This document is classified as **White** in accordance with the Panel Information Policy. Information can be shared with the public, and any members may publish the information, subject to copyright.

SECMP0007

‘Firmware updates to IHDs and PPMIDs’

Modification Report

Version 0.2

About this document

This document is the Modification Report for SECMP0007 'Firmware updates to IHDs and PPMIDs'. It provides detailed information on the background, issue, solution, costs, impacts and implementation approach. It also summarises the discussions that have been held and the conclusions reached with respect to this Modification Proposal.

Contents

1. Summary 3
2. Background 4
3. Solution 5
4. Impacts 6
5. Costs 9
6. Implementation approach 10
7. Discussions and development 11
8. Conclusions 17

Appendix 1: Glossary 19

This document also has three annexes:

- **Annex A** contains the business requirements for the proposed solution.
- **Annex B** contains the Data Communications Company (DCC's) full DCC Preliminary Assessment response.
- **Annex C** contains the full non-confidential responses to the first Working Group Consultation.

1. Summary

The Proposer of this modification seeks to address the issue of the lack of capability to update firmware Over-The-Air (OTA) for mandated Home Area Network (HAN) Devices via the Data Communications Company's (DCC's) infrastructure. The Smart Metering Implementation Programme (SMIP) technical specifications currently capture OTA firmware updates via the DCC to the Communications Hub, Electricity Smart Metering Equipment (ESME) and Gas Smart Metering Equipment (GSME) only. Requirements for OTA firmware updates to mandated HAN devices are not captured.

This Modification Proposal proposes a combination of two methods to including the capability to update firmware OTA for Prepayment Interface Devices (PPMIDs) and HAN Connected Auxiliary Load Control Switches (HCALCSs) via the DCC's infrastructure.

This modification will have wide ranging impacts across Supplier Parties, Network Parties, Other Parties and the DCC, requiring changes to systems and processes as well as introducing new capabilities in terms of updating firmware for mandated HAN Devices. The extent of these impacts will be drawn out through consulting with Smart Energy Code (SEC) Parties and relevant stakeholders. If approved, this modification is provisionally targeted for the November 2020 SEC Release.

2. Background

Firmware updates over the air

The SMIP Technical Specifications, namely the Smart Metering Equipment Technical Specifications (SMETS) 2, the Communications Hub Technical Specification (CHTS), the Great British Companion Specification (GBCS) and Commercial Product Assurance (CPA) Security Characteristics, currently capture OTA firmware updates via the DCC to the Communications Hub, ESME and GSME only. Requirements for OTA firmware updates to other mandated HAN Devices are not captured in these documents or any others in the SEC.

What is the issue?

Suppliers have advocated for a number of years for the inclusion of mandated HAN Devices based on the original agreed industry specifications that were captured in the Industry's Draft Technical Specification (IDTS). Suppliers agreed that not having the ability to carry out OTA firmware updates to these mandated HAN Devices will result in significant cost impacts for Suppliers associated with:

- Operating multiple OTA and non-OTA update processes;
- Stranded assets; and/or
- Site visits to locally update firmware, or replace or remove Devices.

The lack of capability to carry out OTA firmware updates to mandated HAN Devices requires Suppliers to manage multiple processes and systems for firmware updates on all smart metering Devices (OTA and non-OTA) at consumer premises with additional costs associated with this. There is also a risk that Devices which are not currently OTA upgradable may lose their ability to communicate on the HAN if there is a ZigBee stack upgrade that needs to be applied to address, for instance, a security related issue. This is especially relevant given that:

- PPMIDs are key to facilitating consumers' access to information and prepayment functionality; and
- HCALCS are load affecting Devices.

The Proposer considers that the lack of capability for Suppliers to carry out OTA firmware updates limits the opportunity to add value or innovate in the future. This will result in a negative consumer experience and impacts will also add a reputational risk to Suppliers and the SMIP as a whole – therefore impacting the overall benefits argument for smart metering.

SECMP0007 was raised by Npower on 1 March 2016 to resolve this issue.

3. Solution

Proposed Solution

The Proposer seeks to amend the SMIP technical specifications to include the capability to update firmware using OTA for PPMIDs and HCALCSs. The requirements for the proposed solution will be underpinned by the relevant SEC obligations and SEC Subsidiary Documents.

In summary, the assumed high-level process for an OTA firmware update on mandated HAN Devices would involve the following steps:

- Once a firmware Image has been developed and gone through the appropriate assurance, the Supplier sends a 'Distribute Firmware' Command containing the firmware Image and the list of Globally Unique Identifiers (GUID) of the target PPMID to the DCC. This would be a Non-Critical Command (a 'one-to-many' broadcast).
- The DCC distributes the firmware to the Communications Hubs associated with the target PPMIDs.
- The PPMID retrieves the new firmware from the Communications Hub and, after verification of the firmware, performs the firmware activation.
- After a timeout the Communications Hub queries the PPMID for the firmware version and sends a response to the sender with the new firmware version.

For the OTA upgrade of HCALCS the process aligns with the current SMIP technical specifications for the Supplier to distribute and activate firmware on the ESME and GSME via an OTA update, this will be accomplished through the introduction of additional Service Reference Variants for existing Service Requests.

The Proposer seeks to update the SMIP Technical Specifications for the two mandated HAN Devices at the same time. However, if phasing is considered more optimal then the order of preference could be with PPMIDs in phase 1, followed by HCALCS in phase 2.

The Proposer notes that assurance of the overall process will need to be considered. This includes activities such as interface testing with the DCC as well as Device level certification and testing. The Firmware Management Design Note will need updating to reflect changes to the process as specified above.

The business requirements for this solution can be found in Annex A.

Legal text

The changes to the SEC required to deliver the proposed solution will be available toward the end of the Refinement Stage, once the Proposer establishes a solution to take to the Report Phase. These will be made available for comment before the Modification Report is presented to the Panel.

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

Supplier Parties

Suppliers are responsible for the procurement, installation and maintenance of SMETS2 Devices in customers' premises. They have an obligation to ensure Devices are operating as they should be. Therefore, a fit for purpose OTA firmware management process covering all mandated Devices would support Suppliers in delivering their obligation consistently. Further local firmware updates will be banned as a result of this modification.

In response to the first Working Group Consultation on this modification, several Supplier Parties advised that this modification would impact them in terms of changes to systems and IT infrastructure, as well as processes. Some respondents noted this as a negative impact due to the effort required to implement these changes.

Respondents also noted positive impacts with the increased capability to fix Devices remotely rather than through site visits, and with greater capability to innovate with mandated HAN Devices.

Electricity Network Parties

In response to the first Working Group Consultation, a Network Party highlighted that the modification would inevitably impact overall system performance which may have minor knock on effects for Network Parties and that they may have to make minor system changes to facilitate this modification.

Other SEC Parties

Other SEC Parties and PPMID & HCALCS Manufacturers will be impacted by this modification as their mandated PPMIDs and HCALCSs will be able to receive firmware updates OTA via the DCC's infrastructure. Other impacts also include:

- It is assumed that Manufacturers will notify the Panel of a Device Model details and assurance certificates when adding a PPMID or HCALCS to the CPL;
- Suppliers will need to add Manufacturer Image Hashes associated with PPMID and HCALCS CPL entries to the CPL; and
- Manufacturers will need to digitally sign the association of the Manufacturer Images Hash and the CPL model details.

DCC System

The DCC notes that all of the DCC Service Providers will be impacted as a result of the proposed solution, with the Service Providers required to support additional Alerts, Commands, and Responses as well as anticipated changes required for billing and reporting systems/components to incorporate the additional Service Request transaction charges.

The impacted components for each Service Provider have been listed below. The full impacts on DCC Systems and DCC's proposed testing approach can be found in the DCC Preliminary Assessment response in Annex B.

PPMIDs – Zigbee OTA delivery

Data Service Provider

The proposed solution has several impacts across the Data Service Provider (DSP), the components of which are listed below:

- Communications Service Provider (CSP) Smart Meter Wide Area Network (SM WAN) Gateway and CSP Interfaces;
- Changes to the Self-Service Interface (SSI) to enable the read inventory to include firmware versions Anomaly detection volume thresholds;
- Energy Service Interface Inventory Extract;
- DCC User Gateway Interface Design Specification (DUGIDS), DUIS Service Requests, and MMC, Alerts and Messages;
- Updates to the Certified Products List (CPL); and
- Transform – New GBCS Use case.

Communications Service Provider

The proposed solution has several impacts across the CSP, the components of which are listed below:

- CSP North SM WAN;
- CSP/DSP Interfaces;
- Communications Hub;
- CSP solution; and
- Queuing priorities.

HCALCS – Extend existing OTA firmware method

Data Service Provider

- DUGIDS documentation updates for SR11.1[1], SR11.2[2] and SR11.3[3];
- Updates to processing of these Service Requests;
- Support for 'Read Firmware' and 'Activate Firmware' on HCALCS; and
- Changes to GBCS Use Cases.

Communications Service Provider

- Requires Design, Build, and Test changes to the CSP solutions to support the delivery of firmware Images for HCALCS Devices to appropriate connected HAN Devices.
- Support the delivery of firmware for HAN Devices from the Communication Hub to the connected Device over the HAN.
- Two new GBCS use cases expected.

SEC and subsidiary documents

The extent to which this modification impacts the SEC and its subsidiary documents is still being investigated. However, so far, the following parts of the SEC have been identified as being impacted:

- Schedule 8 'Great Britain Companion Specification'
- Schedule 9 'Smart Metering Equipment Technical Specifications 2'
- Schedule 10 'Communications Hub Technical Specifications'
- Schedule 11 'TS Applicability Tables'
- Appendix E 'DCC User Interface Services Schedule'
- Appendix AD 'DCC User Interface Specification'
- Appendix AF 'Message Mapping Catalogue'

Other industry Codes

This modification will not have an impact on any other Industry Codes.

Greenhouse gas emissions

This modification will not have an impact on Greenhouse Gas Emissions.

[1] 'Update Firmware'
[2] 'Read Firmware Version'
[3] 'Activate Firmware'

5. Costs

DCC costs

The estimated DCC implementation costs up to Pre-Integration Testing (PIT) to implement are provided below. These costs are expected to change as the Proposer has opted to seek a solution utilising a combination of the two options provided in the DCC's Preliminary Assessment.

Breakdown of estimated DCC implementation costs (up to PIT)	
Solution Option	**Cost**
Option 1: Original approach, Zigbee OTA delivery	£12,300,000
Option 2A: Existing OTA firmware update with IHDs included	£8,500,000

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

The costs for Systems Integration Testing (SIT), User Integration Testing (UIT) and implementing to live will be provided as part of the DCC Impact Assessment.

SECAS costs

The estimated Smart Energy Code Administrator and Secretariat (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

This modification will place costs on SEC Parties, the extent of which we seek to understand as part of the Refinement Consultation.

6. Implementation approach

Recommended implementation approach

The Working Group is proposing an implementation date of:

- **5 November 2020** (November 2020 SEC Release) if a decision to approve is received on or before 5 November 2019.

The Proposer, Working Group members and the DCC agree that the implementation date for this modification must be as soon as possible.

As stated in the Preliminary Assessment response, the DCC requires a six to twelve-month lead time between the modification being approved and implementing the proposed solution, meaning that this modification is a candidate for inclusion in the November 2020 SEC Release, should it be approved in sufficient time. SECAS is investigating the possibilities of implementing this sooner.

7. Discussions and development

Which Devices will this modification apply to?

It was initially considered that IHDs, PPMIDs and HCALCS would all be in the scope of this modification. A Working Group member had asked if Consumer Access Devices (CADs) were to be considered as well. However, as the specific format and structure of CADs are unknown and are largely consumer-driven options, it was unclear how the modification could be extended to cover them. As such it was concluded that CADs were excluded from the modification but could be raised under a separate modification.

HCALCS were temporarily removed from the scope of this modification. However, the Proposer, taking into account the considerations from the Working Group and the Security Sub-Committee (SSC), re-assessed this and opted to include HCALCSs within the proposed solution with a view that a considerable number of SEC Parties would require the OTA capability for these Devices.

After consideration of the Preliminary Assessment, the Proposer opted to remove IHDs from the scope of the modification. Due to the high costs as well as the complexity of the proposed solution given in the Preliminary Assessment, the DCC suggested the requirements could be constrained to PPMIDs and HCALCS in order to explore cost savings, and that IHDs could be left out of the solution.

The Working Group believed that the vast majority of IHDs in the field today are PPMIDs with IHD capability built in, and so this should be acceptable.

However, it was noted that in order to quantify the number of standalone IHDs in the field, Parties would be asked as part of the industry consultation to assess the impact that excluding IHDs from the proposed solution would have on them. The Working Group pointed out that the removal of IHDs from the solution could further reduce the role of the IHD in the market.

What are the security implications of including PPMIDs within the scope of the modification?

SECAS asked BEIS for advice regarding the appropriate security level for PPMIDs. BEIS noted that the Communications-Electronics Security Group (CESG) supported the removal of PPMIDS from the scope of the CPA scheme. This was due to the industry evidence showing that the PPMID cannot be used to disable a supply, even if its security was to be compromised. It was therefore noted that PPMIDs would not need to be CPA certified, and therefore the Working Group would not need to approach the CESG for further input.

Local firmware updates

It was highlighted that the continuation of local firmware upgrades could cause unreliable information being stored in the SMI. It was also suggested that keeping local upgrades could weaken the case to get the Modification Proposal approved for implementation. SECAS proposed that banning local upgrades will ensure a reliable process and clear records of firmware.

The Working Group discussed the option of using local upgrades as a backup to OTA upgrades. The DCC suggested there should be a trust mode in place to update the inventory. Members discussed the option to create governance surrounding this, but it was highlighted that this will involve added

costs. A security concern was also noted with local firmware updates in that they could not be blocked if carried out locally. This option was therefore not considered further.

How will Firmware Images be managed?

Firmware Image size

In discussing the ramifications of this modification, the Working Group noted that HAN Devices have a limited capacity for holding larger firmware Images. A Member pointed out that larger Images may slow down the HAN, although typically firmware Images for non-meter Devices can be smaller (in the region of 256-512 kilobytes (KB). It was agreed firmware Images applied to a HAN Device would be limited to 750KB and that any higher will require mechanisms in place to support fragmentation. It was noted that there is nothing preventing fragmentation now, as long as the Device is built to support it.

The Working Group asked whether there will be a mechanism to delay the activation of the firmware Image. It was advised that there will be an option to specify activation 'date-time' in the Command and that populating this field as 'zero' will activate the Image immediately if a single Image is distributed to a PPMID or HCALCS. The Working Group discussed setting activation date-time to 'zero' with a fragmented Image when the first part of the Image is sent, and if it would mean that the Image is downloaded by the PPMID or HCALCS and stored until the second part of the Image is downloaded. It was clarified that both parts of the Image would be activated on the activation 'date-time' specified in the second Command and that the Manufacturer will provide guidance on how to activate multiple Images within a release note.

Rejected firmware Images

Questions were raised as to how the Device would inform the Communications Hub if an Image was rejected due to, for example, not being able to verify the signature in the Image. It was advised that a provision could be built in to the 'UpgradeEndResponse' Command from the PPMID or HCALCS to the Communications Hub. This Zigbee Cluster Library (ZCL) Command would specify whether the Image has been successfully downloaded. If the download is unsuccessful, the Communications Hub would then create a Device Alert containing an indication that the Image was invalid and send it to the DCC. The DCC would forward the Device Alert to all Responsible Suppliers.

Accepted firmware Images

The Working Group agreed that once the PPMID has successfully downloaded the Image, the Communications Hub would read the current firmware version on the Device after the activation time plus a specified time period, which was proposed to be 10 minutes.

It was noted that the Communications Hub would only communicate with PPMIDs and HCALCSs when they are switched on and that PPMIDs and HCALCSs cannot download firmware Images when they are switched off. The Working Group therefore decided that the download and activation would fail and the process for sending, downloading and activating Images would need to start from the beginning as and when the PPMID or HCALCS is switched on.

Supplier Alerts

It was acknowledged Suppliers will need to receive Alerts during the process. The Working Group agreed that Suppliers would receive two Alerts:

1. The first Alert would be sent to all Responsible Suppliers (except for the sender as the sender would receive a Service Response) when the DCC processed the Service Request to distribute the Image. The Alert would include a list of specific Device IDs, the hash of the Image and the activation date-time specified in the Service Request.
2. The second Alert would be sent to all Responsible Suppliers confirming the firmware version on the PPMID or HCALCS, proposed to be 10 minutes after the activation date-time specified in the Service Request.

The Energy and Utilities Alliance (EUA) also asked if an upgrade would succeed in a Change of Supplier (CoS) event during a firmware update with multiple Images. It was advised that the new Supplier will not have access to the Images as they may not have an established relationship with the Manufacturer.

Dual Supplier scenarios

Dual Supplier scenarios were noted as having a significant impact. The DCC advised that the benefit of utilising Service Request 11.3 in the proposed solution was that you know who the Responsible Supplier for the given meter is. The Working Group advised both options given in the DCC's second Preliminary Assessment would allow for either of the Responsible Suppliers, as according to the DSP's registration data, to submit the relevant Service Requests. SECAS noted that it was the Working Group's intention for the dual Supplier requirements developed under SECMP0024 'Enduring Approach to Communication Hub Firmware Management' to apply to this modification as well.

Liability scenarios

Liability scenarios were raised in order to facilitate discussion on the existing liability limitations, loss recovery provisions and dispute resolution procedures, and whether they are sufficient with regard to this Modification Proposal. It was highlighted that the SEC does not currently extend Supplier responsibilities to Devices that form part of other Smart Metering Systems (SMSs) in the same premise for which the Supplier is not the Responsible Supplier. This means that if an Import Supplier damaged a GSME by upgrading the firmware on a PPMID or IHD that forms part of both the Gas SMS and the Electricity SMS, they would not be liable for that damage to the GSME, and vice versa. However, it was noted that that if a Supplier damages a Communications Hub that forms part of a SMS for which they are the Responsible Supplier, they would be liable to the DCC for that damage.

The Working Group agreed the liability for physical damage should lie with the sender of the Image but questioned how a Supplier would know who the sender was. The DCC advised that they keep this in their audit trail, however there are constraints on the information that can be shared. The Working Group suggested that the affected Supplier should raise an incident per event and request that the DCC releases the information on the sender of the Image.

SECAS asked the Working Group whether liabilities for damage to physical property should remain as currently set out in the SEC (limited to £1million per incident) and the Working Group confirmed this

should be the provisions. It was also noted that disputes and appeals can be raised with the SEC Panel, in line with the current procedures for a larger scale problem.

Buffer space rules

The Working Group initially questioned why it has not been proposed to create additional buffer space on the Communications Hub. The DCC had previously stated that this is possible but will cost considerably more to implement. The Proposer also stated that they would not want to propose an additional or increased buffer space as part of this Modification Proposal and felt that this should be addressed in a separate Modification Proposal, which the Working Group agreed would be the best course of action.

The Working Group also agreed that the firmware Images for PPMIDs and HCALCSs should be stored in the same buffer space as ESME and GSME firmware Images. The Working Group were asked to confirm that in the event of an ESME or GSME Image arriving whilst a PPMID or HCALCS Image is in process and there is insufficient buffer space, the one in process will be overwritten. The Working Group agreed that ESME and GSME updates were higher priority than PPMID or HCALCS updates.

A Working Group member questioned whether there would be a greater advantage for the PPMID or HCALCS Image in process to complete in order to prevent two Suppliers competing to update. It was also noted the overall process will take approximately 10-15 minutes and therefore the probability of two Suppliers sending firmware Images to PPMIDs and HCALCSs at the same time is unlikely. The Working Group also agreed that if a PPMID or HCALCS Image arrives whilst another PPMID or HCALCS Image is in process and there is insufficient buffer space, the one in process will be overwritten by the subsequent Image.

Consideration of the DCC's first Preliminary Assessment

The DCC provided a high-level Preliminary Assessment in May 2017 which provided a cost of between £7.3m and £8.2m to implement the modification. The DCC also noted that the total cost and implementation lead time may increase following further analysis by its Service Providers.

The Proposer and the Working Group raised questions in relation to the business case of the modification and the high cost to complete a DCC Impact Assessment. It was also noted that there is limited information on how many IHDs and PPMIDs will be in use upon implementation, if this modification is to be implemented. In particular, it was noted that some Devices may be replaced with applications on consumer devices or connected via Wi-Fi.

Whilst noting that there are assumptions and non-functional requirements outlined in the Preliminary Assessment that require clarification and development, the Proposer and the Working Group agreed that a Working Group Consultation would be the best method to assess the impacts and business justification.

Consideration of the DCC's second Preliminary Assessment

The DCC's second Preliminary Assessment contained an assessment of two solution options, one of which had two variants:

- Option 1: Original approach using Zigbee OTA delivery

- Option 2: Extend existing OTA firmware method
    - Option 2A: Including IHDs
    - Option 2B: Excluding IHDs

In reference to Option 2 'Extend Proven OTA Firmware Method' given in the assessment, the Proposer questioned why, if a Device on the HAN is on the CPL, it should need to go through CPA, as this would considerably increase the costs on Suppliers to implement the proposed solution. A Device manufacturer member agreed with this assessment and advised that for their organisation, Option 2 could not be explored due to the CPA requirements whilst highlighting that Option 2 would be difficult for Device manufacturers to facilitate.

The DCC were asked why it had explored Option 2 in the first place, advising that it felt as though the Working Group's comments had been ignored. The DCC confirmed that it was not their intention to ignore the Working Group and that Option 2 had been explored as they believed it reduced the complexity of the solution as well as providing the Working Group and the Proposer an alternative to the original approach.

Questions were also raised with regard to the £12.3 million cost for Option 1 'Original Approach using Zigbee OTA Delivery' given in the assessment, when it was supposed to be the original approach. The DCC noted that Option 1 would require different processing patterns for the DSP, CSPs and the Communications Hub. This was due to the requirement for a new Service Request, requiring a change in the DSP and CSP interface in order to accommodate this.

Do the costs of either option present a strong business case?

Suppliers and Other Parties agreed that the Preliminary Assessment only considered the costs for the DCC to test and implement the solution but did not account for the costs on other SEC Parties. This was due to the emulation testing Parties would have to carry out as part of any solution, as well as the requirement for CPA approval under Option 2 of the assessment which puts both a cost and added time constraint on Parties.

The Working Group also advised that a breakdown of the costs are required in order to justify them. The DCC noted that they are currently working with the Panel to improve costs analysis of modifications, making it easier for Parties to determine the business case for them.

The DCC also noted that costs of the modification were given as if the modification would be implemented as a standalone SEC Release, as Ofgem have requested, as although this isn't what Parties would necessarily want, it is still a possibility it could happen. A Panel member agreed that this is true but that it does not by any means, nor is it intended to, stop the DCC from estimating the costs as if the modification would be delivered as part of a wider scheduled SEC Release.

What will be the solution going forward?

Partly due to the high costs as well as the complexity of the proposed solution, the Working Group agreed that in order to progress the modification, they would seek a combination of the two solutions given in the DCC Preliminary Assessment. The DCC suggested the requirements in Option 1 could be constrained to PPMIDs in order to explore cost savings, and that IHDs could be left out of the solution. The Working Group believed that the vast majority of IHDs in the field today were actually PPMIDs with IHD capability, and so this should be acceptable.

However, it was noted that in order to quantify the number of standalone IHDs in the field, Parties would be asked as part of the industry consultation to assess the impact that excluding IHDs from the proposed solution would have on them. The Working Group pointed out that the removal of the IHD from the proposal could further reduce the role of the IHD in the market.

The Proposer also noted that they did not want to leave out HCALCSs from the solution as they anticipated that a number of Parties would require the OTA capability for these Devices, hence why this requirement will remain.

As a result, the Working Group agreed to progress with a combination of the two solutions:

1. Updating firmware over-the-air (OTA) for PPMIDs via Zigbee (Option 1)
2. Updating firmware OTA for HCALCS via GBCS Critical Commands (Option 2)

Addressing pending firmware updates was discussed as part of the solution. It was suggested that to consider this, as well as the proposed solution as it stands, the wider industry needed to be engaged, especially Device manufacturers, and that the Technical Specification Issue Resolution Sub-group (TSIRS) would be the most suitable place to gather feedback.

It is expected that as part of the Modification Process and the Impact Assessment of the modification, the Technical Architecture and Business Architecture Sub-Committee (TABASC) will have a view on the optimal delivery approach for this proposal. That delivery approach could be the two mandated HAN Devices at the same time or via a phased approach as captured above.

8. Conclusions

Benefits and drawbacks

The benefits and drawbacks of this modification will be assessed once the impacts of the solution have been confirmed in the Refinement Process.

Proposer's rationale against the General SEC Objectives

Objective (a)[4]

The Proposer believes that SECMP0007 will better facilitate SEC Objective (a) as the proposed solution will provide for a fit for purpose, efficient and effective process for updating firmware on the PPMID and HCALCS. It would additionally allow Energy Suppliers to avoid unnecessary costs relating to replacement of Devices and site visits thus helping to ensuring the sustainability of Devices for the longer term.

Objective (c)[5]

The Proposer believes that SECMP0007 will better facilitate SEC Objective (c) as the modification would allow consumers to better manage their energy usage by having sustainable most-up-to-date Devices that provides them with energy related information.

Objective (d)[6]

The Proposer believes that SECMP0007 will better facilitate SEC Objective (d) as the proposed solution would allow Energy Suppliers to use a fit for purpose, efficient and effective process for updating firmware on the PPMID and HCALCS – this process would be consistent between all Energy Suppliers as well as aligned to the process for updating firmware on the ESME and GSME.

Objective (f)[7]

The Proposer believes that SECMP0007 will better facilitate SEC Objective (f) as the proposed solution would cover any potential security vulnerabilities on the PPMID or HCALCS that may need be addressed using a fit for purpose, efficient and effective process for updating firmware on these Devices.

[4] To facilitate the efficient provision, installation, and operation, as well as interoperability, of Smart Metering Systems at Energy Consumers' premises within Great Britain.
[5] To facilitate Energy Consumers' management of their use of electricity and gas through the provision to them of appropriate information by means of Smart Metering Systems.
[6] To facilitate effective competition between persons engaged in, or in Commercial Activities connected with, the Supply of Energy.
[7] To ensure the protection of Data and the security of Data and Systems in the operation of this Code.

Working Group members' views

The views of the Working Group will be summarised once the impacts of the solution have been confirmed in the Refinement Process.

Sub-Committee views

Views of the SSC

In the early stages of the Refinement Process, HCALCSs were removed from the scope of this modification due to perceived security reasons.

On 11 April 2018 the SSC were asked to consider the impacts on the SMS with the inclusion of HCALCSs in the proposed solution. The SSC were keen that HCALCSs should be capable of being updated remotely since they are controlling load and have a more critical role than IHDs or PPMIDs. The SSC noted that there is a greater security risk if HCALCSs are not capable of being upgraded OTA and agreed that there were no security concerns to prevent HCALCSs being capable of remote firmware upgrades, provided that there is a Critical Command to activate the firmware since it is a load controlling Device subject to CPA Certification. When the full proposed solution is available, the SSC will wish to conduct a security risk assessment to confirm that any security risks have been mitigated.

Views of the TABASC

As part of the Refinement Process, the modification was presented to the Technical Architecture and Business Architecture Sub-Committee (TABASC) for consideration. The TABASC questioned the longer-term use of the proposed solution, due to new technology being made available to Consumers in the future (i.e. CADs), noting that new technologies may reduce the usage of IHDs and PPMIDs. The TABASC expressed the importance of the Working Group exploring alternative solutions and suggested that a cost benefit analysis should be a key focus during further refinement.

Appendix 1: Glossary

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

Glossary	
Acronym	**Full term**
BEIS	Department for Business, Energy and Industrial Strategy
CAD	Consumer Access Device
CHTS	Communication Hubs Technical Specification
CoS	Change of Supplier
CPA	Commercial Product Assurance
CPL	Certified Products List
CSP	Communications Service Provider
DCC	Data Communications Company
DSP	Data Service Provider
DUGIDS	DCC User Gateway Interface Design Specification
DUIS	DCC User Interface Specification
ESME	Electricity Smart Metering Equipment
EUA	Energy and Utilities Alliance
GBCS	Great Britain Companion Specification
GSME	Gas Smart Metering Equipment
GUID	Globally Unique Identifier
IDTS	Industry Draft Technical Specification
IHD	In Home Display
HAN	Home Area Network
HCALCS	HAN Connected Auxiliary Load Control Switch
MMC	Message Mapping Catalogue
OTA	Over-The-Air
PIT	Pre-Integration Testing
PPMID	Prepayment Meter Interface Device
SSC	Security Sub-Committee
SEC	Smart Energy Code
SECAS	Smart Energy Code Administrator and Secretariat
SIT	Systems Integration Testing
SM WAN	Smart Meter Wide Area Network
SMETS	Smart Metering Equipment Technical Specifications
SMI	Smart Metering Inventory
SMIP	Smart Metering Implementation Programme
SMS	Smart Metering System
SR	Service Request
SSI	Self-Service Interface

Glossary	
Acronym	**Full term**
TABASC	Technical Architecture and Business Architecture Sub-Committee
TSIRS	Technical Specification Issue Resolution Sub-group
UIT	User Integration Testing
ZCL	Zigbee Cluster Library

If you have any questions on this modification, please contact:

Joe Hehir

020 7770 6874

joe.hehir@gemserv.com

Smart Energy Code Administrator and Secretariat (SECAS)

8 Fenchurch Place, London, EC3M 4AJ

020 7090 7755

sec.change@gemserv.com

This document is classified as **White** in accordance with the Panel Information Policy. Information can be shared with the public, and any members may publish the information, subject to copyright.

SECMP0007 'Firmware updates to IHDs and PPMIDs'

Annex A

Business requirements – version 0.9

About this document

This document contains the business requirements for this Modification Proposal. It provides detailed information on the business requirements for the Proposed Solution agreed by the Proposer, with input from the Data Commination's Company (DCC) and Sub-Committees. It also provides the considerations and assumptions for each business requirement with respect to this Modification Proposal.

1. Business requirements

This section contains the functional business requirements. Based on these requirements a full solution will be developed.

Business Requirements	
Ref.	**Requirement**
1	Manufacturer Image Hashes associated with PPMIDs and HCALCSs to be added to the CPL
2	Suppliers to send firmware updates to PPMIDs and HCALCS
3	The DCC to notify all Responsible Suppliers at certain stages of the associated processing of firmware updates
4	The DCC and Responsible Suppliers to check the latest firmware version on PPMIDs and HCALCSs
5	The Communications Hub will be able to support the prioritisation of firmware Images to all HAN Devices
6	Upon firmware Image activation, the DCC will update the SMI with the new firmware version for the affected Device
7	Additional Communications Hub functionality to support the distribution of firmware Images to PPMIDs and HCALCSs
8	Firmware update support capability will need to be mandated on PPMIDs installed after this modification is implemented
9	Local firmware updates will be banned following the implementation of this modification

2. Considerations and assumptions

2.1 Scope of the modification

The scope of this modification currently covers Pre-Payment Meter Interface Devices (PPMIDs) and HAN Connected Auxiliary Load Control Switches (HCALCSs). The Proposer has opted to remove In Home Displays (IHDs) from the proposed solution due to the complexity of the solution given in the DCC's Preliminary Assessment.

2.2 Firmware update approach for PPMIDs and HCALCSs

The Proposer has agreed to progress with a combination of the two solutions given in the DCC's Preliminary Assessment. It is expected that PPMIDs will receive firmware updates Over-The-Air (OTA) via Zigbee and that HCALCSs will receive firmware updates OTA via Great Britain Companion Specification (GBCS) Critical Commands.

2.3 Non- Functional Requirements

Firmware update Images for PPMIDs are expected to be typically less than 750KB in size and would occur infrequently e.g. once per year. The customisation of PPMIDs with graphics will increase the firmware size, this may happen going forward and require the mechanism for firmware sizes greater than 750KB.

HCALCSs are expected to have much smaller firmware Images and with a very low upgrade frequency. It may be possible that HCALCS do not need updates at all unless changes to the ZigBee version are required.

2.4 Manufacturer Image Hashes associated with PPMIDs and HCALCSs will be added to the CPL

In order for a Manufacturer Image to be added to the Central Products List (CPL), additional details in relation to that Image will need to be provided to the SEC Panel.

The Supplier will need to confirm to the Panel that the firmware update does not affect how the PPMID or HCALCS communicates using ZigBee.

If the firmware update impacts how the PPMID or HCALCS communicates using ZigBee and requires re-testing, a new ZigBee Assurance Certificate will need to be provided to the Panel before the firmware can be updated.

The CPL Requirements Document specifies the additional details in relation to the Manufacturer Image that must be provided to the Panel:

- the Hash of the Manufacturer Image;
- the identity of the organisation that created that Image; and
- a digital signature created by the creator of the Image across the communication containing the CPL entry details.

The digital signature used to sign the communication between the submitter and the Panel needs to be the same as the one received from a Public Key Infrastructure (PKI) chosen by the Panel to check the signature

A template for submitting CPL entries has been published on behalf of the Panel, which sets out the approach to digital signing taken by the Panel.

In addition to the above, HCALCS must comply with the Commercial Product Assurance (CPA) Security Characteristics as per the Smart Metering Equipment Technical Specification (SMETS). Changes to the HCALCS firmware may require either the inclusion of the new firmware version in the existing CPA certificate or a new CPA certificate. For HCALCS this CPA certificate must be submitted to the Panel when adding a new firmware version to the CPL.

2.5 Communications Hub memory considerations

No additional buffer space on the Communications Hub is being proposed. The same buffer space as for Electricity Smart Metering Equipment (ESME) and Gas Smart Metering Equipment (GSME) Images will be used for storing PPMID / HCALCS Images. PPMID / HCALCS Images can be overwritten by ESME or GSME Images if one arrives whilst a PPMID / HCALCS one is in process, and there is insufficient buffer space. If another PPMID / HCALCS Image arrives whilst a PPMID / HCALCS one is in process and there is insufficient space or it is for the same Device Model, the newly arrived one will overwrite the one in process.

3. Sending PPMID Manufacturer Images that are less than or more than 750KB

This section outlines how the process will work for PPMIDs if Manufacturer Images are less than 750KB, as well as how firmware updates can be achieved where Images are 750KB or greater in size. HCALCSs are covered in Sending HCALCS Manufacturer Images below.

3.1 Sending a Manufacturer Image less than 750KB to a PPMID

This section details the steps that will need to be taken to update the firmware on a PPMID. It is assumed that a Manufacturer provides a Manufacturer Image to the Supplier, the Image is a single Image less than 750KB in size, and a new CPL entry has been created.

Sending a Manufacturer Image to a PPMID will require a new non-critical Service Request 'Send PPMID Firmware'.

3.1.1 Supplier preparations

Before sending a new Service Request to the DCC to 'Send PPMID Firmware', the Supplier will be required to follow similar steps as in the case of sending an 'Update Firmware' Service Request to the DCC is respect of a Meter:

Obtain the following information:

1. The Manufacturer Image;
2. OTA Header, which should include:
    a. Manufacturer ID;
    b. Model to which it can be applied;
    c. Firmware Version contained in the Image; and
    d. Minimum and maximum hardware version to which it can be applied.
3. A Hash of the Manufacturer Image.

Undertake the following checks on that information:

1. The Hash the Supplier has calculated over the Manufacturer Image is the same as that provided by the person who created the Manufacturer Image (in this case the Manufacturer); and
2. Check that the Manufacturer Image is associated with one or more Device Models on the CPL. The check should include that:
    a. The Hash is recorded on the CPL against one or more entries;
    b. The OTA Header Manufacturer ID, model and Firmware Version fields match identically with one of the entries identified at step (a); and
    c. The hardware version in that CPL entry is between OTA Header minimum and maximum hardware version, inclusively.

3.1.2 Supplier creation of a 'Send PPMID Firmware' Service Request

Having obtained the information and upon the above checks being successful, the Supplier will create a 'Send PPMID Firmware' Service Request. The Service Request will include the following information:

1. Image: The Image to be sent composed of a base64 encoded version of the concatenation:

   OTA Header || Manufacturer Image || activation date-time

   Note: activation date-time will include an option for an 'activate now' value (e.g. zero)

2. List of Device IDs

Up to 50,000 PPMIDs will be able to be listed within the Service Request.

3.1.3 The DCC checks on the 'Send PPMID Firmware' Service Request

On receipt of the 'Send PPMID Firmware' Service Request, the DCC will follow the following steps:

1. Check whether the Manufacturer Image contained within the Service Request is less than 750KB in size;
2. Calculate the Hash of the Manufacturer Image contained within the Service Request;
3. Check whether the Hash the DCC has calculated is on the CPL, and identify CPL entries with that Hash;
4. For each of the Device IDs in the Service Request:
   a. Check the Device is a PPMID;
   b. From the SMI, identify the Device's current Device Model, and ensure that the Manufacturer ID, model and hardware version fields for that current Device Model equate to one of the entries identified at step 3;
   c. Identify, from the SMI, the Communication Hub Function (CHF) ID to which the Device is associated; and
   d. Check that the Supplier is the Responsible Supplier for one of the Smart Meters Associated with that CHF ID.

If this and all preceding checks succeed, the DCC will identify (and temporarily record against the Device ID) the details of all Responsible Suppliers Associated with the CHF ID. This temporary record will be used to populate the DCC Alerts at the next step.

3.1.4 DCC response to the 'Send PPMID Firmware' Service Request

The DCC will be required to notify all Responsible Suppliers at different stages of the Service Request processing. The first notification will happen when the DCC receives the 'Send PPMID Firmware' Service Request:

1. Upon the DCC receipt of the 'Send PPMID Firmware' Service Request, the requesting Supplier will receive a Service Response. If some of the Device IDs in the Service Request failed any of the checks at step 4 under 3.2.3 (above), the DCC will send a Service Response to the requesting Supplier listing all the Device IDs that failed and the reason for the failure in each case. The DCC will carry on processing the firmware distribution for those Device IDs that passed the check.

2. Upon the DCC completing the processing of the 'Send PPMID Firmware' Service Request, each Responsible Supplier identified in 3.2.3 will receive a DCC Alert containing:
    a. The Hash of the Manufacturer Image in the Service Request (to identify the CPL entry);
    b. A list of Device IDs to which the Image is being sent; and
    c. The activation date-time specified in the Service Request.

3.1.5 DCC Distribution of the 'Send PPMID Firmware' Service Request

If the checks are successful, the DCC will distribute the Image from the Service Request (having decoded from base64 encoding) to the Communications Hub associated with each of the PPMIDs in List of Device IDs where the Device ID passed the validation.

Communication Hub Technical Specification (CHTS) 4.4.4 requires that the receiving Communications Hubs can buffer Images intended for ESME and GSME. The Communication Service Provider (CSP) contracts require Communications Hubs to have the capacity to hold two 750KB Images (to support independent distribution of firmware to the GSME and one of the ESME).

3.1.6 Communications Hub notification of Image availability to the PPMID

Once the Image arrives at the Communications Hub, the Communications Hub will need to:

1. Record OTA Header details and activation date-time
2. Notify the PPMID by sending a message to it/them ('the Communications Hub shall send a Zigbee Smart Energy (ZSE) Image Notify command').

3.1.7 PPMID request for the details of the Image

The PPMID will then, in line with the ZigBee OTA specification, send a message (a 'QueryNextImageRequest' ZSE command containing Manufacturer ID (manufacturer code), model (Image type), current Firmware Version, and optionally hardware version) to ask the Communications Hub if there is an Image that may be suitable for it. GBCS will mandate hardware version to avoid wasted downloads over the Home Area Network (HAN).

3.1.8 Provision of Image details by the Communication Hub to the PPMID

For the Communications Hub to decide that the Image is suitable for the PPMID, the ZigBee OTA specification details a recommended, default policy to determine its response, specifically to:

'send back a response that indicates the availability of an Image that matches the manufacturer code, Image type, and the highest available file version of that Image on the server. However, the server may choose to upgrade, downgrade, or reinstall clients' Image, as its policy dictates. If client's hardware version is included in the command, the server shall examine the value against the minimum and maximum hardware versions included in the OTA file header'

Note that 'server' in the above refers to the Communications Hub and 'client' refers to the PPMID.

The Communications Hub will send back a 'QueryNextImageResponse' accordingly.

3.1.9 PPMID download and authentication of the Image

The PPMID will then download the Image from the Communications Hub, if one is available for it.

When the PPMID has downloaded the Image, it will check the Manufacturer signature (or equivalent) within it. This confirms the Manufacturer Image is as created by the Manufacturer. The PPMID will then store the Manufacturer Image from within the Image sent, so that it is available for activation. The PPMID will then send a 'UpgradeEndRequest' to the Communications Hub.

The Communications Hub will then send a 'UpgradeEndResponse' with activation date-time in it. The Communications Hub will set a 'reminder' for activation time (or current time, when activation time is zero) plus [X] minutes, and record PPMID Device ID against that reminder (there can be multiple PPMIDs of the same type on the HAN, so the Communications Hub will need to remember which one this reminder relates to).

The PPMID will wait for activation time (or begin activation now if activation time is zero). It will need to check time against the Communications Hub if it has no clock of its own. (Note the Smart Metering Equipment Technical Specification (SMETS) does not require a clock on PPMIDs.) The PPMID will then activate the Manufacturer Image, changing Firmware Version if successful.

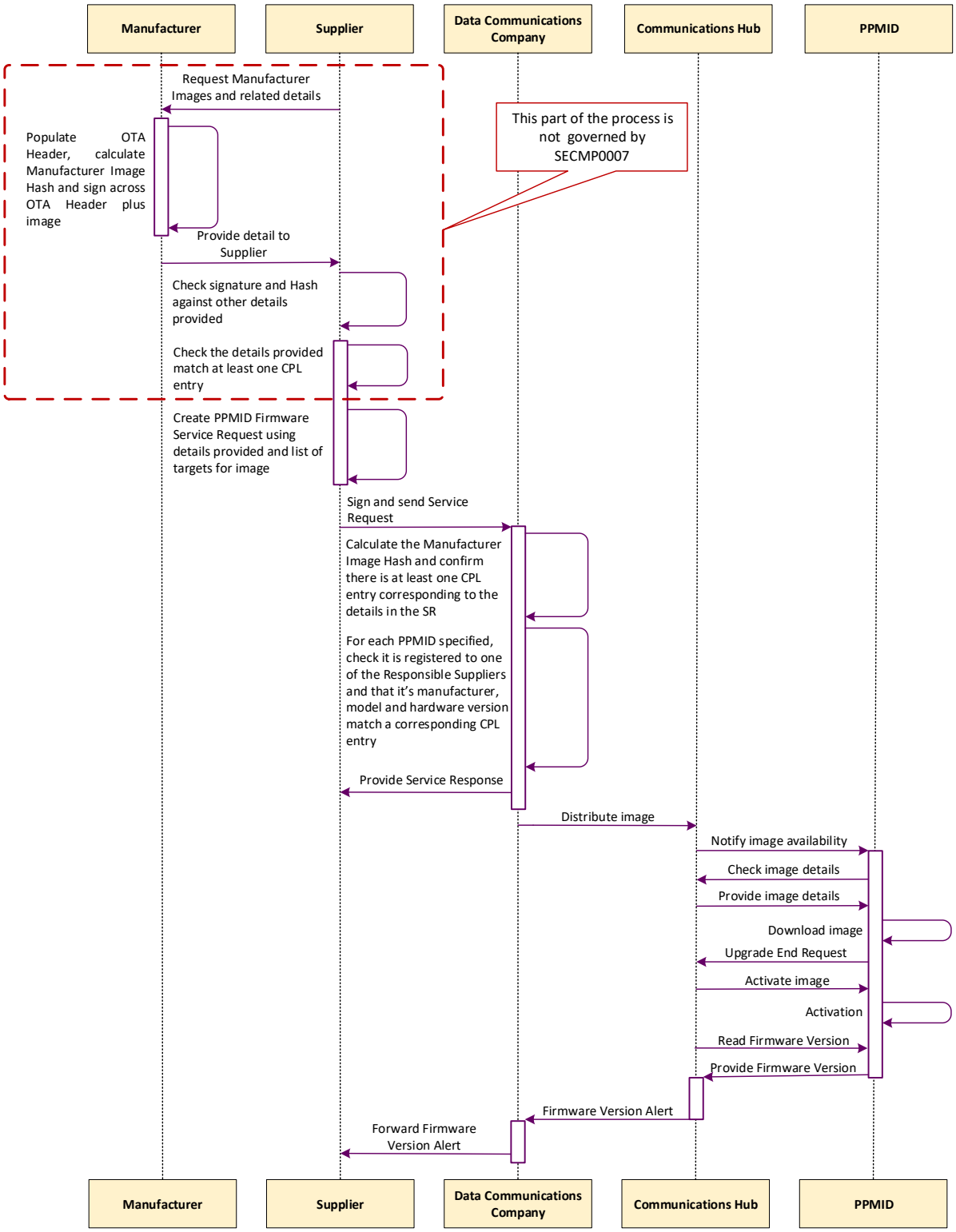
The Communications Hub will wait to activation time (or current time, when activation time is zero) plus [X] minutes and read the OTA cluster's Firmware Version attribute from the PPMID. The Communications Hub will then create a Device Alert containing the PPMID's Firmware Version and send it to the DCC. The DCC will update the SMI if the Firmware Version has changed and forward the Device Alert to Responsible Suppliers recorded to receive the Alert.

If this Device Alert is not received the Supplier can send a 'Read PPMID Device Model via the CH' Service Request to the DCC. This will result in a Command to the Communications Hub to read the OTA Cluster's Firmware Version, manufacturer etc. from the PPMID. The Communications Hub will send a Response containing these details to the DCC, the DCC will then update the SMI and forward the Response to all Responsible Suppliers.

3.1.10 Process for updating an PPMID's Firmware – Image less than 750KB

The process described above for processing PPMID firmware updates for Images less than 750KB is presented in Figure 1 Process for updating an PPMID's Firmware – Image less than 750KBbelow.

Figure 1 *Process for updating an PPMID's Firmware – Image less than 750KB*



3.2 Sending a Manufacturer Image 750KB or greater to a PPMID

The expectation is that Manufacturer Images are typically below 750KB. It may be possible for Manufacturer Images to become larger in size; this section illustrates how activating Images that are 750KB or more in size can be achieved. The operating Firmware Version in this example is 0x10, which is reflected in the CPL entry example in Table 1 below.

A PPMID is to be updated to Firmware Version 0x20. This requires two Images are to be sent to the PPMID, to provide all of the changed Firmware / configuration data required for Firmware Version 0x20.

The Manufacturer has split this upgrade data in to two Images:

- **Image 0x15**: this contains the first part of the upgrade data and contains Manufacturer instructions for the PPMID to only store this first part on activation
- **Image 0x20**: this contains the second part of the upgrade data and contains Manufacturer instructions for the PPMID to check that Image 0x15 has already been activated. Activating this Image causes the functionality of the PPMID to be upgraded to Firmware Version 0x20.

New CPL entry:

Table 1: Example New CPL Entry for Manufacturer Image Greater than 750KB

Manufacturer identifier	Model identifier	Hardware version	Hardware version revision	Firmware version	Hash
FF: FE	AA:BB	01	01	00:00:00:10	(Hash of Image 10)
FF: FE	AA:BB	01	01	00:00:00:15	(Hash of Image 15)
FF: FE	AA:BB	01	01	00:00:00:20	(Hash of Image 20)

To upgrade Firmware of PPMID, the Supplier will follow the following process:

1. Having undertaken the necessary checks, the Supplier will create a 'Send PPMID Firmware' Service Request to distribute Image 0x15 and set the activation date-time as zero (i.e. 'activate now'). Note that when the image needs to be split into two Images or more, the activation date-time should not be in the future, as explained below.
2. The DCC will distribute Image 0x15 to the Communications Hub. When the PPMID has downloaded the Image, the Communications Hub will start a timer for now plus [X] minutes. When that time has passed, the Communications Hub will read Firmware Version from the PPMID and send a Device Alert containing that value. Note that this value will still be 0x10 (in line with the Technical Specification Issue Resolution Sub-Group (TSIRS) decision). Therefore, the Device Alert will only indicate delivery of the Image. It will NOT indicate that the PPMID has successfully validated the Image.
3. On receipt of the Device Alert from the DCC containing the PPMID's Firmware Version, the sending Supplier will send Image 0x20. If this Device Alert was not received the Supplier can only resend Image 0x15 (since the TSIRS decision means, there is no mechanisms to discover if the PPMID had that Image).
4. The DCC will distribute Image 0x20 to the Communications Hub. When the PPMID has downloaded the Image, the Communications Hub will start a timer for activation time plus [X]

minutes. When that time has passed, the Communications Hub will read Firmware Version from the PPMID and send a Device Alert containing that value. Note that this value will, if activation was successful, now be 0x20 (in line with the TSIRs decision). Therefore, this Device Alert will indicate delivery of the Image and that the PPMID successfully activated the Image.

5. If this Device Alert is not received the Supplier can only resend Image 0x20.

The result is that the PPMID (excluding where the Firmware upgrade process cannot be completed e.g. where there is no Wider Area Network (WAN) connectivity), will be operating Firmware Version 0x20.

The above illustrative process is explained in detail in Figure *2* and Figure *3*: Process for upgrading a PPMID Firmware – Image more than 750KB, Part 2 (parts 1 and 2 respectively) below.

Figure 2: *Process for upgrading a PPMID Firmware – Image more than 750KB, Part 1*

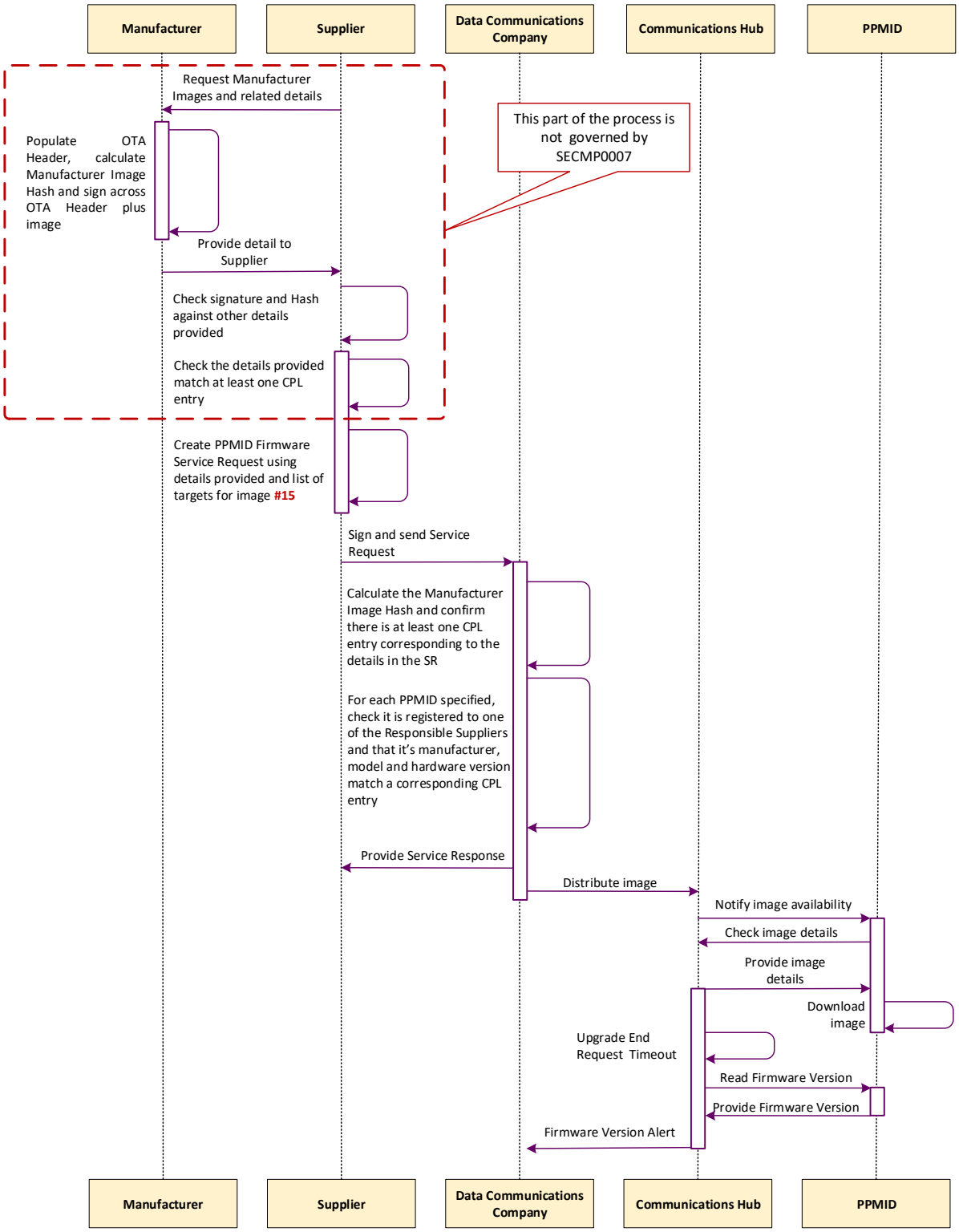
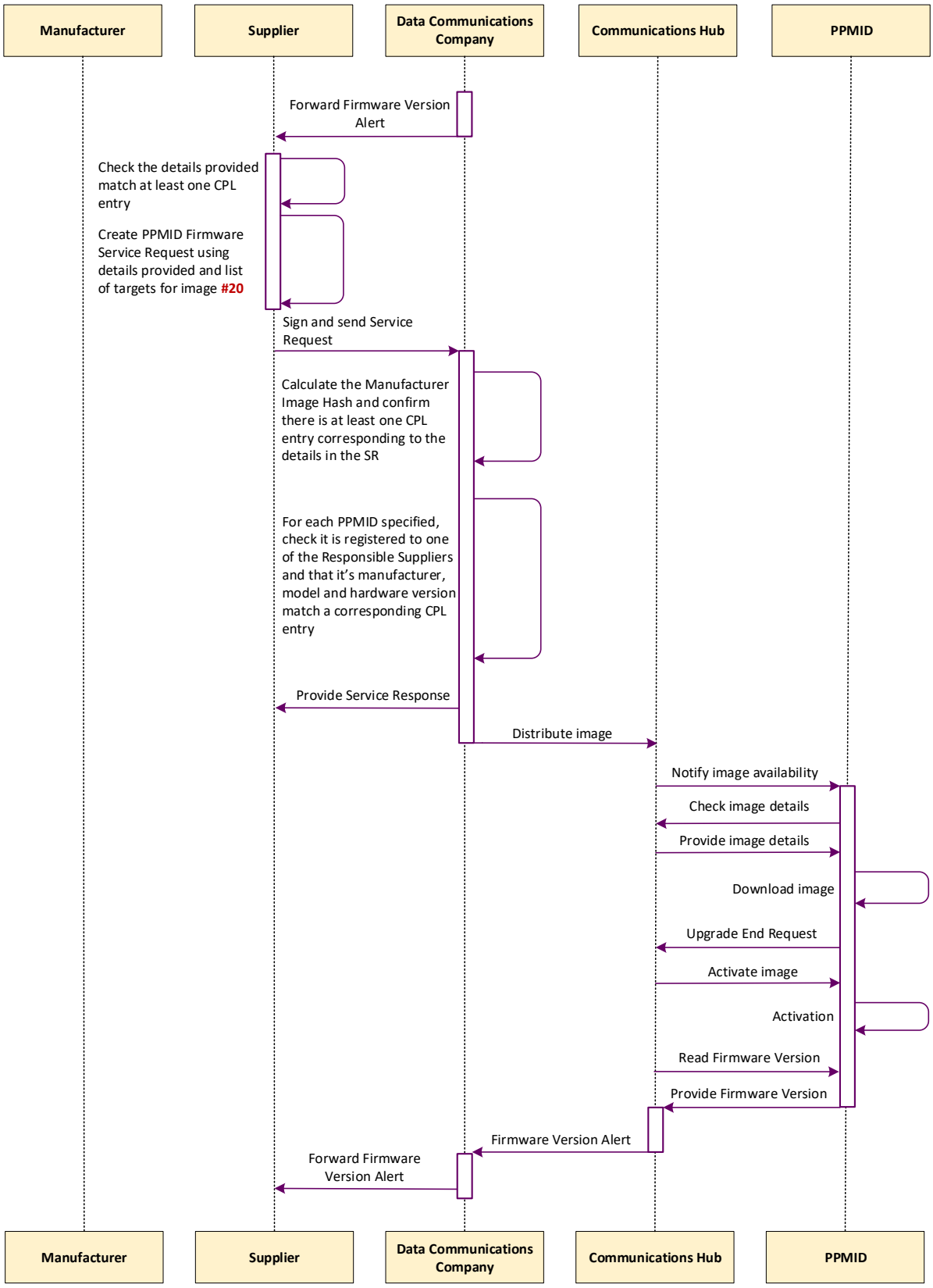


Figure 3: *Process for upgrading a PPMID Firmware – Image more than 750KB, Part 2*



4. Sending HCALCS Manufacturer Images

The process for the OTA upgrade of HCALCSs aligns with the current Smart Metering Implementation Programme (SMIP) technical specifications for the Supplier to distribute and activate firmware on the ESME and GSME via an OTA update; this will be accomplished through the introduction of additional Service Reference Variants for the existing Service Requests.

The expectation is that Manufacturer Images for HCALCSs are typically below 750KB. The existing OTA firmware upgrade mechanisms contained in GBCS allow manufacturers to split firmware upgrades into several parts; this method can be employed in case HCALCS firmware Images exceed the size of 750KB.

The following Service Requests will be enhanced to support the OTA upgrades of HCALCS:

- SR 11.1 ‘Update Firmware’;
- SR 11.1 ‘Read Firmware Version’; and
- SR 11.3 ‘Activate Firmware’.

Additional GBCS Use Cases will be introduced to support the distribution and activation of firmware Images for HCALCSs.

In SMETS the HCALCS sections must be changed to reflect the HCALCS capability of receiving and activating new firmware.

5. Glossary

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

Glossary	
Acronym	**Full term**
CH	Communications Hub
CHF	Communication Hub Function
CHTS	Communication Hub Technical Specification
CPA	Commercial Products Assurance
CPL	Central Product List
DCC	Data Communications Company
ESME	Electricity Smart Metering Equipment
GBCS	Great Britain Companion Specification
GSME	Gas Smart Metering Equipment
HAN	Home Area Network
HCALCS	HAN Connected Auxiliary Load Control Switch
IHD	In Home Display
PKI	Public Key Infrastructure
PPMID	Pre-Payment Meter Interface Device
SEC	Smart Energy Code
SMETS	Smart Metering Equipment Technical Specification
SSC	Security Sub-Committee

Data Communications Company

SEC Modification Proposal, SECMP0007, DCC CR 211

Firmware Updates to IHDs, PPMIDs and HCALCS[1]

Revised Preliminary Impact Assessment (PIA)

Version:	**0.6**
Date:	**23rd April, 2019**
Author:	**DCC**
Classification:	**DCC PUBLIC**

[1] IHD = In Home Displays, PPMID = PrePayment Meter user Interface Devices, HCALCS = HAN Connected Auxiliary Load Control Switch

Data Communications Company

Contents

1 Document History 3
1.1 Revision History 3
1.2 Associated Documents 3
1.3 Terminology 3
2 Introduction 4
2.1 Document Information 4
2.2 Context 4
2.3 Requirements 4
2.4 Detailed Requirements and Business Processes for Firmware Upgrades 5
2.4.1 Requirement 1- IHD's will be added to the CPL 5
2.4.2 Requirement 2- Manufacturer Image Hashes 7
2.4.3 Requirement 3- Sending Manufacturer Images 9
2.4.4 Changes to Existing Business Processes 17
2.4.5 Requirements Summary 17
3 Solution Overview, Option 1 – Original Approach, Zigbee OTA Delivery 18
3.1 Approach Principles and Constraints 19
3.2 DCC Total System Impact 20
3.3 Impact on System Integration and Interfaces 22
3.4 Data Management 22
3.5 Infrastructure 22
4 Solution Option 2 –Extend Proven OTA Firmware Method 23
4.1 Approach Principles and Constraints 23
4.2 Solution Option 2A – Existing OTA Firmware Update with IHDs Included 24
4.2.1 DSP Impact 24
4.2.2 CSP Impacts 25
5 Option 2B, Existing OTA Firmware Update Excluding IHDs 27
5.1 Comparison of Option 1, 2A, and 2B System Impacts 27
6 Impact on DCC Systems, Processes and People 30
6.1 Security 30
6.2 Release Approach 30
6.3 Implementation Approach 30
6.4 Application Support 30
6.5 DCC Service Management System (DSMS) Impact 31
6.6 Infrastructure Impact 31
6.7 Volumetrics 31

6.8 Safety Impact 31
6.9 Billing, Reporting and Performance Measures 31
6.10 Contract Schedules 32
6.11 Out of Scope 32
7 Implementation Timescales 34
7.1 Testing and Acceptance 34
8 Costs and Charges 35
8.1 Design, Build, and Testing Cost Impact 35
9 Risks, Assumptions, Issues, and Dependencies 37
9.1 Risks 37
9.2 Assumptions 39
9.3 Issues 47
9.4 Dependencies 47
9.5 Clarifications 48
Appendix A: Glossary 51
Appendix B:System Impacts, Requirement Traceability Matrix 52

1 Document History

1.1 Revision History

Revision Date	Revision	Summary of Changes
27/03/2019	0.1	Compilation from Service Providers, based on new Solution Design including two options and requested changes
11/04/2019	0.3	Internal DCC Review
23/04/2019	0.60	Further review with Service Providers, SECAS, small revisions

1.2 Associated Documents

This document is associated with the following documents:

Ref	Title and Originator's Reference	Source	Issue Date
1	SECMP0007 – Solution Design Note 0.7	SECAS	07/08/2018
2	SECMP0007 CR211 - Firmware Updates PIA - Requirements v0.51	DCC	25/02/2019

References are shown in this format, [1]

1.3 Terminology

Note the terms "Device" and "HAN Devices" are used interchangeably with the phrases "IHD / PPMID / HCALCS" and "IHD, PPMID, and HCALCS" in this document.

2 Introduction

2.1 Document Information

The original Proposer for this Modification was Mark Pitchford of npower.

An Early Impact Assessment was requested of DCC on 10th June 2016. The Preliminary Impact Assessment was requested of DCC in July 2018, after updated requirements were issued by SECAS.

However a full review of the PIA is now being carried out based on the expiry of the original design and cost estimates in the original PIA. This version of the PIA includes a full listing of the requirements and two options for a solution approach; the first option was covered in the previously issued PIA, but a new approach for implementing firmware upgrades has been proposed. The document was used by the Service Providers as the basis for a high-level solution design with associated, revised costings.

Note that the Risks, Assumptions, Issues, and Dependencies section has been completely reviewed in this document and contains many entries that we request should be considered by the Working Group and Proposer. There is an additional section for Clarifications that require review and feedback as well.

2.2 Context

Over-The-Air (OTA) firmware updates through the DCC Total System are currently supported only for the Communications Hub (CH), Electricity Smart Metering Equipment (ESME) and Gas Smart Metering Equipment (GSME) devices. This modification aims to enable Suppliers to send Manufacturer produced Firmware updates to PPMIDs and IHDs and HCALCS via the DCC, and for PPMID and IHDs and HCALCS to be able to activate those updates, subject to Manufacturer specific checks that updates are valid (i.e., from the Manufacturer; valid for the Device's current Device Model etc.).

2.3 Requirements

Based on the discussions at the Working Group and the Business Requirements as set out in the Solution Design Document [1], DCC understands the outcomes this modification wants to achieve the business requirements can be summarised as follows.

1.	In Home Displays (IHDs) to be added to the Certified Product List (CPL).
2.	Manufacturer Image Hashes associated with IHDs, Pre-Payment Metering Interface Devices (PPMIDs) and Home Area Network (HAN) Connected Auxiliary Load Control Switches (HCALCSs) to be added to the CPL.
3.	Suppliers to send firmware updates to IHDs, PPMIDs and HCALCS.
4.	The DCC to notify all Responsible Suppliers at certain stages of the associated processing of firmware updates.
5.	The DCC and Responsible Suppliers to check the latest firmware version on IHDs, PPMIDs and HCALCS.

6.	Rules around sharing capacity and buffering on the Communication Hub (CH).
7.	SRs supporting the maintenance of the Smart Metering Inventory (SMI) to be revised.
8.	Additional CH functionality.
9.	Firmware update support capability will need to be mandated on IHDs and PPMIDs installed after this modification is implemented.
10.	Local firmware updates will be banned following the implementation of this modification.

Support for the above changes would be mandated through the SMETS for all newly installed IHDs / PPMIDs, and through the CHTS for installed Communications Hubs. The changes would result in new obligations on the DCC, and Suppliers would be required to demonstrate that they are able to support the sending of the new Service Request and receiving the Service Response and DCC Alerts by way of testing obligations. However, Suppliers would not be required to upgrade Firmware on PPMIDs or IHDs, unless there were changes to the SEC or a SEC governance mandated upgrade.

2.4 Detailed Requirements and Business Processes for Firmware Upgrades

A detailed breakdown of the requirements and potential business process solutions for each requirement follows.

2.4.1 Requirement 1- IHD's will be added to the CPL

To support firmware management, IHDs will need to be captured in the CPL. IHDs will need to be subject to the following conditions:

1. The provision of the required values of attributes of the Product to the Panel (e.g. Manufacturer ID, hardware version, firmware version) – an example CPL published on behalf of the SEC Panel specifies the format and contents of each of the attributes required in a CPL entry.

2. The provision of the ZigBee Assurance Certificate to the Panel.

The process for adding an IHD to the CPL will be the same as that for Pre-Payment Metering Interface Devices (PPMIDs). The SEC does not constrain who supplies this information to the Panel. For the purposes of illustrating the processes of adding an IHD and PPMID to the CPL, the following assumptions are made:

1. The Manufacturer is a member of the ZigBee Alliance and the required Manufacturer ID has been issued accordingly

2. The organisation undertaking the ZigBee testing is referred to as a "Test Lab"

3. The organisation notifying the SEC Panel of a Product's details and assurance certificates is the Manufacturer

The resulting steps for adding an IHD and PPMID to the CPL are as detailed following.

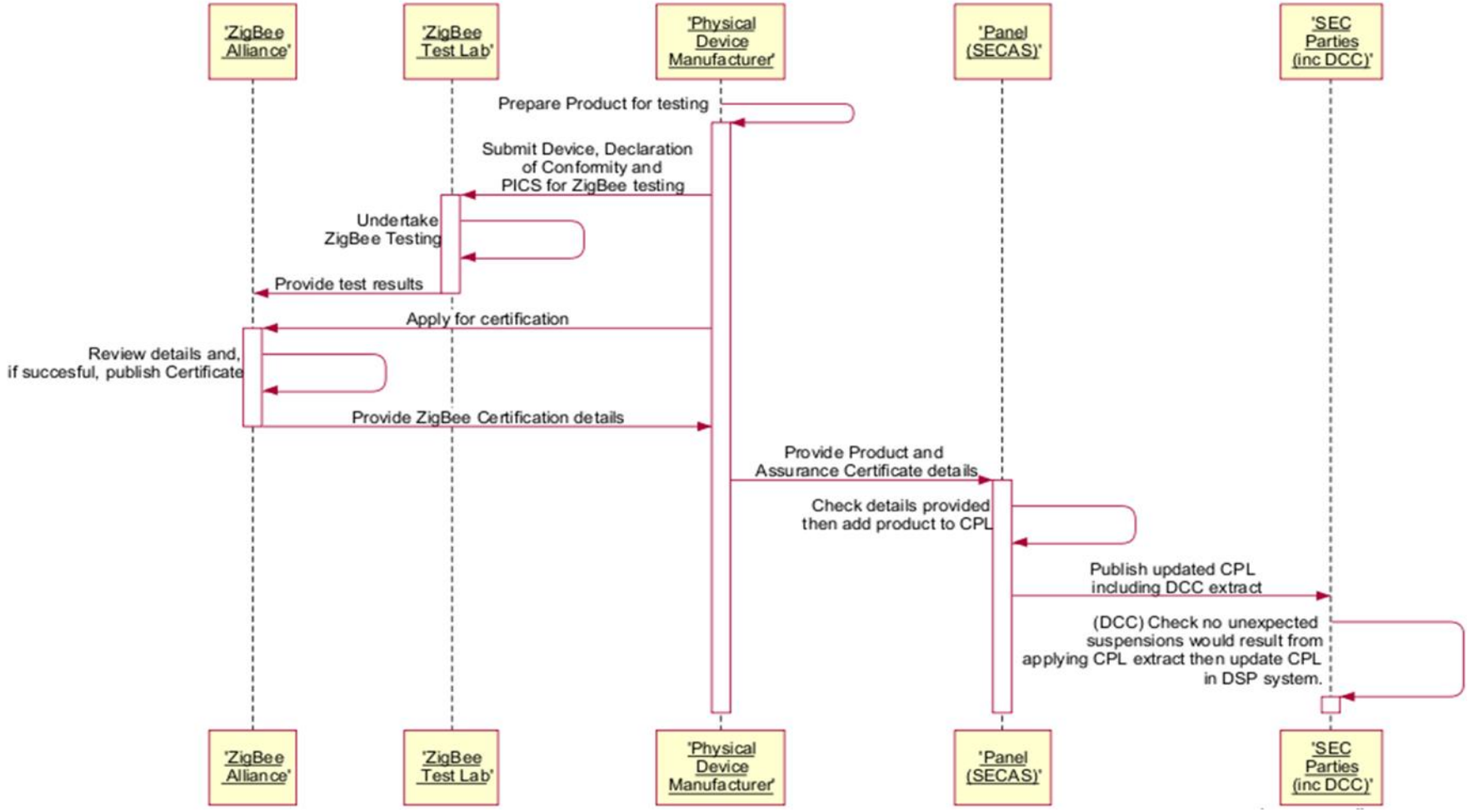


Figure 1 Process for adding an IHD or PPMID to the CPL

Below is an illustrative CPL entry that will be created by the above process. It uses sample data for the hardware, model and manufacturer. It assumes the factory installed firmware is version 10. In summary that example entry is:

Manufacturer Identifier	Model identifier	Hardware Version	Hardware version revision	Firmware version	Hash
FF:FE	AA:BB	01	01	00:00:00:10	(Hash value)

Table 1: Example of a New CPL Entry

2.4.2 Requirement 2- Manufacturer Image Hashes

In order for a Manufacturer Image to be added to the CPL, additional details in relation to that image will need to be provided to the SEC Panel.

The Supplier will need to confirm to the SEC Panel that the firmware update does not affect how the IHD, PPMID or HCALCS communicates using ZigBee. If there is an impact on how the IHD, PPMID or HCALCS communicates using ZigBee which requires re-testing, a new ZigBee Assurance Certificate will need to be provided to the Panel before the firmware can be updated.

The CPL Requirements Document specifies the additional details in relation to the Manufacturer Image that must be provided to the Panel:

- the Hash of the Manufacturer Image
- the identity of the organisation that created that image
- a digital signature created by the creator of the image across the communication containing the CPL entry details

The digital signature used to sign the communication between the submitter and the panel needs to be the same as the one received from a Public Key Infrastructure (PKI) chosen by the Panel to check the signature.

A template for submitting CPL entries has been published on behalf of the Panel, which sets out the approach to digital signing taken by the Panel.

In addition to the above, HCALCS must comply with the Commercial Product Assurance (CPA) Security Characteristics as per the Smart Metering Equipment Technical Specification (SMETS). Changes to the HCALCS firmware may require either the inclusion of the new firmware version in the existing CPA certificate or a new CPA certificate. For HCALCS this CPA certificate must be submitted to the Panel when adding a new firmware version to the CPL.

The process for adding a Manufacturer Image to the CPL is detailed in Figure 2 below.

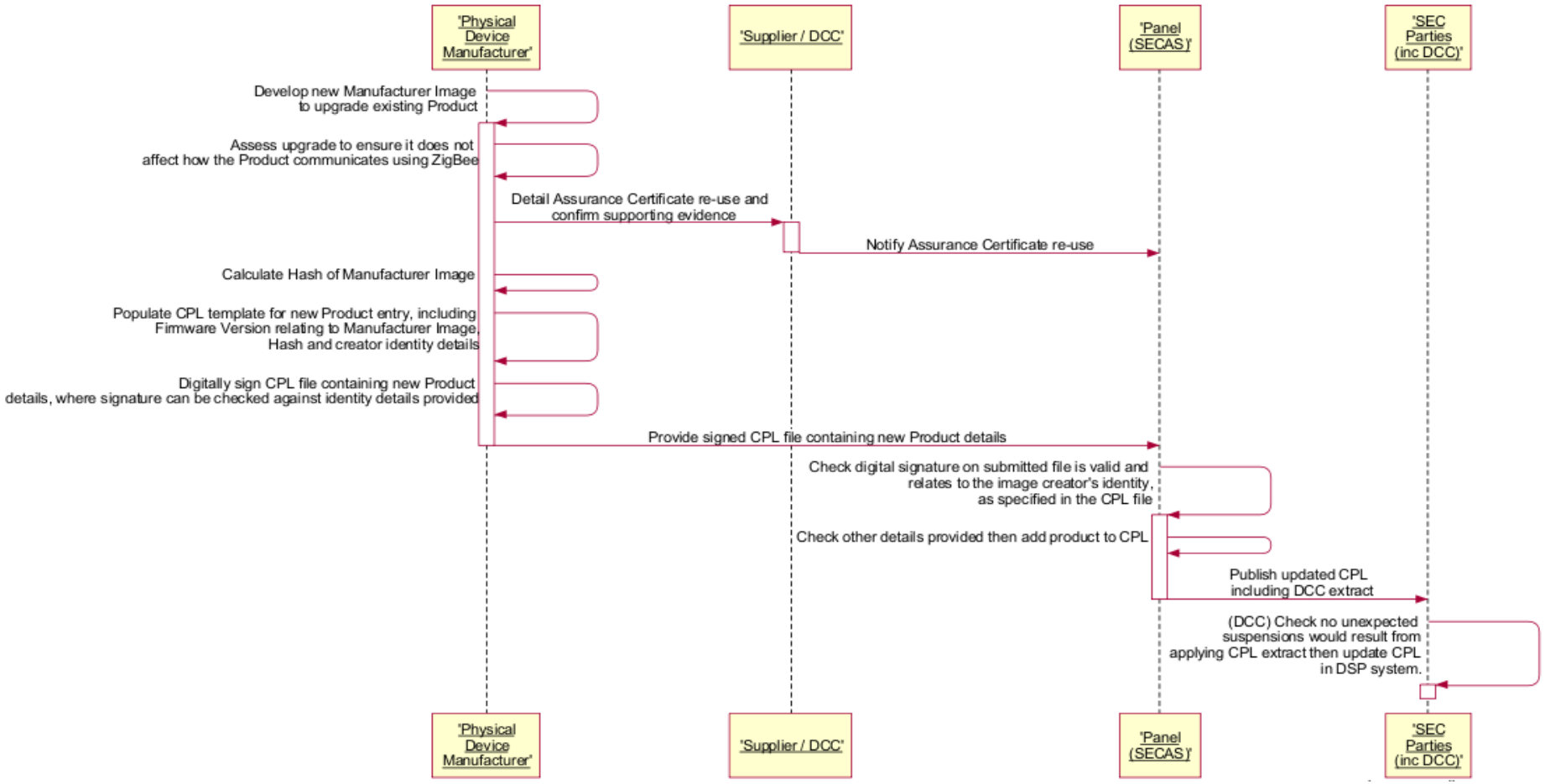


Figure 2: Process for adding a Manufacturer Image to the CPL

.

2.4.3 Requirement 3- Sending Manufacturer Images

There should be no limitation on the size of the manufacturer's firmware change, and this should be treated as an "Image" sent to the appropriate device. The expectation is that Manufacturer Images are typically below 750 KiloBytes (KB), in particular for HCALCS, but it may be possible for Manufacturer Images to become larger in size.

The following sections outline the processes required for Manufacturer Images that are either less than 750KB, or 750KB and greater in size.

Sending a Manufacturer Image less than 750KB to an IHD or PPMID

This section details the steps that will need to be taken to update the firmware on an IHD, PPMID, or HCALCS, where the image is a single image less than 750KB in size, and a new CPL entry has been created. A sequence diagram summarising the steps is shown in Figure 3 on page 13 following.

Sending a Manufacturer Image to an IHD / PPMID / HCALCS will require a new non-critical Service Request 'Send IHD / PPMID / HCALCS Firmware'.

Supplier Preparations

Before sending a new Service Request to the DCC to 'Send PPMID / IHD / HCALCS Firmware', the Supplier will be required to follow similar steps as in the case of sending an 'Update Firmware' Service Request to the DCC in respect of a Meter:

1.	Obtain the following information	The Manufacturer Image An Over the Air (OTA) Header, which should include: i. Manufacturer ID ii. Model to which it can be applied iii. Firmware Version in the image iv. Minimum and maximum hardware version to which it can be applied v. A Hash of the Manufacturer Image
2	Undertake the following checks on that information	The Hash the Supplier has calculated over the Manufacturer Image is the same as that provided by the person who created the Manufacturer Image (in this case the Manufacturer) Check the Manufacturer Image is associated with one or more Device Models on the CPL. The check should include i. The Hash is recorded on the CPL against one or more entries ii. The OTA Header Manufacturer ID, model and Firmware Version fields match identically with one of the entries identified at step (i)

		iii. The hardware version in that CPL entry is between OTA Header minimum and maximum hardware version, inclusively.

Supplier creation of a 'Send IHD / PPMID / HCALCS Firmware' Service Request

Having obtained the information and upon the above checks being successful, the Supplier will create a 'Send IHD / PPMID / HCALCS Firmware' Service Request. The Service Request (SR) will include the following information:

1	Image: the image to be sent	Composed of a base64 encoded version of the concatenation: OTA Header || Manufacturer Image || activation date-time Note: activation date-time will include an option for an 'activate now' value (e.g. 0)
2	List of Device IDs	Up to 50,000 IHD / PPMID / HCALCS can be listed within the SR.

DSP Checks the 'Send IHD / PPMID / HCALCS Firmware' SR

On receipt of the 'Send IHD / PPMID / HCALCS Firmware' Service Request, the DSP will follow the following steps:

1. Check whether the Manufacturer Image contained within the SR is less than 750KB in size
2. Calculate the Hash of the Manufacturer Image contained within the SR
3. Check whether the Hash the DCC has calculated is on the CPL, and identify CPL entries with that Hash
4. For each Device ID in the SR:
   a. Check the Device is an IHD, PPMID or HCALCS
   b. From the SMI, identify the Device's current Device Model, and ensure that the Manufacturer ID, model and hardware version fields for that current Device Model equate to one of the entries identified at step 3
   c. Identify, from the SMI, the Communication Hub Function (CHF) ID to which the Device is associated
   d. Check that the Supplier is the Responsible Supplier for one of the Smart Meters Associated with that CHF ID

If this and all preceding checks succeed, the DCC will identify (and temporarily record against the Device ID) the details of all Responsible Suppliers Associated with the CHF ID. In case the Device is an HCALCS, only the Import Supplier will be recorded as Responsible Supplier. This temporary record will be used to populate the DCC Alerts at the next step.

DCC Response to the 'Send IHD / PPMID Firmware' Service Request

The DCC will be required to notify all Responsible Suppliers at different stages of the SR processing. The first notification will happen when the DCC receives the 'Send IHD / PPMID / HCALCS Firmware' SR:

1. Upon the DCC receipt of the 'Send IHD / PPMID / HCALCS Firmware' SR, the requesting Supplier will receive a Service Response. If some of the Device IDs in the SR failed any of the checks at step 4a, 4b, 4c, and 4d above, the DCC will send a Service Response to the requesting Supplier listing all the Device IDs that failed and the reason for the failure in each case. The DCC will carry on processing the firmware distribution for those Device IDs that passed the check.
2. Upon the DCC completing the processing of the 'Send IHD / PPMID / HCALCS Firmware' SR, each Responsible Supplier identified in 4d will receive a DCC Alert containing:
    a. The Hash of the Manufacturer Image in the SR (to identify the CPL entry)
    b. A list of Device IDs to which the image is being sent
    c. The activation date-time specified in the SR

Distribution of the 'Send IHD / PPMID / HCALCS Firmware' Service Request

If the checks are successful, the DSP will distribute the Image from the SR (having decoded from base64 encoding) to the CH associated with each of the IHDs / PPMIDs / HCALCS in List of Device IDs where the Device ID passed the validation.

The Communication Hub Technical Specification (CHTS) section 4.4.4 requires that the receiving CHs can buffer Images intended for Electricity Smart Metering Equipment (ESME) and Gas Smart Metering Equipment (GSME). The Communication Service Provider (CSP) contracts require CHs to have the capacity to hold two 750KB images (to support independent distribution of firmware to the GSME and one of the ESME).

No additional buffer space on the CH is being proposed. The same buffer space for ESME and GSME images will be used for storing IHD / PPMID / HCALCS images. IHD / PPMID / HCALCS images can be overwritten by ESME or GSME images if one arrives whilst an IHD / PPMID / HCALCS one is in process, and there is insufficient buffer space. If another IHD / PPMID / HCALCS image arrives whilst an IHD / PPMID / HCACLS one is in process and there is insufficient space or it is for the same Device Model, the newly arrived one will overwrite the one in process.

Communication Hub notification of image availability to the IHD / PPMID / HCALCS

Once the image arrives at the CH, the CH will need to:

1. Record OTA Header details and activation date-time
2. Notify the device(s) by sending a message to it/them ('the CH shall send a Zigbee Smart Energy (ZSE) Image Notify command').

IHD / PPMID / HCALCS request for Image Details

The IHD / PPMID / HCACLS will then, in line with the ZigBee OTA specification, send a message (a 'QueryNextImageRequest' ZSE command containing Manufacturer ID (manufacturer code), model (image type), current Firmware Version, and optionally hardware version) to ask the CH if there is an image that may be suitable for it. The Great Britain Companion Specification (GBCS) will mandate the hardware version to avoid wasted downloads over the Home Area Network (HAN).

Provision of Image Details by the Comms Hub to the IHD / PPMID / HCALCS

For the Comms Hub to decide that the Image is suitable for the IHD / PPMID / HCALCS, the ZigBee OTA specification details a recommended, default policy to determine its response, specifically to:

> 'send back a response that indicates the availability of an image that matches the manufacturer code, image type, and the highest available file version of that image on the server. However, the server [in this case, the Comms Hub] may choose to upgrade, downgrade, or reinstall clients' image, as its policy dictates. If client's hardware version is included in the command, the server shall examine the value against the minimum and maximum hardware versions included in the OTA file header'

Note that 'server' in the above refers to the Communications Hub and 'client' refers to the IHD / PPMID / HCALCS.

The CH will send back a 'QueryNextImageResponse' accordingly.

IHD / PPMID / HCALCS Download and Authentication of the Image

The IHD / PPMID / HCALCS will then download the image from the CH, if one is available. When the IHD / PPMID / HCALCS has downloaded the image, it will check the Manufacturer signature (or equivalent) within it. This confirms the Manufacturer Image is as created by the Manufacturer. The IHD / PPMID / HCALCS will then store the Manufacturer Image from within the image sent, so that it is available for activation . The IHD / PPMID / HCALCS will then send a 'UpgradeEndRequest' to the CH.

The CH will then send a 'UpgradeEndResponse' with activation date-time in it. The CH will set a 'reminder' for activation time (or current time, when activation time is zero) plus [X] minutes, and record IHD / PPMID / HCACLS Device ID against that reminder (there can be multiple IHDs / PPMIDs / HCALCS of the same type on the HAN, so the CH will need to remember which one this reminder relates to).

The device will wait for activation time (or begin activation now if activation time is zero). It will need to check time against the CH if it has no clock of its own. (Note the Smart Metering Equipment Technical Specification (SMETS) does not require a clock on the device the device will then activate the Manufacturer Image, changing Firmware Version if successful.

The CH will wait to activation time (or current time, when activation time is zero) plus [X] minutes and read the OTA cluster's Firmware Version attribute from the IHD / PPMID / HCALCS. The CH will then create a Device Alert containing the IHD's / PPMID's /HCALCS' Firmware Version and send it to the DCC. The DCC will update the SMI if the Firmware Version has changed, and forward the Device Alert to Responsible Suppliers recorded to receive the Alert.

If this Device Alert is not received the Supplier can send a 'Read IHD / PPMID / HCALCS Device Model via the CH' SR to the DCC. This will result in a Command to the CH to read the OTA Cluster's Firmware Version, manufacturer etc. from the IHD / PPMID / HCALCS. The CH will send a Response containing these details to the DCC, the DCC will then update the SMI and forward the Response to all Responsible Suppliers.

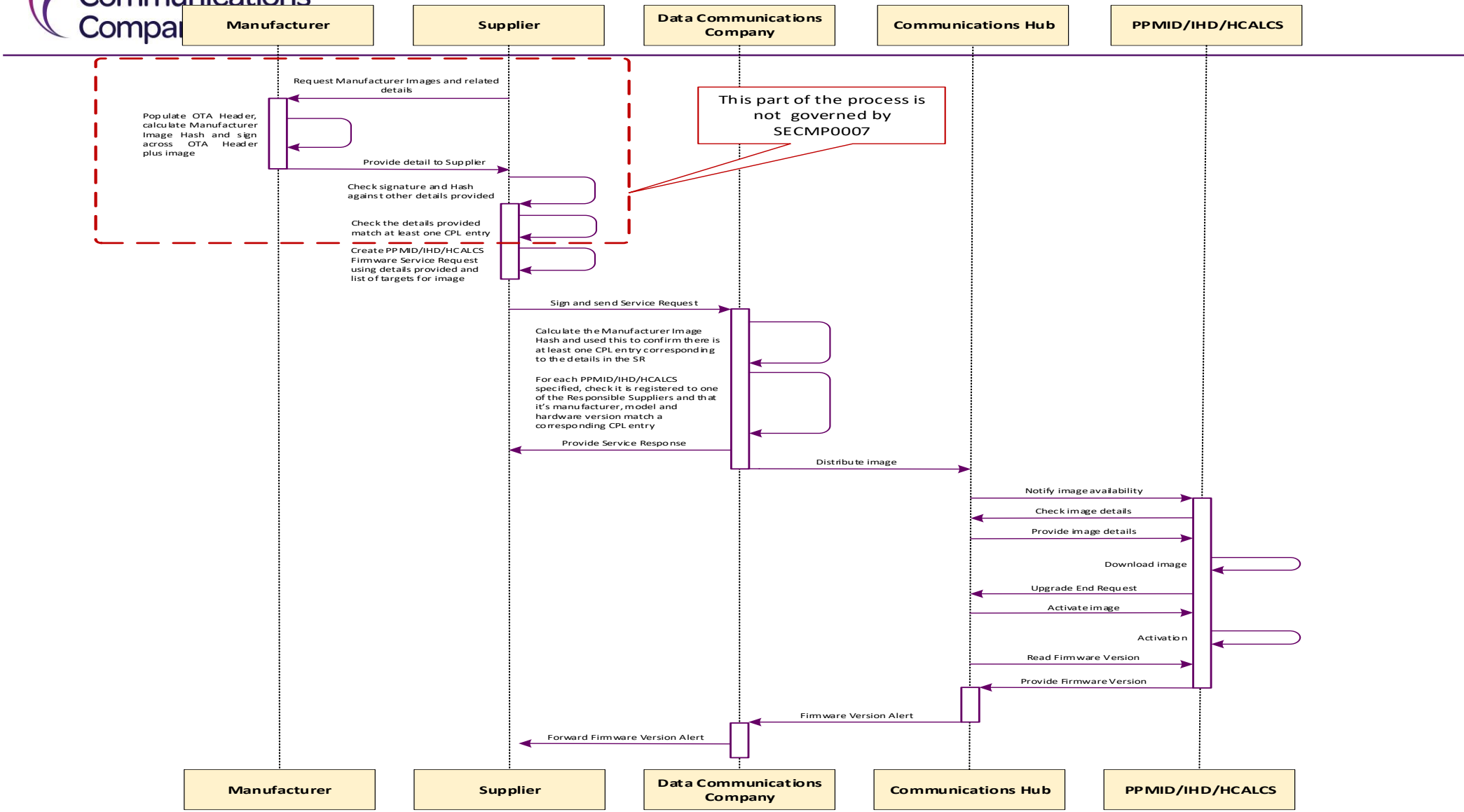


Figure 3: Process for updating an IHD's / PPMID's / HCALCS' Firmware – Image less than 750KB

Sending a Manufacturer Image 750KB or Greater

This section illustrates how activating images that are 750KB or more in size might be achieved. In the illustration following, the operating Firmware Version is 0x10, which is reflected in the CPL entry example in Table 2 below. An IHD / PPMID / HCALCS is to be updated to Firmware Version 0x20. This requires two images are to be sent to the IHD / PPMID / HCALCS, to provide all of the changed Firmware / configuration data required for Firmware Version 0x20.

The Manufacturer has split this upgrade data in to two images:

- Image 0x15: contains the first part of the upgrade data and Manufacturer instructions for the IHD / PPMID / HCALCS to only store this first part on activation
- Image 0x20: contains the second part of the upgrade data and Manufacturer instructions for the IHD / PPMID / HCALCS to check that Image 0x15 has already been activated. Activating this image causes the functionality of the IHD / PPMID / HCALCS to be upgraded to Firmware Version 0x20.

The New CPL entry looks like the following.

Manufacturer identifier	Model identifier	Hardware version	Hardware version revision	Firmware version	Hash
FF: FE	AA:BB	01	01	00:00:00:10	(hash of image 10)
FF: FE	AA:BB	01	01	00:00:00:15	(hash of image 15)
FF: FE	AA:BB	01	01	00:00:00:20	(hash of image 20)

Table 2: Example New CPL Entry for Manufacturer Image Greater than 750KB

To upgrade the Firmware of PPMID/IHD/HCALCS, the Supplier will follow the following process. The illustrative process is shown in Figure 4 on page 16.

1. Having undertaken the necessary checks, the Supplier will create a ‘Send IHD / PPMID / HCALCS Firmware’ SR to distribute Image 0x15 and set the activation date-time as zero (i.e. ‘activate now’). Note that when the image needs to be split into two images or more, the activation date-time should not be in the future, as explained below.

2. The DCC will distribute Image 0x15 to the CH. When the device has downloaded the image, the CH will start a timer for now plus [X] minutes. When that time has passed, the CH will read Firmware Version from the IHD / PPMID /HCALCS and send a Device Alert containing that value. Note that this value will still be 0x10 (in line with the Technical Specification Issue Resolution Sub-Group (TSIR) decision). Therefore, the Device Alert will only indicate delivery of the image. It will NOT indicate that the IHD / PPMID / HCALCS has successfully validated the image.

3. On receipt of the Device Alert from the DCC containing the device’s Firmware Version, the sending Supplier will send Image 0x20. If this Device Alert was not received the Supplier can only resend Image 0x15 (since the TSIR's decision means there is no mechanisms to discover if the IHD / PPMID / HCALCS had that image).

4. The DCC will distribute Image 0x20 to the CH. When the device has downloaded the image, the CH will start a timer for activation time plus [X] minutes. When that time has passed, the CH will read Firmware Version from the device and send a Device Alert containing that value. Note that this value will, if activation was successful, now be 0x20 (in

line with the TSIR's decision). Therefore, this Device Alert will indicate delivery of the image and that the IHD / PPMID / HCALCS successfully activated the image.

5. If this Device Alert is not received, the Supplier can only resend Image 0x20.

The result is that the IHD / PPMID / HCALCS (excluding where the Firmware upgrade process cannot be completed e.g. where there is no Wide Area Network (WAN) connectivity, will be operating Firmware Version 0x20.

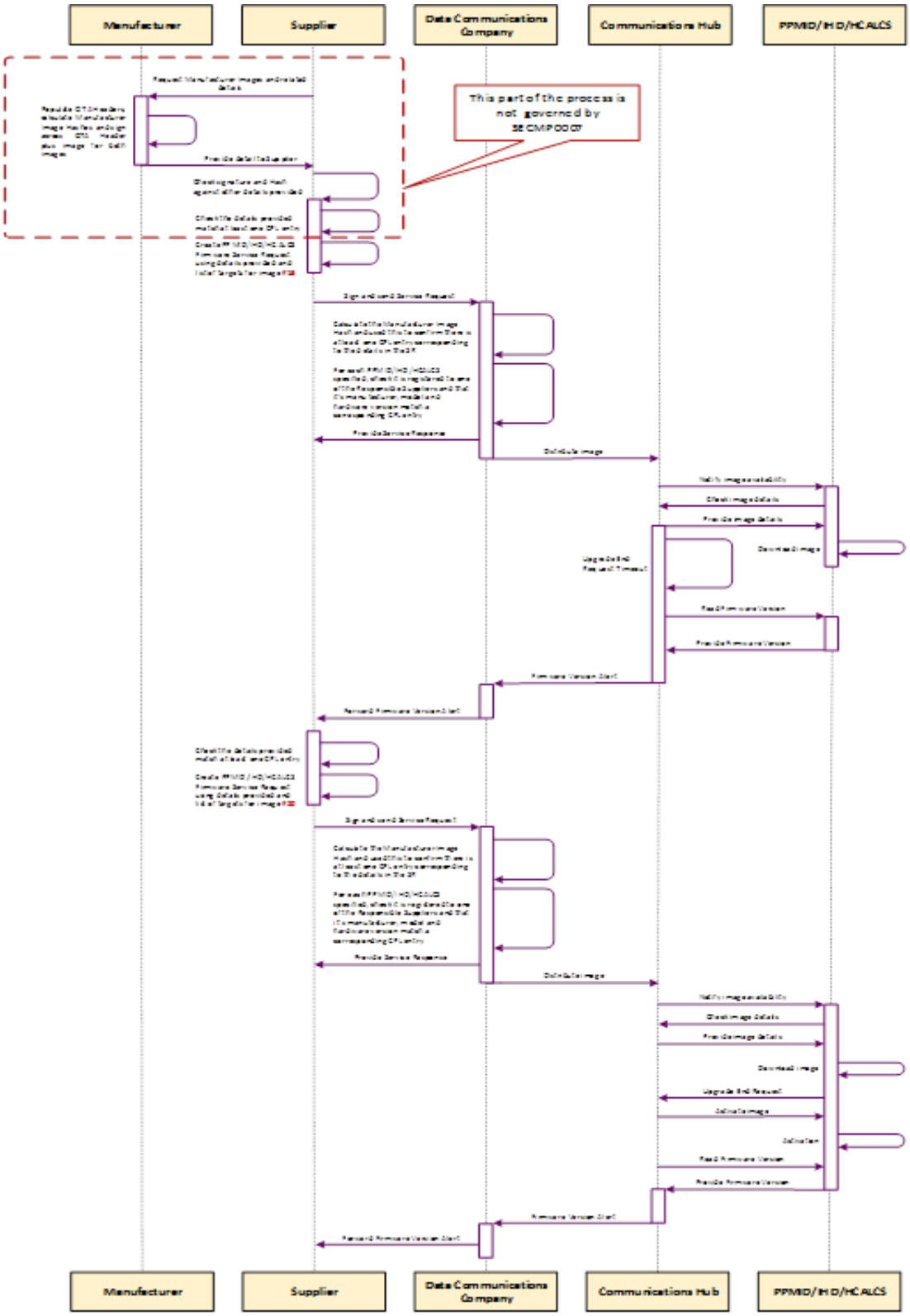


Figure 4: Process for upgrading an IHD's / PPMID's / HCALCS' Firmware – image more than 750KB

Non-Functional Requirements for Firmware Upgrades

Firmware upgrade images for devices are expected to be typically less than 750KB in size and would occur infrequently e.g. once per year. The customization of IHDs or PPMIDs

with graphics will increase the firmware size, this may happen going forward and require the mechanism for firmware sizes greater than 750 KB.

HCALCS are expected to have a much smaller firmware size and with a very low upgrade frequency. It may be possible that HCALCS do not need updates at all unless changes to the ZigBee version are required.

Following from the discussion with the Security Sub-Committee (SSC) there are no security concerns with regards to firmware upgrades for IHD / PPMID / HCALCS.

2.4.4 Changes to Existing Business Processes

Implementing the above requirements will have impacts on the existing business processes as noted below.

CPL Removal and SMI status, including Suspension

The changes defined above will mean that IHDs are on the CPL and therefore can be removed from it. This means that IHDs will need to be ‘suspended’ on the SMI. In turn, this means they will need to have an SMI status, whose values will need to be defined. Specifically, how the previous steps change IHD status (e.g. Update HAN Device Log) affects this status.

This will also constrain which Firmware updates can be sent to IHDs / PPMIDs / HCALCS (e.g. they cannot be sent if the CPL entry related to them is marked ‘removed’). This will affect SEC obligations on DCC Users and Suppliers in terms of which SRs can be sent to IHDs / PPMIDs / HCALCS in which circumstances.

Consumers are currently able to operate ‘suspended’ PPMIDs. If this Modification Proposal is implemented, Consumers will be able to operate ‘suspended’ IHDs.

2.4.5 Requirements Summary

Based on the discussions at the Working Group and the Business Requirements as set out in the Solution Design Document, DCC consider the requirements for SECMP0007 to be **STABLE**.

3 Solution Overview, Option 1 – Original Approach, Zigbee OTA Delivery

Based on a review carried out by DCC and the key Service Providers in February 2019, two potential solution options were identified.

The first option is the one originally defined in the Solution Design provided by SECAS [Document 1], although HCALCS have been added to the scope of this PIA. HCALCS are already supported in the CPL and inclusion of HCALCS is not expected to change the solution option, except for the additional validation checks necessary to support this device type, with a potential added risk to solution complexity and required work. Notes that since the SEC Modification was issued, Service Users have not deployed any significant volume of ZigBee only capable devices and instead a large majority of IHDs deployed are actually PPMID devices. HCALCS are understood to be under development by industry at this point in time.

This option involves a mechanism to deliver the firmware images to the PPMID, HCALCS and the IHD HAN devices, using Zigbee OTA delivery, the processing of which differs from that of other Devices. This mechanism requires new GBCS use cases to read device firmware. As this solution is intended for ZigBee capable devices only, the solution cannot communicate directly with the Service User and cannot re-use the existing capability for distribution and activation of HAN device firmware. As part of this option:

- The Comms Hub is to manage the activation of firmware
- The Comms Hub is to manage the notification to the Service User upon activation

A new DCC Only Service Request will be provided for the Service Users to send the firmware image to DCC Data Systems. DCC Data Systems will perform the necessary validations and forward the firmware image to the relevant Comms Hub by using an interface provided by the CSPs dedicated for firmware image delivery. The Comms Hubs will need to be updated to handle the delivery of the firmware images to the target Devices utilising the Zigbee OTA capabilities.

This is a wide-ranging SEC Modification and the impacts across the system actors and components are as follows:

ARQ	H	BIMI	M	CHTS	Y		
TEF	H	GBCS	Y	CH	Y	HCALCS	Y
CGI	H	DUIS, DUGIDS, MMC XML	Y	CPL	Y	PPMID	Y
P & C	H	SMETS	Y	ESME	N	IHD	Y
BT	N	SEC	Y	GSME	N		

A conceptual architecture view of the solution is shown following.

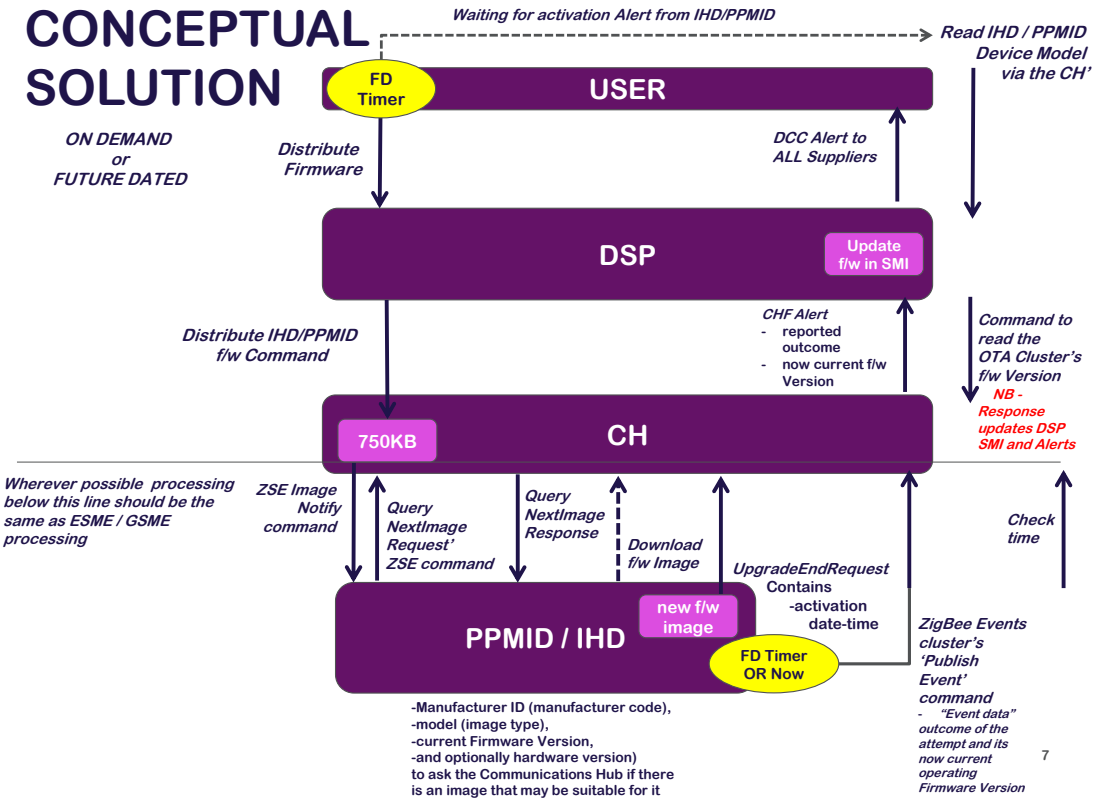


Figure 5: Solution Option 1 Conceptual Architecture

3.1 Approach Principles and Constraints

The following principles and constraints have been identified for this solution option:

- A Comms Hub needs to be aware of the status of a firmware image download to a HAN device i.e., complete or in progress
- Storage prioritisation for both the Comms Hub and the DSP will need to be enabled; the DSP will send only one firmware request at a time until the Comms Hub indicates the update is complete, and the oldest dated firmware is removed
- There must be a capability for two firmware upgrades in the Comms Hub memory, so there is an ability to queue the upgrades, so there is only one running at a time
- CHTS changes will be required
- The DSP would reject any request for a firmware upgrade, if there is already one in progress
- There is a requirement for an uplift to any Comms Hub emulator
- This approach does not require changes to GBCS
- Devices remain as Type 2 devices, and communication is managed by Zigbee

3.2 DCC Total System Impact

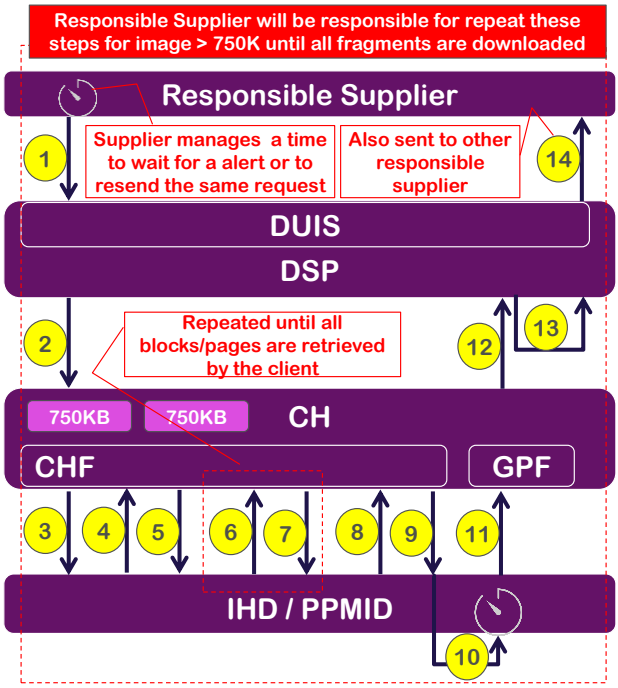
Analysis of the above requirements and consequential changes suggests that support would be mandated through the SMETS for all installed IHDs, PPMIDs, and HCALCS, and through the CHTS for newly installed Communications Hubs. The changes would result in new obligations on the DCC, and Service Providers would be required to demonstrate that they are able to support the sending of a new Service Request and receiving the Service Response and DCC Alerts by way of testing obligations. However, Suppliers would not be required to upgrade Firmware, unless there were changes to the SEC or a SEC governance mandated upgrade.

System	Component	Detail
DSP	CSP SMWAN Gateway and CSP Interfaces	New interfaces (one per CSP) required for sending a firmware image and a list of validated device IDs to the CSP, and for each device the associated CHF to which the request should be directed. There should be a mechanism to enable the CSP to reject device IDs if necessary (e.g. if they do not recognise a Comms Hub device ID), in a similar way to existing firmware updates.
	Self Service Interface	The SSI read inventory screen needs to be able handle an IHD firmware version, SSI Reports RSMI_001 and RSMI_002 will be updated to enable firmware versions to be reported for IHDs. The following SRs will be updated: • 12.2 Device Pre-notification • 8.4 Update Inventory • 8.2 Read Inventory.
	Anomaly detection	Anomaly detection volume thresholds will apply to the new Service Requests and will be mandatory for a new SR11.4, even though it is not a critical request; it is assumed to be similar to SR11.1 in this respect.
	Energy Service Interface Inventory Extract	The Energy Service Interface (ESI) inventory extract for the Device table needs to be able contain a firmware version for an IHD.
	DUGIDS, DUIS SRs, and MMC, Alerts and Messages	Two new Service Requests will be introduced for Service Users to manage the firmware updates: SRV 11.4 – for suppliers to send the firmware; SRV 11.5 – for suppliers to read the firmware version. Unlike existing firmware upgrades there will not be a separate activation SRV. New Alerts will be introduced to handle the following scenarios: • Device image successfully downloaded • Device image successfully activated (or stored an image greater than 750KB and is not the last fragment) Given that PPMIDs, IHDs, and HCALCS may communicate with both GSME and ESME, both Import Supplier(s) and the Gas Supplier associated with the Communications Hub will be notified at the following stages of processing when:

		• the DSP has successfully processed a Service Request for an image's distribution • the device has attempted to activate new firmware (or attempted to store a part of a firmware that is greater than 750KB). New DCC Alert types are required to: • indicate failure by a Comms Hub to deliver a firmware image • notify successful firmware activation • report the Devices rejected by CSPs Changes to SR8.4 Update Inventory, SR8.2 Read Inventory and SR12.2 Pre-Notification.
	CPL	No changes to the structure of the CPL. Updates to CPL interface specification and to the processing of incoming CPL files.
	Transform	New GBCS Use case for CHF to read Firmware Version from device.
CSP	SM WAN (Network)	Within the CSP North SM WAN, Firmware upgrades are supported on dedicated broadcast Firmware download channels within each radio cell. To support this Modification, additional loading will be placed on the Firmware download channels. In the FIA there will be an action to understand the viability to support what this Modification requires, given the current capacity. Further capacity analysis to estimate the scale of any new requirements.
	Interfaces	Modification to the CSP/DSP SD4.4.2 interface to include a new API to provide firmware for IHD, PPMID or HCALC HAN devices. This is required to distinguish between ESME/GSME images and images for ZigBee only capable devices
	Comms Hub	Uplift the Communication Hubs to support the new commands to download firmware to devices in line with GBCS guidelines, over the SM WAN
	Comms Hub	Add support to Communications Hub to make system aware that a command or download is a completed action
	Solution	Modifications on CSP solution to support the new commands, data model variables and reports required to implement the download of firmware to the devices;
	Comms Hub	The Comms Hub will need to support the prioritisation of images, the reading of device model details and storage for additional Alerts, Commands, and Responses
	Queuing	Implementation of a mechanism in the CSP solution to manage the queuing priorities of firmware distribution, to prioritise the ESME/GSME firmware distribution over other devices.
All Service Providers	Support Systems	Uplift of billing and reporting systems/components to incorporate the additional SR transaction charges. The SM WAN transaction billing approach may need to change as

		a result of this Modification.
	Support Systems	Support for additional alerts, commands, and responses.

3.3 Impact on System Integration and Interfaces



No	Description
1	Call DUIS SR – Upgrade Firmware with Activation Date (must be 'Now' if fragmented image and not the last fragment)
2	Send corresponding GBCS command to CH (CSP Systems not shown to aid clarity)
3	OTA: Notify Image
4	OTA: Query Next Image Request
5	OTA: Query Next Image Response
6	OTA: Image Block/Page Request
7	OTA: Image Block/Page Response
8	OTA: Upgrade End Request
9	OTA: Upgrade End Response (includes activation date) If Image > 750, the activation date will always be 'now' except for the last fragment
10	Activate Firmware (If fragmented image and not last fragment, it will just be stored)
11	Event : Publish Event (Firmware Upgraded or Firmware Downloaded based on last fragment or not)
12	Forward Event
13	Update SMI If event = 'Firmware Upgraded' and not 'Firmware Downloaded'
14	DUIS Alert to Supplier and other Responsible Supplier

One new interface per CSP will be built for sending a firmware image and a list of validated device IDs of PPMIDs, HCALCS or IHDs to the CSP, and for each device the associated CHF to which the request should be directed. There should be a mechanism to enable the CSP to reject device IDs if necessary (for example if they do not recognise a Comms Hub device ID), in a similar way to existing firmware updates.

3.4 Data Management

Data Management requires changes to enable the IHDs to have firmware versions mapped to a GBCS version.

In addition, there is a need to add mappings for the new DUIS SRVs, for the alerts between DUIS version and the SRV, and to the GBCS version against the use case where applicable.

3.5 Infrastructure

The Modification will lead to additional data processing. One instance of the new firmware upgrade SR message will trigger a lot more processing effort than typical SRs, since one containing 50,000 device IDs would trigger validation of all them, the need to generate files, interact with both CSPs and the sending of approximately 100,000 alerts. Assuming the messages are billed appropriately, any additional hardware required would be handled through normal capacity planning processes.

4 Solution Option 2 –Extend Proven OTA Firmware Method

The imperative for Option 2 is to extend the existing OTA firmware update procedure to the mandated HAN devices. This approach involves creating a type 1 IHD and extending PPMID's, HCALCS, and the new type 1 IHD to support firmware distribution in a manner that would be similar to ESME firmware distribution and activation using GBCS critical commands. This will require CPA approval of the new IHD/PPMID device which will in turn increase device cost, and was something that Option 1 is designed to avoid. A further variation that may need to be considered is a prompt to the user to plug a battery powered device into the mains supply while a firmware image is transferred and activated.

For this Option, impacts across the system actors and components are as follows:

ARQ	H	BIMI	M	CHTS	Y		
TEF	H	GBCS	N	CPL	2A=N, 2B=Y	HCALCS	Y
CGI	H	DUIS. DUGIDS, MMC XML	Y	CH	Y	PPMID	Y
P & C	H	SMETS	Y	ESME	N	IHD	Y
BT	N	SEC	Y	GSME	N		

4.1 Approach Principles and Constraints

The main principles of the alternative approach to implement firmware upgrades is based on a very different approach from Option 1, described in section 3 above:

- This approach treats any device endpoint like an ESME, such that the firmware is pushed to it with credentials.
- This approach may require modification to the ESME firmware distribution approach in that the user may be required to plug a battery powered device into the mains supply before transferring and activating an image as well as handling exceptions generated by a loss of power during firmware distribution and activation.
- HCALCS certificate support is needed for a supplier key agreement trust anchor, this implies changes are required in:
    - GBCS use cases
    - SMKI (new certificate type)
- PPMID devices can have multiple suppliers, which implies there is a need to support two sets of supplier certificate trust anchors as well as two sets of device certificates. Note MP07-RS20 in section 9.1.
- There will need to be device changes to support keys.
- There is a requirement to ensure end to end security for firmware image.
- There is a risk that firmware upgrades could be fired repeatedly at devices with significant impacts on battery life etc. In this case, the required outcome is that the DSP would reject any request for a firmware upgrade, if there is already one in progress.

- There is no requirement for any prioritisation of firmware request, which reduces the complexity significantly. This approach will use separate functionality as described in assumption
- There is no dependency on the ESME device.
- CHTS changes will be required.
- There is a requirement for a new type 1 IHD. Consideration should be given to whether or not to eliminate the type 2 IHD in which case, a CAD may need to be separately defined in SMETS2. A type 1 IHD would at minimum require specification changes to:
    - CHTS
    - SMETS2
    - GBCS
    - SMKI

This option also requires uplift to emulation environments to allow end to end testing of firmware distribution.

4.2 Solution Option 2A – Existing OTA Firmware Update with IHDs Included

The Option 2A solution is required to support introduction of a Type 1 IHD Device.

4.2.1 DSP Impact

This introduces a set of complex changes in terms of building the functionality and a number of integration testing scenarios. Some of the key implications of introducing a new type of device to the system are:

- The new device type would need to be added to numerous SEC documents including DUIS, MMC, CPL etc, including the DUIS and MMC XML schemas;
- The new device type would need to be added to the DSP data model
- The CPL interface specification would need to be enhanced to support the new device type
- The DSP's CPL upload process would need to be enhanced
- Validation and implementation of all the SRs which are needed for the new device type would need to be enhanced to support it.
- Read and update inventory SRVs 8.2 and 8.4 and decommission device 8.3 will need to be enhanced.

It should be noted that a separate DCC Change Request has been defined to provide a capability within the DSP that will serve to throttle firmware distribution SRs to the CSP by limiting Service Requests sent by Service Users such that only one firmware distribution activity is in progress per CH at any point in time.

Additionally the following areas would need to be investigated and assessed for potential impact at the FIA stage:

- The list of SRs to be updated would need to be compiled and assessed. For instance, PPMIDs have a process to move them to device status Commissioned, while IHDs officially do not have a device status at all, and currently an IHD does not have a process to make it Commissioned; this may require a new process to be defined.
- Should SMKI certificates be associated with the devices, as with PPMID?
- Should Change of Supplier (CoS) have any impact on the new device type?
- What is the impact (if any) on ESI reports?
- What is the impact (if any) on Service Audit Trail?
- What is the impact (if any) on SSI screens and reports?

A detailed analysis needs to be carried out during the FIA stage, if Option 2A is progressed further, to understand the implications of introducing a new device type.

In addition to the general changes identified above to support a new type of device, Option 2A will require the following changes to support the OTA firmware update to a Type 1 IHD:

- The existing SRVs 11.1, 11.2 and 11.3 for updating, reading and activating the firmware will be extended to include the Type 1 IHD. This includes the use of a list of up to 50,000 device IDs in an SRV11.1.
- PPMIDs do not hold the remote party certificates; the same is expected to be the case for the new Type 1 IHD. DSP will need to provide the remote party public certificate to the Type 1 IHDs by appending it to the OTA firmware image as described in the Option 2A solution section.
- The processing of the SRVs 8.2 Read Inventory, 8.3 Decommission Device, 8.4 Update Inventory and 12.2 Pre-Notification will need to be updated to support the Type 1 IHD.
- The SSI read inventory screen will be updated to handle the firmware version of Type 1 IHD.
- The SSI Reports RSMI_001 and RSMI_002 will be updated to enable firmware versions to be reported for the Type 1 IHDs.
- The ESI inventory extract for the device table will be able contain a firmware version of the Type 1 IHDs.
- CPL Interface and processing will need to be updated to support the Type1 IHD.

4.2.2 CSP Impacts

This option will require Design, Build, and Test changes to the CSP solutions to support the delivery of firmware images for IHD, PPMID or HCALCS devices to appropriate connected HAN devices. This uplift includes:

- Support the delivery of firmware for HAN devices to the Communications Hub over the SM WAN

- Support the delivery of firmware for HAN devices from the Communication Hub to the connected device over the HAN

There are expected to be two new GBCS use cases to address two areas:

1. A new GBCS use case to allow IHD, PPMID, and HCALCS firmware images to be transmitted to, and stored on, the Comms Hub. If the devices are end-to-end enabled then the software version can be read directly from the devices. The corresponding SR 11.2 can be expanded to support this. It is assumed that this use case will also contain an activation time which the Comms Hub will send to the selected device once downloading of the firmware is complete, rather than a separate end to end activation command as supported by the existing ESME and GSME processes.

2. A new GBCS use case to retrieve the active firmware versions of the devices from the Communication Hub. This will include the Comms Hub storing additional data items to record this information.

In addition, there will need to be new alerts generated by the Comms Hub to support the firmware upgrade process to the devices. In addition, specific new functionality is required in the Gas Proxy Function (GPF) to receive ZigBee Events indicating the device status of the firmware upgrade and transferring them to the CHF to trigger end to end Alerts.

New rules will need to be defined to manage the limited firmware image storage space on the Communications Hubs, and this effort will need to be included in the FIA to define a standardised rule set.

5 Option 2B, Existing OTA Firmware Update Excluding IHDs

Further analysis reveals that within the Option 2 solution there are two possible variations that differ significantly in terms of complexity and cost. The simpler option excludes IHDs from the list of applicable devices. Given that the majority of the IHDs are built as an integrated function of the PPMIDs it is worth evaluating whether building OTA firmware capabilities for the standalone IHDs will be beneficial.

In this option, only PPMIDs and HCALCSs are the valid mandatory HAN devices for OTA Firmware upgrade. PPMIDs and HCALCs are Type 1 devices and already have entries on the CPL, with hash as an optional field.

In this option, DCC Data Systems will be modified such that the existing SRVs 11.1, 11.2 and 11.3 for updating, reading and activating the firmware will be extended to include PPMIDs and the HCALCSs. This includes the use of a list of up to 50,000 device IDs in an SRV11.1.

HCALCSs hold the remote party certificates and the firmware image and therefore it will be possible for these devices to verify the sender of the OTA Firmware image.

PPMIDs do not hold the remote party certificates. DSP will need to provide the remote party public certificate to the PPMIDs by appending it to the OTA Firmware image as illustrated below.

The existing OTA Firmware image structure is:

OTA Header || Manufacturer Image || Force Replace || 0x40 || Authorising Remote Party Signature

The revised OTA Firmware image structure for PPMIDs will be:

OTA Header || Manufacturer Image || Force Replace || 0x40 || Authorising Remote Party Signature || Cert Len || Authorising Remote Party Public Cert

The **Cert Len** (Length of the Certificate) and the **Authorising Remote Party Public Cert** will be added by the DSP prior to passing the command to the CSPs.

Note that the hash value is calculated over the “Manufacturer Image” part of the OTA image.

DSP would need to change the validation checks for SRV 11.1 to enable these device types to be usable in firmware updates, including validation associated with code W110101. (Note that this is a warning rather than an error).

5.1 Comparison of Option 1, 2A, and 2B System Impacts

Both options would require development by manufacturers under the direction of Service Users and would likely not be supported by any HAN devices that have been deployed to date.

Overall the second option is a simpler, more cost effective approach for the Service Providers, which matches the majority of devices being produced currently. There would be changes to Technical Specifications, costs for CPA, and a major concern that no such devices exiat, but the recommendation of DCC and the Service Providers from the basis of a system oriented design, build, and test view, is to progress with Option 2A. Users have

largely deployed more capable HAN devices than the ZigBee only IHDs that this Modification is designed to support firmware delivery to. As a result, there is a proven capability that is in Production today to deliver meter firmware that could be adopted by further HAN device development. We would expect that this is a better value for money solution with a faster time to market (as device development is required in both options).Existing PPMID devices, whilst not fully supportive of the ESME/GSME model of firmware deployment, do support some forms of GBCS communication and have some SMKI credentials to authenticate this communication. It is possible therefore that any new devices that require HAN firmware distribution could therefore implement the same mechanism that is in use today by ESMEs with less change to the DCC Total System.

It is likely that Option 2 could be delivered at a lower risk by re-using a solution that has been proven to work in live service and be delivered for a lower total cost noting that an expected HAN device specification change is required for both solution options.

We do not believe that Option 2B will meet the requirements of the Proposer, and we have not provided costs for this option. Hiowever if the Proposer believs this is a valid approach, we can revisit.

The following table summarises the impacted components for each of the options.

Component	Option 1	Option 2A	Option 2B
CPL	No changes to the CPL structure. Updates to CPL interface specification and to the processing of incoming CPL files.	Updates to CPL interface specification and to the processing of incoming CPL files.	No changes.
DUGIDS, DUIS and MMC	Changes to DUIS and MMC XML schemas. New SRV 11.4 for Service Users to send firmware images. New SRV 11.5 for Service Users to read the firmware version from a Device. New DCC Alert types • to indicate failure by a comms hub to deliver a firmware image; • to notify successful firmware activation; and • to report the Devices rejected by CSPs. Changes to SR8.4 Update Inventory, SR8.2 Read Inventory and SR12.2 Pre-Notification.	DUGIDS documentation updates for SR11.1, SR11.2 and SR11.3. Changes to DUIS or MMC XML schema to support the Type1 IHDs. Changes to SR8.2, SR8.3, SR8.4 and SR12.2	DUGIDS documentation updates for SR11.1, SR11.2 and SR11.3.

Request Management	Processing new Service Requests, new validation checks, handling scenarios of the new DCC Alerts etc.	Updates to processing of SR11.1, SR11.2 and SR11.3. Changes to SR8.4 Update Inventory, SR8.2 Read Inventory, 8.3 Decommission Device and SR12.2 Pre-Notification.	Updates to processing of SR11.1, SR11.2 and SR11.3.
Data Management	No changes	Reference data updates to support new Type1 IHD.	No changes
Transform	New GBCS Use case for CHF to read Firmware Version from PPMID/HCALCS/IHD.	Support for Read Firmware and Activate Firmware on PPMID/HCALCS/IHD Changes to GBCS Use Cases.	Support for Read Firmware and Activate Firmware on PPMID/HCALCS Changes to GBCS Use Cases.
CSP SMWAN Gateway	New interfaces (one per CSP) required for sending a firmware image and a list of validated device IDs of PPMIDs, HCALCS or IHDs to the CSP, and for each device the associated CHF to which the request should be directed.	No changes.	No changes.
SSI	Add support for IHD in the Read Inventory screen. Updates to SSI Reports RSMI_001 & RSMI_002 to enable firmware versions to be reported for IHDs.	Add support for Type1 IHD in the Read Inventory screen. Updates to SSI Reports RSMI_001 & RSMI_002 to enable firmware versions to be reported for IHDs.	No changes.
Anomaly Detection	Anomaly detection volume thresholds will apply to the new Service Requests and will be mandatory for SR11.4.	No changes.	No changes.
ESI Inventory Extract	Include firmware version of the IHD in the ESI inventory extract for the Device table.	Add support for Type 1 IHD. Include firmware version of the IHD in the ESI inventory extract for the Device table.	No changes

6 Impact on DCC Systems, Processes and People

This section describes the impact of SECMP0007 on DCC's Services and Interfaces that impact Users and/or Parties. These are expected to impact both whichever solution option is selected.

6.1 Security

The solution presented in this PIA will require a security review, particularly in relation to the solution options that require introduction of a new Device Type and the aspect of key management it necessitates. The costs within this PIA assume that the functionality does not require a specific security solution such as physical or logical separation from other parts of DCC Data System (in the same way as SMKI Recovery and Change of Supplier is separated) and does not require any separation of duty for the purposes of operational support.

The solution must allow for maintenance of any existing product certification such that the product certification can be reasonably extended to include the functionality in this Modification.

Further discussion is required in respect of the security solution prior to progressing to Full Impact Assessment. Solution Options 2A and 2B would include security related effort for device manufacturers.

6.2 Release Approach

Following discussion, this PIA response is based on the possible delivery of SECMP0007 alongside other similar SEC Modification changes as part of a larger release. The finalising and timing of the release will be considered as part of the FIA, but is referenced as the June 2020 release at this time.

6.3 Implementation Approach

Within the Smart Meter Implementation Programme (SMIP), the Implementation Approach is referred to as Transition to Operations (TTO).

This change will be implemented as part of a larger release. It is assumed that the activities required for TTO will be minimal following completion of contractual test phases. Some updated service procedures have been implemented and take part in some form of service role playing in advance of go live.

Any required environment uplifts will take place outside of business hours.

6.4 Application Support

On the basis that updates to configuration will be charged under separate Operational Change Requests, it is not expected that there will be any change to ongoing levels of support as a result of the change. There will need to be some updates to service procedures in advance of the new solution being deployed to the Production system.

Logging and ad-hoc retrieval of HAN firmware transfer history where available should be implemented.

There will be a need to support the generation, processing and storage of CH triggered alerts in relation to progress of transfer of firmware across the HAN for both CSPs. CSP South and

Central has identified the need for this capability due to the expected increase of firmware distribution activities and the expected associated increase in firmware storage contention within the Communication Hub.

6.5 DCC Service Management System (DSMS) Impact

No specific DSMS requirements or changes have been identified for either of the options at this stage.

Two further items will be included in the FIA:

- The CSP Service Desk will require coordination for CH Specialists and will need to understand timings and frequency of downloads
- An requirement to plan and schedule such that the system can avoid Network conflicts and saturation when trying to push out CH firmware downloads at specific same time

6.6 Infrastructure Impact

No specific infrastructure requirements or changes have been identified, but there will be an increase in Service Request volumes as a result of this Modification.

Note that the aggregated impact of many such changes to the DSP solution will ultimately result in a reduction of the available headroom assumed as part of the original DSP agreement. There may be a need to raise a Modification to cover additional compute and storage capabilities to cover this aggregated impact in the future.

6.7 Volumetrics

Around 25 million devices are expected to be made firmware updatable as a result of this change. Firm volumetric estimates have not been supplied but as an illustration: if all of them were to have their firmware updated once per year in batches of 10,000, that will result in 2500 Service Requests per year and associated Alerts.

6.8 Safety Impact

DSP will perform a safety risk assessment of the functional design and will update the DSP Safety and Environment Case deliverables accordingly. These items are updated and re-issued for each major DSP release (at least once annually).

6.9 Billing, Reporting and Performance Measures

For whichever Solution option is selected, the FIA for each Service Provider's reporting solutions will require in-depth analysis to ascertain the impact on Performance Measurement 2 (PM2).

The Category 1 Firmware Payload Service Measure target service level may be impacted by the volumes, and therefore the CSPs expect to review this PM target service level to counteract any risk of meeting PM2; There may be a need to expand the scope of the PM to include the delivery of IHD, PPMID and HCALC firmware, and potentially to include an additional service reporting exemption where a CSP is unable to deliver firmware due to an in-progress delivery of firmware

Potentially an additional service reporting exemption where firmware image data integrity issues are identified may be needed.

At this stage we are assuming that the firmware requests are not to be included in the PM2 measurement/calculation, with no associated costs, but the SPs will need to evaluate the impact and timings for these Firmware downloads. Any changes to the reporting will require design, build, and test.

As noted above, a review is required of whether the CSP's SM WAN transaction billing approach needs to change as a result of this Modification. The current SM WAN transaction charging approach defined in schedule 7.1 does not permit Telefónica to charge for any transactions where transaction charges are within band 2 and that this Modification will further increase the number of transactions expected such that Telefónica will be unable to charge for band 2 transaction. CSP South and Central therefore expects to renegotiate the SM WAN transaction billing approach during the FIA process to something that reduces the complexity and operational cost whilst permitting charges for increased service usage.

6.10 Contract Schedules

Schedules will require modification for both the Central and South CSP regions to reflect the changes necessitated under this Modification. The contract schedules will be updated as part of a CAN which combines schedules updates from other relevant Modifications.

Expected contract schedules to be amended include:

- Schedule 2.1 – to reflect additional requirements related to the delivery of new firmware image types;
- Schedule 2.2 - Modification to the existing PM2 Category 1 Firmware Payload Service Measure;
- Schedule 7.1 – to reflect any payments under this Change Request and to reflect any additional service requests to be billed;
- Schedule 11 – to reflect an uplift to the CH specifications;
- Schedule 12 – to reflect the uplifted technical specification versions (such as GBCS and CHTS).

6.11 Out of Scope

The following items have not been included in the solution options and discussions above and are not included in the costings provided following.

• Any additional hardware or any further hardware modifications.

• Introduction of any new service measures and any associated reporting as part of this Change Request. CSP South and Central have assumed that the DCC-L is expecting the performance of the functionality introduced as part of this Change Request is to be included in the existing PM2 definition.

• Any further modification to the overall process relating to the distribution and activation of meter firmware.

• Telefónica notes that the use of meter emulators outside of the Telefónica PIT environment is now a matter of concern for the DCC-L and that DCC-L has taken steps to assume responsibility for assuring, procuring and advising on the use of emulators if they feel this is relevant. As a result, Telefónica has not considered further meter emulator procurement as

part of this Modification beyond software modifications to assure the Comms Hub functionality within the PIT environments. DCC-L will look to procure Test Stubs which DCC-L considers to be suitable for the SIT and UIT environments and instruct both CSPs in the use thereof for SIT and UIT in a forthcoming CR.

• Testing of any or all Telefónica Test Stubs, including the meter emulator, using the GBCS Integration Test for Industry (GFI) software provided by the DCC-L. All further Telefónica managed development of the meter emulator will be for the purposes of assuring the Communications Hub within PIT and as such, Telefónica does not believe it appropriate to perform any testing using DCC-provided GFI software of any revision as part of this Modification.

• Changes to the specifications for the meter emulator beyond those that Telefónica specifically require to assure the Communications Hub functionality confirmed to PIT.

• Deployment of the firmware to any connected Production Communication Hubs that have been installed in consumer premises. Delivery of firmware will be on a reasonable endeavours basis;

• Deployment of the firmware into manufacturing for newly manufactured Communication Hubs on approval of firmware by DCC Operational Acceptance Board (OAB).

• Any responsibility for HAN connectivity and HAN performance beyond support for the technical specifications by the Communication Hub.

• Any responsibility for the content, quality or compatibility of the messages and firmware updates or any downstream impacts following firmware distribution.

7 Implementation Timescales

Implementation of this change is assumed to follow a waterfall methodology. It is assumed that this change will be implemented as part of the June 2020 release alongside other change requests and the lifecycle duration is expected to take between 6 and 12 months. However this duration will be confirmed as part of the FIA.

7.1 Testing and Acceptance

This change includes the standard test phases as documented in schedule 6.2 and standard exit criteria will apply:

The addition of HCALCS to the scope of this solution will have a material impact on testing the firmware update functionality,

The SPs will need to plan for PIT testing which will be performed against stubbed HAN devices, assumed to be developed and supplied by the meter suppliers, as part of their Workstream testing. Further modification of Test Stubs to support the testing of this Modification across the CSP solution within the PIT environment.

Testing against actual devices will be performed in SIT but is not included in the following estimates at this time. If SIT testing for this modification is interleaved with other SIT testing, there will be an opportunity to save testing effort - there will be a dependency on the device manufacturer providing timely updates to their HAN devices.

Further savings could be made if the timings of the device releases are managed carefully so that one Test Engineer can test all the device types/models with no downtime. Similarly, PIT and SIT regression testing effort can be performed once per release. If a future release contains multiple Modifications, the regression testing can be performed once per release rather than once per Modification.

8 Costs and Charges

The table below details the cost of delivering the changes and Services required to implement this Modification Proposal.

The ROM shown here describes indicative costs to implement the functional requirements as assumed now. The price is presented as a +/-15% range and is not an offer open to acceptance. It should be noted that the change has not been subject to the same level of analysis that would be performed as part of a Full Impact Assessment and as such there may be elements missing from the solution or the solution may be subject to a material change during discussions with the DCC. As a result the final offer price may result in a variation outside of the indicative range.

8.1 Design, Build, and Testing Cost Impact

The table below details the cost of delivering the changes and Services required to implement this Modification.

Implementation Costs							
Solution Option	**Design**	**Build**	**Pre-Integration Testing**	**System Integration Testing**	**User Testing**	**Implement to Live**	**Total**
Option 1	*£12,300,000*			*Not included*	*Not included*	*Not included*	**£12.3m**
Option 2A	*£8,500,000*			*Not included*	*Not included*	*Not included*	**£8.5m**
Supplementary Information							
Implementation cost assumptions	*A. Costs are exclusive of VAT and any applicable finance charges* *B. Majority of the costs above represent labour costs.* *C. Costs provided for Design, Build and Pre-Integration Testing are quotes provided by the Service Providers with specific exclusions of costs as identified above. DCC have reviewed and challenged the costs from the Service Providers to ensure this reflects best price to date.* *D. Costs will be refined during future assessments.*						
Explanation of Implementation Phases	*DCC's implementation costs are provided by implementation phases. The following describes the purpose of each phase:* • *Design: The production of detailed System and Service design to deliver all new requirements.* • *Build: The development of the designed Systems and Services to create a solution (e.g. code, systems, or products) that can be tested and implemented.* • *Pre-integration Testing: Each Service Provider tests its own solution to agreed standards in isolation of other Service Providers. This is assured by DCC.*						

	• *System Integration Testing (SIT): All Service Providers' PIT-complete solutions are brought together and tested as DCC's Total Solution, ensuring all Service Provider solutions align and operate as an end to end solution.* • *User Integration Testing (UIT): Users are provided with an opportunity to run a range of pre-specified tests in relation to the relevant change.* • *Implementation to Live Costs: The solution is implemented into Production environments and ready for use by Users as part of a live service. This service is subject to implementation costs.*

The fixed price cost for a Full Impact Assessment is **£112,434**, and is expected to be completed in 40 days.

9 Risks, Assumptions, Issues, and Dependencies

In the following sections, Risks, Assumptions, Issues, and Dependencies have been identified.

9.1 Risks

Ref.	Area	Description	Impact
MP07-RD01	HCALCS	Is the addition of HCALCS to the scope warranted in terms of the business case? How likely are we to need HCALCS firmware updates? It should be noted if issues with HCALCS firmware occurs, the only way to resolve these is via exchange of the HCALCS. This mandates an installer attending the site; inclusion of the HCALCS in SEMP0007 mitigates these costs	H
MP07-RA02	General	Any changes to the scope or interpretation of the items in scope will require re-assessment	M
MP07-RD03	Non Functional Requirements	Without a detailed provision of Non Functional Requirements (NFR), particularly relating to expected frequency and extent of firmware upgrades, it will be difficult to assess network and other infrastructure requirements.	M
MP07-RD04	Non Functional Requirements	Without a detailed provision of Non Functional Requirements (NFR), particularly relating to monthly volumes will be difficult to assess PM2 implications.	M
MP07-RD05	CSP North	In the event that allocating 5 additional channels is not possible due to conflicting demands on bandwidth in the CSP North solution, there is a further risk that CSP North will need to install additional masts and base stations to support the need for additional bandwidth. Note there is a suggestion that updates can be time-multiplexed on a single physical change.	M
MP07-RT01	Technical Specifications	The technical specifications (including GBCS, SMETS and CHTS) associated with the functionality described in this Modification have not been developed, nor have the change resolution proposal (CRP) that would normally be developed to specify new functionality in the technical specifications. As a result, there is a risk that the design effort and duration required to deliver this Modification will increase. Telefónica would expect to review this Impact Assessment following review of the technical specifications should there be a material difference between the information provided to date and the technical specifications. One approach would be to arrange for the formal documentation of the modifications to the technical specifications via CRP / IRP prior to the completion of the Impact Assessment of this Modification	M
MP07-RT02		There is a risk that due to there not being any clear, granular NFRs for firmware delivery within this	

		Change Request, Telefónica will need to revise the PM2 target service level as part of this Change Request. Telefónica will review the viability of maintaining the current PM2 target service level as part of the Impact Assessment. Note that the NFRs provided as part of this Change Request are: - based on an assessment of usage prior to deployment in live; - defined at an annual granularity. This is not a sufficient granularity to determine system capacity. Wider discussions have been taking place with DCC demand management regarding the existing demand planning and providing hourly breakdowns on key service requests which would include firmware delivery. - have not been provided by Service Users as part of a demand forecasting exercise.	
MP07-RT03		There is a risk that increasing the number of devices that can receive firmware images on the HAN via the Communication Hub may result in image storage contention on the Comms Hub and therefore limit Telefónica's ability to meet PM2 in relation to firmware distribution without either overwriting firmware images before they have transferred. Telefónica expects to mitigate this risk by introducing a service reporting exemption for PM2 where the Communication Hub cannot download the firmware image within the PM2 timeframe due to storage contention.	Open
MP07-RT11	DCC-L	There is a risk that extending firmware upgrades to HAN devices that are distributed amongst consumer premises and directly interacted with consumers may result in additional failure modes through consumer manipulation of devices (e.g. removing the power supply). IHDs must be mains powered, so this is most likely a risk for PPMIDs. From a Telefónica perspective, this may result in an increase in the number of tickets regarding HAN communication failure. Telefónica cannot accept liability for indirect or consequential losses which arise in respect of this risk.	Open
MP07-RT12	DCC-L	There is a risk that DCC's overall timeframe for the June 2020 release is not viable given the current Change Request approach of considering each Change Request in isolation rather than as a single delivery. Telefónica recommend that the DCC-L attempt to mitigate this risk via the following points prior to any request to start the Impact assessment process:	Noted

		- confirm the scope of the solution; - progress with a single Impact Assessment containing only the confirmed scope for the June 2020 release; - provide a single list of all solution related and test related clarifications; - confirm the expected Change approval timeframes; - confirm the expected PIT exit timeframes.	
MP07-RT13	DCC-L	There is a risk that the timeframe for the delivery of this Modification and that of DCC CR1047 (assumed to be delivered via as part of a maintenance release) in accordance with the DCC defined Firmware Management Policy will overlap. If this is the case, this may add significant complexity to the delivery of this Modification and potentially affect delivery timeframes.	Open
MP07-RT14	DCC-L	There is a risk that the PIT approach for this Modification may change as there have been no requirements on Testing aspects as to how the solution is to be assured during the PIT timeframe. Assumptions on both the PIT approach and firmware merging approach have been made below.	Open
MP07-RS20	Option 2A	PPMID devices can have multiple suppliers, which implies there is a need to support two sets of supplier certificate trust anchors as well as two sets of device certificates This adds the obligation for IHD manufacturers to pre-load Supplier or ACB certificates. In the case of preloaded ACB certifcates it needs establishing how the second supplier can load their certificates.	Open

9.2 Assumptions

It is likely that further assumptions will be established as part of the FIA.

Ref.	Area	Description	Accept
MP07-D01	Option 1	It is assumed that the DSP will keep track of which individual PPMIDs, HCALCS and IHDs have upgradeable firmware and block firmware upgrade requests to older devices which cannot support upgrades. GBCS version information will be used for IHDs where it is available, however the DSP does not currently record firmware version for IHDs and in such cases the IHD will be assumed to have non-upgradeable firmware. For any cases where IHDs are already in the inventory, before the DSP release, are later-model devices which do have upgradeable firmware, suppliers would be able to use	Open

		SR8.4 Update Inventory to change the inventory firmware version of the IHD, which would be permitted in such cases.	
MP07-D02	Option 1	If a CPL update removes validity for an IHD firmware version, IHDs using it cannot be suspended since IHDs do not have device status. The effect of the CPL removing validity would be that new pre-notifications or firmware upgrades for that firmware version would be blocked, but devices already using it would not be affected.	Accepted
MP07-D03	Option 1	The expectation is that within the Comms Hub the implementation will use the ESI of the GPF. We assume that it is the CSPs' responsibility to verify that this will work even if there is no gas meter on the HAN, or the device is not joined to the GPF, and that there is no requirement for the DSP to check whether the device is joined to the GPF.	Open
MP07-D04	Option 1	Although not identified in the requirements above, we understand that it is expected that a single physical device may contain PPMID, IHD and CAD functionality, with a single device ID. It is assumed that in this case the device model would be identified on the CPL as a PPMID, and correspondingly an individual device would be pre-notified as a PPMID. The inventory would store a record of the device as a PPMID and would have no record of the existence of the IHD or CAD functionality of the device. Any firmware update would be just to the PPMID, again with no separate identification of the IHD.	Open
MP07-D05	Option 1	It is assumed that no change is required to CPL processing to handle firmware updates which are split across two or more images. Each will have a separate CPL entry with a unique firmware version ID and hash for that fragment, and there will be no identification in the CPL or the DSP database that the firmware versions are components of a multi-part firmware version.	Accepted
MP07-D06	Option 1	The CPL will contain no more than one entry for a firmware version. If a firmware version is compatible with more than one GBCS version it will be reported in the CPL for only one of them. This seems to contradict current CPL rules were some meter are associated with two GBCS versions.	Open
MP07-D07	Option 1	Currently hand-held devices are pre-notified as IHDs. However this will not	Open

		work if a CPL-compliant IHD firmware version is required in the pre-notification message. A revised approach to managing hand-held devices may be needed as a result of this change. This is not currently included in the scope of this assessment.	
MP07-D08	Option 1	The original requirements of Option 1 state that there will be an alert which indicates "IHD / PPMID image successfully downloaded". It is assumed that this refers only to successful download of an intermediate part of a multi-part firmware download, and that for a future-dated update there will be no device alert until the trigger date is reached and the update is activated.	Accepted
MP07-D09	Option 1	Although not identified in the requirements above, we assume from workshops that there will need to be a device alert from the comms hub to the ACB if delivery of a firmware image from the comms hub to the target PPMID, HCALCS or IHD has failed, for example because the firmware image was deleted due to a higher-priority firmware image for another device.	Accepted
MP07-D10	Option 1	Where delivery of a firmware image has failed and the comms hub sends a device alert to the ACB, there will be no attempt by the CSP or DSP to retry delivery. It will be the supplier's responsibility to re-request delivery.	Accepted
MP07-D11	Option 1	Anomaly detection volume thresholds will apply to the new service requests and will be mandatory for SR11.4 (in a similar way to SR11.1).	Accepted
MP07-D12	Option 1	The DSP will not manage the state of in flight requests, for example if an ES and a GS send firmware updates for the same device at about the same time, the DSP is not required to prevent that situation and will simply forward valid requests as they are sent.	Accepted
MP07-D13	Option 1	The new DCC Alert which is to be sent to suppliers when firmware for a PPMID or IHD is successfully activated or downloaded will go to all interested suppliers. In the case where it indicates successful download of part of a multi-part firmware update, the SECAS information appears to suggest that the firmware successfully downloaded will not be identified in the device alert which is sent (as only the currently active version will be sent). This means that if two suppliers are trying to upgrade firmware for the same	Accepted as will be covered by SECMP0024

		IHD or PPMID at about the same time, the DCC Alert will not enable the suppliers to determine that it might not be their own firmware image which was successfully downloaded.	
MP07-D14	Option 2A and 2B	The Modification notes that Option 2A and Option 2B may require the consumers to plug a battery powered device into the mains supply before transferring and activating the firmware image. The firmware update process will need to handle exceptions generated by a loss of power during firmware distribution and activation. The PIA assumes that this will be handled outside of the DSP solution.	Accepted, only applies to the PPMID
MP07-D15	Option 2A and 2B	It is assumed that the proposal for the Access Control Broker (ACB) to add Supplier certificate information to commands sent to PPMIDs will be acceptable from a security perspective	Open. SSC agreed with option 1 which does not require to add ACB certificates to the devices. Option 2a needs to reviewed by SSC
MP07-D16	Non Functional Requirements	For volumetric calculations, assume two firmware upgrades per device per year	Rejected, Solution Design states one per device per year
MP07-A24	CSP North Volume	It is assumed that 5 channels of additional Spectrum are required to support Firmware downloads of devices. The network has been sized for the current expectation of traffic volumes and will be reviewed during IA stage. We will require confirmation of the number of Firmware downloads if a FIA is requested.	Open
MP07-A25	Priority	A new priority will be configured in the CSP networks that would prioritize ESMEs and GSMEs over IHDs, PPMIDs, and HCALCS.	Accepted
MP07-A26	CSP Operations	No new Service Levels or Performance Measures will be required.	Open
MP07-A27	Comms Hub	Assumed no impact to CH Memory. If CH Memory is impacted CSPs will need to investigate alternative approaches such as Image Compression and/or the	Accepted

		management of ESME, GSME, PPMID, HCALCS, and IHD firmware downloads to avoid concurrent images. These alternatives are not included in the RoM or IA production cost.	
MP07-A28	Service Management	Assume that no additional Incident Management will be required to support these Firmware downloads. Should the chosen solution create the need for additional incidents then an assessment of resource levels would need to be undertaken as part of the IA.	Accepted, this should be standard Incident Management.
MP07-AT-1	Firmware Image	Any firmware images that are deployed as part of functionality within this Change Request will match the current ESME / GSME firmware image sizes	Accepted
MP07-AT-2	Service Reporting	CSPs assume the following for service reporting of the functionality associated with this Modification: - To be included within the existing PM2 Service Measure - Telefónica may review and amend the PM2 target service measure as required - A period, the duration of which to be defined, of monitoring service performance after the introduction of this Modification into the Live environment during which there will be a let on the PM2 target DCC is supportive of new PM2 service reporting exemption(s).	Open
MP07-AT-3	Specifications	Assume that the scope of the PIT Approach uplift required to support this Modification is limited to changes that are required to assure the specifications as noted above and do not introduce any additional scope including but not limited to: - Distribution of firmware using new service request to updated PIT emulator - Distribution of multiple firmware jobs in succession using both existing and new service requests - Confirmation of correct billing behaviour - Confirmation of correct service reporting and service reporting exemption behaviour - Potential introduction of multiple testing phases to consider reporting as	Accepted

		a separate phase to all other aspects to occur after formal PIT exit / SIT entry	
MP07-AT-4	Changing Specifications	Assume that when the associated TSG specifications and / or CRPs / IRPs to support specification change for this Modification are defined such that there will be no material changes from the documentation referenced above.	Accepted
MP07-AT-5	DUIS Version	Assume that the DUIS schema version used for the CSP management interface will not be required to increment because of this Modification. If this is not the case, then there will be additional effort to load the updated DUIS schema into Telefónica systems and to regression test this functionality in PIT.	Open
MP07-AT-6	Firmware Change	Assume that the firmware changes to support the delivery of this Modification will be managed as part of a DCC release operating in parallel with the maintenance release process.	Open
MP07-AT-7	Specifications	Assume that modifications to the GBCS, SMETS, and CHTS specifications will be based on a baseline in place and established by the time this Modification is implemented.	Open
MP07-AT-8	Emulator Devices	Meter emulator functionality modification to support this Modification is required for PPMID OTA when connected via a meter (rather than direct to the CH). Note that the meter emulator used in the Telefónica PIT environment does not currently emulate interactions with an IHD. If the Working Group believe that IHD testing beyond that detailed in this Modification is required, then this needs to be flagged and added to the scope prior to the FIA creation.	Open
MP07-AT-9	Firmware Image Validation	Assume that the cryptographic validation required by the CSP solution for device images is the same as that currently in place for meter firmware, namely hash integrity checks only	Open
MP07-AT-10	Firmware Storage Prioritisation	Assume that HAN device firmware storage prioritisation rules for implementation in the Comms Hub specifically regarding overwriting stored images on the Comms Hub with a new SMWAN download will be limited to rules of the following complexity: 1. Existing firmware image has been stored on CH for a maximum defined duration and is eligible to be overwritten; 2. No HAN device has attempted to retrieve the original firmware image or	Accepted. If no firmware upgrade is in place the a new SMWAN download can be started (subject to a reasonable timeout for devices on

		any parts of the firmware image following download across the SMWAN; 3. There is currently no firmware image transfer across the HAN in progress; 4. Use of the force replace flag to override firmware storage, except in case 3, when force override will occur after HAN image transfer is complete; 5. Storage of new ESME / GSME firmware will overwrite CH stored IHD / PPMID / HCALC images, except in case 3 where HAN image transfer needs to complete before overwriting.	the HAN to react
MP07-AT-11	CSP Queuing and Prioritising	Assume that the DSP will implement a firmware service request prioritisation approach as follows: - Firmware SRs will be throttled such that there is only one firmware service request per active Communication Hub in progress within the CSP. - Progress in determining whether a Comms Hub has an in-progress firmware SR. This will be measured by the monitoring from the point at which a firmware service request is received for a specified Comms Hub until a GBCS defined alert associated with receiving a firmware image is sent from the HAN and received by the DSP. - The DSP will implement a per Communication Hub timeout for a period that will be agreed with the CSPs to override any throttling by the DSP. It should be noted that a DCC Change Request has been raised to allow DSP to deploy a capability that will serve to throttle and queue firmware distribution SRs to the CSP by limiting Service Requests sent by Service Users such that only one firmware distribution activity is in progress per CH at any point in time.	Open
MP07-AT-12	Service Request Management	Assume that Service Request compatibility across HAN devices including the Communications Hub introduced by this Modification will be managed by an upstream system / party (e.g. DSP / Service User) such that Service Requests to deploy HAN device firmware for HAN devices that do not support this type of operation and not sent to the CSP	Open

MP07-AT-13	Device	The CHF created Device as described in the Requirements above, is a GBCS defined alert sent from the CHF to the DSP directly over the SMWAN.	Open
MP07-AT-14	Testing	Assume that later phases of testing will from a testing perspective include the following as a minimum prior to any Go Live of the functionality delivered in this Modification: - System Integration Testing; - User Integration Testing; - Operational Acceptance Testing; - Business Acceptance Testing - Security Testing	Open
MP07-AT-15	Firmware Images	Assume that the DSP solution will be updated to validate the structure and integrity of the firmware images supported as part of this Modification	Accepted, but needs to be verified by DSP
MP07-AT-14	Firmware Images	Firmware image sizes will not exceed 750Kb and will be prevented from transmission to Telefónica's solution by the DSP should they exceed this. This contradicts the requirements and should be investigated. The suggestion is that larger images must be supported.	Open
MP07-AT-21	PIT	Confirm expectations regarding the PIT Test approach for this Modification in relation to the scenarios and variants to be used in PIT testing. It is assumed the current PIT test approach as used for the testing of maintenance releases of Firmware will be sufficient for the testing of this Modification.	Open
MP07-AT-22	CSP Queuing and Prioritisation	CSP provision of support for queuing and prioritising specific types of firmware distribution over other types. It is assumed the DSP will deploy a capability that will serve to throttle firmware distribution SRs to the CSP by limiting Service Requests sent by Service Users such that only one firmware distribution activity is in progress per CH at any point in time.	Open
MP07-AD-30	Comms Hub Device	Assume there is no option to upgrade memory on the Comms Hub.	Accepted

9.3 Issues

None at this time.

Ref.	Description	Mitigate?

9.4 Dependencies

Ref.	Org	Dependency	Impact
MP07-DD1	GBCS	There is a dependency on provisioning of two new GBCS use cases for Option 1. This has a high impact on the timescales.	Timescales and Cost
MP07-AD2	GBCS	CH development is currently based on the GBCS 2.0 Draft 5. At the time of writing this is the latest version of GBCS as per the Agreement. However, GBCS 3.2 Is planned to be released in November 2019.	GBCS Version for Baseline
MP07-DT-1	DCC-L	CSPs have a dependency on the DSP sharing a version of any updated interface specification during the early design stages such that CSPs can review and incorporate the specification into system designs	Telefónica will not be able to complete design activities in alignment with any provided delivery plan
MP07-DT-2	TEF	Telefónica has a dependency on the implementation of the next major release of Telefónica's Smart m2m solution to support the deployment of this Modification whilst maintaining the existing service obligations as the solution continues to be deployed. Should the timeframes for the deployment of the next Smart m2m (Telefonica application) version make the delivery of this Modification to support a June 2020 Go Live not feasible, Telefónica will review the feasibility of delivering this Modification without the Smart m2m release.	Telefónica assume that DCC-L will be amenable to a temporary let to a number of Service Measures (to be determined during the FIA process) where it is required to meet the timeframes of this Modification.
MP07-DT-3	DCC-L	Telefónica has a dependency on the DCC-L providing technical specifications or CRPs/IRPs related to any additional GBCS functionality related to this Modification prior to agreement of the Impact Assessment associated with this Modification.	Telefónica will produce an impact assessment based on the material provided however this may include (1) additional planned delivery time to review and assess specifications and (2) retaining additional contingency related.
MP07-DT-4	DCC-L	Telefónica have a dependency on DCC-L arranging for uplifted specifications (which may include GBCS, SMETS , and CHTS) to be added within the following documentation prior to Telefónica deploying any Production firmware variants under this Modification attempting into the Production environment:	Firmware versions compliant with the GBCS version associated with this Mod cannot be submitted to the CPL if the CPL template does not support the specific GBCS version and therefore cannot be

		- CPL template - SEC schedule 11 installation and maintenance validity periods Noting that the concepts that are introduced in SEC schedule 11 have not currently been incorporated within Telefónica's CSP contract	pre-notified or OTA'd onto installed Comms Hubs If the SEC schedule 11 has not been updated, then the DCC will be non-SEC compliant should Telefónica deploy any Communication Hubs operating a firmware version associated with this Modification in the Production environment.
MP07-DT-5	DCC-L	Approval of Telefónica's Impact Assessment for DCC CR1013	Telefónica will be unable to support the reduced step upgrade approach introduced within CR1013
MP07-DT-6	DCC-L	Development of the key principles relating to the following areas during the FIA: - CSP/DSP interface - CH storage prioritisation rules	TBD
MP07-DD-8	DSP and DCC	A separate DCC Change Request has been raised to allow DSP to deploy a capability that will serve to throttle and queue firmware distribution SRs to the CSP by limiting Service Requests sent by Service Users such that only one firmware distribution activity is in progress per CH at any point in time.	This will be required to implement Solution Option 2.

9.5 Clarifications

The following clarifications have been requested. which may require Telefónica to review the fixed price for the Impact Assessment and the ROM cost for the future activity contemplated as part of the Impact Assessment. These clarifications must be provided, considered and where relevant incorporated prior to the issue of an Impact Assessment Approval Notice in relation to this Modification, in the following areas noted in the table below:

Ref	Area	Clarification	Impact	Status
C_2	Specification	Provide the technical rules on firmware storage prioritisation within the Communication Hub	Needs to be provided for a complete and more accurate FIA	Open
C_3	Requirements	Confirm the functional requirements on the DSP in limiting multiple requests through to CSP systems per CH	Telefónica assume the DSP behaviour is as noted in dpendency MP07-DD-8 above.	Open
C_4	Firmware approach	DCC-L to confirm expectations regarding how	TBD	Open

		Communication Hub firmware is to be developed and tested for this Modification in relation to firmware developed as part of the firmware maintenance policy.		
C_5	Firmware approach	DCC-L to confirm expectations for how any firmware developed as part of this Modification and delivered as part of a programme release will incorporate any modifications that have been delivered via maintenance releases	Telefónica assume that: Code deployed into PIT for this Modification will be branched off a version of firmware that is delivered via the Firmware Management Process; Defects identified in Prod during PIT will not prevent PIT exit or SIT entry if the fixes are not in the codebase used in PIT. Telefónica expect a SIT test cycle will be used to assure this (outside of the scope of this Modification); The Communication Hub firmware used to exit PIT will be a merge with whatever version of FMP code production candidate if Telefónica unilaterally view this to be reasonable and possible to merge in the timeframes for testing within the PIT window; PIT exit and SIT entry criteria will not use FMP / OAB criteria and in particular defect masks will relate only to the functional change in the scope of the Modification; PIT exit and SIT entry is driven only by the production codebase maturity and does not consider not RTL / ITCH variants; Regression test will include all test products.	Open

C_6	Requirements	DCC-L to confirm how delivery of OTA firmware images to IHD/PPMID/HCALC devices will operate on a Sub GHz HAN, with particular reference to treatment of the OTA during limited and critical duty cycle scenarios.	Telefónica assume that OTA will be suspended during any period when the Sub GHz HAN is in limited or critical duty cycle mode.	Accepted The firmware upgrade to IHD/PPMID/HCALCS must respect the Sub-GHZ rules for the HAN pted.
C_7	Firmware Image Size	We understand that the Firmware Image Size for an ESME is anything up to 750KB, and a GSME is slightly smaller. Are figures available for the HAN devices?	Working on assumption that these images would not exceed 750KB would simplify workings significantly.	Open SECAS state that current ESME and GSME firmware image size may exceed 750 kB; where this is the case the firmware is broken into multiple segments which are treated indepently and are listed individually on CPL. The Suppliers must send the individual segments in the required order and the meter's duty to reassemble the full firmware image from the segments. The same process must be followed by SECMP0007
C_8	Comms Hub Memory	Is extra memory required such that an ESME or GSME download is not interrupted during downloads?	Device specifications might be impacted.	Rejected. SECAS suggestion xMSE updates always take priority over IHD/PPMD/HCALCS updates at any time. If necessary the IHD/PPMI/HCALCS update can be be purged from the CH memory However DSP prioritisation and queuing should eleiminate this concern

Appendix A: Glossary

The table below provides definitions of the acronyms and terms used in this document.

ACB	Access Control Broker	HCALCS	HAN Connected Auxiliary Load Control Switch
API	Application Programming Interface	IHD	In Home Display
CAN	Contract Amendment Note	OAB	Operational Acceptance Board
CH, Comms Hub	Communications Hub	OTA	Over The Air
CHF	Comms Hub Function		
CHTS	Communication Hubs Technical Specification	MMC	Message Mapping Catalogue
CoS	Change of Supplier	PIA	Preliminary Impact Assessment
CPA	Commercial Product Assurance	PIT	Pre-Integration Testing
CPL	Certified Products List	PM2	Performance Measurement 2
CR, CRP	Change Request, BEIS Change Request	PPMID	PrePayment Meter user Interface Device
CSP	Communication Service Provider	ROM	Rough Order of Magnitude
DCC	Data Communications Company	SEC	Smart Energy Code
DSP	Data Service Provider	SIT	Systems Integration Testing
DUGIDS	DCC User Gateway Interface Design Specification	SMETS	Smart Metering Equipment Technical Specification
DUIS	DCC User Interface Specification	SMI	Smart Metering Inventory
DSMS	DCC Service Management System	SMIP	Smart Meter Implementation Programme
ES	Electricity Supplier	SMKI	Smart Meter Key Infrastructure
ESI	Energy Service Interface	SMWAN	Smart Meter Wide Area Network
ESME	Electricity Smart Metering Equipment	SP	Service Provider
FIA	Full Impact Assessment	SR	Service Request
GBCS	Great Britian Companion Specification	SRV	Service Request Variant
GFI	GBCS Integration Test for Industry	SSC	Security Sub-Committee
GPF	Gas Proxy Function	SSI	Self Service Inventory
GS	Gas Supplier	TSIR	Technical Specification Issue Resolution Sub-Group
GSME	Gas Smart Metering Equipment	UIT	User Integration Testing
HAN	Home Area Network	WAN	Wide Air Network

Appendix B:System Impacts, Requirement Traceability Matrix

At the highest level, the changes to the DCC Total System for Option 1 mapped to the specific requirements would be as follows:

1.	In Home Displays (IHDs) to be added to the Certified Product List (CPL).	IHD to be added to CPL This will mean a change to the CPL interface spec and to the processing of incoming CPL files. Hash for both the images to be added to CPL Enable a firmware hash to be recorded for a PPMID. Currently hash is treated as optional in CPL data, and there is no specified behaviour to prevent a hash being provided for a PPMID, but none are expected. No change is expected to the structure of the CPL, only to the permitted data types and validation
2.	Manufacturer Image Hashes associated with IHDs, PPMIDs and HCALCS to be added to the CPL.	To guard against corruption of images and needless distribution of corrupt images, Manufacturer Image Hashes associated with device CPL entries would be added to the CPL. The hash checking would then be undertaken by the Supplier and DCC as part of Service Request generation and processing. ZigBee Assurance Certificates, SMETS/GBCS versions and contact details would need to be provided to the Panel, along with IHD Device Model details in line with the DUIS.
3.	Suppliers to send firmware updates to IHDs, PPMIDs and HCALCS.	SMI to be updated to maintain firmware version for PPMID, IHD, and HCALCS. The following SRs will be impacted: - Device Pre-notification - Update Inventory - Read Inventory
4.	The DCC to notify all Responsible Suppliers at certain stages of the associated processing of firmware updates.	New DUIS request(s) required that enable Responsible Suppliers to upgrade Firmware. Will also contain activation date and time – no separate DUIS request for activation. New DUIS Alerts to notify all responsible suppliers when: - IHD / PPMID / HCALCS image successfully downloaded

		- IHD / PPMID / HCALCS image successfully activated (or stored an image > 750K and not the last fragment). given that the devices may communicate with both GSME and ESME, both Import Supplier(s) and the Gas Supplier Associated with the Communications Hub would be able to update a PPMID, IHD or HCALCS Firmware, and be notified at key stages of processing. All Suppliers would be notified at the following stages of processing: a) When the DCC has successfully processed a Service Request for an image's distribution; and b) When the IHD / PPMID / HCALCS has attempted to activate new firmware (or attempted to store a part of a firmware that is greater than 750KB).
5.	The DCC and Responsible Suppliers to check the latest firmware version on IHDs, PPMIDs and HCALCS.	See impacts related to Requirement 3 To enable this, a new 'Read IHD / PPMID HCALCS Device Model' via the CH' Service Request would be needed (provisionally numbered 11.5). This would result in a Command to the CHF. On receipt, the CHF would query the device and create a Response containing the values provided by the device (or error values if no response is received from the device after [30] seconds)
6.	Rules around sharing capacity and buffering on the Comms Hub.	Rules around sharing capacity on the Communications Hub and buffering would need to be introduced: this is because the proposal is that there would not be additional buffer capacity on Communications Hubs to store PPMID and IHD images
7.	SRs supporting the maintenance of the Smart Metering Inventory (SMI) to be revised.	Service Requests supporting the maintenance of the SMI would need to be revised: The SEC Device Model (including Firmware Version) for IHDs would need to be maintained on the SMI. Three Service Requests supporting the maintenance of the SMI (1. Device Pre-notification, 2. Update Inventory, 3. Read Inventory) would be affected by the adding and updating of related PPMID, IHD and HCALCS information on the SMI

8.	Additional CH functionality.	Support image prioritisation, the activation date-time mechanism, the reading of Device Model details from PPMIDs, with corresponding support for additional Alerts, Commands and Responses.
9.	Firmware update support capability will need to be mandated on IHDs, PPMIDs and HCALCS installed after this modification is implemented.	Correspondingly, the GBCS would mandate ZigBee OTA cluster support on PPMIDs and IHDs. Note that, by definition, already installed Devices cannot be required to support this change, since there is no required mechanism to update them.
10.	Local firmware updates will be banned following the implementation of this modification.	No impact

This document is classified as **White** in accordance with the Panel Information Policy. Information can be shared with the public, and any members may publish the information, subject to copyright.

SECMP0007 'Firmware updates to IHDs and PPMIDs'

Annex C

First Working Group Consultation responses

About this document

This document contains the full non-confidential collated responses received to the first SECMP0007 Working Group Consultation.

Question 1: Will your organisation be impacted due the implementation of this modification?

Question 1			
Respondent	**Category**	**Response**	**Rationale**
E.ON	Large Supplier	Yes	The implementation of this modification will result in changes to: • IT infrastructure; • Operational Processes; and • Contractual arrangements In addition, there may be impacts to any such Devices installed prior to the implementation date should the ban for Local Updates be applied to non-upgradable Device. This however is unclear to us from the Modification and we would welcome clarity around this point.
EDF Energy	Large Supplier	Yes	As an Energy Supplier we would be impacted in 2 ways: • We would need to ensure that the relevant devices that we procure and install are able to meet the revised Technical Specifications that would be implemented as a result of this Modification. However we understand that while many of the current IHDs/PPMIDs are being built with a firmware upgrade capability, it is just that this cannot be accessed via DCC services and so is 'switched off'. • We would need to make changes to our systems and processes to manage firmware across the extended range of devices. This would include changes to our interfaces with the DCC systems in order to deploy firmware to the extended range of devices, as well as changes to processes to track and manage firmware versions. We would hope that we would be able to align the processes for managing firmware in the new devices with those that we use for other devices, and specifically meters, wherever possible.

Question 1			
Respondent	**Category**	**Response**	**Rationale**
Npower	Large Supplier	Yes	Yes, this provides a positive impact as it increases control of customer facing devices and reduces operating cost risks. Given the maturity of the SMETS and GBCS specifications, it also provides mitigation for firmware management risks.
Scottish Power	Large Supplier	Yes	The implementation of this proposal would have both positive and negative impacts on our business: i.e. it may be beneficial to have the facility to upgrade IHD / PPMID firmware using the OTA process, but we would need to implement costly new service request functionality in our IT solution. Implementation would also be an unwelcome distraction from our other rollout activities.
SSE Energy Supply	Large Supplier	Yes	Implementation of this modification will have an impact upon systems and processes within our organisation.
Utilita	Large Supplier	Yes	The ability to update IHD/PPMID firmware may reduce the number of site visits we are required to perform to fix/replace faulty devices. This also means that overall fault resolution time may be brought down. We would always prefer a scenario where we can fix an issue remotely, as opposed to going through the timely and disruptive process of organising and fulfilling a site visit. The modification would also fundamentally change how we view our IHDs/PPMIDs that are in the field. The ability to update firmware remotely means that we could theoretically

Question 1			
Respondent	**Category**	**Response**	**Rationale**
			innovate in this area and improve the experience for the customer through introduction of new features. There is likely to be minimal impact on our BAU activities.
SSE Networks	Network Party	Yes	The working group has assessed that Electricity Distributor parties will not be impacted by this modification. Whilst this may be true of the specific functionality proposed it is inevitable that overall system performance may be affected which in turn will impact SSEN. It may be possible that DCC to SSEN services will be impacted by new functionality delivered by this change. These may be in terms of our ability to communicate with a meter whilst an IHD or PPMID firmware upgrade is in progress. The solution does not yet seem sufficiently developed to enable us to understand the impact of this change on the service that will be delivered to SSEN. We expect the final design of this modification to deliver a solution that has little or no impact on the level of service delivered to SSEN. SSEN may need to make minor system changes to facilitate this modification. It is possible that this modification will create issues associated with the management of data capacity on the DCC's systems. Given that users are "blind" to system component capacity constraint we require further information from the modification working group regarding how capacity and any potential conflicts/ user priorities will be managed. We will inevitably incur increased DCC charges (see Q2).
Chameleon Technology	Other Party	Yes	Our products will be expected to implement the OTA features described in this modification. We will also be expected to continue to support deployed products with firmware updates as appropriate after deployment.
TMA Data Management	Other Party	Yes	There might be some minor system changes required.

Question 2: Will your organisation incur any costs due to the implementation of this modification?

Question 2			
Respondent	**Category**	**Response**	**Rationale**
E.ON	Large Supplier	Yes	The implementation of this modification will incur costs; such costs are not quantifiable until more is known with regard to a) the solution proposed here, and b) the management process adopted by Industry for Firmware changes, specifically in CoS situations.
EDF Energy	Large Supplier	Yes	We would definitely incur costs as a result of the changes detailed in our response to Question 1 but at this stage is not possible to give any indication as to what those costs would be. It is likely that any changes required to devices and/or the DCC systems as a result of this Modification would form part of a wider release which would include other changes – providing costs that are specific to this Modification as if it were to be implemented in isolation from other changes would be very difficult and would provide unrealistic costs. On that note, we believe that the DCC's costs are probably not realistic on that same basis, and are far higher than they would actually be if this Modification were to be implemented as part of a wider package of changes.
Npower	Large Supplier	Yes	Yes, circa £500k. this will involve changes to our DCC gateway, asset management and front end-systems, as well as testing/assurance activities.
Scottish Power	Large Supplier	Yes	As indicated in our response to Q1, we would expect the costs impacts from implementing the SECMP0007 solution in our IT systems to be of a material nature.
SSE Energy Supply	Large Supplier	Yes	Following implementation, we will be able to run OTA which will result in costs for us, but for every device that we are able to OTA rather than replace, we will avoid disruption or adverse consumer experience and reduce the costs of issuing replacement devices.

Question 2			
Respondent	**Category**	**Response**	**Rationale**
Utilita	Large Supplier	No	(Excluding our share of the cost of the modification) We believe that there would be no substantial direct costs to our organisation. There may be some relatively small costs to test new functionality/train staff to utilise said functionality. These costs would likely be accounted for as BAU costs. We believe most of the risk lies with the asset owners (MAPs), but this depends on each Suppliers' contractual arrangement with their MAP.
SSE Networks	Network Party	Yes	SSEN may incur costs associated with a need to make some minor changes to its systems. SSEN do not have sufficient information at this time to determine whether this change will result in specific additional DCC charges. Should SEC parties in future be required to pay charges for individual service requests then it is possible that further additional costs will be incurred. There are potential situations associated with this modification where capacity constraint means SSEN service requests will fail leading to a need to re-issue a command. This will lead to an increase in internal administration costs and may in future be subject to individual service request charging. As a SEC party SSEN will incur higher DCC charges for functionality that will not improve our ability to deliver benefit to our customers.
Chameleon Technology	Other Party	Yes	The extra functionality requires more code space and storage space in our products, increasing the unit cost. The extra development time required to implement and test the features will also add cost. These extra costs have to be taken in the context that there is a significant benefit to having the capability to update assets once deployed. It is not expected that there would is likely to be an increase in the price of assets on a like for like basis.

Question 2			
Respondent	**Category**	**Response**	**Rationale**
TMA Data Management	Other Party	Yes	The cost associated would be very low.

Question 3: Please provide any views or rationale on whether the benefits of the change, outweigh the costs associated with assessing and implementing it. Noting:

questions raised in relation to how many IHDs and PPMIDs will be in use when this modification is implemented; and this will be implemented (if approved) no earlier than Spring 2019.

Question 3		
Respondent	**Category**	**Comments**
E.ON	Large Supplier	We do not understand how the costs proposed have been reached and would welcome a detailed explanation of how DCC arrived at such costs. In addition, the value of this modification is likely to be consumer driven and the use of these Devices across time has not yet been established at Industry. However, it is believed likely that the use of PPMIDs and AIHDs are likely to continue since their use is purpose-driven. At the present time we do not believe that there is sufficient information to inform such a consideration with regard to this modification. We would note however, that we fully support the progression of this modification and the benefits it will bestow upon Industry.
EDF Energy	Large Supplier	We believe that the benefits of this change are likely to outweigh the costs, but we recognise that further detailed analysis needs to be undertaken to determine whether this is the case. As noted in the response to Question 2 we do not believe that the estimated costs that have been provided by DCC are reasonable or realistic, especially as they are based on this being made as a standalone change. Assessing whether this change should be progressed on the basis of these costs is not appropriate. We believe that not being able to upgrade the firmware on additional devices, and especially on PPMIDs and potentially HCALCSs creates a significant risk in relation to those devices. We note that HCALCSs are not currently within the scope of this Modification but many of the risks that this change is looking to address would apply equally to those devices.

Question 3		
Respondent	**Category**	**Comments**
		It should also be noted that in many if not most cases Suppliers are deploying devices that deliver IHD and PPMID functionality within the same device, which for DCC purposes would be registered as a PPMID on the DCC's Inventory. It is not clear how many devices that are purely IHDs will actually be installed – this would need to be understood further. Where it is not possible to upgrade the firmware on a device there is a risk that device may no longer be able to perform its mandated function, or it may not be possible to upgrade that device to include additional functionality which may be required to support the consumer. In the absence of an ability to fix or upgrade a device via a firmware update devices will need to be replaced, which invoices unnecessary cost to consumers, especially should that replacement require a site visit. This is less likely to be the case for IHDs which have limited maintenance requirements, but as noted above in many or most cases Suppliers will be deploying PPMIDs rather than IHDs, with the anticipation that these devices will be more permanent than IHDs – especially where the customer is in prepayment mode. Suppliers will have an ongoing obligation to keep these devices operational that extends beyond the 12 month minimum for IHDs. As noted previously we understand that many of the current IHDs/PPMIDs are being built with a firmware upgrade capability, it is just that this cannot be accessed via DCC services and so is 'switched off'. This would mean that these devices which are provided before 2019 might be capable of receiving a firmware upgrade even if this change is not approved until 2019 – depending on whether this functionality needs to be 'switched on' – if so and this is not possible then these devices would remain incapable Of receiving a firmware update even if the DCC functionality is introduced in 2019 While some of the risks that would cause a device to be replaced might be able to be mitigated through other actions (such as pre-deployment testing) there will always be a residual risk that devices will be stranded and will need to be replaced. We believe that the working group should undertake further analysis which considers what device types are actually being rolled out by Suppliers, what the risks associated with those devices are, and how they might be mitigated. The level of residual risk once these mitigating actions have

Question 3		
Respondent	**Category**	**Comments**
		been taken will indicate whether the costs of progressing this Modification will outweigh the costs – our initial view is that this is likely to be the case.
Npower	Large Supplier	We believe the benefits far outweigh the costs. If we assume that at circa £20 a unit for a PPMID and that by early 2019 we would be a ¼ of the way through the rollout and therefore ¾ of the PPMID population could be upgraded and that ½ the PPMIDs suffer an issue that could be fixed by an OTA firmware upgrade then 54m meters = 27m installed PPMIDS x ¾ x ½ = 10.125m potential PPMIDS that may need an upgrade. If we had to replace those PPMIDS then the benefits would become £202.5m! Also, if a visit is required to replace any of these PPMIDs then the benefits become even greater.
Scottish Power	Large Supplier	The implementation of SECMP0007 is not now expected until Spring 2019 at the earliest; by which time a significant proportion of households can already be expected to have IHD / PPMID units or equivalent deployed. We are concerned, therefore, that the benefits of being able to deliver OTA firmware to these devices are significantly reduced, as this late delivery would mean site visits are not avoided in the interim. Moreover, if the implementation of SECMP0007 was to be pushed out towards 2020, it is likely that only a minimal number of units would ever require this OTA facility during the Relevant Period outlined in the supply licence. In our view, the proposed 2019 implementation date is a consequence of the DCC being unable to divert resources away from its main implementation programme and onto SEC Mods. In our view, then, delaying a decision on SECMP0007 at this time would have no material impact on its subsequent delivery, should we later decide to proceed. We would, therefore, suggest placing this Mod on hold until, say, the second half of 2018, when it could be revisited and a final decision made. We believe, this would require the Proposer to Withdraw the Mod, as the Suspension process only appears to be available to the Panel in very limited circumstances that do not apply in this case.

Question 3		
Respondent	**Category**	**Comments**
SSE Energy Supply	Large Supplier	-
Utilita	Large Supplier	-
SSE Networks	Network Party	There will be no benefit to SSEN from this proposed change. We have no information regarding whether benefits will outweigh the high cost of this change.
Chameleon Technology	Other Party	The ability to OTA update an IHD/PPMID after deployment will provide significant net benefit, by allowing bug-fixes, feature enhancements and security improvements to be applied, rather than needing to recover/replace with new units. The sooner that this change can be implemented the sooner the benefit can be felt. However, once the details are finalised we expect that compatible products may be able to be deployed before the implementation date (subject to suitable testing) on the expectation that the update capability will be able to be used later on. It is key to get the details finalised and the modification introduced at the earliest opportunity in order to realise the maximum benefit from the modification.
TMA Data Management	Other Party	Providing the astronomical cost put forward by the DCC (7.4 to 8.2 Million), no amount of benefit will outweigh that. We find ourselves in a position to reject a change we would otherwise support. This is a major gap in the original design that is unlikely to be addressed given the prohibitive cost put forward by the DCC.

Question 4: If you are a Supplier Party, please provide examples of when you are likely to need to update firmware on IHDs and/or PPMIDs, and how often you expect to do so when this modification is implemented (earliest Spring 2019).

Question 4		
Respondent	**Category**	**Comments**
E.ON	Large Supplier	Based on today's landscape and our experience of SMETS1s, we believe that a minimum of two firmware updates per annum would be required to these Devices.
EDF Energy	Large Supplier	Based on our experience of our SMETS1 IHDS (which are capable of processing firmware updates) the key drivers for updating firmware on these devices is: • To address inaccuracy and defect propagation on devices to ensure they remain compliant with Supplier licence obligations related to these devices. • To resolve any identified risks or vulnerabilities to the HAN from IHDs or PPMIDs. • To deliver functional enhancements that improve the consumer experience and support the delivery of the consumer benefits associated with the smart metering rollout. It is almost impossible to take a view as to how frequently we might need to undertake firmware updates for any of these reasons after 2019 but our experience of our SMETS1 devices is that we have needed to undertake relatively frequent updates. While some of the root causes of this might be addressed and the number of updates reduced, it is unlikely that the need to upgrade devices can be eliminated entirely.
Npower	Large Supplier	Device defects including security Specification level defects including security Interoperability issues New application functionality

Question 4		
Respondent	**Category**	**Comments**
		New service functionality
Scottish Power	Large Supplier	Firmware upgrades would most likely be needed in the event that a corresponding upgrade to other Devices (e.g. Comms. Hub or ESME / GSME) led to a loss of IHD/ PPMID functionality. An indication of such incidence would be a function of testing.
SSE Energy Supply	Large Supplier	-
Utilita	Large Supplier	See Q3.
SSE Networks	Network Party	N/A
Chameleon Technology	Other Party	N/A
TMA Data Management	Other Party	N/A

Question 5: Please provide your organisations views on:

responsibilities for Suppliers that send firmware images to rectify any interoperability issues that may occur; and liabilities for damaged Devices because of firmware updates; and
responsibilities for ensuring that damaged Devices are un-joined and decommissioned, and new devices are whitelisted, joined and commissioned.

Question 5		
Respondent	**Category**	**Comments**
E.ON	Large Supplier	We believe that there is a fundamental requirement to resolve such issues at Industry, but we believe that this needs to be done in a single space and to be made applicable to all Devices requiring Firmware Updates. We would highlight that this modification can be accepted on a good faith basis with regard to the requirement to have a Firmware Management Process.
EDF Energy	Large Supplier	Where a device is 'shared' by multiple Suppliers it should be possible for either of those Suppliers to send updated firmware to that device – the concept of a 'lead' or 'responsible' Supplier would not be appropriate. Where a Supplier sends a firmware update that means a device ceases to work of deliver the functionality required by the other Supplier then it is reasonable to expect that Supplier to be responsible for rectifying that issue, and where required replacing that device. The actions undertaken by one Supplier in deploying firmware should never leave the consumer in a worse position than they were before that update was undertaken.
Npower	Large Supplier	Given suitable levels of assurance from device manufacturer that the firmware has been thoroughly tested and suppliers own assurance processes that they may choose to carry out, then these risks can be minimised anyway. Npower does not think you can lay responsibility on one party in a shared HAN situation for interoperability where the Installing Supplier is no longer a Responsible Supplier, especially when dealing with firmware upgrades as it may be a particular device that is causing an interoperability issue and may be

Question 5		
Respondent	**Category**	**Comments**
		due to a device that hasn't been upgraded. Suppliers have a shared responsibility for the HAN and that should endure. We would expect some level of collaboration between parties in this scenario. Where the installing supplier is the responsible supplier then they should perform the firmware update. Where devices are damaged then responsibility for decommissioning (if possible) the old device and commissioning the new device can only be with the Responsible Supplier or the upgrading party for a shared device.
Scottish Power	Large Supplier	As a supplier committed to delivering an excellent customer experience, we would expect to resolve any issues with IHDs/PMIDs in our customers' premises; though we realise it might not be to the customer's convenience if a site visit is required. Given that alternatives to IHDs and PPMIDs are likely to emerge (e.g. as a feature of a product), a better customer experience might be delivered by providing access to such alternatives, and might also serve to obviate the need for such site visits.
SSE Energy Supply	Large Supplier	We believe that the Responsible Supplier should rectify any interoperability issues and ensure that damaged Devices are exchanged, following the relevant processes. In terms of damaged devices, it is our view that it would be the responsibility of the Responsible Supplier to rectify these situations as and when they become aware. That being said, the answers for the question on liabilities may depend upon the scenario, such as if they were the installing or gaining supplier, and each supplier's commercial arrangements. A particular concern around this is that it could be difficult to determine what has happened at a dual supplier site that has been damaged. This is a complex matter that we believe should be further assessed by the Working Group based upon the consultation responses, and take into consideration the existing SEC provisions for liabilities.
Utilita	Large Supplier	We agree that the Supplier responsible for the damage should be responsible for the replacement. We do not believe that any new obligations should be introduced with regards to joining and commissioning of new Devices. Existing obligations (supply licence conditions) relating to supply and maintenance of an IHD should remain. Provision of a PPMID should remain optional.

Question 5		
Respondent	**Category**	**Comments**
		Firmware upgrades which result in damaging either device should be dealt with using existing obligations and whatever the Supplier believes to be in the best interest of the consumer. We cannot foresee a situation where a firmware upgrade would inadvertently result in a faulty Device which we not then subsequently replace, as this would obviously be in the best interests of the impacted customer(s).
SSE Networks	Network Party	N/A
Chameleon Technology	Other Party	In this topic what must be borne in mind is that at present until this modification is introduced then there is no practical means to address issues in the field with these assets should these occur. It is expected that issues were introduced as a consequence of an update then the update mechanism would have to be used again in order to correct matters.
TMA Data Management	Other Party	N/A

Question 6: Having considered the potential impacts and costs to your organisation, as well as the cost to deliver the modification, do you agree that SECMP0007 should continue to be progressed?

Question 6			
Respondent	**Category**	**Response**	**Rationale**
E.ON	Large Supplier	Yes	We believe this modification ought to progress.
EDF Energy	Large Supplier	Yes	We believe that SECMP0007 should continue to be progressed as we do not believe that evidence has been presented that would indicate that the costs of this change (which we believe are too high) outweigh the benefits. The working group should continue to refine this change to see how costs could be minimised. They should also conduct a more detailed analysis, supported by device manufacturers to understand what risks could arise in relation to maintenance these devices, what other mitigating actions could be taken to address these risks (and their associated costs) and what residual risk remains. This risk analysis should be undertaken on a collective basis rather than by individual parties.
Npower	Large Supplier	Yes	Yes, we believe the benefits far outweigh any costs.
Scottish Power	Large Supplier	No	We do not think SECMP0007 should continue, as the cost of implementation and the late delivery of the solution might well far outweigh any benefits. We also think that less costly, but equally effective, solutions are likely to emerge in the interim, which could be made available to customers in such circumstances.
SSE Energy Supply	Large Supplier	Yes	We do believe this should be progressed but we have significant concerns around interoperability that we believe should be discussed by the workgroup before progression. We recognise that this will require an effort across industry to identify potential issues, but on the basis of mitigating risks, this change is an appropriate capability to develop.

Question 6			
Respondent	**Category**	**Response**	**Rationale**
Utilita	Large Supplier	Yes	We do believe that this modification should be progressed, however we note that the costs seem high. This modification is in the interest of the customer and would also facilitate further innovation by facilitating future IHD/PPMID related modifications. However, it is very hard to evaluate whether this is a justifiable move from an economic standpoint. It is hard to predict whether other innovations will make IHDs/PPMIDs redundant soon. We remain uncertain of how much customers will use their IHDs, especially when considering certain prepayment demographics. Innovations in the payment space may also drastically reduce the usage of PPMIDs. Total costs (£7.3 million - £8.2 million. Rising to £10 million) seem high given that service requests already exist for ESME/GSME firmware upgrades. As DCC do not have any involvement in the creation of the firmware images, we struggle to see how adapting these messages for IHD/PPMIDs could cost up to £10million. We would like to request that the DCC to provide a full and transparent break down of costs before it progressed for voting to Change Board.
SSE Networks	Network Party	Abstain	SSEN will not derive any benefit from this change. We are therefore not able to provide a view regarding whether this modification proposal should progress.
Chameleon Technology	Other Party	Yes	This is a significant benefit that should definitely continue to be progressed.
TMA Data Management	Other Party	No	As mentioned in response to question 3, we are forced to reject the change despite the fact that it would be very beneficial. It is not the first time, we were in favour of SECMP004 and 008 but due to the cost put forward by the DCC, were left with no option but reject them.

Question 7: Do you have any other comments on the solution?

Including any impacts not identified by the Working Group as set out in the consultation document, any alternative solutions, and/or any other comments/questions that you would like the Working Group to consider?

Question 7			
Respondent	**Category**	**Response**	**Rationale**
E.ON	Large Supplier	Yes	The diagram provided for the proposed Firmware update process for Images of 750kb or above, does not seem to match the text provided for the process: the text gives that the first Image (0x15) will "set the activation date-time as zero (i.e. 'active now')."., but the diagram does not contain the associated "Activation" step in the Device column. We would be grateful if the diagram could be update in order that this step being visible.
EDF Energy	Large Supplier	Yes	If this Modification is not progressed Suppliers are likely to seek alternative solutions to maintaining devices – one example would be deploying firmware updates to these devices via an internet connection (which is not precluded by SMETS). Any such solution would not be guaranteed to be interoperable and would not be subject to the security controls that the DCC provides. The DCC systems were always intended to be flexible to enable additional devices to be connected and additional services associated with those devices to be supported. The estimated costs provide by DCC indicate that this flexibility does not exist, and that development of their systems to support the emerging smart energy system is likely to have a very high cost. We are concerned that the costs of this and other modifications are likely to make evolution of the DCC systems cost prohibitive, and to drive Suppliers and other industry parties to seek alternative communication solutions that undermine the case for having a DCC. We note that HCALCSs are not currently within the scope of this Modification but it is not clear why this is the case. These devices are likely to be prone to some of the same issues

Question 7			
Respondent	**Category**	**Response**	**Rationale**
			as IHDs and PPMIDs; they are also permanent devices that need to be maintained over the whole life of the metering system. Consideration should be given to including these devices within the scope of this Modification.
Npower	Large Supplier	No	-
Scottish Power	Large Supplier	No	-
SSE Energy Supply	Large Supplier	Yes	-
Utilita	Large Supplier	Yes	We believe that this should have been part of the fundamental design. The infrastructure should allow for this, given that we are supposed to be providing a "smart" experience to consumers. Needing to visit a property to update software on a Device seems like the opposite of a smart experience. If this modification is not implemented, we note that Suppliers deploying IHDs will be at a disadvantage compared to those who may be able to provide a richer experience via wifi enabled devices. Those deploying wifi enabled devices are still likely to be at an advantage, regardless, given the speed of the DCC network.
SSE Networks	Network Party	Yes	SSEN seek further information regarding how this modification will impact the ongoing capacity management process and its ability to deliver an E2E solution including the Communication Hubs potential constraints. SSEN remain concerned regarding the high costs associated with changes to central systems to deliver modifications. The scale of cost associated with system changes will inevitably lead to many modifications "failing" and stifle innovation. Failure to innovate will ultimately lead to reduced benefits realisation and poorer customer service.
Chameleon Technology	Other Party	Yes	A solution that used the OTA capability as described in the ZigBee specification (with no added requirements) would be the simplest to implement and deploy from our point of view

Question 7			
Respondent	**Category**	**Response**	**Rationale**
			and would be our preferred solution. At the cost of slight increase in comms hub complexity, a less bespoke solution can be provided on the IHD/PPMID devices.
TMA Data Management	Other Party	No	-