronisation of smart meter voltage measurement periods' which was split into two modifications to address the issue for newly manufactured Devices and under MP085B 'Synchronisation of smart meter voltage measurement periods (meters currently installed)', for those currently installed. MP085A will be implemented into the version of SMETS that will go live as part of the November 2022 SEC Release. Devices built to this specification will have to include the added functionality or be upgraded via firmware. Provided they can facilitate the additional functionality, existing Devices will be upgraded to the specification as and when the Supplier chooses to do so. In order to impose the functionality by a set date, previous versions of SMETS would have to be end-dated. This will be investigated under MP085B.

As the cost of firmware updates are borne by Suppliers, the business benefit of this modification must be clear. A TABASC member suggested that DNOs should have monitoring functionality at various points on their own network rather than requesting all Devices provide this information via the smart metering infrastructure. The Chair also questioned who would be funding this modification, suggesting that if it is solely a DNO issue, perhaps it should be at their cost.

Current Technical Specifications

A TABASC member raised concern that there is currently no requirement for Device Manufacturers to share the results of any voltage measurement testing. SECAS highlighted that there is some regulation, for example in the Measuring Instruments Directive (MID), but this does not satisfy the Proposer's requirements.

The SEC Sub-Committee Chairs advised that the modification may require a major version uplift of the Great Britain Companion Specification (GBCS) as potential hardware changes will be needed to facilitate the change. The Chairs advised that although the Proposed Solution will likely impact the SMETS and the GBCS, it is not expected to be a DCC Systems-impacting modification.

Areas for assessment

SECAS believes the following Sub-Committees will need to input to this modification:

Sub-Committee input needed during the Refinement Stage	
Sub-Committee	**Input needed**
OPSG	None – No impact on operational processes
SMKI PMA	None – No impacts on the Smart Meter Key Infrastructure (SMKI) document set
SSC	None – No impacts on the security infrastructure
TABASC	Assessment of the business requirements and the Proposed Solution.

SECAS has identified the following areas and questions that will need to be further considered during the Refinement Process before a suitable solution will be able to be taken forward:

The Proposed Solution may impact Devices currently installed, which may lead to physical replacement and high associated cost.

SECAS will discuss this with the Working Group; any potential solution will need to consider the impacts on existing Devices and any associated costs to update these compared to the expected benefits the solution would realise.

Appendix 1: Progression Timetable

The TABASC has previously stated that the issue is clear and defined. SECAS therefore recommends this Draft Proposal be converted to a Modification Proposal and progressed to the Refinement Process. If the Change Sub-Committee (CSC) agrees, SECAS will then work with the Proposer to develop the business requirements for the Proposed Solution. Following this, SECAS will present a strawman solution to the Working Group.

Timetable	
Event/Action	**Date**
Draft Proposal raised	27 May 2021
Presented to CSC for initial comment	29 Jun 2021
Modification discussed with the TABASC	5 Aug 2021
Modification discussed with the Operations Group (OPSG)	6 Jul 2021
CSC converts Draft Proposal to Modification Proposal	15 Mar 2022
Proposed Solution developed with the Proposer	Late Mar 2022
Legal text drafted with the Proposer	Apr 2022
Modification discussed with Working Group	4 May 2022
Modification discussed with the TABASC	5 May 2022
Update provided to CSC	17 May 2022

Appendix 2: Glossary

This table lists all the acronyms used in this document and the full term they are an abbreviation for.

Glossary	
Acronym	**Full term**
AC	Alternate Current
BEAMA	British Electrotechnical and Allied Manufacturers' Association
CSC	Change Sub-Committee
DC	Direct Current
ESME	Electricity Smart Meter Equipment
ESQCR	Electricity Safety, Quality and Continuity Regulations
GBCS	Great Britain Companion Specification
LCT	Low Carbon Technology
MID	Measuring Instruments Directive
OPSG	Operations Group
RIIO	Revenue = Incentives + Innovation + Outputs
RMS	Root Mean Square
SECAS	Smart Energy Code Administrator and Secretariat
SMETS	Smart Metering Equipment Technical Specifications
TABASC	Technical Architecture and Business Architecture Sub-Committee