SEC
Smart Energy Code

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Smart Energy Code

MP085A

‘Synchronisation of smart meter voltage measurement periods’

Modification Report

Version 0.6

1 November 2021

Corporate member of Plain English Campaign
Committed to clearer communication
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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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This document also has three annexes:

- **Annex A** contains the business requirements for the original, now discarded Proposed Solution.
- **Annex B** contains the redlined changes to the Smart Energy Code (SEC) required to deliver the Proposed Solution.
- **Annex C** contains the Data Communications Company (DCC) Preliminary Assessment response for the original, now discarded solution.

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1. Summary

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

Electricity Distribution Network Operators (DNOs) believed that during the development of the smart meter technical specification, the average Root Mean Square (RMS) voltage readings from smart meters would be measured across a consistent period. An example of this would be for an average to be measured across a 30-minute period starting on the hour and on the half hour, which would match half hour consumption profile data. However, this is not currently codified in the Smart Metering Equipment Technical Specifications (SMETS) or the Great Britain Companion Specification (GBCS) and this has led to some voltage reading periods starting at different times.

There are examples where some electricity meter Manufacturers' meters work begin the measurement period on the hour or half hour, however this is not uniform across the industry. This has resulted in Electricity Network Parties:

(i) making conservative, less efficient analysis assumptions to account for the lack of data alignment; or

(ii) recreating synchronised data by downloading high granularity (for example minute resolution) data and calculating the required data.

Investigations during the Refinement Process have found the issue affecting existing installed meters more complex than initially envisaged. This could result in a lengthy lead time for implementation where meter Manufacturers could potentially still produce Devices that do not commence average RMS voltage readings on the hour. Therefore, was agreed that there should be two separate solutions to address the issue;

- MP085A – a Technical Specifications document change for meter Manufacturers to ensure a predictable approach for when newly manufactured Devices commence average RMS Voltage Measurement Period readings; and
- MP085B – a solution for meters that are already installed.

This modification will impact Electricity Network Operators and Device Manufacturers. As there are no DCC System impacts implementation costs are limited to Smart Energy Code Administrator and Secretariat (SECAS) time and effort. This modification is targeted for 3 November 2022 (November 2022 SEC Release) and is a Self-Governance Modification.

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. Electricity Network Parties use smart meter average RMS voltage and average consumption data to monitor the performance of distribution networks and identify any problems by the recorded voltage variations.

Once there is data available from a sufficient number of smart meters on a DNO network, Network Parties will use this data to identify problems and solutions to those problems. The uptake in Low Carbon Technologies, particularly Electric Vehicles and Distributed Generation is expected to cause an increase in the number of power flow and voltage issues in distribution networks. Voltage and consumption data from smart meters will help manage these issues efficiently in the future.

What is the issue?

The expectation of DNOs during the development of the smart meter technical specification was that the average RMS voltage readings from smart meters would be measured across a consistent period. For example, with the default being for an average to be measured across a 30-minute period starting on the hour and on the half hour as is the case with the half hour consumption profile data. However, this is not an explicit requirement codified in the SMETS or the GBCS.

Whilst some electricity meter Manufacturers' meters do work in this way, other Manufacturers' meters do not. Without voltage measurements being made in a consistent way, DNOs must either make conservative, less efficient analysis assumptions to account for the lack of data alignment or recreate synchronised data by downloading high granularity (for example minute resolution) data and calculating the required data.

During the Refinement Process, SECAS obtained information from a Network Party relating to meters that do not commence average RMS voltage readings on the hour. Of the meters tested by four Network Parties, over 50% provide average RMS voltage readings later than required.

Average RMS voltage readings that relate to 30-minute periods not starting on the hour or half hour are helpful for identifying voltage problems at an individual customer premises. However, without synchronised recording times it will be difficult to:

- understand voltage issues on Low Voltage feeders that may be affecting more than one customer;
- identify trends or forecast future voltage issues; or
- validate power flows and voltages on a network model relating to a defined 30-minute period, and hence identify the most efficient solution.

What is the impact this is having?

There are two headline implications if this issue is not addressed:

- DNOs will either need to make conservative assumptions about network voltages which may lead to inefficient, potentially more costly solutions being implemented; or
- DNOs will need to reconfigure the Average RMS Voltage Measurement Period from the default period of 30 minutes to one minute and download the high granularity data so that they can recreate synchronised data in their own systems. This will require DNOs to develop systems to manage a greater volume of data than originally envisaged as well as increasing traffic on the DCC System. This is not considered to be an efficient solution.

Currently specific timings for measuring the RMS Voltage Measurement Period are not stipulated in the Technical Specifications and so there will need to be amendments to SEC Schedule 9 'Electricity Smart Metering Equipment Technical Specifications' (SMETS)

3. Solution

Proposed Solution

The Proposed Solution is to provide a consistent approach for all Electricity Smart Metering Equipment (ESME); ensuring that the Average RMS Voltage Measurement Period starts or resumes from a predictable point in time, allowing automatic realignment of a Device's measurement periods with those of other ESMEs. This will allow DNOs to make full use of the Average RMS Voltage Profile Data Logs for remote comparison across all of their ESMEs.

As there are several situations that can lead to an Average RMS Voltage measurement being interrupted, e.g. due to a power interruption, reboot of the ESME, firmware activation, etc., a solution was needed that would allow the sampling of the Average RMS Voltage to recommence after an interruption in a way that would realign the measurement period to that of neighbouring ESMEs (an ESME in a similar location under the same DNO but at a difference premise). In the case of such an event or when starting up for the first time, the ESME should align the start of a reoccurring Average RMS Voltage Measurement Period sequence to the start of the current Coordinated Universal Time (UTC) day. The accumulation of RMS voltage values should then begin when the ESME reaches the start of the next period.

To align the measurement periods of multiple ESMEs it is expected that the length of the Average RMS Voltage Measurement Period be consistent across all of a given DNO's ESMEs, as well as ensuring that the length of the period be a factor of 1800 seconds (30 minutes). This is to align with the default value an ESME is configured to prior to installation (GBCS defines this as 1800 seconds). This will also ensure that the sequence of measurement periods continues to align throughout the day, regardless of when an interruption to the measurement of Average RMS Voltage may occur.

The DNO is the only impacted Party should the measurement period not be configured to a factor of 1800 seconds. DNOs can resolve this issue by reconfiguring the measurement. As a result, it was deemed unnecessary to restrict the setting of the measurement period within SMETS or GBCS.

4. Impacts

This section summarises the impacts that would arise from the implementation of this modification.

SEC Parties

SEC Party Categories impacted			
	Large Suppliers		Small Suppliers
✓	Electricity Network Operators		Gas Network Operators
✓	Other SEC Parties		DCC

Breakdown of Other SEC Party types impacted			
	Shared Resource Providers		Meter Installers
✓	Device Manufacturers		Flexibility Providers

This modification will impact electricity DNOs as the Proposed Solution may cause a change in the expected behaviour of their ESMEs.

Device Manufacturers will also be impacted by this modification as they will have to build Devices to the new versions of the Technical Specifications that implement this change.

DCC System

This modification has no impact on the DCC System.

The first iteration of the Proposed Solution contained business requirements that would result in changes to the DCC System. Through further refinement of the legal text, the Proposer, the Technical Specification Issue Resolution Sub-committee (TSIRS), the Technical Architecture and Business Architecture and Sub-Committee (TABASC) Chair and SECAS agreed that business requirement 4 was no longer necessary. It was agreed that the relevant DNO would be responsible for a misalignment of data should the Average RMS Voltage Measurement Period not be configured to 1800 seconds in length (or a factor of).

This resulted in a Proposed Solution that was no longer DCC System impacting.

SEC and subsidiary documents

The following parts of the SEC will be impacted:

- Schedule 9 'Electricity Smart Metering Equipment Technical Specifications' (ESMETS)

Technical specification versions

This modification will be implemented in the latest versions of the Technical Specifications issued at the relevant SEC Release. This modification is targeted to be implemented in the November 2022 SEC Release (3 November 2022). SECAS anticipate that the ESMETS will be uplifted to version 5.2 for this release.

Consumers

This modification will ensure DNOs are provided with accurate data in the granularity they require to enable Networks to operate more reliably and to become more efficient as the data is collated. Furthermore, aligning the Average RMS Voltage Measurement Periods across ESMEs will allow DNOs to identify issues on Low Voltage feeders and forecast future voltage issues. This will result in DNOs providing a higher level of service to consumers. The aligned data is likely to become even more important with the increased uptake of Low Carbon Technologies being installed at consumers' premises, and the consequential increased load on the network.

Other industry Codes

This modification will have no impact on other industry Codes.

Greenhouse gas emissions

This modification will have no impact on greenhouse gas emissions.

5. Costs

DCC costs

There are no DCC System costs to implement this modification

SECAS costs

The estimated SECAS implementation costs to implement this modification is two days of effort, amounting to approximately £1,200. The activities needed to be undertaken for this are:

- Updating the SEC and releasing the new version to the industry.

SEC Party costs

Information regarding SEC Party costs will be gathered as part of the Refinement Consultation.

6. Implementation approach

Recommended implementation approach

SECAS is recommending an implementation date of:

- **3 November 2022** (November 2022 SEC Release) if a decision to approve is received on or before 3 May 2022; or
- **2 November 2023** (November 2023 SEC Release) if a decision to approve is received after 3 May 2022 but on or before 2 May 2023.

As the change impacts the Technical Specifications, the modification should be implemented in a SEC Release that includes an uplift to the Technical Specifications. The earliest release this modification can be implemented in is the November 2022 SEC Release. New versions of the Technical Specifications are usually targeted for November SEC Releases. SECAS has therefore recommended that if the modification is not implemented in the November 2022 SEC Release, it will be deferred to the November 2023 Release.

SECAS has currently allowed for a six-month lead time, though this will be reviewed once the Refinement Consultation has been carried out. Please note SECAS aim to baseline the Technical Specifications six months in advance to provide a level of certainty for industry.

7. Assessment of the proposal

Observations on the issue

The proposal was taken to the Change Sub-Committee (CSC) for initial discussion. A CSC member pointed out that there were some synchronisation issues as a whole and it would be beneficial to look at all synchronisation issues together to explore any efficiencies in a solution to several problems. Another member pointed out that these would have been discussed at the TSIRS. This was discussed with the Proposer and Technical Operations and it was agreed that, although a valid concern, other synchronisation problems were separate to the one defined in this proposal and therefore outside the scope of this modification.

During the Development Stage, the proposal was presented to the other SEC Sub-Committees to gain feedback on the issue identified. The TABASC and the Operations Group (OPSG) were interested in this proposal, however, would only like to be kept up to date if the proposal was not approved for implementation. The Security Sub-Committee (SSC) confirmed that there were no security risks with this proposal.

During the Refinement Process SECAS was informed by a Network Party that testing had taken place to gauge the scale of the issue. The models of four meter Manufacturers were tested and two of the Manufacturers' ESME commenced their measurement period on the hour whereas the other Manufacturers' ESME did not.

Solution development

Views of the Working Group

SECAS presented the issue and three potential solution options to the Working Group.

The three Proposed Solutions were as follows:

- Potential solution 1: set SR6.5 to Future Dated.

  This Service Request would be Future Dated at Data Service Provider DSP level with an anticipated delay in transmission and processing by the ESME of approximately 30 seconds or less. Future Dating being a current functionality and so no DCC Systems changes would be required.

- Potential solution 2: amend SMETS to state that any changes to the Average RMS Voltage Measurement Period are applied from the start of the next hour according to the Device's clock.

  A retrospective firmware update would be required to add this functionality to Devices currently installed.

- Potential solution 3: amend SR6.5 to be Future Dated at the Device.

  This would require changes to the DCC User Interface Specification (DUIS) to allow Future Dating at a Device level and with a configurable start time. This is a more complex version of the first potential solution; however, it would remove the approximate time delay as the DSP would send the Service Request with the datetime to the Device. This would mean the Device processes the instruction at the right time.

A Network Party stated that it had previously run tests on several smart meters to test the functionality of the first potential solution which would require setting SR6.5 to Future Dated. The Network Party confirmed that the test had returned inadequate results and therefore this solution was discarded. The Network Party confirmed that the testing they had undertaken also applied to the third potential solution and so this was also discarded. This was because although the Service Request would set the measurement period, GBCS is silent on when the revised measurement period would take effect.

The second solution received a much more positive response and was the solution taken forward. This is a Device behavioural change that will require amendments to SMETS to ensure that any changes to the Average RMS Voltage Measurement Period takes place at the start of the next hour. The Proposed Solution was subsequently taken to the TABASC where comments were received that there would be a need to amend SMETS, GBCS and DUIS. The Working Group stated that a firmware update would also be required for existing meters. This will undergo further research during the Refinement Process as part of MP085B 'Synchronisation of smart meter voltage measurement periods (meters currently installed)'.

Views of the TABASC

The TABASC agreed that the business requirements would address the issue. The Chair of the TABASC advised that the Proposed Solution should be applied to all types of ESME.

Comments were received regarding testing of the proposed solution. The TABASC advised that issues may occur if a measurement period that is not a factor of 1,800 seconds as specified. The Proposer believed that limiting measurement periods to that which are factors of 1,800 would be the best approach to prevent this from happening. This would require GBCS to be amended to document the limitations of the values available and this would be mirrored in DUIS. The list of measurement periods can be found in the MP085 business requirements (Annex A).

Feedback was received from TABASC asking for realignment of the Average RMS Voltage Measurement Period to only occur on the hour as opposed to on the hour and half-hour, in order to simplify the text and remove the need for a change in DUIS. Unfortunately, as the maximum possible value of the Average RMS Voltage Measurement Period is 4,294,967,295 seconds, DUIS would still need to change to only allow the Average RMS Voltage Measurement Period to be set to a factor of 3600 seconds, as opposed to 1800 seconds in the current drafting. As a change would be required either way it was preferred to keep the modification proposal as is so as to keep the maximum possible time that average RMS values would not be recorded down to 30 minutes. Following further refinement, the Proposed Solution no longer requires DUIS changes.

Views of BEAMA

During the Refinement Process, SECAS engaged with the British Electrotechnical and Allied Manufacturers' Association (BEAMA) to further understand the functionality of the Proposed Solution. SECAS issued a Request for Information (RFI) document to gain feedback from Device Manufacturers in relation to whether existing Devices currently installed can be updated to provide average RMS voltage readings that commence on the hour or half past the hour (whichever occurs first when a Device has first been energised or received a request to change measurement period).

The respondents confirmed that ESME Manufacturers could implement the Proposed Solution via a firmware upgrade. The respondents stated that this is generally current behaviour and advised that if

time is an important factor, it should be recognised that the ESME, whilst synchronised, has the Communications Hub as a time reference, as the ESME is not aware of the time independently.

In terms of the complexity of the change, the respondents requested that the requirements were further refined to specify edge case behaviours. The complexity of the proposed changes at the time was categorised as medium.

Respondents stated that the costs would be reduced if other changes where to be made at the same time, such as in a SEC Release. This would make the testing and approval processes more efficient. Costs were however provided for a single change, which were estimated at £50,000 to £200,000.

Information was also sought in the case the modification was not approved. It was stated that if Network Parties elected to use shorter measurement periods (for example, one-minute intervals), logs will fill more quickly and there could be memory wear out issues although there are processes in place to protect against this. Comments were received stating that this would generally have no impact, however logs would fill more quickly which could lead to memory issues. It was also highlighted that there are processes in place to protect against this.

The question was asked whether a Device would delete existing entries if a request to change the measurement period was executed. Clarification was provided that logs are not normally cleared when a change occurs. This could be safeguarded by producing an explicit business requirement. This was captured under business requirement 5.

BEAMA sought further clarification on edge cases, to ensure that the business requirements and legal text were robust enough to cover all scenarios. SECAS provided the draft legal text to BEAMA to distribute to its members. SECAS amended the legal text at the request of BEAMA members.

The responses to the consultation and the amended legal text were discussed at the SEC Working Group in February 2021. It was agreed that by including the edge case scenarios in the legal text would result in all meter Manufacturers having to build Devices to the latest specifications, as opposed to only the Manufacturers whose Devices do not commence average RMS voltage readings on the hour or half past the hour.

Post-BEAMA consultation Working Group response

Concern was raised regarding how the complexity of the Proposed Solution impacts ESME already commencing their Average RMS Voltage Measurement Periods on the hour or half past the hour. One of the edge case scenarios requests that incomplete periods are not logged when there is a supply interruption, a firmware update takes place, or a ESME's clock is reset. A Working Group member stated that this would impact a Manufacturer whose ESMEs' Average RMS Voltage Measurement Periods align to the hour, as they would then have to alter their functionality to facilitate this new obligation.

Including these edge cases in the Proposed Solution would impact all ESME Manufacturers and would likely increase implementation costs. For the two identified Manufacturers to make a new standalone firmware upgrade, the cost was estimated at £50,000 to £200,000 per Manufacturer. SECAS then investigated further with BEAMA who clarified that for all Manufacturers to align to the proposed legal text would have an estimated combined cost of £450,000 to £550,000 (due to several Manufacturers already utilising certain functionality). The Working Group sought clarity on who would be liable to pay for the proposed changes. It is commonplace that when Manufacturers produce new firmware, Suppliers must purchase the firmware at a cost, but this firmware upgrade would only benefit Network Parties. These costs relate to firmware updates for existing meters which are now out of scope of MP085A.

A meter Manufacturer summarised the Proposed Solution whereby the Network Party must have the data alignment, whereas all other functionalities borne out of the BEAMA consultation are 'nice to have' changes.

Working Group members raised concerns that MP085 would result in a retrospective change with some of the costs being incurred by Suppliers who receive no clear benefit. The Working Group were concerned that MP085 would set a precedent for retrospective changes and, due to there being no clear benefit for Suppliers, if the cost allocation was reasonable for such a change. It was noted that Suppliers pay the cost of firmware updates and so it is vital to pinpoint the implementation approach and the Devices it would apply to. The Working Group suggested that the modification should only be applicable to meter Manufacturers whose ESME do not commence Average RMS Voltage Measurement Periods on the hour or half past the hour. This would be accomplished by simplifying the proposed legal text changes and reducing the scope of edge case scenarios. Retrospective changes will now be investigated under MP085B.

For the reasons cited above, the Proposer agreed that MP085 should be split into two separate modifications. MP085A would address the issue for new Devices by amending the SEC so that once implemented, Manufacturers will build Devices with the desired functionality. MP085B would look to address the issue for Devices currently installed through a firmware update (as confirmed by BEAMA respondents).

Views against the General SEC Objectives

Proposer's views

The Proposer believes that MP085A's implementation will better facilitate SEC Objectives (a)[1], (c)[2] and (g)[3]. As the Proposed Solution will provide a consistent approach for all ESMEs in relation to Average RMS Voltage Measurement Periods, the modification will bring improvements to the operation and interoperability of smart meters while also providing Network Parties with more accurate data for them to better manage their networks. Furthermore, from a more general perspective, MP085A's implementation will better facilitate the efficient and transparent administration and implementation of the SEC,

Industry views

Industry views against the SEC Objectives will be gathered during the Refinement Consultation.

Views against the consumer areas

Improved safety and reliability

This modification will give DNOs better visibility of faults on the electricity network and therefore be able to build in improvements to mitigate against these faults reoccurring.

[1] Facilitate the efficient provision, installation, operation and interoperability of smart metering systems at energy consumers' premises within Great Britain.
[2] Facilitate energy consumers' management of their use of electricity and gas through the provision of appropriate information via smart metering systems.
[3] Facilitate the efficient and transparent administration and implementation of the SEC.

Lower bills than would otherwise be the case

This modification will have a neutral impact on the price of a consumer's bills.

Reduced environmental damage

This modification will have a neutral impact on environmental damage.

Improved quality of service

This modification will have a positive impact on service quality as DNOs will be able to respond quicker to faults on the electricity network and work to mitigate against the same fault reoccurring.

Benefits for society as a whole

This modification will have a neutral impact on benefits to society.

Appendix 1: Progression timetable

Following further refinement of the draft legal text, SECAS will now issue the Refinement Consultation. The collated responses will then be reviewed by the Working Group before returning to the Change Sub-Committee under the recommendation that MP085A proceeds to the Report Phase.

Timetable	
Action	**Date**
CSC recommendation that Panel convert into a Modification Proposal	29 Oct 2019
Panel convert Draft Proposal to Modification Proposal	15 Nov 2019
Potential solution options agreed with the Proposer	Dec 2019 – Jan 2020
Business Requirements discussed with the Proposer	Feb 2020
Potential Solution options discussed with Working Group	4 Mar 2020
Solution refined with the Proposer	Mar 2020
Modification discussed with the TABASC	16 Apr 2020
Legal text developed with the Proposer	Apr 2020
Preliminary Assessment requested	July 2020
Preliminary Assessment returned	10 Sep 2020
Modification discussed at Working Group	7 Oct 2020
Request for Information issued to BEAMA	Nov 2020
Modification discussed at Working Group	3 Feb 2021
Solution refined with the Proposer	Feb – Mar 2021
Modification split into MP085A and MP085B	22 Mar 2021
Modification discussed at Working Group	7 Apr 2021
Modification discussed with the TABASC	5 May 2021

Timetable	
Action	**Date**
Modification discussed at Working Group	1 Jul 2021
Legal text further developed with the Proposer	Jul – Sep 2021
Refinement Consultation	2 Nov – 22 Nov 2021
Refinement Consultation responses discussed at the Working Group	1 Dec 2021
Modification presented to the CSC	21 Dec 2021
Modification Report Consultation	22 Dec 2021 – 21 Jan 2022
Change Board vote	23 Feb 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	Alternating Current
BEAMA	British Electrotechnical and Allied Manufacturers' Association
CSC	Change Sub-Committee
DC	Direct Current
DCC	Data Communications Company
DNO	Distribution Network Operator
DSP	Data Service Provider
DUIS	DCC User Interface Specification
ESME	Electricity Smart Metering Equipment
ESMETS	Electricity Smart Metering Equipment Technical Specifications
GBCS	Great Britain Companion Specification
OPSG	Operations Group
RFI	Request For Information
RMS	Root Mean Square
SEC	Smart Energy Code
SECAS	Smart Energy Code Administrator and Secretariat
SMETS	Smart Metering Equipment Technical Specifications
SR	Service Request
SSC	Security Sub-Committee
TABASC	Technical Architecture and Business Architecture Sub-Committee
TSIRS	Technical Specification Issue Resolution Sub-Committee
UTC	Coordinated Universal Time