APPENDIX AJ

SEC Variation Testing Approach Document (SVTAD)

Document Control

References

Ref	Title	Source	Date	Version
1	Glossary of Testing Terms	ISTQB	Mar 2016	3.1
2	Joint Test Strategy	DCC	Apr 2015	3.5
3	Testing Issue Resolution Process	DCC	Sept 2015	1.0
4	Joint Test Methodology[1]		Pending Publication	3.0

Table 1 – References

Where this document references sections of the Smart Energy Code (SEC), those references shall be construed by reference to any intended future variations to those Sections (and the SEC Subsidiary Documents associated with those Sections) which are due to take effect at Release 2.0 Go Live as specified by the Secretary of State.

Abbreviations & Acronyms

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

Abbreviation	Meaning
BAT	Business Acceptance Testing
BEIS	Department for Business, Energy & Industrial Strategy
CHTS	Communications Hub Technical Specification
CSP	Communications Service Provider
CTSD	Common Test Scenarios Document
DBCH	Dual Band Communications Hub
DCC	Data Communications Company
DIT	Device Integration Testing
DSP	Data Service Provider

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1   JTM is a methodology agreed by BEIS and industry participants for repeatable laboratory testing of HAN radio performance

Testing Approach for Release 2.0

FAT	Factory Acceptance Testing
GIT	GB Companion Specification Interface Testing
HAN	Home Area Network
IRB	Issue Resolution Board
ISMS	Information Security Management System
ITCH	Instrumented Test Communications Hubs
OCT	Operational Confidence Testing
PIT	Pre Integration Testing
PTCH	Prototype Test Communications Hub
RDP	Registration Data Provider
SBCH	Single Band Communications Hub
SEC	Smart Energy Code
R2	Release 2.0
RIT	Radio Interface Testing
SIT	Systems Integration Testing
SMETS	Smart Metering Equipment Technical Specifications
SMKI	Smart Meter Key Infrastructure
SM WAN	Smart Metering Wide Area Network
SP	DCC Service Provider
SP UAT	Service Provider User Acceptance Testing
SVTAD	SEC Variation Testing Approach Document

Testing Approach for Release 2.0

TAG	Testing Advisory Group
TSP	Trusted Service Provider
TTO	Transition to Operations
UEPT	User Entry Process Testing
UIT	User Integration Testing

Table 2 - Abbreviations & Acronyms

Narrative Text

In a number of places this document contains background narrative text, rather than specific rights or obligations (for example in the Introduction section). Whilst not required in the Sec Variation Testing Approach Document, this narrative text is provided for background context for stakeholders.

Glossary

The table below defines only terms that are specifically not as defined in Section A (Definitions and Interpretations) of the SEC[2].

This document uses standard testing terminology, a glossary (Reference 1) of which can be found on the International Software Testing Qualification Board website www.istqb.org

Term	Meaning
1.1 Communications Hubs ("1.1 CHs")	Means single-band and Dual Band Communications Hubs which comply with, or are designed to comply with, the requirements of CHTS v1.1 and GBCS v2.0
DCC Meter Protocol Emulators	Testing Stubs developed by DCC to emulate the functional aspects of smart metering Devices
Modified DCC Total System	Means the DCC System as modified in order to meet (or to be designed to meet) the DCC's obligations under the SEC as at Release 2.0 go live, together with the Communications Hubs that form part of Enrolled Smart Metering Systems.
Instrumented Test Communications Hub	Means a Test Communications Hub that includes an interface making diagnostic information relating to the HAN available. The interface will allow Users to capture HAN activity in real time using a Windows PC.
Release 2.0	Is defined in 1.1 of this document.

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2   https://www.smartenergycodecompany.co.uk/sec/sec-and-guidance-documents

Testing Approach for Release 2.0

X11 Direction	Means the Secretary of State's direction under section X11 of the SEC dated 23 February 2017, pursuant to which the DCC has prepared this document.
UIT Approach Document	means the User Integration Testing Approach Document for Release 2.0.
User Regression Testing	The regression testing that must be conducted by certain Supplier Parties as described in Section 5 of this document.
Exit Criteria	means the criteria that must be satisfied before testing can be considered complete.
User Testing	means testing by one or more Users of all or part of any changes to the DCC Total System.
User Interface Testing	means the testing that tests the capability of the DCC and the DCC Systems together with the Communications Hubs to interoperate with User Systems.

Table 3 - Glossary

Approval of this Approach Document

The X11 Direction requires that DCC submit this Release 2.0 Testing Approach Document to the Secretary of State for approval after appropriate stakeholder consultation. When submitting the document, DCC will be required to provide the information set out in section X11.6, including why DCC considers the document fit for purpose and details from the consultation process. The Secretary of State will then consider the document, instruct DCC to carry out any remedial actions as necessary and then incorporate the document into the SEC using the powers in Section X5 of the SEC.

As part of the consultation process, the document will be issued to the SEC Panel's Testing Advisory Group and the SEC Panel for review and comment. Any recommendations emerging from this review will be considered by DCC, with amendments made to the document as necessary, and provided to BEIS as per the requirements of section X11.6.

1.   Introduction

1.1.   General

On 23 February 2017, the Secretary of State directed DCC to produce a Testing Approach document for the changes to the SEC that will be made for the purposes of Release 2.0, in accordance with Section X11 of the Smart Energy Code.

Release 2.0 is defined in the baseline documents agreed by the Technical and Business Design Group on 30 May 2017, as such baseline documents may be updated from time to time, as may the related amendments to the SEC, including the DCC User Interface Specification and Message Mapping Catalogue. These documents are published by SECAS on the 'Developing SEC' page of their website.[3]

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3   https://www.smartenergycodecompany.co.uk/sec/the-developing-sec

Testing Approach for Release 2.0

Release 2.0 may include additional elements of scope as may be added by DCC itself, which do not affect SEC Parties.

This document sets out the information required of a SEC Variation Testing Approach document in section X11.5 of the SEC, including the manner in which testing will be conducted by DCC as directed for Release 2.0.

1.2.   Modification of this Document

This document:

(i)   shall be modified by DCC in accordance with any direction to do so made by the Secretary of State;

(ii)   may be modified by DCC following consultation with affected parties, the Authority and the Secretary of State, provided that:

(a)   prior to making any such modification, DCC must present to the Secretary of State a summary of the consultation responses received and an explanation of how the DCC has taken them into account; and

(b)   it may not be modified to the extent that the Secretary of State directs otherwise; and

(iii)   may be modified by DCC without consultation where the modification is of a minor typographical nature, or where the modification does not have any material effect on the rights or obligations of SEC Parties or any other person who is entitled to undertake testing in accordance with this document.

2.   Scope

In plain terms, Release 2.0 will update the DCC Total System to support updated versions of key technical smart metering specification documents. It will see DCC introduce new Communications Hubs with additional radio capabilities (Dual Band Communications Hubs) that will enable Supplier Parties to install Smart Metering Systems in an increased proportion of GB homes. In addition, it will see DCC provide updated single band Communications Hubs and upgrade existing Single Band Communications Hubs to reflect amendments and clarifications in the Release 2 requirements. Further, all CHs will need to support current and updated versions of the ZigBee Alliance specifications and the Devices that use them.

This will be the first Release to introduce new Devices to the DCC Total System that operate to different device specifications. As a consequence, the DCC Total System will need to support Devices operating on multiple technical specification standards.

As for earlier Releases (R1.x), DCC will perform testing following established industry practice. The changes will be developed and tested by DCC Service Providers, then subjected to integration testing by DCC and then made available to Parties for integration testing with their Systems and Devices.

This approach document describes how this testing will be conducted and assured to make sure the changes fully meet the new requirements and obligations, at the same time as ensuring that the changes do not undermine the ability of Parties to continue to meet their existing obligations.

The document describes the objectives of testing and defines the different stages of testing in terms of the activities, resources and evidence needed to meet those objectives.

All 1.1 CHs variants will be subject to testing in R2.0.

In addition to, and supporting the specific direction received from the Secretary of State, Release 2.0 includes changes to the following components of the DCC Total System/Services;

- GIT for Industry (GFI Testing under section X9 of the SEC)

- DCC Meter Protocol Emulator (see 13.2 below)

- Parse & Correlate Software

- DCC enterprise systems (the systems which support the usage, billing and reporting of use of DCC Services)

- Instrumented Test Communications Hubs (see section 13.3.3)

Where this document places an obligation on any DCC Service Provider, or any personnel of a DCC Service Provider, it shall, for the purposes of the SEC, be read as an obligation on DCC to ensure that the relevant Service Provider meets that obligation.

2.1. Documents for Release 2.0

The table below lists the specifications that were notified to DCC for implementation in Release 2.0.

Document Name	Version
Smart Metering Equipment Technical Specification (SMETS2)	v3.0
Communication Hub Technical Specification (CHTS)	v1.1
GB Companion Specification (GBCS)	v2.0

Table 4 - Technical Specification

2.2. Joint Testing Strategy and Other DCC Testing Approach Documents

For Release 1.2 and 1.3 DCC produced a Joint Testing Strategy and a number of individual Testing Approach documents covering separate testing phases and activities. These documents established processes, reports and other elements that are now ongoing elements of DCC activities.

The Joint Testing Strategy has not been updated to reflect developments and improvements resulting from the delivery of Release 1.x and large parts of other Testing Approach documents are similarly no longer applicable.

Where relevant, or where there is an apparent conflict with the Joint Testing Strategy and other Testing Approach Documents developed for Release 1.x, this Testing Approach Document for Release 2.0, and relevant Approach Documents for Testing Phases, supersede and replace those earlier documents.

Recognising the potential variety of future DCC change, a new high level DCC Testing Principles document will be created to inform and reflect the ongoing change activities, the content of this Testing Approach Document and lessons learned.

2.3. Out of Scope

A number of requirements in this document do not apply for DSP PIT, which is a testing phase planned to be completed ahead of other testing phases and has been designed based on the existing DSP PIT processes and the Joint Testing Strategy. At the time of consulting on this document, DSP PIT has already commenced - DCC considers there to be minimal risk to Parties associated with that development work.

A number of the requirements in this Testing Approach Document do not apply to UIT, which is a Testing Phase to allow Parties to conduct their testing. For instance, the DCC Systems Integrator is not responsible for providing test artefacts for test participants and a separate defect process and repository is used.

The following assurance activities are outside the scope of the testing approach for Release 2.0:

(i)   CPA Certification of Communications Hubs (CSPs are responsible for this activity)

(ii)   DCC is not responsible for proving that Devices are compliant with SMETS requirements, but will undertake testing with Devices and provide testing services that Parties can use as part of their own Device testing

(iii)   Testing of the Home Area Network (HAN) except for:

(a)   its interaction with the Modified DCC Total System

(b)   where the HAN is tested as part of Device Integration Testing and User Integration Testing

(iv)   Testing the inter-changeability of Devices connected to the Home Area Network

3.   Objectives of Testing

3.1.   Testing Objectives

The following testing objectives are contained in the X11 Direction received from the Secretary of State[4]:

(a)   demonstrate that 1.1 CHs designed to comply with CHTS v1.1 do comply with CHTS v1.1 and GBCS v2.0

(b)   demonstrate that Communications Hubs that comply with CHTS v1.0 / GBCS v1.0 can be upgraded to comply with CHTS v1.1 / GBCS v2.0 via a firmware upgrade sent over the SM WAN

(c)   demonstrate that DCC and the component parts of the Modified DCC Total System together with 1.1 CHs operating to CHTS v1.1 / GBCS v2.0 technical specifications operate and interoperate with each other, and with User Systems and RDP Systems, to the extent necessary that DCC and RDPs are capable of complying with their obligations under Sections E (Registration Data), G (Security), H (DCC Services) and L (SMKI) (and for such purposes DCC shall, to the extent reasonably practicable, use Devices that comply with (or have been designed to comply with) SMETS2 v3.0

(d)   demonstrate the extent to which the Modified DCC Total System and both new 1.1 CHs and those upgraded from CHTS v1.0 are capable of interoperating:

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[4]   Note that the definition of DCC Total System in the direction is that as modified to include changes for Release 2.0. This is reflected in the use of the term Modified DCC Total System in this document.

(i)   with the Device or Devices that form part of an Enrolled Smart Metering System; and

(ii)   with IHDs that have been installed pursuant to Condition 34 or 40 of (respectively) the Electricity Supply Licences or the Gas Supply Licences

in each case where one or more of those Devices comply with SMETS2 v2.0 (but not SMETS2 v3.0)

(e)   enable (to the extent that it is reasonably practicable to do so, and in each case as far as reasonably practicable in advance of Service Release 2.0 Go Live):

(i)   Parties to test the interoperability of their User Systems with the DCC System together with 1.1 CHs; and

(ii)   Testing Participants to test the interoperability of Devices that comply with (or have been designed to comply with) the requirements of SMETS2 v3.0 with the DCC System together with 1.1 CHs

(iii)   Demonstrate that the new versioning aspects of the DUIS operate correctly for Users to facilitate communication to a mixed estate of Devices operating to multiple different technical specifications with different functionality sets

(iv)   Demonstrate that Users can successfully install and commission and operate all Communications Hubs using the Modified DCC Total System

In addition, the following testing objectives shall also apply:

(f)   demonstrate that the Modified DCC Total System can operate successfully within a wider Smart metering ecosystem comprised of multiple Devices operating to different technical specifications in a consistent manner;

(g)   test end-to-end communication from User to Device and back again for all technical specifications in operation, together with the updated Parse and Correlate Software;

(h)   verify that all other functional changes that are part of Release 2.0 are functionally correct including consequential amendments (e.g. anomaly detection);

(i)   throughout the process, testing will be in accordance with Good Industry Practice, and with wider DCC objectives in Condition 5 of the DCC Licence;

(j)   wherever practicable, use of automated testing is required to improve the efficiency and lower the cost of testing;

(k)   assure Single Band Communications Hubs and Dual Band Communications Hubs against v3.0 of the Joint Test Methodology;

(l)   ensure that the changes do not materially impact the security risks associated with the Modified DCC Total System, or changes are identified, tested and accepted. Consideration should be given to the security capabilities in the DCC security architecture including the protection of data and infrastructure;

(m)   validation, as defined in specific Test Phase Approach Documents, of all DCC operational impacts and regression testing of the service to ensure continuity; and

(n)   validation, as defined in specific Test Phase Approach Documents, of the end-to-end data flows via the Modified DCC Total System (including reporting).

(o)   In pursuance of objective c above, all Communications Hub variants will be subject to testing in R2.0 to evidence that:

   (i)   R2.0 development has not introduced any unintended capability regression from existing functional or non-functional behaviours such that backward compatibility is assured

   (ii)   New or modified functional or non-functional behaviour which is required for the Modified DCC Total System in order to meet the R2.0 requirements has been developed and implemented and is fit for purpose

   (iii)   Where practicable, overall Communications Hub behaviours are consistent between variants across the CSP Regions

In respect of the testing objectives described above:

(a)   references to the SEC shall be construed as a reference to the intended future version of the SEC (including any Subsidiary Documents) which are due to have effect at Release 2.0;

(b)   the testing objective shall be read as an objective to demonstrate or enable (as the case may be) testing of any particular thing only to the extent that such thing has not already been demonstrated or enabled by previous testing under the SEC;

(c)   the testing objective shall include the regression testing of existing key end-to-end processes to ensure that they are able to operate under both Release 2.0 and previous releases;

(d)   the testing objective may be met in multiple stages; for example, meeting it separately in relation to single-band and then Dual Band Communications Hubs; and

(e)   the testing objective may be met in parallel with meeting the testing objective of other changes to DCC Systems.

3.2.   Technical Specification Versioning

Release 2.0 of the DCC Systems will be the first release of the DCC Systems that will support Devices that may comply with different versions of GBCS, SMETS and CHTS according to the entry for the Device Model in the Certified Products List.

The introduction of updated technical documents means that Devices within the smart metering ecosystem can have different features and functionality while still being conformant to the regulation and be interoperable with other Devices conformant with a different set of technical documents. The Modified DCC Total System for Release 2.0 has to operate successfully to support communication to all Devices regardless of which applicable technical documents they are conformant with.

The DCC User Interface and the rest of the Modified DCC Total System shall therefore support multiple versions of technical documents across the mixed estate of Devices that will exist within the smart metering eco-system at any point in time.

DCC will provide information for Users on the process steps involved to operate with DUIS v2.0.

Release 2.0 of the DCC Systems introduces an upgrade to the DCC User Interface Specification (DUIS) and enables, for the first time, User choice regarding which version of DUIS they wish to operate against, v1.0 or v2.0. A User may only operate against a single version of DUIS at any one time.

Backward compatibility of GBCS use cases in versions of GBCS with a valid Applicability Period must be supported by the DCC User Interface and the rest of the Modified DCC Total System (unless specifically mandated otherwise within GBCS for a specific GBCS Use Case). The latest version of DUIS will support Devices with older GBCS versions as well as the Devices compliant with the latest GBCS version.

Forward compatibility, meaning use of DUIS v1.0 with a Device that is compliant with GBCS v2.0, shall be supported by DCC for GBCS use cases that are in common between GBCS v1.0 and GBCS v2.0.

It shall not be possible for a Service Request issued by a User to DCC via DUIS v1.0 to be transformed by the Modified DCC Total System into a GBCS Command/message code which has been newly introduced in GBCS v2.0.

The upgrade to DUIS v2.0 is optional for Users however if any of the v2.0 functionality is required, it will be necessary for the User to upgrade.

It is expected that some Users will want to test the new DUIS v2.0 (functionality and regression) and some Users (not upgrading to DUIS v2.0) will want to regression test against DUIS v1.0. Some Users may wish to undertake both activities.

DCC will test technical specification versioning during the DSP PIT and SIT test phases.

Testing during these phases shall demonstrate that the new versioning aspects of the DUIS operate correctly to allow Users to communicate, using their preferred version of DUIS, to a mixed estate of Devices operating to multiple different technical specifications with different functionality sets.

The following are key principles for DUIS versioning (DUIS versions and GBCS versions):

- The old DUIS v1.0 remains supported by DCC and continues to support all the use cases in GBCS v1.0.

- The new DUIS v2.0 needs to support Devices running both old and new versions of GBCS.

- The old DUIS version can be used with updated Devices where existing GBCS use cases are still supported in the later GBCS version.

- DUIS v1.0 cannot be used to access use cases that appear in GBCS v2.0 but not in GBCS v1.0

- A User should plan to operate against a single version of DUIS, either DUIS v1.0 or DUIS v2.0

Users, as part of UIT, will be able to test with the new DUIS versioning functionality to ensure that the Modified DCC Total System is working correctly as designed against the version of DUIS that they intend to use upon implementation of Release 2.0. Users will be able to test Service Requests in UIT against their chosen DUIS version against a mixed estate of Devices operating at different GBCS versions to ensure that commands are processed as expected and appropriate Responses received correctly by Users.

4.   Testing Approach

As described above, Release 2.0 comprises changes to support the increment of a number of baseline technical documents, the introduction of Dual Band Communications Hubs and any changes to the DCC Systems and processes needed to support the release.

The scope of the DCC Total System that relates to processing communications with Users and Devices is shown below (in the grey box + the HAN).
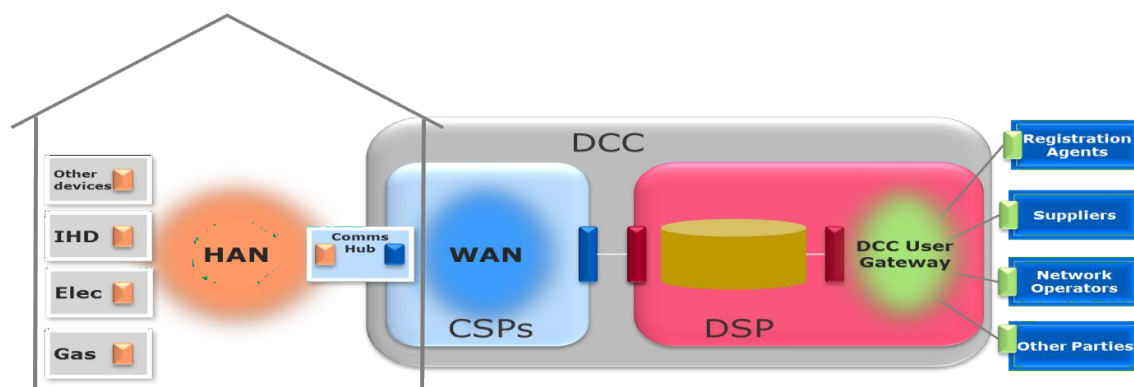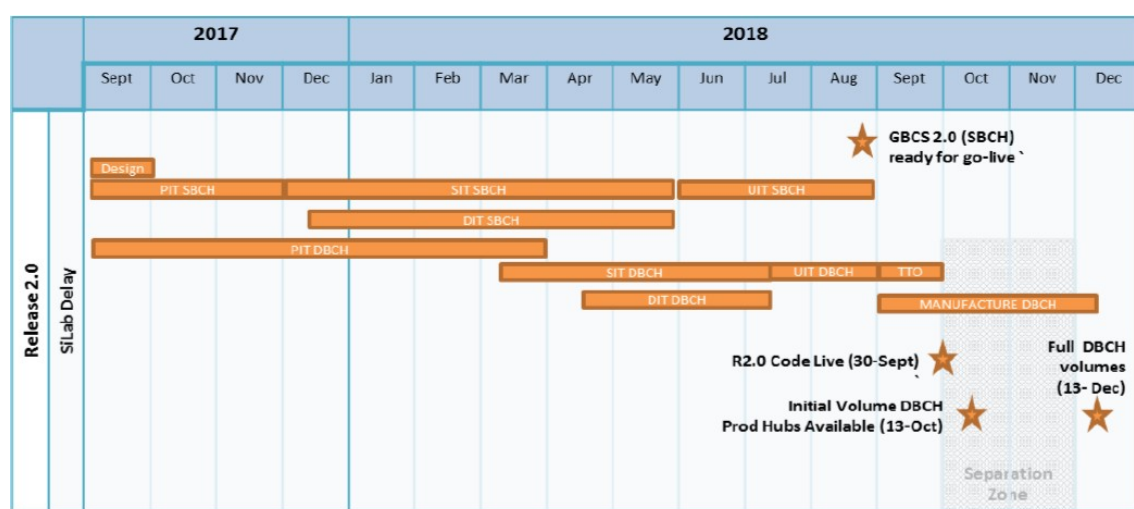

Figure 1 – Scope of DCC Total System for Processing Service Requests

All interfaces and functions of the Communications Hub, including the HAN interface and Gas Proxy Function, fall within the scope of the DCC Total Systems. The Parse and Correlate Software is also part of the scope of the DCC Total System.

This document will describe the specific testing approach requirements for each phase, and then describe the common approach requirements that apply across the release.

4.1.   High Level Plan

The detailed delivery plan is described in the Licence Condition 13 planning document for Release 2.0 and is not included in this Testing Approach Document. A high level outline plan is shown below.

The changes that comprise Release 2.0 will be developed and tested by DCC and its Service Providers in three parts. All parts will include regression testing and backwards compatibility testing.

- Part 1 – Early Integration (DSP Only). Regression testing of the R1.3/1.4 functionality by DSP only for backwards compatibility, plus testing of new DSP functionality to support a Device estate operating to multiple different versions of technical specifications with a CSP simulator.

- Part 2 – GBCS v2.0 testing with a Single-Band Communications Hub compliant to CHTS v1.1 for all Service Providers. Testing of new GBCS v2.0 functionality between DSP and CSPs.

- Part 3 – GBCS v2.0 testing with a Dual Band Communications Hub compliant to CHTS v1.1 for all Service Providers. Testing to complete the scope of Release 2.0.

4.2. Description of Test Phases

The approach to testing will include defined test phases. Subject to 4.3 below, and accepting an overarching principle for Release 2.0 to progress testing from phase to phase iteratively to facilitate progress and provide access to Parties for testing earlier than waiting for a test phase to complete, these are steps to develop and assure code or products prior to making them available in production.

In plain English, and with further detail provided in section 5 below, the test phases can be described as follows:

- The Pre Integration Test (PIT) phase covers the testing by DCC Service Providers undertaken individually to verify that the solution meets the requirements

- Systems Integration Testing (SIT) confirms that the different DCC Service Provider and DCC internal systems work effectively together to meet the requirements of the SEC and operate as a working system for Users. This phase will include

- Solution Testing and Service Provider User Acceptance Testing (SP UAT). It will also include Operational Confidence Testing by the DCC Service Providers.

- Device Integration Testing (DIT) will test the interoperability between the Modified DCC Total System and 1.0 CHs, new 1.1 CHs (Single and Dual Band) and those that have been upgraded from CHTS v1.0 and

    - Devices that form part of Enrolled Smart Metering Systems and associated IHDs; and

    - new Devices complying with SMETS2 v3.0 (where Devices are available to support testing)

- DIT will take place independently of other phases, and will be subject to the overall LC13 plan, but is expected to be undertaken at the same time as SIT. The start of DIT will be offset from the start of SIT to ensure that components integrate prior to beginning testing with Devices.

- User Integration Testing (UIT) allows Users to test their systems and Devices with the Modified DCC Total System before changes are made available in the production environment. For Release 2.0, each Supplier Party that is a Responsible Supplier for any Device with an SMI Status of 'commissioned' is required to execute User Regression Testing against the Modified DCC Total System, as further described in Section 5. UIT also allows new and existing Parties to provide evidence of their ability to interact with the Modified DCC Total Systems for formal user testing using DCC Meter Protocol Emulators.

- Testing to support the Transition to Operations (TTO). These testing stages may operate independently and overlap with other phases. Testing as part of this group will include Operational Acceptance Testing, Business Acceptance Testing, security testing, pre-production proving and any required Performance Testing. It is the phase that assures that DCC Systems and processes – including billing and reporting are ready to support the changes introduced by the wider release.

The table below shows how the test phases address the testing objectives (using summarised language) described in detail above in section 3.1.

Ref	Objective	Test Phase
A	Demonstrate that new 1.1 CHs comply with CHTS v1.1	CSP PIT, SIT
B	V1.0 Communications Hubs can be upgraded to comply with CHTS v1.1 and GBCS v2.0	CSP PIT, SIT
C	Demonstrate that Modified DCC Total System together with v1.1 CHs interoperate with each other and User Systems to comply with SEC	CSP PIT, SIT, UIT, DIT, TTO
D	Regression testing for existing Devices and new SMETS2 3.0 Devices	PIT, DIT, SIT
E	Support User testing of Systems and Devices	UIT
F	Good Industry Practice and DCC objectives	PIT, SIT, UIT, DIT, TTO
G	Use of automated testing	PIT, SIT
H	Assure the 2.4GHz and Sub GHz RF Coverage performance	CSP PIT
I	Security	PIT, SIT, UIT, TTO
J	Communications Hubs work as intended	CSP PIT, SIT, DIT
K	DCC operational impact	UIT, TTO
L	End-to-end data flows	PIT, SIT, UIT, DIT

Table 5 Testing Objectives by Phase

Alongside the testing activities associated with Release 2.0, DCC will continue to provide support for testing by new and existing Parties as part of the ongoing provision of testing services.

Release 2.0 changes a live system and will be developed and planned at a time when significant User testing of the system will be taking place within E2E testing. The Release must take account of incidents from production, and issues raised in E2E testing, both in test plans, but also as they arise during test phases.

Security testing should include appropriate testing to demonstrate security of the test and production environments and code. This may include penetration and other vulnerability testing, and may occur across multiple test phases.

DCC shall make available a version of the Parse and Correlate Software that is consistent with the functionality of Devices and DCC Systems that will be in operation from Release 2.0 live in the timescales set out in the Release 2.0 LC13 plan.

4.3. Delivery of Test Phases and Stages

In accordance with the X11 Direction, the execution of the testing to support Release 2.0 may be undertaken in multiple stages, this could include the possible delivery of multiple PIT, SIT and UIT phases, but using the same Release 2.0 PIT, SIT and UIT environments.

The approach may also include overlapping testing phases and stages to support early availability of elements of the scope, but consistently subject to the established DCC quality gating process including the DCC Test Assurance Board.

Apart from SIT and DIT which have been designed to be parallel and concurrent phases (with suitable dependencies for components and service requests to pass in SIT prior to being used in DIT), there will be no parallel testing across phases for any given functionality – functionality will not be released into a subsequent phase until testing, assurance and governance procedures are completed for prior and current test phases. The option to overlap, for instance SIT and UIT, is intended to allow Parties to test the GBSC v2.0 solution in UIT with Single Band Communications Hubs whilst SIT for Dual Band Communications Hubs is ongoing.

The detail of the execution plan for Release 2.0 is contained in the Licence Condition 13 Plan.

5. Supplier Parties – User Regression Testing

Each Supplier Party that is a Responsible Supplier for any Device that has an SMI Status of 'commissioned' on the date of the milestone "UIT TSG 2.0/SBCH Commence" (as defined in Table 7 of UIT Approach Document), shall:

(a) take all reasonable steps to meet the Entry Criteria for User Regression Testing, as set out in Section 5.1.1 of the UIT Approach Document, by no later than 50 working days prior to the date of the milestone "R2 End of UIT testing Window" (as defined in Table 7 of the UIT Approach Document);

(b) ensure that in carrying out User Regression Testing it sends test Service Requests that are consistent with Version 0.8.2.1 of the DUIS XML Schema;

(c) ensure that the scope of its User Regression Testing tests comply with the requirements of Section 5.1.3 of the UIT Approach Document;

(d) cooperate with the DCC to ensure that all of its User Regression Testing tests are executed by a date which is no later than 10 working days prior to the date of the milestone "R2 End of UIT testing Window" (as defined in Table 7 of the UIT Approach Document); and

(e) provide the DCC, by the date which is no later than 5 working days prior to the date of the milestone "R2 End of UIT testing Window" (as defined in Table 7 of the UIT Approach Document) , a self-certification of completion of User Regression Testing in the form provided by the DCC.

6. Test Phase Description

This section 6 of the Release 2.0 Testing Approach Document defines the testing activities and assurance requirements for individual test phases.

Subsequent sections describe and define generic elements of the approach to testing for Release 2.0. e.g. roles and responsibilities.

The testing deliverables required in section 8 below shall ensure that these requirements and focus areas are suitably covered by each DCC Service Provider and each testing phase, and assured accordingly. All requirements and deliverables for each phase shall ensure that the test objective coverage described in Table 5 above is met.

6.1. Requirements & Focus Areas for Pre Integration Testing

PIT for Release 2.0 is required to provide assurance of quality earlier in the process than has previously been the case for DCC Releases.

As an overall requirement, any and all testing which can be reasonably and cost- effectively undertaken prior to SIT should be undertaken in PIT.

Ref	Requirement
PIT.1	DCC Test Assurance will engage in PIT across all activities except unit and link testing, as subsequent activities within PIT provide assurance of outputs from those tests
PIT.2	DCC Systems Integrator shall support the DCC Service Provider PIT activities
PIT.3	DCC Service Provider PIT shall include suitable performance testing
PIT.4	DCC Service Provider PIT shall be conducted using the latest available version of Parse and Correlate Software
PIT.5	DCC Service Provider PIT shall include suitable security testing of the whole solution. Specifically for CSPs this will include security testing of their Sub-GHz design and components
PIT.6	CSPs shall use a common methodology to assess the effectiveness of their HAN radio implementation and HAN coverage
PIT.7	Functional testing shall be aligned with all specifications, including CHTS v1.1 requirements
PIT.8	CSP Testing of GBCS v2.0 10.6.2.2 (Duty Cycle Monitoring) shall be undertaken using emulators
PIT.9	DCC shall review and approve the PIT test scenarios, where used, for appropriateness and suitable functionality coverage
PIT.10	CSP to verify ZigBee interPAN functionality

PIT.11	CSP to verify full functionality with maximum Devices attached
PIT.12	CSPs to demonstrate through testing that the WAN coverage assumptions which support the CSP "B" milestones are not jeopardised by the new Dual Band CHs
PIT.13	CSPs to demonstrate through testing that SM WAN connectivity is reliable and robust over a range of timed periods, at different power levels

Table 6 PIT Requirements

6.2. Requirements & Focus Areas for Systems Integration Testing

SIT for Release 2.0 shall be planned to allow for incremental delivery (based on incremental proving out of PIT) of functionality from SIT to support earlier delivery of final, assured code for User testing.

Ref	Requirement
SIT.1	SIT will be undertaken using scenario testing and will ensure that Service Requests are validated for the correctness and consistency of content, alongside the correctness of formatting
SIT.2	SIT coverage will be proved using a test traceability matrix, which may be facilitated by the use of additional reporting tools
SIT.3	SIT will be designed to make use of automation where practicable to improve testing throughput rates
SIT.4	SIT will test all variants of 1.1 CHs, and regression against 1.0 CHs
SIT.5	SIT will include suitable security testing, including protection of data and E2E messaging security
SIT.6	SIT will include Solution Test and Service Provider User Acceptance Testing
SIT.7	SIT will include non-exhaustive testing of disruptive and negative functional test scenarios
SIT.8	SIT shall be performed using assured testing stubs and Meter Protocol Emulators. If there are Devices where there are no assured emulator alternatives, e.g. In Home Displays, then SIT shall use actual Devices
SIT.9	Testing of the integration with the Parse & Correlate Software
SIT.10	SIT will include testing of the Local Command Interface using a hand held terminal Device, or a suitable testing tool developed to emulate connectivity at the Local Command Interface[5]

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5   This interface is only required for the 2.4GHz interface

Testing Approach for Release 2.0

SIT.11	SIT will include verification of the correct operation of all interfaces in DCC Systems

SIT.12	SIT will include verification that the correct E2E data is contained in all relevant DCC enterprise system produced report feeds

SIT.13	SIT will include suitable tools to allow testing and verification of encrypted and sensitive payloads

SIT.14	Where SIT makes use of the DCC Meter Protocol Emulator, testing must include emulator configuration to provide valid data in a service response. A blank / null response cannot result in a passed test. The response must include valid data that can be successfully parsed and where relevant decrypted, to prove the response data received is as expected based on the emulator configuration for that test

SIT.15	SIT will include appropriate levels of testing of the v1.0 to v1.1 Communications Hub upgrade process to reflect the installed base of v1.0 Communications Hubs

SIT.16	SIT will include testing 1.0 CHs with the Modified DCC Total System

Table 7 SIT Requirements

Specifically for SIT.10, testing of the Local Command Interface shall cover, as a minimum, the following activities:

- Service user simulator to DSP to service user simulator local command

- Local command to Communications Hub Function to Device

- Device to Communications Hub Function to local response

- Local response to service user simulator to DSP

6.2.1 Service Provider User Acceptance Testing

The SIT Phase includes the DCC Service Provider User Acceptance Testing (SP UAT) activity. This activity will operate concurrently with Solution Test, and is undertaken to provide additional assurance.

It allows DCC to witness an agreed subset of the tests carried out in Solution Test. The subset of tests will be described in a SP UAT test plan.

Giving at least 2 Working Days' notice, the DCC Systems Integrator will provide DCC with a schedule of when and where tests will be executed and invite DCC to witness either on- site or remotely.

Witnessing of the test execution, or reviewing evidence of executed tests, will adhere to two key rules;

- There will be no deviation from test scripts

- There will be no hands on execution by witnesses

Testing Approach for Release 2.0

SP UAT will report on test completion, test failures and test pass rate independently of Solution Test, in order to ensure that 100% coverage and other success criteria of SP UAT are met.

6.2.2 Operational Confidence Testing

At the same time as SIT, and for functionality that has completed SIT, the CSPs will undertake Operational Confidence Testing to assure functionality and non-functional performance of the Communications Hubs, supported by the DCC Systems Integrator and the DSP.

In the absence of a suitable environment for complete non-functional testing, Operational Confidence Testing will address non-functional testing as is practicable, and will include characterisation of timings, testing of different network transport layers and soak testing of Communications Hubs over a range of time periods to identify defects and issues occurring as a result of extended operation, including intermittent HAN connections.

Because of the nature of Operational Confidence Testing a different definition of success criteria will be applied. These will be defined by the Communications Service Providers in a joint OCT approach document and reviewed by the SEC Panel Testing Advisory Group (TAG), but will not be part of the SIT audit scope.

The OCT approach document will include;

- summary scope of tests to be carried out by each CSP

- detail of the environments to be used for OCT

- assurance approach and progress/test coverage reporting

- interaction with the DCC Systems Integrator

- approach to classifying and managing defect

- success criteria and completion report.

Where relevant, Operational Confidence Testing will be coordinated with DIT.

6.3. Requirements & Focus Areas for User Integration Testing

The provision of User Integration Testing environments and associated services is part of DCC's ongoing activities, this section 6.3 describes the specific requirements and focus areas for Release 2.0.

Release 2.0 will introduce a second UIT environment to allow Parties to continue to test against the Release 1.0 code base/production (using the existing UIT A environment) in parallel with testing the Release 2.0 solution (using the new UIT B environment initially). How DCC will operate multiple UIT environments, and how Parties will interact with those environments, will be covered in a new DCC deliverable defined in section 8 below.

DCC shall provide a testing service (User Integration Testing (UIT)) that allows a Party to test the interoperability of its User Systems with the Modified DCC Total Systems (including via the Self-Service Interface), and to test simultaneously the interoperability of User Systems and Devices (other than those comprising Communications Hubs) with the Modified DCC Total Systems and with Test 1.1 Communications Hubs provided by DCC. This testing service shall be made available on the same basis as Testing Services under Section H14 (Testing Services), but subject to this Testing Approach Document.

As for previous releases, there will be a period between the completion of SIT and promoting functionality to live operations. This period allows for Parties to undertake any User Entry Process Testing (UEPT) activities and test with the Modified DCC Total System as they choose. Certain Supplier Parties will also carry out User Regression Testing as described in this Testing Approach Document.

The UIT Approach Document will provide timings for the uplift of DCC documents relating to User Testing, including the options for completing additive UEPT for Release 2.0 and how test Devices should be managed in a multiple environment context.

DCC now operates a production business, and defects found in User testing against DCC Systems will be managed through to resolution by the appropriate DCC release channel available. The Enduring Test Approach Document will be updated to provide detail of this process.

Ref	Requirement
UIT.1	UIT will enable Parties to test Release 2.0 functionality
UIT.2	UIT will be planned to allow earlier availability of functionality from SIT for Parties to test against their systems and Devices, ahead of the completion of the full Release
UIT.3	UIT will include the provision of a Prototype Test Communications Hub for remote test labs, to enable the testing and diagnosis of HAN interoperability and HAN performance
UIT.4	UIT will include the provision of an Instrumented Test Communications Hub for DCC and remote test labs, to allow participants to diagnose and assure HAN performance and interoperability with other Devices, and undertake functional testing[6]
UIT.5	The deployment of new releases to UIT will be subject to specific entry criteria and testing to ensure minimal risk of disruption to ongoing participant testing in the environment
UIT.6	UIT security testing of DCC user authentication and authorisation, including protection of data and E2E messaging security
UIT.7	UIT testing shall include the capability for participants to verify all installation and maintenance activities for CHs as described in the SEC
UIT.8	UIT testing must include the capability for participants to verify their end-to-end data is operating correctly over DUIS and SSI, and in SSI reports
UIT.9	UIT testing must include the capability for DCC operations to verify their processes using SSI, SSMI, and reports as in the production environment but based on actual participant activities

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[6]   Release 2.0 will introduce a Dual Band Instrumented Communications Hub for use in DCC and remote test labs. A single band Instrumented Communications Hub is subject to a separate DCC Change Request and is not part of Release 2.0. The earlier of the provision of DB ITCH or SB ITCH will see DCC update working practices and testing participant guidance documentation to support the use of ITCH in RTLs as part of overall issue management activities

UIT.10	UIT testing shall allow for users to test with the mesh technology

UIT.11	DCC will make meters available to be requested for testing by Users who are not in a position to install and commission meters themselves – e.g. Network Operator Parties

UIT.12	Supplier Parties with commissioned Devices are required to execute User Regression Testing as described in Clause 5 of this Test Approach Document

Table 8 UIT Requirements

UIT will continue to support UEPT. DCC will propose updates to the Common Test Scenarios Document (CTSD) to reflect the functionality available as a result of Release

2.0. All Parties who have not previously completed UEPT will be required to prove their capability against the full set of relevant requirements in CTSD for the user roles they seek to operate in production.

Existing Users will be required to prove their capability against the updated requirements in CTSD for the User Roles they seek to operate in production. Parties can select whether to follow the documented UEPT process supported by DCC, or provide evidence of their capabilities outside of the documented UEPT process for DCC to consider prior to issuing certificates. UIT for Release 2.0 will be sufficient in scope for Parties to prove their capability to use the new Services.

Full detail of the process and how Parties will be able to engage with DCC to complete UEPT in the manner of their choosing, if they are entitled to choose, will be provided in the UIT Approach Document.

Where a Party provides evidence to DCC that it has proven its capability to use one or more of the new Services and DCC is not satisfied that a Party has successfully demonstrated that capability, that Party may refer the matter to the Panel for its determination (which shall be final and binding for the purposes of the SEC).

It is noted that DCC maintains its obligations to provide and support an integrated environment for the purposes of user testing, which includes ongoing assurance of the provision of CSP and remote test labs used within UIT, and demonstrating that the UIT environment is secure.

6.4. Requirements & Focus Areas for Device Integration Testing

DIT as a phase will build upon the lessons learnt from Release R1.2 and R1.3. During DIT DCC will engage with Device manufacturers throughout and notify Parties of the ongoing DCC interoperability events and other DCC engagement.

The deliverables for this test phase shall acknowledge the potential availability risk of suitable Devices and make exceptional provision for DIT to be undertaken using testing stubs, subject to approval to do so being provided by BEIS.

Further to the lessons from R1.3 testing with meters, DIT will be a formal test phase, and shall be required to achieve 100% coverage of planned tests, rather than be time limited. The exception will be when tests are blocked due to meter defects which are confirmed to exist in the live code base, which are not fixed by meter manufacturers within DIT timescales.

DIT will provide industry with confidence that v1.1 Communications Hubs, and v1.0 Communications Hubs upgraded to v1.1 interoperate with existing SMETS2 v2.0 Devices (including IHDs) and Devices designed to

meet SMETS2 v3.0. DIT will also provide industry with the confidence that v1.0 Comms hubs and SMETS2v2 Devices interoperate with the Release 2.0 code base.

DCC has undertaken a documented commercial selection activity to determine which Devices and manufacturers will participate in DIT in line with the requirements below. All selected participants in DIT have confirmed the readiness and suitability of their Devices to support DIT.

All of the requirements below are subject to the availability of sufficient firmware and individual Devices, capable of fully participating in the testing at the time of the planned activity and supported by the manufacturers of those Devices.

If the availability of sufficient capable and supported Devices would result in any of the requirements below being at risk of not being proven, following confirmation with BEIS, DCC will complete such testing as is practical (potentially utilising emulators) and provide detail of the reasons why DIT has not been fully completed in the Test Phase Completion report. DCC will endeavour to complete any coverage of testing with Devices in UIT should suitable Devices become available after the completion of DIT and prior to go live.

DIT will be conducted in the same environment as SIT, coordinated to ensure Device testing scenarios and combinations take place against an appropriate code base.

Ref	Requirement
DIT.1	DIT shall test Communications Hubs with a minimum of 2 ESME Device Models from different manufacturers designed to meet SMETS2 v3.0
DIT.2	DIT shall test Communications Hubs with a minimum of 2 GSME Device Models from different manufacturers designed to meet SMETS2 v3.0
DIT.3	DIT shall test Communications Hubs with a minimum of 2 GSME Device Models from different manufacturers designed to meet SMETS2 v3.0 and capable of Sub-GHz HAN communications
DIT.4	DIT shall test Communications Hubs with a minimum of 2 PPMID or combined PPMID/IHD Device Models from different manufacturers designed to meet SMETS2 v3.0
DIT.5	DIT shall test Communications Hubs with a minimum of 2 PPMID or combined PPMID/IHD Device Models from different manufacturers designed to meet SMETS2 v3.0 and capable of Sub-GHz communications
DIT.6	DIT shall test Communications Hubs with a minimum of one Device Model for each of the leading ZigBee Alliance silicon stack providers
DIT.7	DCC shall select Device Models for DIT using dry-run qualification events and commercial proposals from Device Model providers to support DIT activities
DIT.8	DIT shall specifically ensure that Communications Hubs are verified as capable of complying with: • GBCS v2.0 10.6.2.6 (Frequency Agility) • GBCS v2.0 10.6.2.2 (Duty Cycle Monitoring)

DIT.9	DIT shall include risk based regression testing of Communications Hubs with a minimum of 2 SMETS2 v2.0 ESME and GSME Device Models selected to be representative of a significant proportion of the installed base of SMETS2 v2.0 Devices at the time of undertaking DIT
DIT.10	Should actual HCALCS Device Models exist and be in a suitable state of readiness, DIT shall test Communications Hubs with a minimum of 1 HCALCS Device
DIT.11	Removed
DIT.12	DIT shall test Communications Hubs with a minimum of 2 IHD Device Models from different manufacturers
DIT.13	DIT shall include end-to-end testing of the Local Command Interface using Hand Held Terminal Devices, if available, or using the DCC tool required to be developed for testing in SIT[7]
DIT.14	Removed
DIT.15	DIT shall include regression testing of SMETS2 v2.0 Devices with R2.0 of DSP

Table 9 DIT Requirements

6.5. Requirements and Focus Areas for Transition to Operations Testing

The Transition to Operations (TTO) Test Phase will include Business Acceptance, Operational Acceptance and Security related requirements as focus areas to transition R2.0 solution to operations. TTO Testing will focus upon the service management processes as SIT will have tested technical end-to-end functionality. Completion of SIT Testing is a prerequisite for TTO Test execution to start. Support from the DCC Systems Integrator and CSPs is required to carry out internal and external testing as part of TTO Testing.

The Environment Plan deliverable will highlight how TTO will utilise existing DCC environments. It is assumed that the DCC pre-production environment will not be available for Release 2.0.

Ref	Requirement
TTO.1	Transition to Operations testing shall ensure that non-functional security risks to the production environment are identified, assessed and resolved or managed, e.g. through PEN testing, work off plans and appropriate ISMS risk entries
TTO.2	TTO will include pre-production proving
TTO.3	Prioritise the resolution of known User and Service Issues evident from testing Release 2.0
TTO.4	Review impact to existing operational Services, security processes and any adverse effects

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7   The End to End process for the Local Command interface is described in 6.2 above

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TTO.5	Assess information security risk and vulnerabilities
TTO.6	Prove that the system supports business/operational requirements and/or Service design
TTO.7	Transitional, business, operational processes and documents are proven and in place
TTO.8	Provide confidence that solution/services are suitable for wider infrastructure, fully implemented and fit for live service
TTO.9	TTO will test DCC internal systems and processes, including but not limited to the Cognos business information management/management information tool, SMKI Recovery and Repository Management
TTO.10	DCC operations will be included as a test participant in order to validate their processes, scenarios and procedures supporting User activity
TTO.11	Determine the potential impact of Release 2.0 on operational demand management, through regression testing and non-functional testing. Specifically this will include detailing the final message sizes

Table 10 TTO Requirements

7. Common Testing Requirements and Activities

The following sections describe the approach to testing that is required for all test phases and stages, unless explicitly described otherwise.

As a general principle, the established testing and test assurance governance, resources, processes and other activities developed by DCC for previous releases will continue – except as where explicitly required otherwise by this Testing Approach Document.

7.1. Test Activities

For each Test Phase, the following activities will be performed;

- Prepare and maintain a Test Phase Approach
- Implementation of testing infrastructure
- Test Phase planning
- Identification of test scenarios
- Design of test scripts
- Produce test specification document

- Produce requirements traceability matrix, or equivalent

- Design and preparation of test Data, including loading of test Data into the test environment

- Preparation of test execution schedule

- Execution of testing

- Performing quality gate reviews

- Test issue management

- Test issue resolution

- Release management

- Configuration management

- Test Progress reporting

- Test assurance of third party components

- Training for Test Execution

7.2. Test Method

As for previous DCC Releases, testing will be conducted using high-level test scenarios (or sequences of Service Requests for specific Test Phases). The Test Phase Approach Documents will specify the detailed testing methodologies for each individual Test Phase.

Testing should cover both functional and non-functional aspects of the dynamic interaction between solution elements, and shall provide full coverage of the DCC Service Request variables – user role, command variant, and mode of operation. Where interfaces are to be tested within a Test Phase – all relevant interfaces should be tested. Similarly, testing should account for all elements of the Modified DCC Total System, for example the internal DCC-Enterprise components that support billing and reporting.

Priority, within the design of testing for Release 2.0, shall be on the changes introduced by the scope of the Release, but also on the functionality and Service Requests that are considered to be of highest risk to Parties and Energy Consumers.

Where testing makes use of the DCC Meter Protocol Emulator, testing must include emulator configuration to provide valid data in a service response. A blank / null response cannot result in a passed test. The response must include valid data that can be successfully parsed and where relevant decrypted, to prove the response data received is as expected based on the emulator configuration for that test

DCC is seeking a significant increase in the amount of automated testing that will be performed for Release 2.0, and will require the DCC Systems Integrator to provide detail of this in the SIT Test Phase Approach Document, including reporting to demonstrate that automation expectations have been met.

Also in relation to the design of testing for SIT, coverage of DUIS v1.0 and DUIS v2.0 interfaces and how testing between regression and new elements is balanced across the interfaces and Communications Hubs types and CHTS versions.

7.3. Test Scenarios

Except for the DSP PIT test phase[8], Release 2.0 will include the non-exclusive use of test scenarios to reduce the risk of the design of testing not sufficiently matching the intended real life use of the system.

Test scenarios may, within the context of the individual Test Phases, be represented by defined sequences of Service Requests or other relevant activities.

Test scenarios shall be used in PIT to ensure that the products which are received in SIT have been exercised in an expected manner, prior to the start of SIT.

Each test phase will define test scenarios as a deliverable as appropriate, but as a minimum the definition of test scenarios will include:

- Description

- Responsibility for development

- Type (Normal, Exception, Alternative)

- Prerequisites

- Test conditions

- Verification method

- Traceability to requirements (or use case for DSP PIT)

- Test variations – User Roles, Communications Hub, mode of operation, Command variant, Device

The definition of Test Scenarios for SIT and DIT shall include and consider:

- Key common scenarios that will be experienced by the Parties in production – e.g. install and commission, Communications Hub replacement, over the air Firmware upgrade etc.

- A reasonable minimum number of exception or non-happy path scenarios

- A relevant subset of scenarios (or Service Request sequences) to reflect Network Operator Party use cases

- Include data and infrastructure security tests, taking into account DCC security architecture and security standards and patterns, alongside functional and non- functional testing

DCC will review the proposed Test Scenarios, or sequences of Service Requests, for SIT and DIT with Parties at the DCC monthly testing forum – the Testing Design and Execution Group.

Test Scenarios may be updated to take account of activities from live operation, subject to suitable change controls.

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8   DSP PIT is based on Use Cases.

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Test Scenarios will also include sequences for use by DCC operations and DCC finance in order to test other DCC business processes that more generally provide support to Parties, invoice customers, and correct data errors.

Test scenarios must cover exercising all of the interfaces in DCC Systems in an end-to- end manner verifying functionality as well as data is reported correctly.

Where emulators are used, test scripts should define the required emulator configuration to provide valid data in a service response. A blank / null response cannot be considered a passed test and the response must include valid and expected data that can be successfully parsed and where relevant decrypted, to prove the response data is received as expected based on the emulator configuration to meet the defined test objective for that test.

7.4. Regression Testing

All new releases of any element of the solution from all DCC Service Providers will be subject to completing a successful regression test prior to being accepted into subsequent testing phases and environments.

The following requirements for regression testing shall apply:

- Wherever practicable, regression testing will be automated

- Regression testing will be an ongoing activity

- Any regression testing must include the SMKI – even if that element has not been changed[9]

- The regression test approach for each phase will be described in the Test Phase Approach Document

- The scope of regression, where appropriate, is permitted to be risk-based with regard for combinations of User Role, Command variant etc. The exact scope of regression shall be defined in the Test Phase Approach Document for each phase

- If risk based regression is used within a test phase, as a minimum it should include key processes

- Regression testing of the uplifted technical specifications with single band Communications Hubs cannot be risk based

- The Regression Test Pack (test scripts, test data and documentation) will be submitted to DCC at the end of the test phase, with any agreed omissions being rectified promptly.

- As part of the completion of testing phases, a minimum of two full regression cycles will be undertaken to provide confidence in the stability of the release[10]

- Regression testing for DIT must be completed against Devices for single band Communications Hubs. This requirement also applies to dual band Communications Hubs except where no suitable Device is available to test against. Only where suitable Devices are not available will it be possible to use emulators to complete DIT regression testing.

- User Regression Testing, as required by the obligations set out in this Testing Approach Document, must be completed by certain Supplier Parties.

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9   Not in scope for PIT

10   Not in scope for DSP PIT

7.5. Dependencies and Assumptions

The following table describes the dependencies that need to be satisfied in support of Release 2.0 – individual test phases are expected to detail specific dependencies.

No.	Description	Dependent Upon
1	Commencement of specific test phases	Availability of test environments for Release 2.0
2	Commencement of UIT	Availability of the UIT-B environment, Communications Hubs and supporting User guidance
3	Commencement of DIT	Availability of Devices capable of satisfying the DIT Device Selection criteria (as outlined in 5.4 above)

Table 11 - Dependencies

In order to deliver Release 2.0 as a whole with a suitable level of confidence in the planning and assurance of the testing, there is an underlying principle that all solution elements will be fully tested and assured before being used in subsequent test phases. Therefore, SIT cannot test solution elements that have not received an approval to proceed certificate from PIT, issued by DCC – but the commencement of SIT is not dependent upon the whole scope of PIT being completed.

The following table describes the assumptions that underpin this test approach:

No.	Description
1	All solution elements will be PIT tested and gated before being subjected to SIT, i.e. defects will fall within agreed thresholds and any Work Off Plans (see Table 13) will be agreed with DCC
2	Emulators and Devices used in SIT and DIT will be assured and approved as fit for purpose prior to being used in testing

Table 12 - Assumptions

8. Deliverables

DCC will follow the testing documentation practices established for earlier releases. These are described at a high level in this section, and specific enhancements and requirements for Release 2.0 are highlighted.

8.1. By Test Phase

Deliverables will be produced for each Test Phase. The Test Phase Approach Document will detail the other deliverables required for the individual Test Phase.

For Release 2.0, a UIT Test Phase Approach Document for UIT is required. The provisions of the Enduring Test Approach Document apply, where relevant, to all testing carried out in accordance with this Testing Approach

Document modified, where necessary, to reflect the fact that the testing in this document applies to the Modified DCC Total System and includes 1.1 Communications Hubs in addition to Communications Hubs.

For the SIT and DIT Test Phase Approach Documents, DCC Test Assurance will introduce an industry review and feedback process, whereby content and/or the documents themselves will be circulated and discussed with the DCC Testing Design & Execution Group and the SEC Panel Testing Advisory Group.

The author for individual Test Phases will create the deliverable, which will be subject to the established DCC documentation review processes and 8.2 below:

- PIT – DCC Service Providers

- SIT – DCC Systems Integrator

  - OCT – Communications Service Providers

- DIT

  - DCC Test Assurance – Test Phase Approach Document, Test Scenarios

  - DCC Systems Integrator – All other DIT deliverables

- UIT – DCC Testing Services

- TTO - DCC

The table below describes the generic content and anticipated timing of the deliverables that may be required to be produced for each Test Phase by the Test Phase Approach Document.

Deliverable	Description	Timing
Test Phase Approach Documents[11]	Describes for the relevant test phase: the activities, participants, resources, roles and responsibilities, assurance requirements, reporting, success criteria and other information relating to the execution of the Test Phase. Where relevant, the Test Phase Approach Documents shall also define the entry and exit criteria, and the basis of any risk basis for regression	Following any applicable review cycle with industry, final version to be submitted to DCC by the relevant DCC Service Provider no later than 20 Working Days before the commencement of test execution. Following approval by BEIS, Test Phase Approach Documents will be published on the DCC website.
Test Plan & Test Schedule	Details the extent of the testing to be carried out and the responsibilities of DCC Service Providers and other parties	Final approved version to be provided to DCC by DCC Service Providers DCC no later than 10 Working Days before the commencement of test execution, including identification of any security constraints, e.g. sensitive scripts

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11   There will be a SIT Approach Document, a DIT Approach Document, a UIT Approach Document and a TTO Approach Document

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Test Specifications	Includes Requirements Traceability Matrix and Test Scripts	To be provided to DCC by DCC Service Providers no later than 20 days before the commencement of test execution
Test Readiness Reports	Statement of readiness to commence testing	To be provided to DCC by parties undertaking testing, on a weekly basis, commencing no later than 20 days before the start of test execution
Test Results	Detail may vary by Test Phase – report content and frequency will be defined by the Test Phase Approach Document	Made available by DCC Service Providers for review DCC throughout test execution
Test Issue Log	Outstanding Testing Issues	Made available by DCC Service Providers for review by DCC throughout test execution[12]
Regression Test Pack		To be provided to DCC by DCC Service Providers with the final Test Stage Completion Report
Test Phase Completion Report	Will follow the format and content established for earlier DCC releases, and will include; • Overview of testing undertaken • Actual number of tests run, passed, failed and not run • Explanation of any tests not run • Test issue I.D. detail for failed tests • Number of test issues outstanding, split by severity • Number and severity of test issues raised • Specification of test environment used	Draft version to be provided to DCC by DCC Service Providers DCC no later than 10 working days before the planned end of test execution Final version to be provided to DCC by DCC Service Providers DCC within 5 Working Days of the completion of test execution

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12   This can be via direct access to the system, or through the provision of regular reports from the system

	• Recommendations for tests to be included in the next Test Phase • Lessons learnt during the Test Phase	
Test Scenarios	May comprise of planned and sequenced series of Service Requests.	To be available from DCC Service Providers at the same time as the finalised Test Phase Approach Document.
Work Off Plan	A plan to resolve outstanding issues	To be provided to DCC by DCC Service Providers with the final Test Stage Completion Report.

Table 13 – Deliverables

8.2. Specific Deliverables

DCC will publish the following documents.

Deliverable	Description	Timing
Environment Plan	Describes the plan for the utilisation of specific environments for each test phase, and how R2.0 will manage issues within the 1.x environments	To be provided by DCC as soon as possible following the Test Phase Approach Document being approved and prior to the start of R2.0 SIT
Environment Guide for UIT Participants	Describes the approach, policies and procedures for users testing across multiple UIT environments. Will include, as a minimum, details of Device certification and mobility, triage, defect and fix management, change management, Device management in UIT	To be provided by DCC Testing Services Team as soon as possible following the Test Phase Approach Document being approved and prior to the pre-UIT pipe-cleaning tests to be run by Users
DIT Device Selection Approach	Describes the approach for selecting the Devices to be used in DIT	To be provided by DCC Device team alongside the DIT Approach Document
Independent Assurance Reports	As described in section 16, a range of independent assurance activities will be undertaken – where appropriate there will be reports	As determined by the timing for the completion of the assurance

CTSD Update	DCC will propose changes to update CTSD to reflect the new service requests for Release 2.0, and the options for evidence for participants undertaking additive testing	DCC will consult on the updates to the CTSD following confirmation of this Testing Approach Document by the Secretary of State
Test Communications Hub Definition	Describes the capabilities and highlights the differences between the PTCH and ITCH Devices	To be presented and discussed at DCC forums (TDEG, CH Forum etc.)
PIT Communications Hub Performance Information	Provides the results of PIT testing for activities relevant to operation of Communications Hubs – e.g. firmware activation and reset timings. Will also include detail of relevant non- functional PIT testing	To be presented and discussed at DCC forums (TDEG, CH Forum etc.)

8.3. Requirements Traceability

The Service Providers will each use their own tools to manage their requirements and demonstrate traceability to both the solution design and the Pre Integration Tests. The DSP and CSPs will each provide DCC with a PIT Requirements Traceability Matrix (RTM), extracted from these separate tools.

The scope of testing will be validated by use of Test Traceability Matrix (TTM), setting out how each requirement within the scope of the direction from the Secretary of State for this release is met. The TTM supersedes the RTM developed and used within PIT.

The TTM will be prepared by DCC, based on the updates to the specifications listed in section 2.1 above, and will consider the resulting impact of those changes and resulting coexistence of enrolled Devices operating to different mixtures of versions of those specifications as well as current version of those specifications. Completion of the TTM is a dependency for SIT to commence.

The DCC Systems Integrator will support DCC in reconciling the planned Solution Testing against the TTM.

At the completion of SIT, any additional tests which have been created during SIT will be added to the TTM.

The TTM will be used by DCC, and form a key element of the independent SIT audit, to demonstrate the completion of SIT, alongside the enhanced tracking 'Heatmap' approach described in section 10.1 below.

9. Test Procedure

This section describes the requirements for the testing process to prove the solution for Release 2.0.

The Test Phase Approach Documents will define specific Entry and Exit Criteria for the individual Test Phases, with generic requirements for these described below.

Specific criteria for individual Test Phases, and the governance process relating to the approval of the criteria, and the evaluation of success against them.

9.1. Generic Entry and Exit Criteria

Progression through testing phases for Release 2.0 will be gated using generic and specific Entry and Exit Criteria.

The Test Phase Approach Documents will provide detail of the evidence to be gathered in the form of an evidence pack.

9.1.1 Generic Entry Criteria

The following generic Entry Criteria will gate the entry to all Test Phases:

- Test Phase Approach Document for Test Phase signed off;

- Solution Test Plan signed off (except UIT);

- Test Phase Complete Certificate for preceding Test Phase issued, unless the plan clarifies that Test Phases overlap;

- Test Specification prepared, including traceability to Requirements/Design documents (except UIT);

- Test labs, Devices, tools, stubs, environments and data are assured and accepted as fit for purpose, including external assurance;

- DCC and all relevant Service Providers have confirmed they have resources with the requisite skills and access available to support the Test Phase; and

- Approval to proceed certificate issued by DCC.

9.1.2 Generic Exit Criteria

The following generic Exit Criteria will gate the exit of all Test Phases except UIT:

- All tests run, or any exceptions documented and agreed by DCC Test Assurance Board;

- All test success criteria (e.g. test pass rate) achieved, or any exceptions documented and agreed by DCC Test Assurance Board;

- The number and severity of any outstanding Test Issues is at or below the target thresholds, or any exceptions documented and agreed by DCC Test Assurance Board;

- Test results documented and evidence captured;

- Set of test issue logs have been produced;

- Regression testing successfully completed;

- Regression test pack has been prepared or updated;

- Production of agreed Work Off Plans for any outstanding Test Issues that occurred in the Test Phase;

- Work Off Plans from preceding Test Phases have been completed; and

- Test completion reports have been produced and test completion certificates have been issued by DCC.

9.2. Governance of Test Phase Approach Documents and Entry and Exit Criteria

The following requirements shall apply in relation to each of the SIT, DIT and UIT Test Phase Approach Documents, and in particular the relevant entry and exit criteria:

(i) DCC shall prepare a draft of the document and submit the document to the SEC Panel Testing Advisory Group for comment;

(ii) Following the receipt of comments from the SEC Panel Testing Advisory Group, DCC shall update the document, taking into account the TAG comments as appropriate, and submit the draft document to the Secretary of State for approval (noting those SEC Panel comments that have not been incorporated);

(iii) DCC shall comply with any direction given by the Secretary of State to reconsider, re-consult and/or re-submit the draft document.

Where DCC proposes to deviate materially from a Test Phase Approach Document, it shall consult on its proposal to do so with the SEC Panel Testing Advisory Group and submit the proposal to the Secretary of State for approval.

DCC shall conduct its testing in a manner that is consistent with this document and the Test Phase Approach Document (as approved by the Secretary of State) for each phase including, in each case, as modified by any deviations that have been approved by the Secretary of State.

9.3. Specific Entry and Exit Criteria for Test Phases

Specific Entry and Exit criteria for individual test phases will be listed in the relevant Test Phase Approach Document.

For PIT and SIT, this will include the definition in the Test Phase Approach Document of any incremental gating into subsequent Test Phases.

9.3.1 Entry into SIT

The entry criteria for SIT shall include, inter alia:

- Completion of independent assurance of the DCC Meter Protocol Emulator will be included in the SIT entry criteria.

9.3.2 Exit from SIT

The exit criteria for SIT shall include, without limitation:

- All 1.1 Communications Hub variants introduced or changed by Release 2.0 have been tested, alongside regression testing of 1.0 CHs

9.3.3   Exit from DIT

The exit criteria for DIT shall include, without limitation:

- In the event that insufficient capable and supported Devices are available to achieve full coverage of DIT scope, DCC will complete such testing as is practical and provide detail of the reasons why DIT has not been fully completed in the Test Phase Completion report. DCC will endeavour to complete any coverage of testing with Devices in UIT should suitable Devices become available after the completion of DIT and prior to go live

9.3.4   Entry into UIT

The entry criteria for UIT shall include, inter alia:

- Successful completion of testing, assurance and DCC governance of the SIT and DIT test phases for the functionality to be promoted into UIT.

- For TSG 2.0/SBCH UIT, at least SIT and DIT regression testing with SMETS2v2 Devices will have been completed.

- For DBCH UIT, DCC will enter UIT based on the completion of SIT only.

9.3.5   Exit from UIT

The exit criteria for UIT shall include:

- Successful completion of User Regression Testing by all Supplier Parties required to carry out such testing, the details of which are defined in the UIT Approach Document. Any relaxation of the exit criteria from UIT with regard User Regression testing would be subject to approval of the SEC Panel and the Secretary of State.

9.4.   Acceptance Process Following SIT Completion

Following the completion of SIT (and DIT), DCC will notify the Secretary of State, the Authority, the SEC Panel and the SEC Parties that SIT (and DIT) for a Region or Regions has ended.

DCC will provide the Authority, the SEC Panel and the Secretary of State with copies of the SIT and DIT Test Completion Report(s) and the SIT Auditor's report, along with a list of those sections of such reports that it considers should be redacted.

DCC will review the documentation and evidence to support the relevant entry and exit criteria with the SEC Panel Testing Advisory Group to inform the SEC Panel recommendation to the Secretary of State regarding the completion of SIT (and DIT).

On direction from the SEC Panel, DCC will provide the SEC Parties and DCC Service Providers with copies of the Test Completion Report(s) and the auditor's report, having first redacted any sections specified by the SEC Panel.

9.5.   Go Live Decision and DCC Incentives

The SEC Panel and/or Parties shall provide such reasonable support and assistance that is requested from them by the Secretary of State in relation to:

(i)   The Secretary of State's decision to make (or bring into legal effect) any of the SEC variations associated with Release 2,0; and/or

(ii)   The administration of any Baseline Margin Project Performance Adjustment Scheme (having the meaning given to that term in the DCC Licence) relating to Release 2.0, including as set out in any BMPPA Scheme Principles (also having the meaning given to that term in the DCC Licence).

DCC will undertake a review with Parties of their activities, progress and concerns from UIT, and include collected feedback to the Secretary of State as part of the DCC go live activities.

The process for Parties to provide feedback to DCC on their UIT experiences, and how DCC will review and present the feedback will be defined in detail in the UIT Approach Document.

Supplier Parties that undertake User Regression Testing will provide the DCC with a self- certification of completion of User Regression Testing. The DCC will consider all such completed User Regression Testing as a part of the DCC go live activities.

The final report of UIT feedback and User Regression Testing will be reviewed with the SEC Panel prior to inclusion in the DCC go live submission to the Secretary of State.

DCC will provide the following materials as part of the submission to the Secretary of State relating to go live, in addition to the established DCC live services criteria:

- UIT feedback and User Regression Testing report

- UIT defect report

- All independent assurance or audit reports prepared for Release 2.0

- OCT completion reports.

9.6.   Post Go Live Activities

In order to mitigate the risk to Energy Consumers, DCC will continue to offer the support for production provided at R1.3 go live, whereby for a maximum period of six months following the Release 2.0 go live date Communications Hub firmware upgrades are not initiated unless requested by the User.

This allows Users to continue to perform regression testing in Device and User System Tests (carried out in accordance with Section H14.31 of the SEC) with specific combinations of Communications Hubs and Devices and resolve issues without affecting service to Energy Consumers.

This requirement also applies to the firmware supported for the installation and commission process until a User confirms they accept that the new Communications Hub firmware operates acceptably with their Devices.

9.7.   Test Phase Success Criteria

For SIT and DIT and the testing for SP UAT the following Test Success Criteria will be included in the Exit Criteria:

- 100% of tests listed in the Test Specifications have been executed, or any exceptions documented and agreed with DCC, and reported to SEC Panel;

- at least 85% of planned tests have been passed, or any exceptions documented and agreed with DCC, except for regression testing with single band Communications Hubs in DIT where 100% of tests passed is the requirement

9.8.   Test Issue Defect Masks

The following table lists the standard target thresholds for outstanding test issues in each test phase.

Test Issue Severity	PIT	SIT	DIT	TTO
1	0	0	0	0
2	0	0	0	0
3	15	15	15	15
4	30	30	30	30
5	60	60	60	60

Table 14 Test Issue Thresholds

Note that:

- The defect mask thresholds are applied as part of the exit criteria for relevant test phases, and apply cumulatively if there are iterative deliveries within a test phase, for example from PIT to SIT or from SIT to UIT. For example there will never be more than 15 Severity 3 defects per Service Provider at an exit gate.

- BAT defects will be included in the TTO defect mask

- For PIT, SIT and DIT, the figures in Table 14 Test Issue Thresholds are per DCC Service Provider, i.e. 15 Severity 3s for the DSP, 15 for CSP N and 15 for CSP C/S

- The defect masks shall include any security defects within the relevant testing phase

- the Test Assurance Board, including industry representatives, may judge that the next Test Phase can start even if the target thresholds set in the Exit Criteria for the Test Phase Plan have not been achieved, provided that an agreed work off plan is in place

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- If the Test Assurance Board, including industry representatives, believes that an exception for a Severity 2 issue at SIT exit should be considered, DCC will request an ex-committee review by the SEC Panel before confirming SIT exit

- A defect mask will apply for UIT Exit and will be linked to the User Regression Testing. The Exit Criteria are detailed in the UIT Approach Document.

9.9.   Work Off Plans

Work off plans will be produced by each Service Provider as part of the quality gate process at the end of Testing Phases, detailing the defects that are outstanding and the plan for resolving them.

Each Service Provider must resolve all of the items within the work off plan within the following timescales;

- For Severity 3 defects, within 20 Working Days from the quality gate meeting

- For Severity 4 defects, within 40 Working Days from the quality gate meeting

- For Severity 5 defects, within 60 Working Days from the quality gate meeting

In the event that the timescales for the work off plan are not met, the DCC Service Provider shall produce and agree a correction plan with DCC.

If a Test Phase Complete Certificate has been issued subject to completion of a work off plan, and the work off plan has not been completed within the applicable time period, then DCC will revoke the Test Phase Complete Certificate unless the failure relates solely to Severity 5 test issues.

9.10.   UIT Test Issue Thresholds and Work off Targets

During the UIT Test Phase, by DCC Service Provider, the following performance targets will apply to defects assigned to a Service Provider for resolution, at any given point:

- 0 Severity 1 defects

- Fewer than 5 Severity 2 defects

- Fewer than 15 Severity 3 defects

- Fewer than 30 total Severity 4 and 5 defects

In all cases, each DCC Service Provider must resolve UIT defects within the work off timings shown below, measured from the point of the defect being accepted by the Service Provider:

- For Severity 1 defects, within 10 days

- For Severity 2 defects, within 20 days

- For Severity 3 defects, within 40 days

- For Severity 4 defects, within 50 days

The above targets and work off times shall apply to defects associated with UIT testing of the new R2 functionality in relation to both Single and Dual Band.

Defects associated with User Regression Testing are subject to the UIT Exit Criteria described in the UIT Approach Document.

10. Test Result Management & Reporting

Test Result Management and Reporting is to be provided to DCC by the DCC Systems Integrator with input from SPs for PIT, SIT, UIT, DIT and TTO Test phases, as relevant, on a frequency to be detailed in the Test Phase Approach Documents.

10.1. Tracking & Reporting

HP's Application Lifecycle Management (ALM) Test Management tool will be used to manage testing and testing issues[13].

All requirements, scripts, tests, execution results and defects are to be maintained in ALM. Connectivity between requirements, tests and defects is to be maintained for traceability and reporting purposes.

Overall responsibility of maintaining traceability of test and defects will lie with the DCC Systems Integrator for SIT Test Phase.

DCC Systems Integrator shall implement a tool and processes based upon the existing solution revised with learnings from previous releases to provide enhanced visibility and reporting of the progress, completion and coverage of testing for SIT across a number of parameters.

Security testing defects should be recorded/reported with other testing defects, redacted as required, but counting towards defect masks.

10.2. Weekly DCC Test Execution Report

DCC will provide a weekly Test Execution report to the SEC Panel and the Secretary of State. The content of this report will reflect the status of progress within Release 2.0, based upon data from HP ALM and other DCC Systems.

It will include detail of testing progress in relevant test phases, reporting on testing issues and matters relating to the capacity and availability of the user testing services. Whilst SIT, DIT and TTO are being conducted, it will include detail of the progress against the testing glide path. The report will include testing coverage of functional areas, alongside Service Requests. The content of this report will be anonymised and redacted as if it was subject to Section H14.44 of the SEC.

10.3. SIT & DIT Test Completion Reports

In accordance with 9.3.1 above, DCC will produce its own Test Completion Reports when it considers that the Exit Criteria required by the SIT/DIT Test Phase Approach Documents for a Region have been met. The report will provide evidence of the testing undertaken, the results of testing and how the exit criteria have been met.

DCC will also produce a TTO Test Completion Report.

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13   Except where not applicable for PIT

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These reports, alongside any relevant independent assurance reports, will be provided to the Authority, the SEC Panel and the Secretary of State.

11. Acceptance and Test Assurance

DCC has established processes for the acceptance of testing activity completion – these will continue for Release 2.0. The DCC Test Assurance Board will conduct quality gate meetings and review testing completion reports before issuing Test Completion and Approval to Proceed Certificates.

Where a Test Completion Certificate has been issued subject to completion of a Work Off Plan, and the Work Off Plan has not been completed within the applicable time period, then the Test Completion Certificate will be revoked unless the failure relates solely to Severity 5 test issues.

11.1. DCC Service Provider Self Assurance

DCC Service Providers will continue to assure their own PIT activities against this Testing Approach Document and specific PIT Test Phase and Test Plan. Service Providers will also continue to make their relevant testing deliverables available to the other Service Providers and exchange constructive comments to ensure solution and testing compatibility.

11.2. Test Assurance by DCC

DCC will continue to assure Service Provider testing using the processes and activities established for earlier releases, and will include the following methods, at times determined by the individual Test Phase Approach Documents:

- Test Assurance Board quality gates

- Test Witnessing

- Test Observation

- Reviewing Test Evidence

- Test Quality Audits

- Product Inspections

- Document Review

11.2.1 Quality Gating & the DCC Test Assurance Board

DCC will continue to operate the Quality Gating process developed for Release 1.x and enhanced through experience.

The Quality Gate process provides:

- Controlled entry of functionality into subsequent test phases

- Formal and objective evidence that test criteria have been met for a stage

- Transparency of test activities and outcomes to facilitate DCC Test Assurance

- Formal evidence for signoff of Service Provider test milestones and/or associated payments

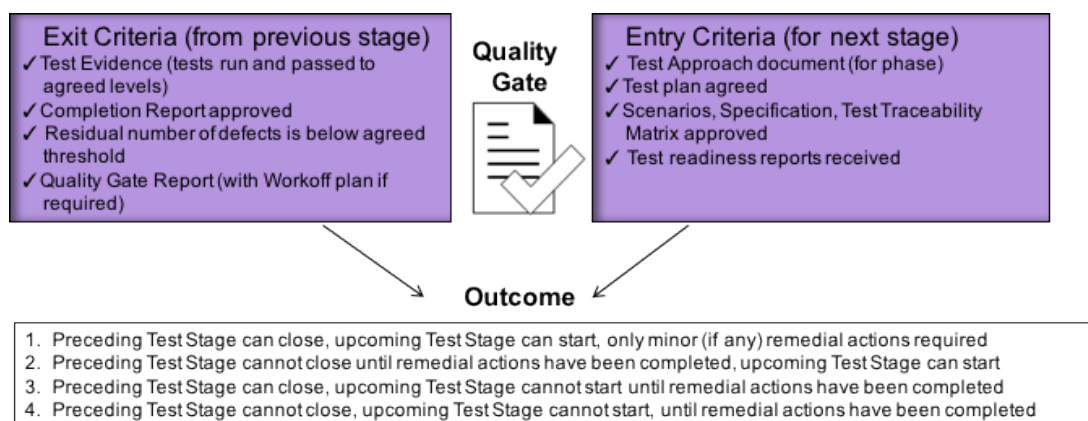- A mechanism for managing remedial work associated with closure of test stages

Exit Criteria (from previous stage)	Quality Gate	Entry Criteria (for next stage)
✓Test Evidence (tests run and passed to agreed levels) ✓Completion Report approved ✓Residual number of defects is below agreed threshold ✓Quality Gate Report (with Workoff plan if required)		✓Test Approach document (for phase) ✓Test plan agreed ✓Scenarios, Specification, Test Traceability Matrix approved ✓Test readiness reports received

Outcome

1. Preceding Test Stage can close, upcoming Test Stage can start, only minor (if any) remedial actions required
2. Preceding Test Stage cannot close until remedial actions have been completed, upcoming Test Stage can start
3. Preceding Test Stage can close, upcoming Test Stage cannot start until remedial actions have been completed
4. Preceding Test Stage cannot close, upcoming Test Stage cannot start, until remedial actions have been completed

Figure 2 – DCC Quality Gate Process

The Quality Gate process will apply to all PIT and SIT testing, and relevant elements of UIT, DIT and TTO testing.

The Quality Gates from PIT into SIT and from SIT into UIT are operated as DCC Test Assurance Board gates.

The Test Assurance Board (TAB), is a meeting called, facilitated and chaired by the DCC Head of Test Assurance, attended by Service Providers, the DCC Systems Integrator, relevant attendees from DCC departments and nominated representatives of the industry, on behalf of the BEIS Smart Meter Delivery Group.

11.2.2 Test Witnessing

DCC will agree, in advance, with the SPs which tests it wants to witness during FAT and Service Provider UAT. Details of these tests (which will be a subset of System Tests for FAT and a subset of Solution Tests for UAT) will be described in the FAT and Service Provider UAT test plans. The SPs will provide DCC with a schedule of when the tests will be executed and invite DCC to either witness on-site or remotely. The witness will have the skills required to fulfil the role. The SP will provide the witness with relevant documentation and access.

For R2.0 DCC Test Assurance and the SIT Auditor must be given full access to attend and witness such testing.

Execution of the agreed set of tests will be performed by the relevant SP test analyst, and there will be:

- No deviation from the scripts (e.g. in response to "what if" questions raised by witnesses)

- No hands-on execution by witnesses

Test issues raised during witnessing will be entered in to the relevant Test Issue Management tool and progressed through the Test Issue Management process.

As far as possible, any queries and issues arising during the witnessing period will be addressed at the time with the relevant SMEs. A wash-up session will be convened at the end of the witnessing period to discuss the outcome of witnessing and to agree any outstanding queries and issues.

DCC may elect to receive System/Solution Test execution evidence as a substitute for some tests nominated for witnessing.

11.2.3   Test Observation

By prior agreement with the SPs on the timing, duration and scope, DCC staff may observe test execution and test issue management activities during System Testing and Solution Testing in order to familiarise themselves with SP processes and the systems under test. The DCC observers will have the skills required to fulfil the role.

12.   Testing Issue Management

This section describes the processes for Testing Issue Management and the Test Issue Lifecycle. The Testing Issue Management process remains the same across all phases of testing in scope[14] with a slight variance to how UIT (i.e. UEPT and End to End testing) Testing Issues are handled.

The process defined in the Testing Issues Resolution Process covers both SIT and UIT based testing. However there are small variations that arise due to the requirement to interact with Service User Testing Participants. In summary the main differences are as follows:

Triage process: This varies depending upon the types of Testing Issue detected, particularly where the issue is CSP related (where test labs are used) rather than DSP related.

Communications process: In UIT Testing Participants may or may not have access to the Testing Tool used for Testing Issue recording, in which case a manual workaround process is employed.

Escalation: Where a Testing Issue needs to be referred to the Issue Resolution Board (IRB) and a Service User is the Testing Participant that is the subject of the IRB, special information disclosure conditions will apply.

For clarity, Testing Issue Management will not apply to TTO.

The 'Testing Issue Resolution Process' document can be found on the DCC website: *https://www.smartdcc.co.uk/media/332365/testing_issue_resolution_process.pdf*.

This document will be updated by DCC to incorporate the option for Testing Participants to use Instrumented Test Communications Hubs in their own Remote Testing Laboratories.

12.1.   Logging and Triage of Test Issues

Where testing is taking place in the SIT environment all issues relating to the DCC solution will be logged and recorded in HP ALM by the person executing the test. New testing issues will be referred to the Triage team, who will:

- •   classify them as one of:

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14   The test issue management process does not apply to DSP PIT, which will follow the existing DSP PIT defect management process

(i) Testing issue:

- that prevents execution of a test; or

- that causes an unexplained or unexpected outcome or response to a test

(ii) not a Testing issue (e.g. a misunderstanding)

(iii) duplicate of an existing Testing Issue

(iv) change to DCC systems i.e. not a valid Testing issue

(v) a situation where more information is needed

- set their Severity and Priority (see Section 12.7 for definitions)

- evaluate the potential impact on the DCC production solution, and record that evaluation in a suitable, searchable field on HP ALM, or other appropriate tool

- assign the Testing Issue to the relevant Resolver Group (typically a DCC Service Provider)

In situations where a Testing Participant wishes to raise a Testing Issue whilst undertaking testing in the UIT environment (for example during UEPT), then the above process applies with the following variations:

- The Testing Participant may have access to the DCC hosted HP ALM system, in which case they may log the Testing Issue themselves via their web browser. If they don't have this capability then they are required to log the Testing Issue using a manual spreadsheet form (full documentation is available on the DCC website), which is then picked up and logged in HP ALM by DCC on their behalf.

- Classification, setting Severity/Priority and assignment to Resolver Groups is carried out in the same way as described for issues raised in the SIT environment above.

- The process of logging and triage for testing in UIT testing may involve more steps than are required for SIT, due to the remote nature of some of the testing, specifically where testing occurs in remote test labs without an Instrumented Test Communications Hub. In such cases it may be necessary to rerun the tests that cause the Testing Issue so that additional diagnostic information can be captured, for example Communication Hub logs, prior to the assignment of the Testing Issue for triage. Further documentation defining this process has been prepared by DCC and is available to Testing Participants on request.

- Testing Participants may log Testing Issues discovered in UIT for further assessment and triage, even where they are discovered during testing that hasn't followed a specific test script.

12.2. Resolution of Test Issues

The DCC Systems Integrator Testing Issue Manager will:

(i) regularly review all outstanding test issues to ensure that they are resolved with reasonable speed

(ii) agree with the relevant SP Test Managers the defect fixes to be included in each Release to the SIT environment

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(iii)   report progress directly to stakeholders.

12.3.   Target Response Times

For issues raised in SIT, DIT and UIT, the following table lists the target response times, which apply and are measured from the point at which the issue is logged in the test issue management tool.

The timings:

- Are in working hours

- Assume the working day to be Monday to Friday, 08:00 to 18:00

- Assume that a suitable Triage group and Issue Resolution Board are each available to meet once a day

- Are for in-house supported system elements only: system elements supported by third parties are subject to the timings defined in the relevant contracts

- May need to be adjusted for cases where a resolver group is not working to UK time.

Note that the targets are not binding, and there are no penalties associated with non- achievement. Target response times are subject to ongoing reporting and may be reviewed to reflect circumstances in test phases.

Priority	Initial Response Completed	Triage Completed	Assessed by Resolver Group	Fix Time Assessed
1	1 hour	4 hours	6 hours	18 hours
2	1 hour	Next Triage Panel	Next Triage Panel + 2 hours	Next Triage Panel + 14 hours
3	4 hours	Next Triage Panel	Next Triage Panel + 4 hours	Next Triage Panel +22 hours
4	4 hours	Next Triage Panel	Next Triage Panel + 6 hours	Next Triage Panel + 30 hours

Table 15 Target Issue Response Times

The Triage Panel will meet daily.

The checkpoints in the above table are defined as follows:

- Initial response completed: acknowledgement sent to the person raising the Testing Issues

- Triage Completed: the Triage Panel (either scheduled or emergency) has triaged the test issue and either a) assigned it to a resolver group, or b) escalated it to the Issue Resolution Board

- Assessed by Resolver Group: the resolver group has either accepted or rejected the test issue

• Fix Time Assessed: the resolver group has estimated how much effort it will take the fix the test issue.

Note also that there are not target fix times because:

• In a complex, bespoke system such as the DCC Total System, there will be an extensive variation in fix times

• Any such targets would be inconsistent with the existing DCC Service Provider Contracts.

12.4. Assurance and Disputes

12.4.1 Assurance

The Triage Panel, comprising each DCC SP's design authorities, the DCC System Integrator and the DCC including DCC Design Authority, and chaired by the DCC Systems Integrator Triage Manager, will meet daily (and on demand for urgent test issues which are delaying testing) to:

• resolve cases where the ownership of a test issue is disputed;

• confirm, by a process of review of all new issues, that test issues are being given the correct Severity and Priority by the local triage process or Service User raising the test issue;

• confirm, by a process of sampling, that Priority 1 and 2 defects are being resolved at the requisite speed.

• The DCC's Issue Management Team are responsible for reviewing by sampling the execution of issue management activity and for ensuring that all aspects of this are correctly undertaken and documented, including (but not limited to):

(i) Full and proper adherence to the process;

(ii) Use of appropriate and sufficient communications around the process;

(iii) Documentation of the process having been properly followed via commentary, collection of appropriate support documentation, e.g. logs, evidence and release notes;

(iv) That each action that has been taken within the process has been taken by the appropriate member of staff; and

(v) That audit requirements have been met.

12.4.2 DCC Issue Resolution Board

Testing Issues can be referred to the DCC Issue Resolution Board (IRB) as a means of escalation in the following circumstances:

(a) Agreement cannot be reached on the severity level and priority status of the Testing Issue;

(b) Agreement cannot be reached on the status of a Testing Issue; or

(c) The Testing Participant is dissatisfied with the speed at which the Testing Issue is being resolved; or

(d)   A Testing Participant disagrees with the manner in which a Testing Issue should be resolved.

In the case of a), b) or c), the Testing Participant (or DCC Service Provider) must provide justification for its view and DCC may request further supporting information from them.

The IRB will determine:

(a)   The severity, priority, status and response timescale that should apply to the Testing Issue;

(b)   The organisation responsible for rectifying the Testing Issue;

(c)   Whether the error is due to an issue with the design baseline, which could result in a Change Request (in which case the matter will be referred to the DCC Design & Assurance Director); and

(d)   Whether the Testing Issue should be rectified pre-DCC Live or postponed to the post- DCC Live release.

The IRB is scheduled to occur every working day by default, and will be cancelled if not required.

Where a Testing Participant disagrees with the determination of the IRB they may request that DCC refers the matter to the SEC Panel, as if Section H14.43 applied. Note that this is only available where a Testing Participant disagrees with the manner in which a Testing Issue should be resolved.

12.5.   Reporting of Test Issues

Information on the status of test issues will be reported by the DCC Systems Integrator to DCC in the weekly Test Execution reports described in 10.2 above.

DCC will report information regarding Testing Issues that have the potential to impact testing undertaken by Testing Participants during End to End Testing.

12.6.   Test Issue Management Process

The detailed Test Issue Management process will be reviewed and revised in conjunction with the creation of the Release Test Plan.

The high level lifecycle for test issues raised during testing is shown in the following diagram.
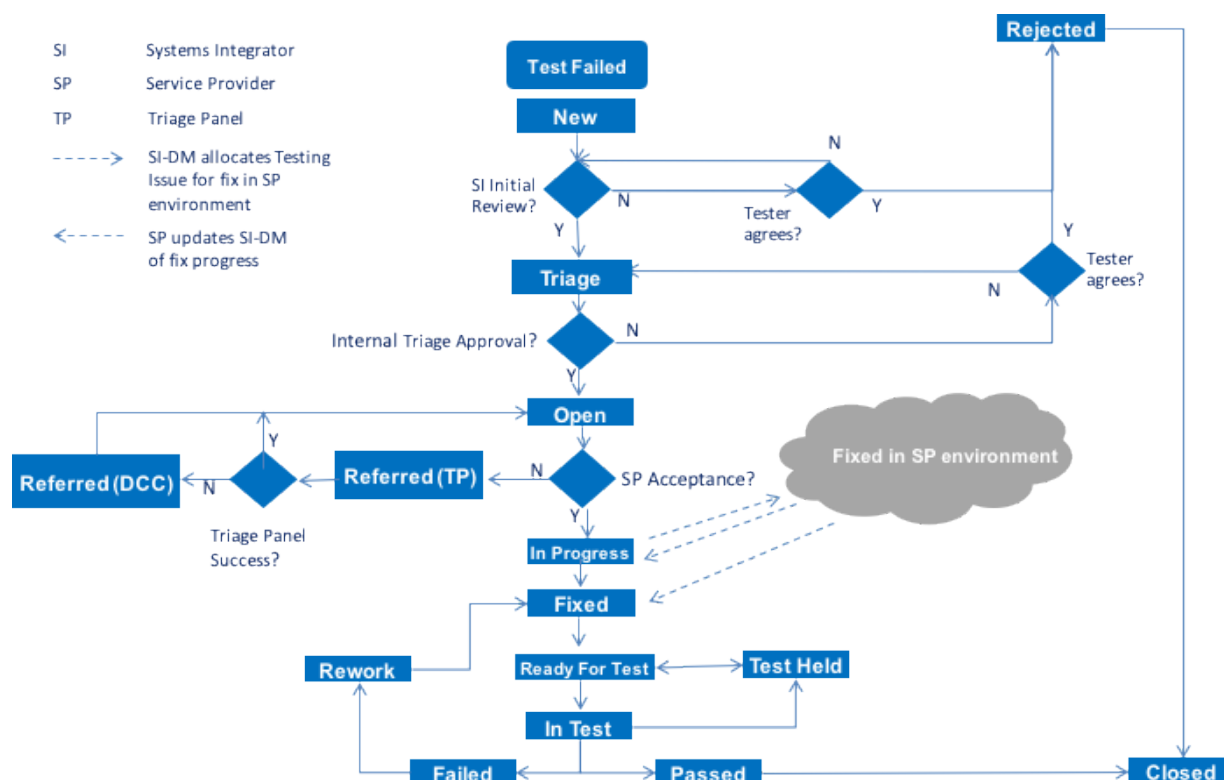
Figure 3 – Test Issue Lifecycle (with transition states)

Note that test issues can be passed back to "Triage" from the various process steps (e.g. "Failed PIT"), but these links are not shown on the diagram in order to preserve clarity.

Test Issues which are agreed to be a Change will follow the DCC Change Control process (set out in the "Core SP Change Management Process" document).

Testing Issues Resolution Process will apply for this release, which is available at the following link:

https://www.smartenergycodecompany.co.uk/docs/default-source/sec- documents/guidance/decc-guidance---testing-issue-resolution-process.pdf?sfvrsn=4

DCC will have the final judgement on the severity of a particular defect based on the impact on User operations.

12.7.   Test Issue Severities and Priorities

The following table lists the standard Test Issue Severities. The Severity of a Testing Issue relates to the impact it would have on **Users and Parties, and/or DCC,** if released into production. Particular consideration should be taken of the impact on end consumers, especially those in vulnerable circumstances.

Issue Severity	Description
1	A Test Issue which: • Prevents a User or large group of Parties from using the DCC Systems; • Has a critical adverse impact on the activities of Users and Parties, and/or DCC; • Could cause significant financial loss and/or disruption to the DCC services or

	DCC Parties; or • Results in any material loss or corruption of data. Non-exhaustive examples: • An issue leading to non-availability of the DCC Services; • An issue leading to non-availability of the CSP core solution element(s).
2	A Test Issue which: • Has a major (but not critical) adverse impact on the activities of Users and Parties, and/or DCC but the service is still working at a reduced capacity; or • Causes limited financial loss and/or disruption to Users and Parties, and/or DCC Non-exhaustive examples: • An issue leading to non-availability of the network management centre; • An issue leading to loss of resilience of the SM WAN gateway; • Large areas of functionality will not be able to be tested.
3	A Test Issue which: • Has a major adverse impact on the activities of Users and Parties, and/or DCC but which can be reduced to a moderate adverse impact through a work around; or • Has a moderate adverse impact on the activities of Users and Parties, and/or DCC.
4	A Test Issue which: • Has a minor adverse impact on the activities of Users and Parties, and/or DCC Non-exhaustive examples: • Minor service interruptions in the business process or functionality of the DCC Systems and/or Services
5	A Test Issue which: • Has minimal impact to the activities of Users and Parties, and/or DCC Non-exhaustive examples: • Trivial issues with workarounds which are noted for future releases but minimal impact of running existing services

Table 16 Test Issue Severities

The following table lists the standard Test Issue Priorities. The priority of a Test Issue is the impact of the issue on **testing** progress – it is a measure of how quickly the issue needs to be fixed to allow development and testing to continue.

Issue Priority	Description
1 – Urgent	Has a severe impact on testing. Must be fixed immediately. A critical set of functionality scoped to be tested cannot be completed and needs this issue fixed before testing can continue.

2 – High	Has a major impact on testing. Should be fixed within a day of the issue being logged. A major set of functionality can only be tested by use of a complicated workaround which is slowing down test progress.
3 – Medium	Has a medium impact on testing. The issue could be fixed before release of the current version is in development. Incident affects pass success on some tests but the issue can be by-passed for other tests by means of a simple workaround.
4 – Low	Has a minor impact on testing. The issue would be fixed if there is time, but it could be deferred until another build release. The issue is normally cosmetic in nature and does not affect the key delivery of the business requirements

Table 17 Test Issue Priorities

13. Test Resources

Given the scale of Release 2.0, and the number of organisations supporting its delivery, this document will not provide detail of the DCC internal teams or the DCC Service Providers who will be undertaking the actual testing, but does provide detail of the DCC Test Assurance Team who are responsible for assuring compliance with this Testing Approach Document.

The Test Phase Approach Documents will also highlight how Release 2.0 will impact Release 1.0 resources.

This section also describes the Testing Stubs which will be used, and the other Testing Tools.

13.1. Test Assurance Team

Notwithstanding any organisational change at DCC affecting the structure of the team, dedicated DCC resources will support the assurance of testing described in this document.

The functions and services delivered by the DCC Test Assurance Team shall include:

(a)   Systems Test Assurance – responsible for assuring the progress of testing, including witnessing and observing testing within PIT, DIT,SIT and TTO; reviewing test plans, scripts and scenarios; undertaking User Acceptance Testing; providing evidence and documents into the Test Assurance Board meetings; assuring reporting by Service Providers. This team also includes the Business Acceptance Testing and Operational Acceptance Testing resources

(b)   Issue Management – responsible for operating the issue management process; including chairing the Issue Resolution Board and reporting on issues for all test phases except PIT. Responsible for producing reports on testing issues, including providing regular reporting to DCC problem management on issues potentially affecting the DCC production solution

(c)   Device Management – responsible for the use of Devices in DIT and UIT; maintaining GFI Testing and the Meter Protocol Emulator; providing Device expert support to triage and issue management processes; planning and managing ongoing DCC interoperability testing events; reporting on Device testing

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(d)   Test Assurance Management – responsible for reporting progress to industry; point of escalation for testing participants; conducting Test Assurance Board meetings; managing independent audit and assurance providers; maintaining this approach document; submitting evidence and reporting to SEC Panel and the Secretary of State as required

(e)   Industry Test Team – responsible for supporting the SREPT and UEPT entry process activities; supporting user testing and managing relationships with testing participants; reporting on user testing

13.2.   Test Stubs

This Testing Approach Document allows for the use of Testing Stubs where appropriate across each of the testing phases to support entry into and completion of those phases. Individual Service Providers, DCC and Testing Participants may utilise Testing Stubs to simulate or emulate elements of the solution which are either not available or practical for use in the relevant test phase. For example, within SIT, a Service User Simulator will be used to act in the role of a DCC User.

DCC has developed a Meter Protocol Emulator, capable of acting as an Electricity or Gas meter, or as a PPMID or HCALCS Device. This emulator will be used as part of SIT for Release 2.0, be used for User Entry Process Testing and made available to Testing Participants in the DCC Labs should they choose to use it in UIT.

The DCC Meter Protocol Emulator will not be used by Service Providers in PIT, they are responsible for meeting their own emulator requirements during PIT.

The Meter Protocol Emulator will be updated to enable its use to complete testing for Release 2.0 including the addition of acting as an In Home Display, and will be subject to an independent assurance activity.

13.3.   Testing Tools

13.3.1   ALM

HP's Application Life Management (ALM) Test Management tool will be used to manage testing and test issues in all phases after PIT, where test management is supported by the DCC Systems Integrator.

HP ALM will be used to maintain:

*   Requirements connecting to Test Scenarios/ Scripts and defects for traceability and reporting purposes across respective test phases.

*   The test scripts

*   Execution details of each test script (e.g. when run, by whom)

*   Evidence of system behaviour (e.g. screen shot, log file) observed during execution

*   The result of execution (pass, fail)

*   Defects raised for failed tests (which will be linked to the failed tests).

13.3.2   GFI Testing Service

DCC shall make available an enhanced GFI testing service, being the testing service referred to in X9.1 of the SEC, enhanced to enable eligible persons to test the interoperability of Devices (other than those comprising

Communications Hubs) with the Modified DCC systems and with v1.1 CHs, such that those Devices are able to respond to Commands received from or via DCC in accordance with the requirements defined in the GB Companion Specification version 3.0. This testing service shall be made available on the same basis as Testing Services under Section H14 (Testing Services), but subject to this Testing Approach Document. This service and the requisite Test Communications Hubs must be made available by DCC by the commencement of SIT (see Section 16 – Interoperability Testing Events for further detail of this Testing Service).

13.3.3   Communications Hubs for Testing

Release 2.0 requires that DCC makes the following Dual Band Test Communications Hub variants available for participants to request for use in the UIT environment in both the DCC and remote test labs, alongside non-instrumented Communications Hubs:

(a)   Prototype Test Communications Hub (PTCH) – this variant will be available to request for use in UIT, at DCC Test and Remote Test Labs if required, prior to the completion of SIT. This variant will enable participants to assure HAN connection and interoperability with other Devices, but may not support testing of all 1.1 Communications Hub functionality

(b)   Instrumented Test Communications Hub (ITCH) – this variant will be available to request for use in UIT, at DCC and Remote Test Labs. It will allow participants to diagnose and assure HAN performance and interoperability with other Devices, and undertake functional testing. The ITCH shall be capable of producing logs in a format that can be easily interrogated.

A Deliverable explaining the capabilities of PTCH and ITCH will be produced by DCC.

The ITCH for Dual Band will not replace the ITCH for Single Band CHs.

13.4.   Test Laboratories

Each CSP will provide a test lab facility and supporting services to enable Parties to complete User Entry Process Testing using the DCC Meter Protocol Emulator, DCC meters and DCC Communications Hubs, alongside enabling Parties to test with their own Devices and DCC Communications Hubs and SM WAN infrastructure in the User Integration Testing environment.

DCC will continue to support the use of remote test labs by Testing Participants.

13.5.   Assurance of Emulators and Tools

As described in section 17.4 below, and with SEC Panel Testing Advisory Group oversight, DCC will appoint independent parties to undertake assurance of any changes to the DCC Meter Protocol Emulator and the GFI tool. The assurance activities will include the provision of a report to DCC.

•   In particular, the assurance will review the ability of the DCC Meter Protocol Emulator and GFI tool to support testing and assurance of GBCS v2.0 10.6.2.6 and 10.6.2.2.

•   Completion of the independent assurance will be a pre-requisite for entry into SIT

14.   Roles and Responsibilities

All parties involved in Release 2.0 testing shall:

- Follow the SEC definition for "Good Industry Practice", i.e. the exercise of that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced person engaged in a similar type of undertaking as that party under the same or similar circumstances

- Take all reasonable steps to facilitate achievement of the testing objectives

- Ensure that all testing issues are evaluated for the potential impact on the DCC production solution, at the point of raising the issue or during triage, and recorded as such on HP ALM

14.1. DCC Systems Integrator

DCC shall ensure that the DCC Systems Integrator will manage SIT and be responsible for the following activities:

(a) Assure Service Provider PIT by supporting DCC, where required for:

    (i) Reviewing the SP PIT Approach documents;

    (ii) Reviewing the SP System Test Plan and FAT plan;

    (iii) Reviewing SP Requirements Traceability Matrix;

    (iv) Reviewing SP FAT test scenarios and data

    (v) Reviewing SP Test Completion Reports and Work Off Plans for Systems Test and FAT for PIT; and

    (vi) Attending the SP Quality Gate Review.

(b) Producing and maintaining the SIT Approach, the Solution Test Plan and the SP UAT Test Plan;

Ensuring that SIT activities are carried out in accordance with the SIT Approach, the Solution Test Plan and the SP UAT Test Plan;

Overall planning and control of SIT, including chairing entry Quality Gates between FAT and Solution Test, and between Solution Test and User Interface Testing

Maintaining Risk, Assumption, Issue and Dependency Logs for SIT

Leading the design and creation of test scenarios, test scripts, test data and test environments for SIT

Preparing test execution and environment usage schedules for SIT

Supporting the other SPs in their assigned test preparation and execution activities within SIT

Managing test issue resolution, and supporting SPs in the resolution process for selective test phases

Producing the Test Stage Plans, Test Specifications, Test Traceability Matrices, Progress Reports and Test Completion Reports for SIT and DIT

Operating the master Configuration Management Plan

Operating the master Release Schedule

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Operating the Environment Plan Support the Interoperability Test Events

14.2.   DCC Service Providers

DCC shall ensure that the DCC Service Providers (including DCC in its role as provider of Enterprise Systems) shall:

(a)   Manage its own PIT Test Phase, including their own processes, staff, test environments, test data, test tools including emulators and test labs. Other Service Provider PIT responsibilities include:

- Provide PIT Test Approach and PIT Test Plan documents to DCC ahead of test execution;

- Provide regular progress reports on testing and testing issues;

- Provide a Test Completion Report at the end of PIT, or an equivalent report for incremental gates throughout PIT;

- Support DCC in assuring, through witnessing and the review of evidence, the quality of PIT;

(b)   Support the DCC Systems Integrator in:

- Planning and control of test phases;

- Design and creation of test scenarios, test scripts, test data and test environments;

- Preparing test execution and environment usage schedules;

- Diagnosing test issues;

- Producing Test Plans, Test Specifications, Requirements Traceability Matrices, Progress Reports and Test Completion Reports;

- Contributing to the Master Configuration Plan;

- Contributing to the master Release Schedule;

- Contributing to the Environment Plan;

Establish, maintain and control their own test environments, in terms of software/hardware configuration and access control;

For tests within their agreed test boundary, under the direction of the DCC Systems Integrator;

- Execute and monitor test scripts;

- Capture evidence;

- Report progress;

Resolve test issues for their solution elements and undertake PIT testing (including regression testing) of any fixes required

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Support the interoperability test events

The CSPs will:

(a)   Establish, maintain and control their own Test Labs;

(b)   Procure and install 1.1 Communications Hubs in their Test Labs;

(c)   Install, maintain and support DCC Device Emulators in their Test Labs;

(d)   In conjunction with their Communications Hub manufacturers, obtain Communications Hub certifications from the relevant authorities.

14.3.   DCC

DCC shall:

(a)   Comply with its obligations under this Testing Approach Document (this document);

Ensure that activities attributed to Service Providers that are described in this document are undertaken;

Use its reasonable endeavours to ensure that SIT and DIT are completed as soon as is reasonably practicable to do so;

Enter into agreements with Device manufacturers to provide and support Devices for use in DIT, following appropriate qualification or selection activity;

Support the DCC Systems Integrator in the planning, control and operation of testing;

Assure planning, preparation and execution activities undertaken by the DCC Systems Integrator and Service Providers as detailed in this document and through the Test Traceability Matrix;

Operate and Chair the DCC Test Assurance Board process to review and approve the relevant Test Documents and issue the Approval to Proceed certificates, including the approval of test phase Completion Reports;

Operate and Chair the DCC Design Assurance Board; Participate in Quality Gate Reviews;

Agree with the DCC Systems Integrator and Service providers the subsets of Solution Tests to be witnessed in the UAT stage;

Witness the execution of UAT;

Specify, procure, provide and maintain the DCC Meter Protocol Emulator Devices and Service; and

Appoint and manage the independent audit and assurance activities described in this document.

15.   Environments

Release 2.0 requires the following changes to the integrated DCC environments:

• an additional UIT environment – UITb for R2.0, with the existing UIT environment becoming UITa to mirror production

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- an additional SIT environment for the Central & South Communications Service Provider

These additional environments will be available as required by the overall plan for Release 2.0. Specific deliverables relating to the management and use of environments, particularly co-existing UIT environments, will be published by DCC. This will clarify the approaches to issue and Device management, triage across environments, code streams and management.

Each DCC Service Provider is responsible for establishing, maintaining and controlling its own Test Environments. Service Providers are also required to design, develop and support Test Stubs, Test Data, Test Labs and necessary hardware installations (Communication Hubs/Smart Meters/Other Devices) that are required for execution of respective test phases.

DCC Service Providers are also expected to follow necessary software installation versions, firmware versions and adhere to ZigBee and other relevant certificates.

15.1.   Code Management

DCC will operate a process to merge code changes and fixes from production into the SITB environment used by R2.0. The SIT Approach Document will provide detail of the frequency of the operation of this process.

16.   Device Interoperability Testing Events

DCC will continue to host interoperability testing events, with a minimum of four taking place in a twelve month period.

These events will see the CSPs provide resources and communications hub hardware to enable other participants to test their Devices with.

The aim of the interoperability events are to provide a testing environment where Device manufactures can test with the Communications Hubs in an informal yet structured way. The events are generally scheduled to test features before they reach SIT, in order to provide an element of risk mitigation.

The Interoperability Testing Events will support Release 2.0 by acting as Market Facilitation Events – allowing participants to test interoperability with Sub GHz HAN Devices.

DCC will continue to provide notice of, and reporting, following these events.

To support these events the Communications Service Providers will provide ZigBee Sub GHz Test Devices, compliant with the relevant technical specifications.

17.   Audit and Independent Assurance

As part of the testing approach for Release 2.0 further assurance of the testing and the tools used will be subject to independent review.

17.1.   Independent Audit of SIT Exit Criteria

DCC shall appoint an auditor (that is sufficiently independent of Parties) to monitor SIT activities and to confirm that the exit criteria have been met for each Region.

This appointment will take place a minimum of one month prior to the commencement of SIT using the existing DCC Audit and Assurance Framework Agreement.

DCC shall engage with the SEC Panel Testing Advisory Group to seek a minimum of one representative to participate in the definition of the audit scope, and the selection of the SIT auditor.

The auditor will be procured against the scope that is set out below and tender responses assessed by DCC against criteria that will include:

(a)   Independence from DCC and the DCC Service Providers;

(b)   Proposed Audit Approach;

(c)   Relevant Experience; and

(d)   Cost

The identity of the SIT auditor will be provided to the Authority, SEC Panel and Secretary of State following contract award.

17.2.   SIT Audit Scope

The SIT audit will encompass activities that are undertaken in the Solution Test and SP UAT testing stages, and will provide confirmation that all exit criteria have been met including that:

- Testing had been conducted in accordance with this approach document;

- The coverage and completeness of testing, making specific reference to the Test Traceability Matrix, and the operation of the heatmap test management tool by the SI;

- A robust issue/defect resolution process has been used, including the manner in which issues have been closed, and that no bias has been introduced into the process.

The SIT Auditor will be engaged and will monitor the matters being tested pursuant to SIT during Release R2.0 and confirm that the exit criteria have been met for each Region.

17.3.   Approach to SIT Audit

The SIT audit will be undertaken on a Region by Region basis.

The auditor will be required to produce an audit approach document for review by DCC prior to commencement of the work. A risk-based approach will be taken to the audit and the manner in which the risk assessment will be conducted should be set out in the audit approach document.

The audit will include: observation of test activities during Solution Test and witnessing during SP UAT; review of test artefacts; suitability of testing methodology and review of issue resolution logs. The auditor may also attend selected IRB and Triage Panel meetings, alongside participating in Test Assurance Board meetings.

The auditor will inform DCC of any observations that are raised during Solution Test within 1 Working Day, such that DCC can initiate corrective action at the earliest possible opportunity. DCC will inform the Panel's Testing

Advisory Group of any such observations and corrective actions, and may request the attendance of the SIT auditor at monthly Testing Advisory Group meetings.

A report on the testing that has been conducted within a Region, including confirmation that the exit criteria have been met, will be provided to DCC no later than 2 Working Days following the completion of SIT for that Region.

DCC and the SIT Auditor will review the report with the Panel's Testing Advisory Group as part of the SIT exit governance process.

DCC shall include the independent auditor's report as part of the evidence submitted to SEC Parties and the Secretary of State as part of the SIT Completion process.

17.4.   Assurance of Testing Tools and Stubs

DCC shall appoint a party or parties to undertake independent assurance assessments of the updates to the following testing tools being updated to support testing for Release 2.0:

(a)   ALM

(b)   DCC Device Emulator

(c)   GIT For Industry tool (GFI)

Where relevant the independent assurance of the readiness of these tools for their use in Release 2.0 will be completed ahead their use in test phases. For example, the assurance of the Device Emulator shall be completed prior to SIT entry, and the report will be required as one of the SIT entry criteria.

17.5.   Assurance of 2.4GHz and Sub GHz RF Coverage

DCC shall appoint a suitably competent independent party to review the results of Joint Test Methodology Testing against the acceptance criteria specified in the Joint Test Methodology. The review shall assure that DCC has performed sufficient testing to demonstrate the degree to which Dual Band Communications Hubs meet expectations for RF Coverage.