Data Communications Company

DCC Firmware Management Consultation

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Abbreviations & Acronyms

Please note for the purposes of this consultation, when referring to devices, these will be those devices that DCC Customers are responsible for and will exclude the Communications Hub Function (CHF) and Gas Proxy Function (GPF).

This document uses standard terminology but for the avoidance of doubt, the meanings of abbreviations and acronyms are shown below.

Abbreviation	Definition
BAU	Business as Usual
CHF	Communications Hub Function
Comms Hub	Communications Hub
CPL	Certified Products List
CSP	Communication Service Provider
DCC	Data Communications Company
DCC Customer	Service User
Devices	HAN equipment other than the CHF and GPF
DIT	Device Integration Testing
DPL	Deployed Products List
DSP	Data Service Provider
ESME	Electricity Smart Metering Equipment
FAT	Factory Acceptance Test
GBCS	Great Britain Companion Specification
GPF	Gas Proxy Function
GSME	Gas Smart Metering Equipment
HAN	Home Area Network
HCALS	HAN Connected Auxiliary Load Control Switch
IHD	In-Home Display
MAP	Meter Asset Provider
OTA	Over-The-Air
PIT	Pre-Integration Test
PPMID	Prepayment Interface Device
RTL	Remote Test Lab
SEC	Smart Energy Code
SI	System Integrator
SIT	System Integration Test

Abbreviation	Definition
SMDA	Smart Metering Device Assurance
SME	Subject Matter Expert
SMETS	Smart Metering Equipment Technical Specification
SMICOP	Smart Metering Installation Code of Practice
SP's	Service Providers (CSPs & DSP)
SRPD	Service Request Processing Document (SEC Appendix AB)
SSI	Self Service Interface
UIT	User Integration Test

1 Introduction

DCC is consulting on proposals for improvements to the current SMETS2 DCC Communications Hub (Comms Hub) Firmware Management processes. DCC has engaged with its Customers, delivery partners and other key stakeholders to identify improvements which can be made to enhance end to end Comms Hub Firmware processes.

Whilst keeping in mind the crucial role DCC plays in enabling the Smart Metering System, this consultation focuses on improvements to the end to end delivery of Comms Hub firmware as DCC's key area of firmware influence and responsibility. The goal of the proposed improvements is to:

- Improve Comms Hub delivery stages to ensure new firmware delivers the functionality it intends to
- Achieve confidence that new Comms Hub firmware is operable with devices deployed on the production estate to facilitate the Smart Metering System
- Improve governance and accountability on processes related to Comms Hub Firmware

DCC is confident that the proposed changes outlined in this consultation will benefit industry but is keen to understand stakeholder views before quantifying the final time and cost implications of the proposed changes.

In preparing this consultation, DCC has gathered feedback from key stakeholders which has also identified that industry could benefit from working together more effectively to deliver firmware related obligations together. DCC is willing to support and co-ordinate any such efforts, Section 4 of this consultation asks DCC Customers how such industry collaboration could be enabled.

2 Background

The Smart Energy Code (SEC) sets out the high level functionality for the Smart Metering System and the devices on the HAN which include Comms Hubs, ESME, GSME, PPMIDs, HCALCs and IHDs. The SEC also includes Technical Specifications which Smart Meter devices must comply with in order to provide interoperability with the Smart Metering System. These are the requirements and obligations which individual SEC Parties must adhere to in order to be SEC compliant, and collectively the obligations enable the delivery of the overall Smart Metering Implementation Programme. A summary of firmware obligation details is outlined in this document in Appendix A - Firmware Obligations.

Component devices like the Comms Hub and those listed in the paragraph above collectively form the Smart Metering System which is sometimes referred to as the HAN (Home Area Network) by DCC Customers. It is the Smart Metering System which provides Smart Metering functionality within energy consumers' properties. The

responsibility to maintain the Smart Metering System sits across both DCC and DCC Customers. DCC is responsible for the development, testing, assurance and deployment of Comms Hub firmware. DCC Customers procure devices from device manufacturers and are responsible for those devices meeting their required specifications.

DCC has been engaging with key stakeholders from across industry and considers that there is a consensus view that there is a need to improve processes in order to collectively deliver a quality operational service with the Smart Metering System. During workshops DCC Customers defined the following problem statement:

"How industry will coordinate the deployment of device firmware to the GB Smart Metering estate in a safe, robust and controlled manner whilst protecting smart functionality and the associated consumer experience."

Firmware enters operational use either as the firmware version that the device was manufactured with, or as firmware that the device is upgraded to via an Over the Air (OTA) upgrade. Only Comms Hubs, ESMEs and GSMEs can be upgraded with firmware OTA once they are installed. PPMID, HCALC and IHD firmware can't currently be upgraded OTA. New firmware for component devices is required to provide new functionality or resolve faults as a result of:

- Technical Specification changes;
- Operational incidents and defects; or
- Manufacturer Product Enhancements.

Individual devices do not provide the "consumer experience" noted in the problem statement above; devices which collectively form the Smart Metering System enable "smart functionality" and the "consumer experience". Upgrading firmware on component devices which make up the Smart Metering System carries the risk of unintended impacts to the Smart Metering System or HAN, which could regress "smart functionality". It is this type of regression which the problem statement aims to protect against.

DCC Customers have also been working to resolve issues related to the area of firmware management with the proposal of SEC Modifications which could potentially introduce changes to how firmware is managed across the industry. Where relevant these modifications are referenced in this consultation. DCC expects these modifications will continue to progress in parallel to any recommendations made in this consultation. DCC will look to align its efforts to take these recommendations forward with this wider industry activity. Complete details on these proposed modifications (set out below) can be found on the SECAS website:

- SECMP0007 – Firmware updates to IHDs and PPMIDs
- SECMP0009 – Centralised Firmware Library
- SECMP0024 – Enduring Approach to Communication Hub Firmware Management.

2.1 Current End to End Comms Hub Firmware Lifecycle

This section of the consultation provides a high level overview of the current end to end lifecycle for the delivery of new Comms Hub firmware. Based on feedback from key stakeholders the potential key issues with the current process and how they influence the problem statement have also been identified. This high level overview is a generic representation of the process for both CSPs and the Comms Hub Manufacturers, and does not distinguish between firmware for major releases or maintenance releases. Key issues identified with each step in this process are also included.

1. **CSP works with Comms Hub Manufacturer to determine firmware content** – CSPs work closely with Comms Hub Manufacturers in order to deliver requirements for their service e.g. new functionality, resolutions for testing defects, resolutions for production incidents.

   Key Issue: *No clear product roadmap exists for Comms Hubs firmware changes which would facilitate future planning for key stakeholders*

2. **Comms Hub Firmware Developed by Comms Hub Manufacturer** – The Comms Hub Manufacturer develops the new Comms Hub firmware in line with requirements.

3. **CSP performs Pre-Integration Test (PIT)** – CSPs test to ensure that the new Comms Hub firmware delivers the required functionality and verifies that the firmware is operable with CSP end to end systems. Device testing is performed with emulators which verifies that the new firmware conforms to industry specifications e.g. SMETS, DUIS. Once the Comms Hub firmware has successfully completed PIT it is submitted for SIT.

   Key Issue: *DCC undertakes significant testing and assurance of new Comms Hub firmware to ensure interoperability with the DCC System and to meet its obligations. However due to the lack of real devices used in PIT, device integration issues can be discovered too late from a DCC Customer perspective. Resolving these types of integration issues later in the delivery cycle increases associated time and cost for many stakeholders in the process*

4. **System Integrator (SI) performs System Integration Testing (SIT)** – DCC Testing Assurance oversees this test phase. The SI performs System Integration Testing which verifies that the new Comms Hub firmware is operable with end to end DCC Systems. In the past due to the lack of availability of devices testing was performed with emulators; however as seen in Release 2 this is now transitioning to the use of real devices. Previously SIT was also service request or transaction focussed which was not reflective of DCC Customer use so Release 2 has also seen the transition to more business scenario focussed testing. Once SIT has successfully completed, the firmware is submitted for DCC approval.

   Key Issue: *As identified above the lack of real devices in SIT and lack of business scenarios reflective of DCC Customer use meant integration issues not being*

discovered effectively in this test phase. The Release 2 programme has begun to address this however further improvements are required to ensure adequate device testing takes place

5. **Approvals Process** – DCC Test Assurance and Operational Boards assess the relevant documentation (e.g. Test Evidence, Release Notes) ensuring that the required criteria have been met and based on this approve the firmware for operational use. For major releases industry governance already exists and will continue to apply as it currently does. The firmware would also be submitted for entry onto the Production Certified Products List (CPL), in preparation for production use.

6. **Approved firmware used for Production OTA upgrades and for manufacturing in DCC Comms Hub Supply Chain** – Once SIT has been completed and the relevant approvals have been gained the firmware can be used by the CSP to upgrade eligible Comms Hub to this latest version. Within the obligations and Service Agreements CSPs must provide 7 days' notice to DCC Customers before they begin upgrading production Comms Hubs to the latest approved firmware. Once new firmware has been approved, DCC also begins to manufacture Comms Hubs with the latest approved version.

   To provide DCC Customers the opportunity to gain confidence with the new firmware in production an interim agreement called Hypercare has been established until 6 months after Release 2 go-live, which provides DCC Customers with the opportunity to approve Comms Hub upgrades. After this Hypercare period expires the CSP takes over deployment of the firmware to the remainder of the eligible estate.

   Key Issue: *Hypercare provides an interim solution but DCC Customers have no enduring role in early deployments of new Comms Hub firmware. This lack of involvement means critical Smart Metering System interoperability issues could occur as DCC Customers have no opportunity to engage at a pivotal moment of change on the environment*

   Key Issue: *DCC Customers need more stability in terms of changes to manufactured Comms Hub firmware version. Due to time constraints frequent changes to Comms Hub firmware can result in device configuration sets which DCC Customers have not had an opportunity to verify in testing*

7. **Firmware made available for DCC Customers for use in ongoing User Integration Testing (UIT)** – In point 6 above the new firmware has been approved for production use either for OTA deployment or accepted for use to manufacture new Comms Hubs. After this the firmware is made available for DCC Customers to test in the UIT environment for any testing they wish to do. Before the firmware is formally released to DCC Customer's the System Integrator performs testing to verify the firmware is ready to use on the UIT environment. User Integration Testing is an ongoing test phase controlled by DCC Customers but has no formal bearing on the acceptance of new Comms Hub for use in production

Key Issue: *DCC Customers don't get an opportunity to test their chosen devices against any new Comms Hub firmware to identify potential interoperability or interchangeability issues before the Comms Hub firmware is approved for production use. DCC Customers could discover device integration issues at this point which could impact production if the new Comms Hub firmware is deployed*

3 Proposals for Comms Hub Firmware Management Process Improvements

DCC processes for delivering new versions of Comms Hub Firmware can be divided in to four areas:

- Comms Hub Firmware Content Agreement and Communication;
- Comms Hub Firmware Development and Testing;
- Comms Hub Firmware OTA Deployment; and
- Comms Hub Manufacturing and Supply Chain.

After engagement with key stakeholders DCC has considered how to improve its current processes in order to address the issues identified in Section 2, increase confidence that the Communication Hub firmware delivers the functionality it intends to, and is operable with the deployed production estate.

In summary, the recommended improvements are in four key stages:

- **Comms Hub Firmware Content Agreement and Communication**
  - Introducing governance and processes for DCC and Service Providers to agree the content of Comms Hub firmware releases;
  - Product Roadmaps for Comms Hubs Firmware; and
  - Improved Communication; for example proposed firmware content and release roadmaps to key stakeholders.
- **Comms Hub Firmware Development and Testing**
  - Improved PIT Exit Gate to ensure firmware quality earlier in the delivery cycle;
  - PIT and SIT executed with real devices, reducing the need for emulators where practicable;
  - Business Scenario based testing in SIT;
  - DCC to utilise DCC Customer feedback from device testing in UIT to inform Comms Hub firmware go-live decisions, with enduring process changes building on Release 2 improvements; and

    - Prior to production deployment being approved DCC to utilise new Production Proving Capability to prove new firmware. Production Proving Capability is a separate project and will delivered independent of this work.

- **Co-operative Comms Hub Firmware OTA Deployment Phase**
    - DCC Customers able to play active role in initial Comms Hub Firmware OTA deployment.

- **Comms Hub Manufacturing and Supply Chain**
    - Only firmware that is proven after successful production deployment is submitted for Comms Hub Supply Chain manufacturing; and
    - DCC communicates timelines for changes to firmware version to be manufactured for a given Comms Hub variant.

Further details on these improvements are detailed in the remainder of Section 3. Beyond the aforementioned DCC processes for delivering new Comms Hub firmware there are several boards and panels which form the enduring industry governance for smart metering under the SEC. These include the Security Sub Committee (SSC), Testing Assurance Group (TAG), Technical Architecture and Business Architecture Sub-Committee (TABASC) and the Operations Group. The improvements outlined within this consultation do not seek changes to existing governance within the Smart Metering programme and DCC assumes that these improvements can be implemented under existing governance.

3.1 Comms Hub Firmware Content Agreement and Communication

The improvements DCC proposes in this area will provide a clear roadmap of change for every Comms Hub variant. The intention is to communicate a version of this roadmap to DCC Customers providing clarity on what DCC will be delivering in the future, with clear communication when changes occur.

As highlighted earlier, there are several reasons why Comms Hub firmware will change, this may be due to:

- Specification changes;
- Defects and operational incidents; and
- Manufacturer Product Enhancements.

To improve this element of the firmware management process, DCC is proposing to introduce improved governance and processes for DCC and Service Providers to determine the content of Comms Hub firmware releases and to clearly communicate this to industry. As part of this improved governance, consideration will be given to key elements e.g. inputs from the drivers of change into the DCC Change Process, demands of the business and changes in priority.

Comms Hub Firmware Content Agreement and Communication Process Map

A high level representation of the process for agreeing and communicating content of Comms Hub firmware is described in Figure A below.

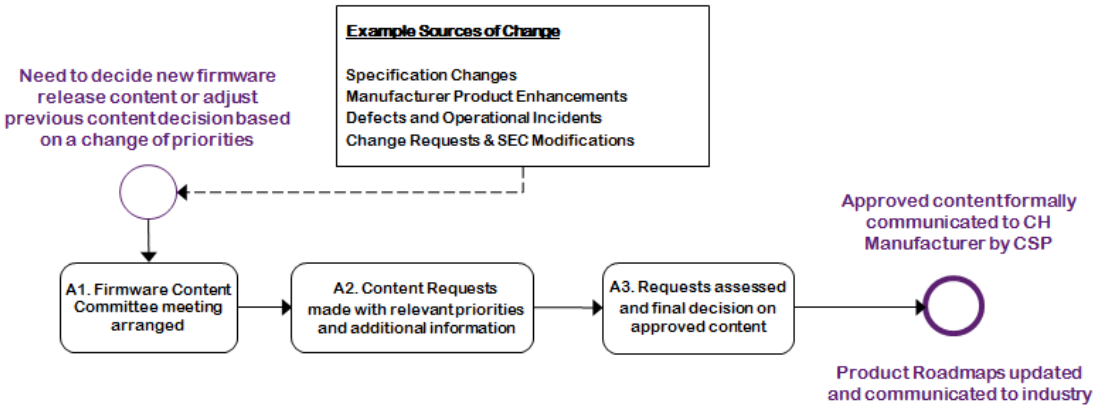

Figure A - Comms Hub Firmware Content Agreement and Communication Process Map

DCC proposes that the review forum will discuss the timelines and associated priority of functionality being developed and tested. Where Comms Hub firmware changes are required, the development, testing and release of the firmware should be planned to align with the appropriate DCC System Release, Planned Maintenance Release or Unplanned Maintenance Release (where it is an emergency or security issue and it demands new firmware for resolution). However, Comms Hub firmware OTA deployments will not target specific release windows across the whole deployed estate and the firmware will be deployed to the estate systematically over a period of time.

DCC will work closely with Service Providers to ensure that the requisite changes are delivered in order to maintain or provide the Smart Metering service. These changes should provide all parties with a clear roadmap for Comms Hub firmware change which helps to build confidence across the industry. When developing the new processes and tools DCC will work with DCC Customers to establish the most effective means of communicating this information. Communication methods could be through existing channels like SharePoint, SSI or appropriate new methods could be created if required.

3.2 Comms Hub Firmware Development and Testing

DCC is proposing process improvements to the delivery mechanisms of new Comms Hub firmware development and testing, so that critical issues are discovered and resolved earlier in the development cycle. The earlier defects can be found in new firmware the more time, effort and development costs will be saved across industry. The proposed improvements to the firmware development and testing processes are:

- Improved PIT exit assurance;
- Real device testing in PIT;

- Device testing in SIT with a range of devices reflective of production;
- Increased use of DCC Customer business scenarios in SIT;
- Allocated time for utilisation of UIT by DCC Customers and additional test services to identify interoperability and interchangeability issues prior to any DCC Customer deployment; and
- Utilising the new DCC Production Proving capability to prove critical Business Scenarios can be executed within the Production environment utilising devices selected to be reflective of prevalent production combinations.

Comms Hub Firmware Development and Testing Process Map

A high level representation of the process for developing and testing Comms Hub firmware releases is described in Figure B below.

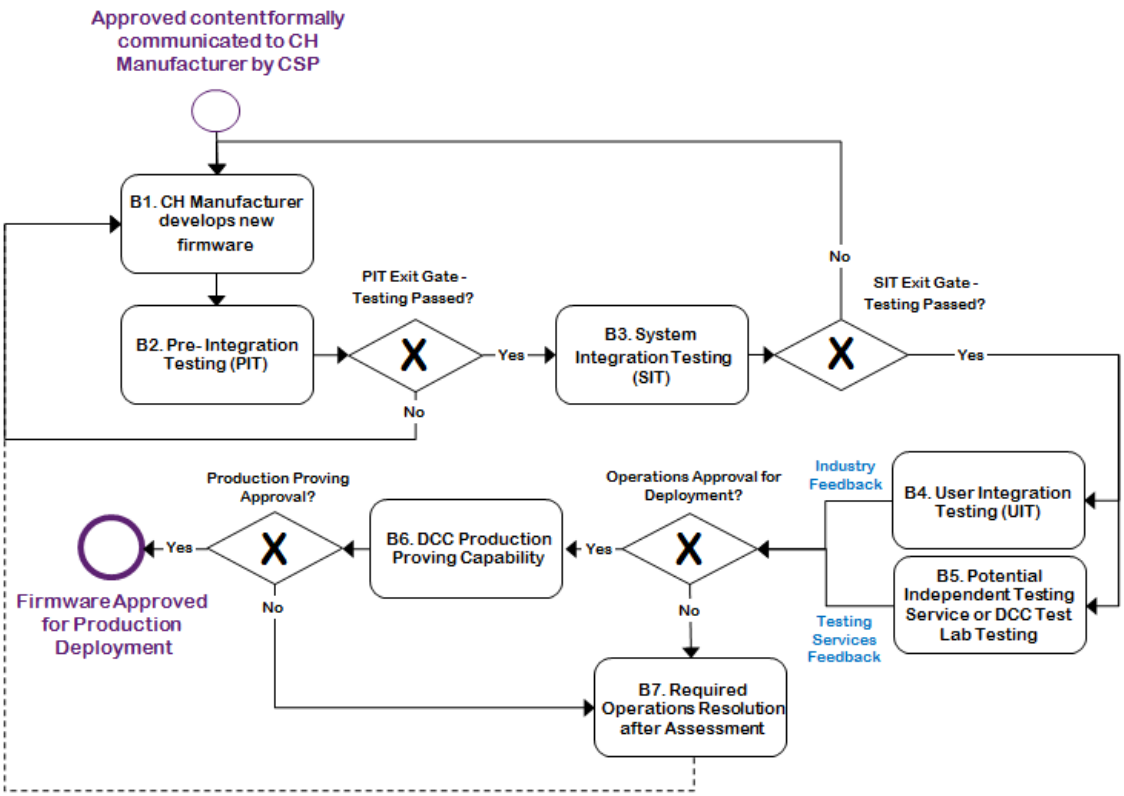

Figure B - Comms Hub Firmware Development and Testing Process Map

Pre-Integration Testing (PIT) Assurance

Comms Hub manufacturers will develop new firmware in line with their own processes. DCC are working to strengthen the criteria for Comms Hub firmware entering PIT. DCC is proposing that assurance conditions will need to be satisfied before new firmware is allowed to progress into PIT.

Once the firmware successfully enters PIT, testing is carried out to verify that the new firmware version delivers functional and non-functional requirements. DCC is proposing that PIT includes some level of testing with meters and other devices, where feasible and where devices are available. This will aim to identify Comms Hub and device integration issues early in the testing phases rather than later in UIT or Production as can happen today. The intention would be that PIT testing with devices would be focussed on testing with device versions which are prevalent on the DPL as testing with firmware versions which are not in predominant production use by DCC Customers would not be as useful. When appropriate Comms Hub firmware is also provided to DCC Customers early whilst it is in the PIT phase so that DCC Customers can verify fixes that cannot be adequately recreated in the PIT environment.

DCC are seeking views on the availability of devices that are assured to meet the required specification for operating on the SMETS2 system, for use in PIT. At this stage of testing new Comms Hub firmware DCC would propose to test with established, proven production device firmware versions based on the DPL in order to avoid testing too many changes to component parts of the overall system. DCC will need to have agreements in place with device vendors such that appropriate devices and support are available at an agreed time. If this is not possible then emulators may need to be used. Emulators have their role but testing with devices in all stages will be vital to gain confidence that the new Comms Hub firmware is able to operate as a part of production device combinations.

At the PIT exit stage DCC shall review the test evidence and determine if the new Comms Hub firmware is operating satisfactorily and provides intended functionality to an acceptable level. Only then can PIT exit be approved by DCC.

Q1	**Do you agree with the proposal to use Devices in PIT? Please provide a rationale for your views**

System Integration Testing (SIT)

As the candidate firmware has passed and exited the PIT stage it progresses to System Integration Testing (SIT). SIT provides comprehensive integration testing with DCC Systems and not just the Comms Hub firmware. SIT testing will use both emulators and devices. The aim of device testing in the SIT phase is so that SIT can be as close to real-life as is feasible with the candidate Comms Hub firmware and the devices selected from the DPL. The inclusion of devices within SIT builds on the device testing confidence established in PIT.

As part of Release 2.0, DCC is undertaking Device Integration Testing (DIT). DCC proposes to incorporate the formal DIT phase into the enduring SIT phase. Device testing in SIT will be derived from the prevalent devices on the DPL. The selection of these devices from the DPL will result in greater test coverage of deployed devices in the Production estate and lead to improved test assurance. Each device selected from the DPL would be tested with the Comms Hub firmware and subjected to agreed test scenarios. The DPL list of Comms Hub/device configuration sets will be sampled and

updated at regular intervals to ensure that DCC testing reflects the current deployed estate.

Improvements have already been made for Release 2.0 in terms of Devices in SIT and this consultation proposes to build upon these for the enduring processes for all types of Comms Hub firmware releases. DCC recognises that adding device testing into PIT and SIT will add additional time and cost at an earlier stage in the testing process. However, DCC considers that the benefit of doing this, namely discovering integration issues earlier, as opposed to later on in the testing cycle, outweighs the relatively modest increased cost associated.

DCC also proposes to introduce more testing of business case scenarios which will be included to mimic real life operations rather than simple, functional tests. Where feasible, testing with devices in SIT shall follow business scenarios derived from DCC Customer input, examples of which may be:

- Install & Commission;
- Pre-payment top up;
- Comms Hub Replacement; and
- Change of Modes (Credit, Pre-Pay).

DCC proposes that SIT exit will only be approved by DCC when the percentage of tests passed and issues identified meets the SIT exit criteria defined for any release (be that as set out in the Release Implementation Document (RID) for a SEC Release, or as agreed for a Planned / Unplanned Maintenance Release).

Once SIT is successfully passed and SIT exit criteria have been met, the Comms Hub firmware is approved to progress to the next stage of the assurance process.

Q2	**Please provide your views on the proposal to use business scenarios within SIT. In particular could you provide views on how these business scenarios can be defined and agreed as an industry through the relevant industry bodies?**

Q3	**Do you agree with the proposal for increased use Devices in SIT? Please provide a rationale for your views**

User Integration Testing (UIT)

Currently UIT is an ongoing test phase where DCC Customers can conduct their chosen testing in the UIT environment. The improvement proposed by DCC is that once new Comms Hub firmware has completed DCC testing, it is then passed to DCC Customers in

UIT who will undertake testing with it for a defined period of time, and this provides the opportunity to feedback any issues which may be discovered, more details are set out in this section. Based on engagement with key stakeholders DCC consider it is vital to provide this opportunity to DCC Customers to gain confidence and consider that it is equally essential for DCC Customers to utilise this opportunity to ensure that the prevalent device configuration sets they are operating in production provide the required smart functionality. Once the defined period for UIT has expired DCC proposes that, in accordance with any governance requirements set out with governance bodies, it will consider DCC Customer feedback received for the decision whether to allow the firmware to be approved for production use or not.

The proposed UIT activity would be defined by DCC Customers, working together to meet a minimum industry set of functional / non-functional tests within a defined period of time. This time period will be dependent on the nature of the 'release' being provided by DCC. DCC proposes that the scope for this testing should be led by DCC Customers. For example:

- **SEC Release** – A DCC impacting SEC Release will almost certainly include the addition of 'new' DCC functionality and would align with a UIT window as set out in the Release Implementation Document and plan for that Release, against which DCC Customers would conduct their key test scenarios.
- **Planned Maintenance Release** – Maintenance Releases are likely to be defect fixes from previous work off plans. A Maintenance Release would align with a UIT window of up to 4 weeks for the DCC Customer to conduct their key test scenarios.
- **Unplanned Maintenance Releases** – Unplanned Maintenance Releases are likely to be specific focused upgrades to address security vulnerabilities or emergency fixes that have come to light and are issued ad-hoc. An Unplanned Maintenance Release would be given a defined UIT window, the duration of which would be agreed (dependent on the nature and urgency of the problem being addressed). DCC will issue separate guidance in due course, on the expedited process for emergency fixes.

The UIT phase as defined above has been identified as a vital and significant phase and gives the opportunity for DCC Customers to verify that their devices continue to maintain the HAN, provide the required smart functionality and verify critical business processes. These tests provide an opportunity for DCC Customers to test and validate against a wider range of devices than used in the DCC SIT test stage and more business scenarios can be run against DCC Customers' systems than could realistically be carried out in earlier test phases.

DCC Customers can continue to use UIT based on their own requirements but DCC propose that UIT testing before new Comms Hub firmware is approved is mandatory for DCC Customers to undertake. During the UIT phase, DCC Customers can choose to use the time available in the UIT phase as they wish and using independent test services is an option that industry may want to investigate. It has been suggested that DCC could engage with independent testing bodies to perform independent testing on Comms Hubs could build further confidence in terms of interoperability and interchangeability with HAN

devices, but this would incur additional time and cost. DCC has not investigated the cost benefit analysis associated with this testing. If DCC Customers consider this would be valuable we would request specific feedback in your response to question below.

Q4	**Please provide your views on the proposal for DCC Customers to be given a specified time period to test their Devices in UIT in response to different release types. In particular, can you provide your view to the DCC proposal that this testing is mandatory for DCC Customers before new Comms Hub firmware is approved for production use?**

As highlighted earlier, the UIT phase is a vital phase and DCC consider that collaborative, industry utilisation of the testing time allocated will be key for the identification of interoperability and interchangeability issues prior to any production Comms Hub firmware deployment. As detailed earlier DCC is improving DCC led testing to reduce interoperability and interchangeability issues however the potential effectiveness of this is a stepping stone in comparison to what the industry can collectively achieve with coordinating industry wide testing in UIT. DCC is willing to lead or participate on this front as DCC Customers require, it is crucial that real partnership develops within this area to ensure there is confidence before changes are made on the production environment. Further discussion around greater industry collaboration is set out in section 4.

Production Proving

During early 2018, BEIS consulted on a DCC requested change to the Smart Energy Code that would allow DCC to develop and use a “Production Proving” capability and was incorporated into version 5.16 of the SEC on 31 May 2018. This capability allows the DCC to prove the functionality of its live systems. This is in addition to the existing Comms Hub Production Proving arrangements set out in Appendix AC of the SEC. The additional Production Proving capability proposed allows DCC to install and operate their own ring-fenced device sets. For security reasons through design DCC is only allowed to interact with these devices and not with any devices installed on the wider Production estate.

The activity in Production Proving is an opportunity for DCC to gain confidence on the production environment. The Comms Hub new firmware would be released within the DCC Production Proving capability and would enable DCC to prove the operation of the new firmware with real meters and other devices. Comms Hubs would be upgraded with the new firmware version OTA to these ring-fenced devices and a number of yet to be agreed scenarios will be carried out on them to mimic critical business scenarios of DCC Customers. This additional assurance activity will provide DCC with further confidence that the Comms Hub firmware / device set(s) that were approved in SIT are upgradable OTA and continue to operate successfully within the Production environment.

Firmware Approval

At the end of the UIT and DCC Production Proving, DCC will make a final decision as to whether the firmware is approved for production OTA deployment or not, based on the evidence and feedback from Production Proving, DCC Customers in UIT or other testing activities. If DCC identifies a significant risk of the Comms Hub firmware creating issues for the production service, then it will not be promoted for full Production use on Comms Hubs deployed by DCC Customers. The issue is logged and passed back to the relevant resolving party for triage and analysis. Any such incidents would require resolution before the new Comms Hub firmware can be deployed in production.

The addition of formal UIT test assurance phases and Production Proving activity provides further assurance from DCC to DCC Customers that the new Comms Hub firmware is fit for purpose and operates with a number of devices. Firmware development and testing timescales could be impacted; however, it is believed that the introduction of the proposed additional assurance significantly reduces the risk of major issues being identified later in the deployment and/or on the Production system.

3.3 Co-operative Comms Hub Firmware OTA Deployment Phase

During engagement with stakeholders in preparation for this consultation, a key improvement identified was the need for DCC Customers to play an active part in the initial deployment of new Comms Hub firmware before it is rolled out to the remainder of the estate for that Comms Hub variant. The concern with a lack of DCC Customer involvement is that critical HAN issues which have not been discovered in testing cannot be monitored during production deployment. The result is that issues are discovered too late in the upgrade cycle, once a significant portion of the estate for that Comms Hub variant has already been upgraded. The suggested improvement is that new tools and processes are put into place which allow DCC Customers to easily engage in the initial deployment of any new Comms Hub firmware.

DCC are proposing a staged DCC/CSP/DCC Customer co-operative OTA phase to build confidence that both the Comms Hub and Devices continue to operate as expected following an upgrade. DCC would undertake the roll out of new Comms Hub firmware in partnership with industry so that the impact can be assessed before mass roll out begins. The intention is to offer this co-operative approach for as many new Comms Hub firmware releases as possible, however it should be noted that to manage the production estate DCC may need to roll out emergency or security releases without this phase. DCC would do its upmost not to remove this vital phase unless required to and would still work as closely with DCC Customers before any such deployment.

Co-operative Comms Hub Firmware OTA Deployment Phase Process Map

A high level representation of the process for the co-operative deployment phase of Comms Hub firmware releases is described in Figure C.

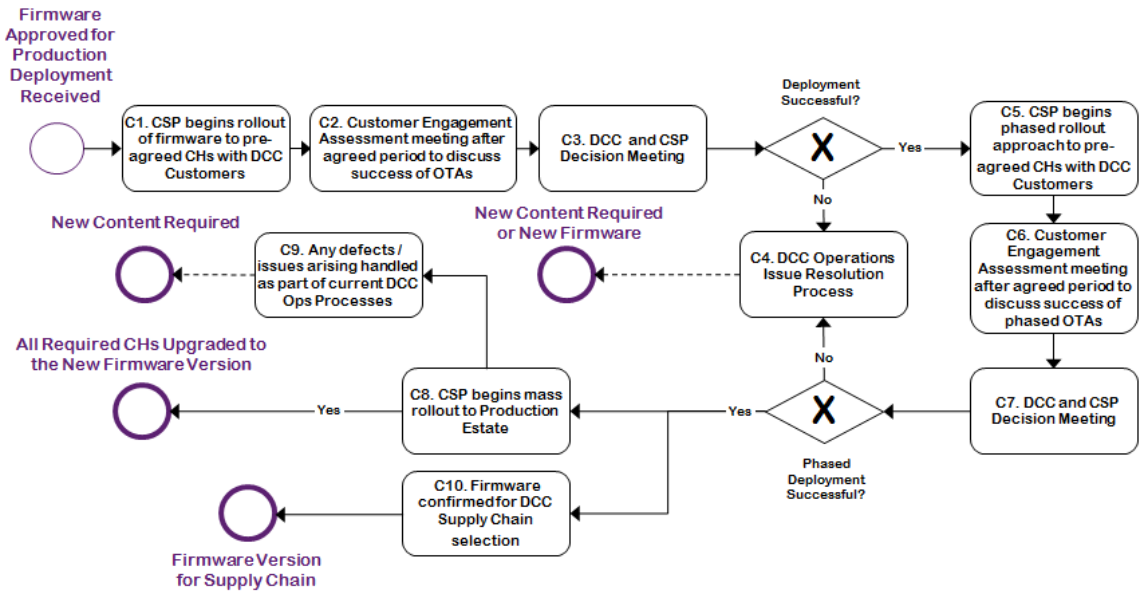

Figure C - Co-operative Comms Hub Firmware OTA Deployment Phase Process Map

Previously in the area of Comms Hubs Firmware deployment an internal DCC improvement project called “Comms Hub Firmware Upgrade Hypercare” has been implemented to provide DCC Customers additional time to build confidence before Comms Hub firmware is rolled out to the deployed Comms Hub estate. It should also be noted that there has been significant industry engagement on this topic with SEC Modification “SECMP0024: Enduring Approach to Communication Hub Firmware Management” and DCC has worked alongside industry to support this. At a high level SECMP0024 aims to provide DCC Customers with service request based control over Comms Hub firmware upgrades as they have for meter upgrades. The co-operative Comms Hub Firmware OTA Deployment proposed by DCC in this section aims to provide DCC Customers control over which Comms Hubs are initially upgraded when new Comms Hub firmware is to be deployed to production before the CSPs use their existing toolset to upgrade the remainder of the eligible estate. The aim for the co-operative Comms Hub Firmware OTA Deployment is to provide the improvements DCC Customers want in SECMP0024 without the potential significant changes to DCC Systems, obligations of Comms Hub ownership and performance responsibilities.

This section will not attempt to capture the great level of detail that industry has defined as requirements. This detail will however be used in the working level discussions that DCC propose to undertake with DCC Customers to define the process if the proposed co-operative deployment approach is accepted as a viable option. As mentioned earlier, SECMP0024 is an active SEC Modification currently under refinement by SECAS, therefore DCC would request DCC Customers to consider in their responses that the co-operative initial deployment approach proposed in this consultation is different to that which is being proposed in SECMP0024.

The proposed approach is made up of three stages.

Phase 1 – DCC would agree with DCC Customers which Comms Hubs/devices would be included in the initial deployment of firmware and DCC would notify DCC Customers that

phase 1 of the OTA deployment was about to begin. Following phase 1 OTA deployment, an assessment meeting would be held between DCC and DCC Customers to discuss any defect and critical issues raised through the standard operations process. Should this be a Comms Hub firmware issue DCC will review the available resolution options. Following that meeting DCC would decide as to whether to progress to Phase 2 of the firmware deployment.

Phase 2 - On successful and agreed completion of phase 1, the DCC would conduct one or more phases of larger OTA deployment as agreed with DCC Customers. Following phase 2 deployment, another assessment meeting would take place between DCC and DCC Customers. If the larger OTA active deployment was deemed successful then the Comms Hub firmware would move to the third and final stage of the OTA deployment process.

Phase 3 - Successfully passing phase 1 and 2 of the OTA deployment should provide assurance that the Comms Hub firmware is fit for purpose and wider OTA deployment to the Production estate would begin. Phase 3 would be the mass rollout phase where firmware would be rolled out to upgrade all installed productions Comms Hubs which require this latest firmware version.

As a consideration for the future, in the current environment of immature protocols and relatively new product implementations DCC supports DCC Customers concerns in the requirement for them to play an active role in the initial deployment of new Comms Hub firmware. However, as specifications and implementations mature over time the integration of devices will mature as a result, which in turn will reduce the risk of impacts to other devices forming the Smart Metering System. In this future state based on appropriate consultation with DCC Customers the need for involvement in the initial deployment of new Comms Hub firmware may be reduced or stopped altogether to allow new functionality to be released quicker and issues to be resolved faster.

Q5	**Do you agree with the proposal for DCC Customers to play an active part in the initial deployment of new Comms Hub firmware? Please provide a rationale for your views.**

3.4 Comms Hub Manufacturing and Supply Chain

Currently, if a decision is taken too early to manufacture Comms Hubs with a certain firmware variant insufficient confidence has been gained that the new Comms Hub firmware version and other Smart Metering devices are able to operate together. To overcome this risk DCC proposes to delay the current decision point at which new Comms Hub firmware is selected to be used for Comms Hub manufacturing until the mass deployment of the new Comms Hub firmware is approved and the designated UIT phase has been successfully completed. DCC would also communicate with appropriate notice when Comms Hub firmware version manufacturing changes can be expected in support of this approach.

This decision point would determine whether a new firmware version will be manufactured or whether manufacturing will continue on a previous firmware version. As a general approach DCC would aim to minimise the frequency of changes to Comms Hub versions in the supply chain being delivered to DCC Customers so that they are able to plan with greater accuracy the firmware versions which their installers will be using for installation and commission. The changes in the new firmware or other conditions may mean that use of the new firmware for manufacturing may need to be mandated but wherever possible DCC will endeavour to allow the selection process defined above to make the decision. This proposed reduction in change is intended to provide DCC Customers the stability they have requested by allowing new firmware more time to be proven before it is selected for manufacturing and allowing DCC Customers to have greater timeline accuracy on the firmware versions they are going to receive.

Comms Hub Manufacturing and Supply Chain Process Map

A high level representation of the process for the co-operative deployment phase of Comms Hub firmware releases is described in Figure D.

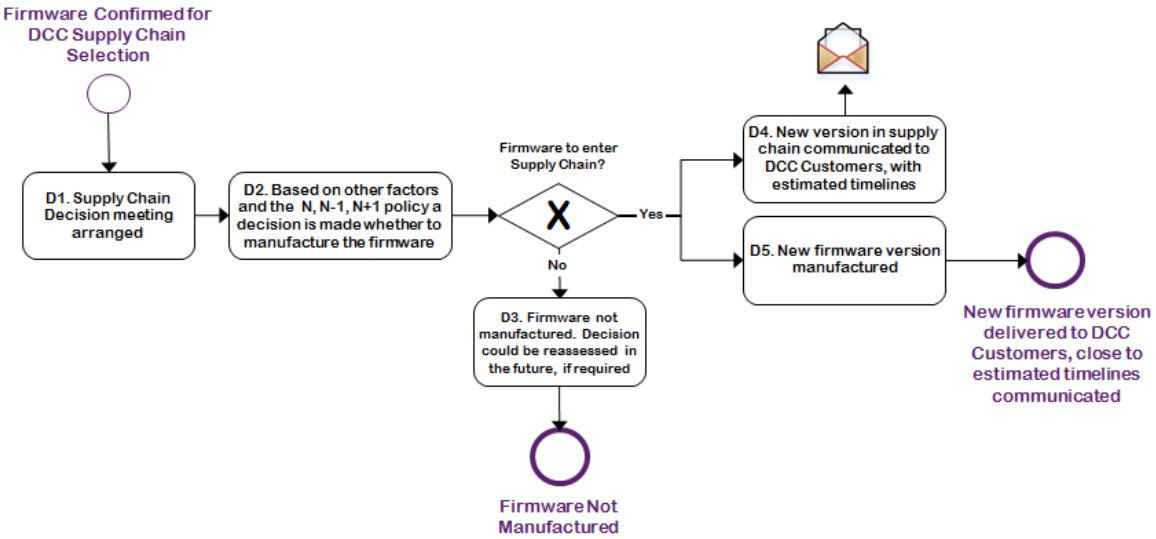

Figure D - Comms Hub Manufacturing and Supply Chain Process Map

Comms Hub firmware that is deemed suitable for Production deployment has:

- passed all DCC test phases (PIT / SIT / Prod Proving)
- been tested by DCC Customers on UIT environments
- successfully passed the initial OTA production deployment
- been approved by the DCC boards for operational use.

There may be instances where a decision is made by DCC for the approved firmware to only be deployed via OTA, as opposed to it also being used for manufacturing Comms Hubs. This decision could be based on information relating to imminent fixes that are soon to be available on subsequent firmware or on-going triage for other known defects. In this

instance a subsequent release would incorporate the previous fix along with other improvements. This approach would mean there would be fewer changes to Comms Hub firmware versions selected to be manufactured and therefore less frequent change in the firmware version delivered to DCC Customers. This will support the overall aim to reduce firmware complexity on the production estate.

It is important to note that due to supply chain lead times the newly approved Comms Hub firmware will not be delivered to the DCC Customer for several months. Previously approved Comms Hub firmware versions, which are older than that which have been approved for OTA by this process, will continue to be delivered and will require OTA upgrade once installed. Wherever possible firmware will also upgraded to the latest firmware version in a single hop, thereby avoiding interim firmware versions which may also have been proved for production use. Further details on this and other firmware principles DCC has put into place are in Appendix B - Firmware Principles.

The aim of these new process changes is to provide DCC Customers with confidence and stability in terms of the firmware that is delivered and subsequently is to be installed per Comms Hub variant.

Q6	**Do you agree with the proposal to govern Comms Hub firmware entering the supply chain? Please provide a rationale for your views.**

3.5 Minimising Production Comms Hub Firmware Versions

A key overarching concept that was identified in engagement with DCC Customers was the need for DCC from a Comms Hub perspective to actively reduce the complexity associated with many firmware versions for the various Comms Hub variants. To achieve this DCC is proposing to minimise the number of Comms Hub firmware versions to be deployed to the Production estate. In practise this will mean DCC Production Comms Hubs will either be operating the latest approved firmware version - "**Version N**" or the immediate predecessor of the new Version N - "**Version N-1**". Following this nomenclature, the new firmware version in development will be referred to as "**Version N+1**". Once sufficient confidence has been achieved with deployment of Version N in the Co-operative Comms Hub Firmware OTA Deployment Phase DCC will transition the deployed production estate from Version N-1 to Version N as quickly as can be effectively managed. The result of this will be minimising the potential complexity of the many configuration sets which could occur if this was not managed in this disciplined manner.

Despite the aim to minimise the number of deployed Comms Hub firmware versions the demands of running the production estate may necessitate additional Comms Hub firmware versions to be delivered at a faster rate than previous versions can be upgraded. This would mean that the number of Comms Hub firmware versions operating on the

production estate might increase in the short term however this would be a temporary state before the estate can be upgraded to the latest, approved production version.

DCC acknowledge that in the short term before SMETS2 Comms Hubs and devices have had sufficient time to mature this proposal will be difficult to implement, but nevertheless proposes that this should be the best practise approach over the longer term. DCC considers that simplifying the complexity of firmware version combinations is necessary in order to mitigate the risks for the problem statement defined by DCC Customers in the introduction of this document.

4 Development of Industry Firmware Collaboration

In the sections above DCC has set out proposals to improve current processes in order to achieve confidence that new Comms Hub firmware delivers the intended functionality and is operable with the deployed production estate. As part of its engagement with stakeholders in developing these proposals, many stakeholders have expressed the view that industry could benefit from working together to deliver obligations collectively for all device firmware. As a result DCC has already tried to incorporate collaboration into the proposals outlined in Section 3, examples of which are DCC Customers allocated time in UIT to test with new Comms Hub firmware and DCC Customer involvement in the initial production deployment of new Comms Hub firmware.

However the obligation to maintain devices other than Comms Hubs falls on DCC Customers. It is DCC's view that collaboration on device firmware management could enable risk to be shared whilst also bringing time and cost savings through efficiency. However proposals on what would be done, by which stakeholders and how this collaboration could be established have yet to be identified. This last section of the consultation offers an opportunity for DCC Customers to provide their views on this subject. DCC believes that industry collaboration and partnership on device firmware management is crucial so that the resulting knowledge from the collective effort can be utilised to ensure that device firmware issues do not impact Smart Metering Systems on the production service. DCC supports effective industry collaboration and is willing to facilitate delivery wherever possible. Based on feedback received from the consultation DCC will return with recommendations and facilitate these proposed discussions with DCC Customers, other key stakeholders and existing industry bodies on how enduring industry collaboration can be established and maintained.

The following sections provide DCC Customers a summary of the ideas that have been discussed to date and provide some further context to DCC Customers to consider as part of the response to the consultation.

Industry User Integration Testing collaboration

As highlighted earlier in the consultation, UIT is a vital and significant phase and is the opportunity for DCC Customers to verify that their Devices continue to maintain the HAN, or Smart Metering System, and provide the required smart functionality. As detailed in Section 3, as an improvement to the current process DCC Customers will now be given a

defined period of time to verify their own device configuration sets in UIT before DCC makes the decision whether to approve the new Comms Hub firmware for production use.

DCC Customers can choose to utilise this time as they see fit but DCC sees benefits in establishing a more unified and collaborative industry approach to testing. This would ensure that the maximum benefit from this testing period is achieved, with more combinations on the deployed estate being verified as opposed to effort being duplicated on similar configuration sets. For example, DCC Customers could choose to focus test effort on device sets they have chosen to lead on and share selected results and information with other testing participants and/or industry more broadly.

Industry Information Sharing

Building on the collaboration in the example above, DCC Customers could share information so that the cost and effort to obtain the information is not replicated across the whole industry. Examples of this could be:

- Adherence to established Industry Defect Mask standards
- Device Compatibility Information determined in testing
- Upgrade Sequencing information.

In Section 3 the intention to provide clear product roadmaps for Comms Hubs was detailed. Respondents are invited to consider whether there would be value in sharing similar roadmaps for devices so that all such product changes can be better coordinated across the industry.

DCC would recommend that where possible DCC Customers consider the use of suitable existing industry governance and bodies for this purpose.

Minimising firmware versions for devices

To reduce complexity of Comms Hub firmware, DCC will be aiming to minimise the number of versions deployed in production and delivered by our supply chain. Device firmware is the responsibility of DCC Customers, and whilst there are obligations on DCC Customers to maintain devices to the relevant valid technical specification, beyond that DCC Customers are free to use whichever firmware they wish.

Whilst there is currently no obligation for DCC Customers to do so, DCC suggests that other industry parties work together towards reducing the number of device firmware versions deployed in the production estate. DCC appreciates that due to operational demands this reduction will not always be achievable and that at certain times individual organisations will wish to make upgrades based on their own business priorities. However, through engagement DCC consider that DCC Customers would support a drive to keep the number of deployed configuration sets in production to a minimum.

Q7	**Do you agree that industry should adopt a strategy on minimising firmware versions for Devices? Please provide a rationale for your views.**

Managing devices gained through the Change of Supplier process

A Centralised Firmware Library has been discussed, in the development of SECMOD009, as a means to allow DCC Customers to better manage device firmware. As part of this modification, an Information Repository is to be established so that gaining suppliers have contact details to establish any required commercial arrangements to gain access to firmware, information and support required to maintain devices to an operational standard. As this is required to meet SEC obligations and is vital for DCC Customers to be able to maintain their deployed Production devices DCC's recommendation to all DCC Customers, large or small, would be to investigate setting up the required commercial arrangements as soon as possible. Failure to establish these commercial arrangements poses a significant risk for the deployed production estate and DCC considers it is vital that industry has a workable solution, whether that is the Information Repository or another solution in the future.

Full details on this SEC Modification can be found on the SECAS website.

Scheduling and Sequencing of Upgrades

DCC Systems will schedule requests as they are sent to DCC to process however these requests will not be sequenced and scheduled in any other way over and above that. Scheduling and sequencing of upgrades for all devices is another area which has been discussed with DCC in workshops however there currently appears to be no industry discussion on this.

DCC Customer Views

DCC is seeking views from industry on whether collaboration would be beneficial for industry and if so ideas on how it could be enabled. DCC acknowledge that it is important to be mindful of commercial impacts and disproportionate effort across the industry. However, DCC suggests that industry-wide solutions would benefit all stakeholders in the smart metering market.

Q8	**Please provide your views on the current issues facing wider industry collaboration and suggestions on how this could be improved? Provide a rationale for your views and ideas on how such collaboration could be enhanced.**

5 How to respond

This consultation closes on Monday 17th December 2018. Please email your response to consultations@smartdcc.co.uk.

Contents of responses may be (where not marked confidential) shared with other stakeholders. Please state whether all or any part of your response is confidential. Please note that responses in their entirety (including any text marked confidential) will be shared with the Department for Business, Energy and Industrial Strategy (BEIS) and may be made available to the Gas and Electricity Markets Authority (the Authority).

6 Consultation Questions

DCC requests feedback to the following consultation questions:

Q1	**Do you agree with the proposal to use Devices in PIT? Please provide a rationale for your views**

Q2	**Please provide your views on the proposal to use business scenarios within SIT. In particular could you provide views on how these business scenarios can be defined and agreed as an industry through the relevant industry bodies?**

Q3	**Do you agree with the proposal for increased use Devices in SIT? Please provide a rationale for your views**

Q4	**Please provide your views on the proposal for DCC Customers to be given a specified time period to test their Devices in UIT in response to different release types. In particular, can you provide your view to the DCC proposal that this testing is mandatory for DCC Customers before new Comms Hub firmware is approved for production use?**

Q5	**Do you agree with the proposal for DCC Customers to play an active part in the initial deployment of new Comms Hub firmware? Please provide a rationale for your views.**

Q6	**Do you agree with the proposal to govern Comms Hub firmware entering the supply chain? Please provide a rationale for your views.**

Q7	**Do you agree that industry should adopt a strategy on minimising firmware versions for Devices? Please provide a rationale for your views.**

Q8	**Please provide your views on the current issues facing wider industry collaboration and suggestions on how this could be improved? Provide a rationale for your views and ideas on how such collaboration could be enhanced.**

7 Appendix

7.1 Appendix A – Summary of Firmware Obligations

DCC and DCC Customers have a responsibility to ensure Comms Hub and devices forming the HAN are interoperable with the DCC System (SEC Section F). Both the DCC and each DCC Customer, as the Service User, are required to retain evidence including testing evidence for new firmware to demonstrate compliance with the Technical Specifications or GBSC changes and interoperability with the DCC System. There are also regulatory requirements in the Energy Supply Licences around protection of the Smart Metering System and the HAN connection. Licence condition 49 of the Electricity Supply Licence and licence condition 43 of the Gas Supply Licence requires Suppliers to maintain the HAN once a connection has been established.

Under the SEC (Appendix AB - Service Request Processing Document (SRPD) Section 5.2), DCC are required to provide at least 7 days' notice notification period in advance of the deployment of Comms Hub Firmware. The exception being in the case of urgent security related reasons.

7.2 Appendix B – Firmware Principles

As part of continuous process improvements DCC has added additional criteria for firmware that is to be manufactured and delivered to DCC Customers. The aim for these principles is to improve overall quality and ensure Comms Hubs meet standards which are reflective of DCC Customer use of our Products.

The following 6 firmware principles will be applied before new Comms Hub firmware is considered for production use.

1. **Manufactured firmware versions must allow DCC Customers to complete their installation SMICOP obligations and not require a second site visit**
   Manufactured Comms Hubs shall always be able to facilitate Smart Meter installations to the industry standard and at time of manufacture contain no known issues that contradict this.

2. **Manufactured firmware should not necessitate an Over the Air (OTA) Upgrade at point of installation**
   Manufactured Comms Hub do not require the installer to wait for an OTA upgrade during the installation, the manufactured version is able to facilitate the installation detailed in principle 1. Once the installation is successful the CSP can schedule required upgrades to bring the firmware up to the latest approved level.

3. **A single OTA upgrade will bring the CH to the latest firmware version, with multiple hops only considered by exception**
   Multiple firmware hops are only permitted after agreement within DCC. DCC Customers will be informed in the required documentation (e.g. release notes) and with appropriate communication.

4. **Manufactured firmware will not contain defects which are considered by DCC to impact Smart Services or the working HAN**
   At point of manufacture firmware versions will only be allowed by DCC to contain defects which are considered not to have a critical impact on the ability to support Smart Services or maintain the working HAN. These defects however must be able to be resolved in subsequent firmware versions, either via OTA upgrades or in new manufactured firmware versions.

5. **Firmware used in the production environment must have been approved by the DCC Operational Boards**
   The decision on which firmware version to use in the manufacturing process will require the firmware version to have been approved by the required DCC Operational Boards.

6. **DCC and CSPs will provide DCC Customers clear communication on the retirement of firmware versions and their intended succession**
   Following N, N-1 best practice for reducing firmware complexity DCC will provide DCC Customers clear communication on upgrade paths and when previous firmware is to be retired from future maintenance. DCC will no longer support the retired firmware version as upgrading the Comms Hub estate to the latest approved firmware version is vital for reducing fragmentation of the production estate.