SEC
Smart Energy Code

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Smart Energy Code

MP085A

'Synchronisation of smart meter voltage measurement periods'

Modification Report

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592

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.

Contents

1. Summary 3
2. Issue 3
3. Solution 5
4. Impacts 5
5. Costs 7
6. Implementation approach 8
7. Assessment of the proposal 8

Appendix 1: Progression timetable 12

Appendix 2: Glossary 12

This document also has two annexes:

- **Annex A** contains the business requirements for the Proposed Solution.
- **Annex B** contains the Data Communications Company (DCC) Preliminary Assessment response.

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1. Summary

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

Electricity Network Parties 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 made across a 30-minute period starting on the hour and on the half hour, matching half hour consumption profile data. This is not currently codified in the Smart Metering Equipment Technical Specifications (SMETS) or the Great Britain Companion Specification (GBCS).

There are examples where some electricity meter Manufacturers' meters work in this way, however this is not uniform across the industry. This results 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.

This proposal is currently in the Refinement Process where the Proposed Solution is being developed.

Investigations during the Refinement Process 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, it has been agreed that there should be two separate solutions to address the issue;

- MP085A (this modification) – a Technical Specifications document change for meter Manufacturers to ensure newly manufactured Devices commence average RMS Voltage Measurement Period readings on the hour or half past the hour (whichever occurs first); and
- MP085B – a solution for meters that are currently installed.

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.

Once there is data available in reasonable quantities from smart meters Electricity Network Parties plan to use this data to develop the most efficient solution to any identified problem. 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 Electricity Network Parties 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 made across a 30-minute period starting on the hour and on the half hour as per the half hour consumption profile data. This is not an explicit requirement codified in the SMETS or the GBCS.

Whilst some electricity meter Manufacturers' meters work in this way, other Manufacturers' meters do not. Without voltage measurements being made in a consistent way, Electricity Network Parties 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, the Smart Energy Code Administrator and Secretariat (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 random 30-minute periods 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:

- Electricity Network Parties will either need to make conservative assumptions about network voltages which may lead to inefficient solutions being implemented; or
- Electricity Network Parties 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 increase the voltage related traffic on the DCC infrastructure by a factor of 30 and require Electricity Network Parties to develop systems to manage a greater volume of data than originally envisaged. This is not considered to be an efficient solution.

The Proposer has stated that the issue lies with the requirements for specifying the timings when the RMS voltage readings take place. Currently it is not stipulated in the Technical Specifications and there will need to be amendments to SMETS (Smart Energy Code (SEC) Schedule 9).

3. Solution

Proposed Solution

The Proposed Solution is to ensure that the Average RMS Voltage Measurement Period commences on the hour or half past the hour (whichever occurs first). Any changes in duration to the Average RMS Voltage Measurement Period are to be applied from the start of the next hour or half past the hour according to the Device's clock. Users will be able to choose a measurement period from 11 pre-determined values. The maximum length will be 1,800 seconds (30 minutes), and all other values will be factors of 1,800. Please see the available values below:

Average RMS Voltage Measurement Period	
Seconds	**Minutes**
10	00:10
15	00:15
30	00:30
60	01:00
120	02:00
180	03:00
300	05:00
360	06:00
600	10:00
900	15:00
1,800	30:00

If a Distribution Network Operator (DNO) attempts to set the measurement period to a length outside of the above 11 values, a new Data Service Provider (DSP) validation check will be failed, resulting in the Service Request (SR) being rejected along with producing a new error code, notifying the DNO that their request has been unsuccessful.

For MP085A, this will be applied to newly manufactured Devices once the modification has been implemented.

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 Network Operators as the Proposed Solution will provide Network Operators with average RMS voltage readings that align to half-hourly consumption data.

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.

The DCC will also be impacted by this modification as changes will be made to the DCC User Interface Specification (DUIS) schema. This is in order to provide a Network Party with a new error code if a request to use a measurement period outside of the 11 possible values.

DCC System

The DCC Preliminary Assessment confirmed that this modification will require changes to the DCC Systems, in particular, the DSP's system.

DNOs use the SR 6.5 'Update Device Configuration (Voltage)' to set a measurement period in Electricity Smart Metering Equipment (ESME). The DSP will be required to amend the processing of SR 6.5 to introduce a new validation check to verify the value of the attribute 'Average RMS Voltage Measurement Period'. If the Average RMS Voltage Measurement Period is not a factor of 1800, then the Service Request will be rejected using a specific error code. A new error code will be introduced for this, which will require changes to the DUIS schema.

In situations where the Service Users do not use a version of DUIS that supports the new error code, the existing error code E060501 will instead be used to indicate failure. DUIS Guidance will be required for Service Users to inform them of this possible usage of E060501.

The valid values for Average RMS Voltage Measurement Period will be finalised as part of the Impact Assessment.

The full impacts on DCC Systems and DCC's proposed testing approach can be found in the DCC Preliminary Assessment response in Annex C.

This is subject to change under the DCC Impact Assessment as the modification has since been split into MP085A and MP085B.

SEC and subsidiary documents

The following parts of the SEC will be impacted:

- Schedule 9 'Smart Metering Equipment Technical Specifications 2'
- Appendix AD 'DCC User Interface Specification'

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 June 2022 SEC 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 to the hour or half-past the hour 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.

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

The estimated DCC implementation costs to implement this modification is £100,000 - £200,000 (these costs were provided before MP085 was split). The breakdown of these costs are as follows:

Breakdown of DCC implementation costs	
Activity	**Cost**
Design, Build and Pre-Integration Testing (PIT)	£100,000 to £200,000
Systems Integration Testing (SIT)	TBC
User Integration Testing (UIT)	TBC
Implement to Live	TBC
Application Support	TBC

More information can be found in the DCC Preliminary Assessment response in Annex B.

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:

- **30 June 2022** (June 2022 SEC Release) if a decision to approve is received on or before 30 April 2022; or
- **3 November 2022** (November 2022 SEC Release) if a decision to approve is received after 20 April 2022 but on or before 3 September 2022.

As the change impacts Technical Specifications, the modification should be implemented in a SEC Release that includes an uplift to the Technical Specifications. The DCC Preliminary Assessment has stated that there is an anticipated lead time of two months. The earliest release this modification can be implemented in is the June 2022 SEC Release. New versions of the Technical Specifications are usually targeted for November SEC Releases; however, the DCC has advised that due to the planned implementation of Enduring Change of Supplier (ECoS), including updates to the Technical Specifications in the June 2022 SEC Release will allow for cost savings relating to testing.

If, following a decision and allowing enough lead time, an earlier Release made updates to the Technical Specifications, the Panel may request that this modification be moved to that Release.

If the ECoS change does not go ahead in June 2022 and the next Technical Specification uplift occurs in November 2022 then this modification should be included in the November 2022 Release. If however the ECoS change does go ahead in June 2022, resulting in technical specification uplifts, but this modification misses the cut off date, it will then be implemented in the next Release which includes a technical specification update.

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 a number of

problems. Another member pointed out that these would have been discussed at Technical Specification Issue Resolution Sub-committee (TSIRS). This was discussed with the Proposer and Technical Operations and it was agreed that, although a valid concern, it was felt that other synchronisation problems were separate to the one defined in this proposal.

During the Development Stage, the proposal was presented to the other SEC Sub-Committees to gain feedback on the issue identified. The Technical Architecture and Business Architecture and Sub-Committee (TABASC) and the Operations Group (OPSG) showed an interest in this proposal, however, would only like to be kept up to date if the proposal is not approved for implementation. The Security Sub-Committee (SSC) confirmed that there are no security risks with this proposal, and they are happy with it to proceed.

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 Working Group agreed that the issue was clear and needs to be addressed.

The three Proposed Solutions were as follows:

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

  This Service Request would be Future Dated at DSP level with an anticipated delay in transmission and processing by the ESME of approximately 30 seconds or less. Future Dating is 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 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.

Views of the TABASC

The Proposed Solution was presented to the TABASC for discussion on 16 April 2020. 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 feels that a limiting measurement periods to that which are factors of 1,800 would be the best approach to prevent this from happening. SECAS discussed this with the Proposer and advised that 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).

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 has to 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 are further refined to specify edge case behaviours. The change was categorised as medium.

Similar to how modifications are grouped together to be implemented for a scheduled SEC Release, the respondents stated that the costs would be reduced if other changes where to be made at the same time. 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 not being approved. It was stated that if Network Parties elected to use shorter measurement periods (for example, one-minute intervals). Comments were received stating that this would generally have no impact, however logs would fill more quickly which could lead to memory issues. 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.

BEAMA sought further clarification on edge cases, to ensure that the business requirements and legal text are robust to cover all scenarios. SECAS provided the draft legal text to BEAMA to distribute to its 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 that are 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 will impact all ESME Manufacturers and will likely increase implementation costs. For the two identified Manufacturers to make a new standalone firmware upgrade, the cost is estimated at £50,000 to £200,000 per Manufacturer. SECAS has since investigated further with BEAMA who have 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 is 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 results 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 will set a precedent for retrospective changes and, due to there being no clear benefit for Suppliers, if the cost allocation is reasonable for such a change. It was noted that Suppliers pick up the cost of firmware updates and so it is vital to pinpoint the implementation approach and the Devices it will 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 has agreed that MP085 is split into two separate modifications. MP085A will address the issue for new Devices by amending the SEC so that once

implemented, Manufacturers will build Devices with the desired functionality. MP085B will look to address the issue for Devices currently installed through a firmware update (as confirmed by BEAMA respondents).

Appendix 1: Progression timetable

During the Refinement Process, it was agreed that MP085 should be split into two separate modifications. The split took place on 22 March 2021. SECAS will now further refine the MP085A draft legal text before returning to the TABASC. Once the draft legal text has been agreed, SECAS will issue the Refinement Consultation.

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
Refinement Consultation	10 May – 28 May 2021

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
ECoS	Enduring Change of Supplier
ESME	Electricity Smart Metering Equipment
GBCS	Great Britain Companion Specification
OPSG	Operations Group
PIT	Pre-Integration Testing
RFI	Request For Information
RMS	Root Mean Square
SEC	Smart Energy Code
SECAS	Smart Energy Code Administrator and Secretariat
SIT	Systems Integration Testing
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
UIT	User Integration Testing