Smart Metering Implementation Programme

Systems Integration Test Approach

V5.8

Document History

Version	Date	**Comment**	Author
0.1	04/04/14	Initial draft for internal DSP review	DCC
0.2	25/04/14	Updated with DSP review comments	DCC
0.3	23/05/14	Updated with Test Forum comments, including Xoserve and St Clements	DCC
0.4	23/06/14	Updated with comments from Test Forum and DCC Licensee. Aligned with SEC3 Legal drafting	DCC
0.5	04/07/14	Updated with DSP review comments	DCC
1.0	04/07/14	Up-issued without change from v0.5	DCC
1.1	14/07/14	Added text for Section 15	DCC
1.2	17/07/14	Updated with Test Forum comments on v1.0, including Xoserve and St Clement	DCC
1.3	08/09/14	Updated with comments from RDP Consultation and SEC Panel review	DCC
1.4	15/09/14	Updated with comments from Test Forum and DCC Licensee	DCC
1.5	03/10/14	Updated with comments from DCC Licensee	DCC
1.6	06/10/14	Updated with Hydra Network explanation	DCC
1.7	20/10/14	Updated with TAG review comments	DCC
1.8	24/10/14	Updated with Test Collaboration Forum comments	DCC
1.9	28/10/14	Updated by internal DCC Review	DCC
1.10	06/11/14	Updated with TAG review comments	DCC
1.11	10/03/15	Updated with comments from DCC Licensee	DCC
1.12	23/03/15	Updated with comments from Test Forum and DCC Licensee	DCC
1.13	26/03/15	Updated with comments from DCC Licensee	DCC
1.14	27/03/15	Updated with comments from DCC Licensee	DCC
1.15	24/04/15	Updated with comments from RDP Consultation	DCC
1.16	30/04/15	Updated with comments from DCC Licensee	DCC
1.17	06/05/15	Updated with comments from TAG	DCC
1.18	06/05/15	Further updates	DCC

2.0	29/05/15	Up-issued, with placeholder for Annex to set out functionality to be tested during SIT	DCC
3.0	24/07/15	Updated to include SIT1 functionality annex	DCC
4.0	21/09/15	Updated to include SIT2 functionality	DCC
5.0	26/01/16	Updated to include SIT3 functionality	DCC
5.1	13/03/16	Draft to reflect phased implementation plan	DCC
5.2	24/03/16	Updated prior to consultation	DCC
5.3	18/04/16	Updated to address consultation comments	DCC
5.4	06/05/16	Updated following TAG meeting	DCC
5.5	12/05/16	Updated following comment from DECC	DCC
5.6	13/05/16	Updated following comment from DECC	DCC
5.7	17/6/16	Updated in line with Direction from DECC on 14 June regarding contingency request and overlap of SIT and Interface Testing	DCC
5.8	23/6/16	Updated following DCC internal & TAG review	DCC

References

Ref	Title	Source	Date	Version
[1]	Joint Test Strategy	DCC	Apr 2015	v2.3
[2]	Smart Energy Code Stage 4.2	DECC	Mar 2015	
[3]	Glossary of Testing terms	ISTQB	Oct 2012	v2.2
[4]	Test Approach for the Pre-Integration Test Phase	Arqiva	Apr 2014	001
[5]	PIT Phase Test Approach	Telefonica	Jan 2014	v1.0
[6]	PIT Phase Test Approach	CGI	Dec 2013	v1.1
[7]	Schedule 6.2 (DSP version)	CGI	Sep 2013	v.1
[8]	Schedule 6.2 (CSP N version)	Arqiva	Sep 2013	v.1
[9]	Schedule 6.2 (CSP C/S version)	Telefonica	Sep 2013	v.1
[10]	Integrated Solution Delivery Plan	DCC	TBC	TBC
[11]	SMKI & Repository Test Approach	DCC	Mar 2015	v1.1
[12]	SMKI PIT Approach	BT	Aug 2014	v1.0
[13]	Smart Meter Stub Requirements	CGI	TBC	V1.2

Contents

1 Introduction

1.1 General

This document sets out the manner in which Systems Integration Testing (SIT) will be conducted for the smart metering eco-system, which is depicted in the following diagram. Readers of this document are expected to be familiar with the Joint Test Strategy[1] (Reference [1]).

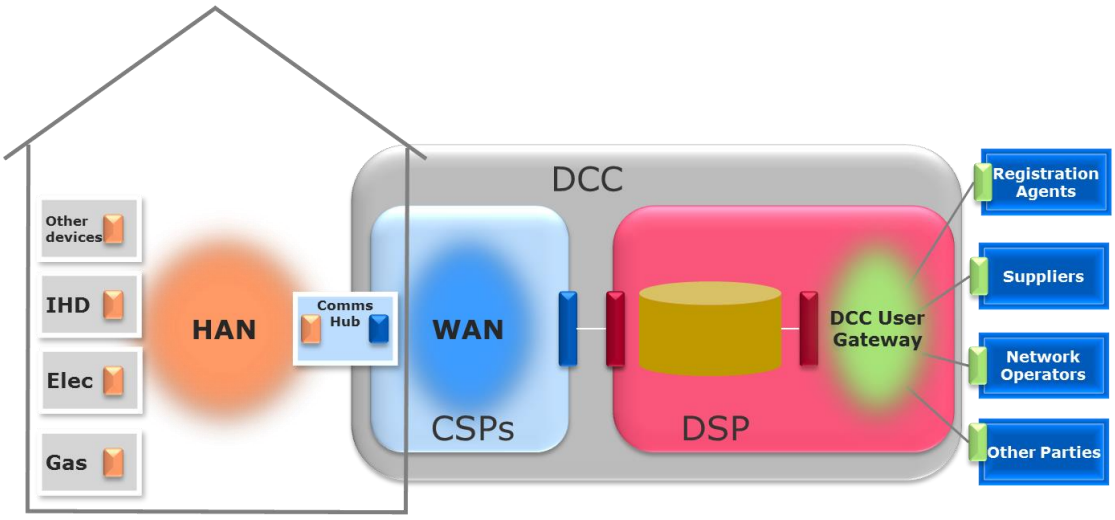

Figure 1 – DCC Solution

The Test Approach is based upon:

- the Joint Test Strategy; and
- the DSP and CSP Service Provider Contracts (References [7], [8], [9]); and
- is compliant with the Smart Energy Code (SEC) (Reference [2]).

The contents of this Test Approach were originally derived from a series of SIT Planning workshops organised by the DSP, involving Test Managers and End to End Architects from the DSP, the CSPs, the DCC Licensee, Xoserve, and St Clements Services Ltd[2] and the Registration Data Providers (RDPs).

Version 5.1 onwards have been updated to reflect the phased implementation of DCC systems. In its most recent consultation on changes to the Smart Energy Code (insert ref), DECC sets out its proposal that an additional phase of SIT will be undertaken prior to Release 1.3 going live. Version 5.1 incorporates changes as a consequence of this approach..

[1] Currently being updated for SEC 4, and the programme re-plan.

[2] Xoserve on behalf of the gas RDPs and St Clements Services Ltd on behalf of the electricity RDPs.

The diagram below demonstrates how this Test Approach (enclosed within the red oval) fits in with the hierarchy of test documents that will be produced for the programme.

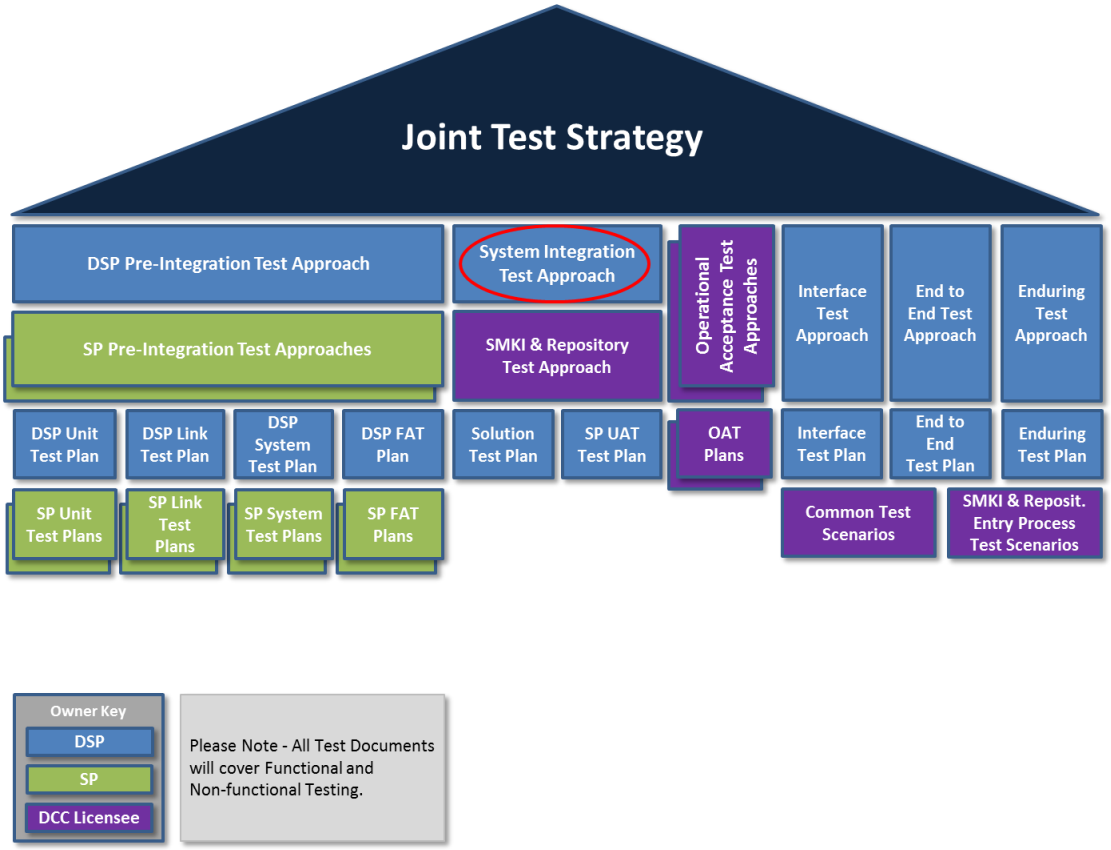

Figure 2 – Test Documentation Hierarchy

The activities described in this document will be further elaborated in the Solution Test Plan and Service Provider User Acceptance Test (UAT) Plan documents (shown underneath the SIT Approach document in Figure 2), which will be developed in collaboration with the Service Providers and RDPs.

1.2 Change Forecast

This document is not expected to undergo any further updates.

Any revisions that do become necessary will be made in accordance with the review, approval and appeal process outlined below.

1.3 Reviews, Approvals and Appeals

The document will be issued to the DCC Licensee for approval, and thence the Test Advisory Group prior to submission to the SEC Panel. Following approval by the SEC Panel it will be published on the DCC website, www.smartdcc.co.uk.

The document can be rejected by the SEC Panel prior to approval and the decision of the SEC Panel (to either approve or reject the document) can be appealed. The SEC[3] sets out the process that will be followed by the DCC in such an event.

Appeals pursuant to Section T2.14 of the SEC shall be made to the Secretary of State or other such person as the Secretary of State directs (and not the Authority). Guidance published by the Secretary of State[4] states that the Party should state which SEC requirement that they consider has not been met and why they consider this to be the case and under which section of the SEC the appeal is being made. Parties should also explain the urgency of the matter and the consequences of a) any delay and b) of an adverse determination. Appeals and disputes should be e-mailed to: SmartMeters-TestingAppeals@decc.gsi.gov.uk.

1.4 Terminology

In this document the term “Service Provider” includes all of the following:

- the DSP;
- both CSPs;
- the Trusted Service Provider (TSP), supplier of the SMKI solution element;
- the DCC Enterprise Service Provider (DCC Enterprise), i.e. the DCC Licensee in its role as supplier of Enterprise systems such as Billing and BI/MI;
- the Parse and Correlate Service Provider

The term “User Integration Testing” (UIT) refers to the test phase that comprises Interface Testing and End to End Testing.

The term “Test Stub” means systems and actions which simulate the behaviour of Devices and systems external to the solution (e.g. User systems). Test stubs are used for testing along with the meters and the User Systems.

Where the Service Provider systems functionality has not been available in an initial release that functionality may be stubbed until all the functionality is available, which will be before the end of SIT. By the end of SIT the real functionality would have been tested.

The term “Testing Issue” means in respect of any tests (a) anything that is preventing the execution of the test or (b) once commenced or executed, the test has an unexpected or unexplained outcome or response.

For the purposes of this document, the term “protocol-certified Communications Hub (Comms Hub)” means a Comms Hub which has a ZigBee Alliance Assurance Certificate.

[3] Sections T2.11 to T2.14 apply

[4] https://www.smartenergycodecompany.co.uk/docs/default-source/sec-documents/guidance/testing-related-appeals-during-transition---guidance-(updated-15-07-15).pdf?sfvrsn=2

The term “fully-certified Comms Hub” means a Comms Hub which has a ZigBee Alliance Assurance Certificate and a CPA Certificate.

The term “Registration Data Provider (RDP)” means:

(a) in respect of each Electricity Distributor, the person nominated in writing to the DCC from time to time by that Electricity Distributor; or

(b) in respect of each Gas Transporter, the person nominated in writing to the DCC from time to time by that Gas Transporter

on the basis that more than one Party may specify the same Registration Data Provider, and that the Electricity Distributor or the Gas Transporter shall be deemed to have so nominated itself in the absence of any other nomination.

This document uses standard testing terminology, a glossary (Reference [3]) of which can be found on the International Software Testing Qualification Board website, www.istqb.org.

Abbreviations used in this document are listed in the following table.

Abbreviation	Meaning
BI	Business Intelligence
CI	Configuration Item
CPA	Commercial Product Assurance
CSP	Communication Service Provider
DAB	Design Assurance Board
DCC	Data Communications Company
DCC KI	DCC Key Infrastructure
DECC	Department of Energy and Climate Change
DLMS	Device Language Message Specification
DSP	Data Service Provider
DSM	Device Selection Methodology
GBCS	Great Britain Companion Specification
HAN	Home Area Network
HP ALM	Hewlett Packard Application Lifecycle Management tool (aka Quality Center)
IHD	In Home Display
iGT	Independent Gas Transporter
IRB	Issue Resolution Board (for Test Issues)
MI	Management Information
MPAN	Meter Point Administration Number
MPRS	Meter Point Registration System
MPRN	Meter Point Reference Number

Abbreviation	Meaning
PIT	Pre-Integration Testing
RDP	Registration Data Provider
RTM	Requirements Traceability Matrix
SEC	Smart Energy Code
SIT	Systems Integration Testing
SMKI	Smart Meter Key Infrastructure
SP	Service Provider
TSP	Trusted Service Provider
UAT	User Acceptance Testing
UIT	User Integration Testing

Table 1 - Abbreviations

2 Scope

2.1 Overview

In its role as Systems Integrator, the DSP will manage SIT with support from the SPs and RDPs. All participating organisations will take an active part in the planning, preparation and execution of test activities.

SIT will verify that the DCC and RDP systems integrate to form a working system that meets the functional and non-functional requirements that are defined in the SEC and SEC subsidiary and supporting documents, and the SP contracts. User interfaces will be "stubbed" for SIT, and will be tested in the Interface Test stage.

SIT will be undertaken on a Region by Region, RDP System by RDP System basis, with Regions and RDP Systems being tested in parallel wherever it is efficient to do so. The DCC will witness an agreed subset of tests during the Solution Test and stage and SP UAT stage of SIT. SIT will be conducted in a manner that supports the incremental introduction of functionality.

Where functionality is introduced into SIT on an incremental basis the DCC will develop release note setting out the functionality being introduced; work-off plans for the functionality yet to be introduced; and a regression plan. Annexes to this document describe the functionality introduced on an incremental basis.

Devices will be used in SIT and will be selected in accordance with the Device Selection Methodology (DSM)[5]. The SEC requires that these Devices are SMETS compliant, provided that they need not (where the Secretary of State so directs) have a ZigBee Alliance Assurance Certificate or a DLMS Certificate and need not have a CPA Certificate until CPA Certificates are generally available.

All Comms Hub variants will be subject to testing. The SEC requires that the DCC tests each Comms Hub with at least 2 Electricity Meter Device Models and 2 Gas Meter Device Models from Device manufacturers that are not the manufacturer (or an Affiliate of the manufacturer) of the Comms Hub.

2.2 Phased implementation of DCC systems

The direction of the DECC Senior Responsible Officer, dated 18 December 2015, regarding the SMIP Contingency Request submitted by DCC, accepted the establishment and overlapping development of Releases R1.2 and R1.3.

Release R1.3 will be tested in a period of Additional SIT Testing, in line with section 8.2 of DECC's consultation on New Smart Energy Code Content and Related Licence Conditions, dated 25 February 2016[6].

Subsequently version 1.3 of the Testing Baseline Requirements Document[7], which sets out the requirements for demonstrating that the testing objectives have been

[5] As required under Section T1.3 of the SEC.

[6] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/503345/February_2016_SEC_consultation.pdf

[7] https://www.smartenergycodecompany.co.uk/docs/default-source/sec-documents/developing-sec/tbrd---testing-baseline-requirements-document-v1-3.pdf?sfvrsn=4

met, has been published with an annex (Annex B). This sets out transitional variations to Subsidiary Documents - i.e. requirements that are de-scoped from Release R1.2 and will be delivered in Release R1.3.

2.3 Out of Scope

The following assurance activities are outside the scope of SIT:

- certification of Meter Device Models (energy Suppliers are responsible for ensuring that any meters they install at consumers' premises are SMETS compliant, including a requirement that they are protocol certified);
- certification of Communications Hubs (the CSPs, in conjunction with their Comms Hub manufacturers, are responsible for this activity);
- testing of Meter Device Models, other than the interaction of those Devices that are selected via the Device Selection Methodology with the DCC solution (energy Suppliers are responsible for ensuring that any Meter Device Models that they install are interoperable with the DCC and are SMETS compliant);
- testing of the Home Area Network (HAN) other than its interaction with the DCC solution (it is the responsibility of energy Suppliers to ensure that a SMETS compliant HAN is established in each consumer premise);
- testing of Hand Held Terminals other than their interaction with the DCC solution (energy suppliers are responsible for ensuring that any Devices that they use are compliant with the relevant technical specifications);
- testing the inter-changeability[8] of Devices connected to the Home Area Network (this is not a requirement under the provisions of the SEC);
- testing the interaction of the DCC systems with User systems (this will be undertaken in Interface Testing, User systems will be stubbed in SIT);
- testing of DCC Business Processes. These will be tested as part of Business Acceptance Testing (a component of Operational Acceptance);
- testing of User Business Processes (Users can test their back office systems 'against the DCC' during the End to End Test stage on a voluntary basis).

[8] The ability to exchange one device with another without affecting the original functionality

3 Objectives

3.1 SIT Objective

The objective of SIT is set out in T2.2 of the SEC. It is to demonstrate that the DCC and the component parts of the DCC Systems together with the Comms Hubs selected pursuant to T1 of the SEC interoperate with each other and with the RDP Systems to the extent necessary in order that:

- the DCC Licensee is capable of complying with its obligations under Section E (Registration Data), G (Security) and H (DCC Services) of the SEC; and
- the RDPs (through the Network Operators) are capable of meeting the obligations under Section E (Registration Data) of the SEC

in each case at levels of activity commensurate with Volume Scenarios that are developed by the DCC.

3.2 Test Approach Objectives

The objectives of this Test Approach document are to:

- define the scope, deliverables, activities, resources and test processes required for SIT, in accordance with T2.5 of the SEC; and
- define the roles and responsibilities of those involved in SIT.

4 Deliverables

4.1 General

The following sections list the SIT deliverables, the contents of which are described in the Joint Test Strategy.

4.2 By Test Phase

The table below lists the deliverables for the SIT Phase as a whole.

Deliverable	Timing
Test Approach (this document)	To be published on the DCC website.
Test Scenarios	To be submitted with the Test Approach: see Section 12
Test Phase Completion Report	Draft version to be submitted to DCC no later than 10 working days before planned end of test execution. Final version to be submitted on completion of test execution.

Table 2 - Test Phase Deliverables

4.3 By Test Stage

The table below lists the deliverables for each of the two Test Stages that comprise the SIT Phase, namely Solution Test and Service Provider UAT.

Deliverable	Timing
Test Plan	Final version to be submitted to DCC by the DSP no later than 30 working days before commencement of test execution
Test Schedule	To be submitted to the DCC with the Test Plan
Test Specifications	To be submitted to DCC by the DSP no later than 20 working days before commencement of test execution
Test Traceability Matrix	To be submitted to the DCC by the DSP before the commencement of test execution
Test Readiness Reports	Issued weekly by test participants to the DCC, to start 20 working days before commencement of test execution
Test Execution Reports	Issued by test participants to the DCC, for the duration of test execution
Test Results	Available for inspection by the DCC throughout test execution
Test Issue Log	Available for inspection by the DCC throughout test execution
Regression Test Pack	To be submitted to the DCC by the DSP with the final Test Stage Completion Report
Test Stage Completion Report	Draft version to be submitted to the DCC by the DSP no later than 10 working days before the planned end of test execution. Final version to be submitted to the DCC by the DSP on completion of test execution.
Work-Off Plan	To be submitted to the DCC by the DSP with the final Test Stage Completion Report

Table 3 - Test Stage Deliverables

5 Test Phase Description

5.1 Focus areas for Systems Integration Testing

Under their own Pre-Integration Test (PIT) phase, each Service Provider (SP) and RDP (Xoserve as the Gas RDP, St Clements Services Ltd on behalf of the Electricity RDPs) will fully test their elements of the Smart Metering solution in isolation for all functional and non-functional requirements (including exception paths and negative conditions), as laid out in their PIT Test Approach and Test Stage Plans.

There is no need to repeat all such testing in SIT: instead, the primary focus of SIT will be on the dynamic interaction between solution elements that span SP/RDP boundaries.

SIT will also include:

- operation of SMKI: this security feature is fundamental to the processing of Service Requests, Responses and Alerts but is not available to the DSP or CSPs during their PIT. SMKI testing will be based on the SMKI & Repository Test Approach (Part 2a SRT) [11];
- use of certified Comms Hubs: CSPs will use Test Stubs or prototypes in their PIT if certified Comms Hubs are not available;
- Devices that are selected in accordance with the Device Selection Methodology;
- operation of the Service Management system: this will involve multiple interactions between the DSP and CSP systems. Service Management testing will be defined in a separate Test Approach document;
- testing of the Parse & Correlation solution element.

SIT coverage will be proved using a Test Traceability Matrix, which sets out which phase of testing will prove that the requirements of SEC Sections E, G and H and the Testing Baseline Requirements Document[9] are met.

5.2 Planning assumptions

The approach to SIT outlined in this document and the underlying timescales, quality levels and costs are predicated on the principle that all solution elements will be fully PIT tested before they are SIT tested[10]. Where SP solution elements are introduced into SIT incrementally, each increment will be subject to a Quality Review Gate 3, as described in Section 6.7.

The only exception to this principle relates to the provision of Comms Hubs:

[9] The Test Traceability Matrix will be updated to reflect the Testing Baseline Requirements Document, which will be updated, and the SEC as necessary

[10] Early Integration Testing (R1.1) intentionally does not conform to this principle.

- the SEC does not require fully certified versions of Comms Hubs to be used if CPA Certificates are not generally available and protocol certification requirements may be further 'relaxed' by the Secretary of State;

- CSP C/S may not have protocol-certified versions of all four Comms Hubs variants available at the start of SIT, but at least one must exist at the start of SIT for this region, subject to the availability of the relevant ZigBee certification standards;

Meter Device Models will be selected for use in accordance with the Device Selection Methodology and test stubs will be used where appropriate. These Devices are not part of the DCC-supplied solution and do not constitute an exception to the principle.

It is further assumed that functionality will be tested in SIT on an incremental basis:

- an internal release, R1.0, comprising core functionality, that will not progress beyond SIT;

- an internal release, R1.1, which is used for Early Integration Testing and is based on GBCS V0.8.2;

- the first production-candidate release, R1.2, comprising the minimum functionality required for go-live (Credit functionality);

- the second production-candidate release, R1.3, comprising the full functionality for go-live (including Pre-Payment functionality).

Each of these Releases will be subject to a Quality Review Gate 3, as described in Section 6.7.

5.3 De-risking SIT

5.3.1 Introduction

There are three preliminary verification steps that need to be completed before SIT starts: DSP Review of PIT, Early Integration Testing and Technical Readiness.

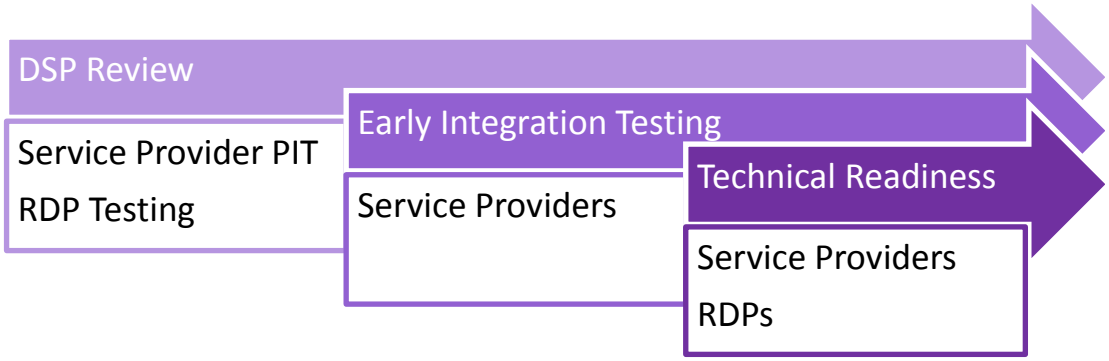

Figure 3 – Verification steps

5.3.2 DSP Review of PIT

The DSP will assure Service Provider PIT by:

- reviewing SP PIT Approach documents;
- reviewing SP System Test Plan and FAT Plan;
- reviewing SP Requirements Traceability Matrix (3rd Iteration);
- reviewing SP FAT test scenarios and data;
- reviewing SP Test Completion Reports and Work-Off Plans for System Test and FAT;
- reviewing SP Test Completion Report for PIT; and
- attending SP Quality Gate Review 2.

The DCC will review Xoserve and St Clements Service Ltd testing by inspection of the relevant test plans, design and reporting documentation.

5.3.3 Early Integration Testing

Early Integration Testing will be conducted by the DSP and CSPs. The objective of Early Integration Testing is to verify the "motorway traffic" between the DSP and CSP. It takes place at the same time as, but is separate to PIT, and uses "early" versions of the DSP and CSPs, as necessary, solution elements, i.e. versions which:

- have sufficient maturity to confirm that sample Service Requests, Responses and Alerts can be successfully exchanged between the DSP and CSP systems, but
- have not yet completed System Testing or Factory Acceptance Testing.

The DSP will lead the planning and control of Early Integration Testing, with input from the CSPs. Test preparation and execution activities will be shared across the DSP and CSPs. Appropriate release management processes will be established to ensure that testing takes place against consistent design and build baselines.

In addition to this "dynamic" testing of the interfaces between the DSP and CSP systems, "static" testing of these and other interfaces will be undertaken by all Service Providers, Xoserve and St Clements Services Ltd whereby sample interface files will be manually exchanged and desk-checked.

5.3.4 Technical Readiness

All SPs, Xoserve, St Clements Services Ltd and the Electricity RDPs will undergo a Technical Readiness assessment before participating in SIT, which will confirm:

- whether the SPs', Xoserve and St Clements Services Ltd have completed PIT;
- the impact on SIT of any outstanding PIT defects, and whether the dates in the Work-Off Plan are acceptable;
- whether the relevant SP, Xoserve, St Clements Services Ltd and Electricity RDP SIT environments has been:

- built;
- configured;
- loaded with the required solution elements (including Test Stubs, tools and devices);
- connected (e.g. firewalls opened up and validated);[11]
- smoke tested; and
- penetration tested

- that the SMKI Organisation and Device Test Certificates and keys required for SIT have been generated and applied;
- whether appropriate evidence of security controls have been provided to the DSP Security Governance Team;
- if the base test data required to commence SIT has been loaded to the relevant data stores;
- whether the test management tool has been set up and made available to the relevant personnel; and
- if guidelines for the test management tool have been developed and the relevant SP, RDP and St Clements personnel made familiar with its use.

Further details of the manner in which the technical readiness assessment will be conducted are provided in the Solution Test Plan. Note that technical readiness assessments for Electricity RDPs will be agreed by the DCC and RDPs together as part of detailed planning, with reasonable notice given.

5.4 Service Provider and RDP sequence

SIT will be performed on a Region by Region and on an RDP System by RDP System basis, so that achievement of the SIT Objective can be demonstrated for each Region and each RDP System separately. The technical solution for Regions Central and South is identical, and so these Regions will be tested together. Regions North and Central/South will be tested in parallel wherever it is efficient to do so. The Gas and Electricity RDP Systems will be tested in parallel wherever it is efficient to do so.

SIT will start in a Region once the DSP, in its role as System Integrator, has deemed that the following minimum set of SPs is ready:

- the DSP;

[11] For RDPs, this will include set up of the connectivity into the Hydra network and set up of the DCC Key Infrastructure (DCCKI)

The Hydra Network is a private cloud based MPLS Network provided by Gamma Business Communications Ltd. It is the network that will provide RDP connectivity into the DSP.

- at least one CSP;
- the TSP.

The DCC Licensee will confirm that PIT has completed satisfactorily in respect of any functionality that is introduced into SIT, including the issuance of Approval to Proceed certificates where appropriate.

Any SP or RDP not ready at the start of SIT will join at a time agreed with the DSP, and will undergo a technical readiness assessment as defined in Section 5.3.4.

5.5 Testing with the RDPs

Detailed scheduling of testing with RDPs will be agreed between the RDPs and DCC / DSP (as Systems Integrator). The risk of delay caused by encountering issues will be managed through Technical Readiness support, scheduling of testing, management focus and consideration of the point at which Registration Data Files are required for live operation.

5.5.1 Gas

The following diagram shows the high level Gas RDP system:

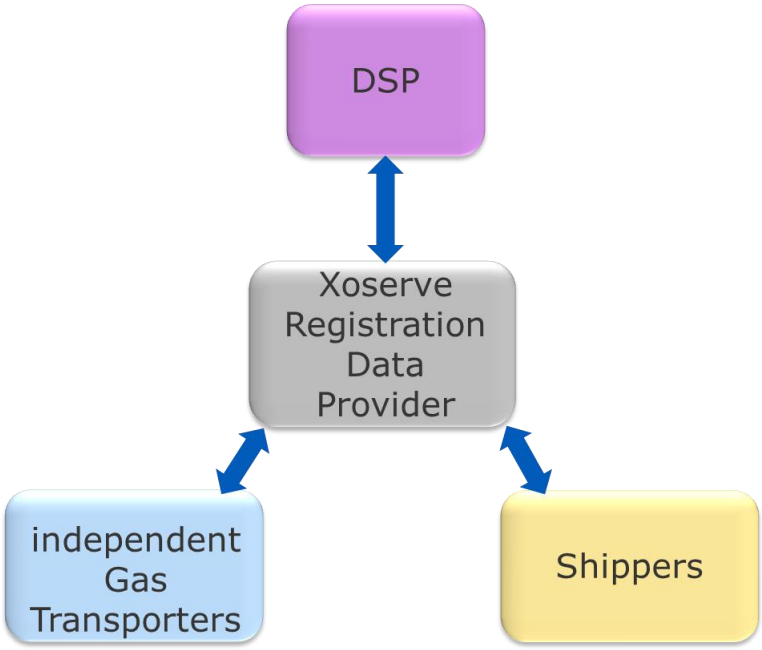

Figure 4 – Gas RDP system

Xoserve is the Gas RDP and runs its RDP system on a central platform. Independent Gas Transporters (iGTs) and Shippers send their registration data to the Gas RDP, and receive data updates from the Gas RDP.

Xoserve tests changes to this RDP system under the following test stages within its Pre-Integration Test phase:

- Unit Testing;
- Integration Testing;

- Business Testing; and
- User Trials.

Xoserve will fully test the interaction of its system with the systems of the iGTs and Shippers during the User Trials test stage, including a two-way connectivity test of the new communications links.

SIT will focus on the functional and non-functional interaction of the Gas RDP system and the DSP system, including:

- a performance test of the transmission of a full refresh from the Gas RDP to the DSP;
- a resilience test of a failed transmission between the Gas RDP and the DSP; and
- a two-way connectivity test of the new communications links between the Gas RDP and DSP.

5.5.2 Electricity

The following diagram shows the high level Electricity RDP system:

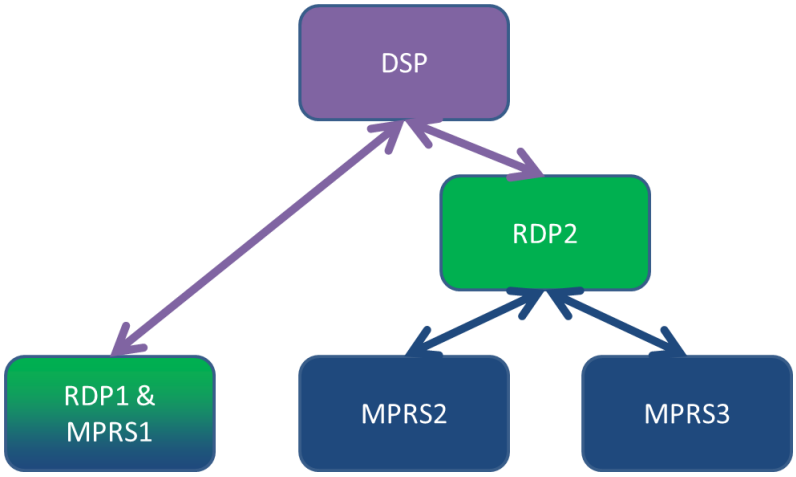

Figure 5 – Electricity RDP system

St Clements Services Ltd supplies and maintains the Meter Point Registration System (MPRS) operated by all Electricity RDPs on a distributed basis. The approach to SIT with Electricity RDPs for Smart Metering will follow that used for the national Government Green Deal implementation, whereby St Clements Services Ltd (on the collective behalf of all Electricity RDPs) will perform all necessary PIT testing, and also perform functional SIT testing with the DCC. Functional issues will be identified and resolved prior to each RDP implementing the MPRS release into their own environments. RDPs will then perform the following non-functional tests:

- prove the technical connectivity and security between themselves and DCC;
- prove the capability to provide full Initial Migration files to DCC (which the DCC will use as the basis for a performance test);

- prove the capability to receive and process update files from DCC (which will include a resilience test of a failed transmission); and

- prove the capability to send update files to DCC.

5.6 Certified Products List

The SEC Panel maintains a list of the Device Models for which the Panel has received all the Assurance Certificates required for the Physical Device Type relevant to that Device Model. This list is the Certified Products List (CPL).

The Panel is required to provide a Digitally Signed copy of the CPL (or an extract of it) and any updates to the DCC. SECAS, by arrangement with SECCo, on behalf of the Panel, will participate in testing to validate the provision of the CPL (or extract) to the DCC as set out in [insert SEC ref]. This testing will validate the structure, signing, processing and update of the CPL (or extract) and the related file-signing using an IKI token.

5.7 Systems Integration sequence

The various elements of the solution will be integrated and tested via a series of Test Scenario groups as laid out in Section 5.10.1.

5.8 Device strategy

5.8.1 Certified equipment – Smart Meters

The DCC selected the Devices to be used in SIT in accordance with the Device Selection Methodology.

Should improved versions of Devices or Test Stubs become available during SIT, they will be introduced into SIT in a controlled manner subject to an assessment of the following:

- how thoroughly has the Device or Test Stub been tested by the manufacturer and/or the CSP;

- what additional confidence will be provided by testing with the Device or Test Stub in SIT;

- how much of the SIT testing that has already been completed needs to be repeated in order to mitigate the requirement for regression testing and create the requisite level of confidence[12]

- the size of the remaining SIT test window. Should the window be too short to test all Service Requests, Responses and Alerts with the improved certified Device or Test Stub, then a subset will be selected and tested based on:

    - the priority of the test; and

[12] Each test will have two classifications: “Final test to be run with certified Comms Hub Y/N” and “Final test to be run with certified Smart Meter Y/N”, based on the classifications of the test’s parent Test Scenario listed in Section 12

- a sampling principle, whereby similar Service Requests, Responses and Alerts are grouped together and a representative example for each group is tested.

Note that this assessment will be carried out by the DSP in consultation with the CSPs and DCC.

5.8.2 Certified equipment – Comms Hubs

Ideally, SIT will start with certified versions of all five Comms Hubs variants. If this is not possible, SIT will start with at least one protocol-certified[13] Comms Hub prototype from each CSP. When improved versions of Comms Hubs become available during SIT, they will be introduced into SIT in a controlled manner subject to an assessment of the following

- how thoroughly has the improved Comms Hub been tested by the manufacturer and/or the CSP prior to SIT;
- what additional confidence will be provided by testing with the improved Comms Hub in SIT;
- how much of the SIT testing that has already been completed needs to be repeated in order to mitigate the risk of regression and create the requisite level of confidence;
- the size of the remaining SIT test window. Should the window be too short to test all Service Requests, Responses and Alerts with the Comms Hub, then a subset will be selected and tested based on:
  - the priority of the test
  - a sampling principle, whereby similar Service Requests, Responses and Alerts are grouped together and a representative example for each group is tested.

Note that this assessment will be carried out by the DSP in consultation with the CSPs. Where the DSP does not consider that protocol certified Comms Hubs should be introduced into SIT, it will notify the DCC. The DCC will present the assessment to the Secretary of State for determination. (Note: It is not possible for the DCC to exit SIT without protocol certified Comms Hubs unless otherwise directed by the Secretary of State).

5.8.3 Risk mitigation – representative Test Stubs

There is a significant risk that any Device Test Stubs will not be fully representative of the certified devices, and so any associated test results need to be regarded as

[13] A “functional” prototype has the same functionality as the certified Comms Hub but may use different hardware components, circuit design and form-factor; an “integration” prototype has the same functionality and only minor differences between hardware components, circuit design and form-factor; the “protocol-certified” prototype is identical to the Comms Hub that will be mass-produced for Consumer premises

provisional. The following strategies will be used to mitigate this risk during SIT and improve the confidence that can be placed on the test results:

- The criteria for the selection of Devices against relaxed section criteria is set out in the Device Selection Methodology. The criteria and process for the selection of Test Stubs will be set and applied by the DSP in consultation with the CSPs.

5.8.4 Risk mitigation – certified Comms Hubs

Both CSPs are working closely with their Comms Hubs manufacturers to ensure that protocol certified Comms Hubs are available for and have been tested prior to the start of SIT.

CSP N will use one Comms Hub variant for SIT, provided by EDMI, (the Fylingdale variant will not be available until after the system has gone live).

CSP C/S will be using four Comms Hub variants for SIT, provided by Toshiba and WNC:

- Cellular only - WNC
- Cellular only – Toshiba
- Cellular and Mesh, cellular aerial port – Toshiba
- Cellular and Mesh, 2 aerial ports – Toshiba.

5.8.5 Test Stub requirements

This section describes the requirements for Test Stubs. Note that:

- a Smart Meter Test Stub will be used if there are no suitable Devices available for selection via the Device Selection Methodology (DSM) and to support testing with Devices selected via the DSM (it is planned that a Service Request is tested using a Smart Meter Test Stub before it is tested with a real Smart Meter); and

The summary requirements are as follows:

- the Test Stub will receive a variety of Service Request messages output by the DSP Communications Handler and forwarded by the CSP Gateway, interpret those messages and produce an appropriate Service Response. The Test Stub will also need to produce Alert messages to be sent to the DSP. SIT will be conducted with all Service Requests, Responses and Alerts, regardless of whether Test Stubs or certified Smart Meters/Comms Hubs are available. If Test Stubs are used the Test Stub need only dynamically deal with a prioritised subset of Service Requests, Responses and Alerts e.g. Install and Commission, Meter Read. The Test Stub will therefore need to:
    - authenticate and, where necessary, decrypt the message, involving application of the public keys of the various message senders and the private key of the Smart Meter
    - interpret the message to determine what sort of response is required
    - for certain messages include specific test data in a response

- build and, where necessary, encrypt the response using appropriate keys and references to enable the DSP system to link the response to the original message.

- the Test Stub should also be capable of producing scheduled responses, where the response is triggered by the schedule and not by the receipt of a Service Request..

- The Test Stub should be capable of acting as electricity or gas Meters Devices at different times to allow testing to continue if data for any one Meter Device becomes unusable. The Test Stub will need to determine which Meter Device any particular message is meant for in order to respond appropriately.

Each CSP will require Comms Hub/Smart Meter Test Stubs.

These Test Stub requirements have been further elaborated in the Smart Meter Stub Requirements document [13], which will evolve as necessary.

Should it become necessary to complete SIT using Smart Meter Test Stubs those Smart Meter Test Stubs will be validated to ensure that they are representative of real Smart Meters.

5.9 Non-Functional Testing

5.9.1 Performance Testing

During PIT, the SPs, Xoserve and St Clements Services Ltd. will use their performance test results to develop a Performance Model to demonstrate that, in isolation, their solution elements can meet the relevant performance requirements. In the case of the DSP and CSPs:

- a set of volume scenarios (capacity levels to which the system will be tested) will be derived from the five roll-out Profiles defined in the SP Contracts

- these volume scenarios will be based on the capacity of the PIT test environments

- where the capacity of the test environments is not fully live-like, test results will be extrapolated to demonstrate that requirements can be met for all five Profiles.

In SIT, these separate Performance Models will be synthesised into a single End to End Performance Model to demonstrate that the SP/RDP solutions together meet the relevant performance requirements.

The development of this synthesised model may require SPs, Xoserve and St Clements Services Ltd to undertake additional “stand alone” performance testing of their solution elements on their own live-like test environment should:

- such environments not have been fully available during PIT, and/or

- analysis of the End to End Performance Model indicate errors or omissions in the individual Performance Models.

The development of this model may also require some elementary (e.g. latency) End to End performance tests to be run across the integrated solution but it should be noted that:

- there are wide variations in the capacity of each SP's, Xoserve's and St Clements Services Ltd's non-functional SIT environment and the comms links between them
- such variations constitute a major constraint on:
  - the ability to undertake SIT End to End performance tests, and
  - the value of undertaking such tests.

The specific volume scenarios to be exercised during SIT are:

- processing large refreshes of Registration data;
- a variety of functional tests will be run at volume with parts of the system running at reduced capacity

These volume scenarios will be exercised within the limits of the SIT test environments and test labs, and further details of these volume scenarios along with the full set of tests scenarios can be found in Section 12.

Full End to End performance testing on production environments connected together with production comms links will take place in Operational Acceptance Testing, and the results will be included in the Interface Test Stage Completion Report. Any constraints on such testing (e.g. the inability to exercise the access network, environments already in live use) will be taken into account in the design of the tests and the interpretation of the results.

5.9.2 Resilience Testing

The environment and comms link capacity variations noted in Section 5.8.1 mean that full resilience testing in SIT is not feasible. Instead, the resilience test results from each SP's PIT will be analysed and SPs may be required to undertake additional "stand alone" resilience testing of their solution elements on their own live-like test environment should such environments not have been fully available during PIT.

Full resilience testing will take place on production environments in Operational Acceptance Testing, and the results will be included in the Interface Test Stage Completion Report.

5.9.3 Security Testing

The main Security requirements defined in Section G of the SEC (e.g. recording system activity in event logs, detecting anomalous events) will be tested in PIT for those events which can be attributed to the SP solution in isolation. Any events that are relevant to the integrated DCC solution will be tested in SIT.

5.10 Test Method

5.10.1 Test Scenarios

A series of high level test scenarios has been developed to support the approach outlined in Sections 5.1 to 5.8 above, and these scenarios can be found in Section 12, noting that the solution test plan will evolve. The scenarios cover both functional and non-functional aspects of the dynamic interaction between solution elements spanning SP/RDP boundaries and are based on:

- the DSP and CSP contracted requirements;
- the Service Request Catalogue;
- the DSP and CSP PIT Test Approach documents ([6], [5], [4]);
- the SIT Planning workshops held with the SPs, Xoserve and St Clements Services Ltd representing the Electricity RDPs.

The scenarios have been grouped as follows:

Registration/de-registration of Users

At least one of each type of User Role will be created.

Interaction with Registration Data Providers

A selection of "old live" registration data will be taken from Xoserve and supplemented with matching, hand-crafted data[14] from St Clements Services Ltd, to provide the basis from which all other test data will be developed.

The data in these files will be updated initially with changes to ensure consistency with CSP data and to ensure some locations are capable of dual fuel.

Daily update files from Xoserve and St Clements Services Ltd to DSP will cover the various change scenarios identified.

Daily update files from DSP to Xoserve and St Clements Services Ltd will be triggered by certain Service Requests below.

Set up of Comms Hubs

At least one Comms Hub will be created for each User Role and RDP created above, subject to the limits set out in the SP contracts. It is anticipated that approximately 75 Comms Hubs will be required in all (15 for each Comms Hub variant), although there will be separate provisions for non-functional tests requiring larger numbers, e.g. single devices simulating multiple Comms Hubs.

[14] This will be achieved by St Clements Services Ltd using a single test database instance which will not be aligned to the data held in within individual Electricity RDP systems. It should be noted that the Electricity RDP test environments will be full scale copies of Production MPRS environments, as such it is not possible to run individual test scenarios across both St Clements Services Ltd systems and individual Electricity RDP systems.

Service Requests

The bulk of testing will comprise the testing of numerous Service Requests. These will be grouped as follows:

- On Demand vs Scheduled vs Future Dated, with the On Demand versions of the Service Requests (SRs) addressed first;
- High Priority vs Low Priority SRs. This distinguishes SRs which must be applied to every meter (e.g. commissioning) from those which will only be applied in specific circumstances, e.g. reset PIN.

This will give a small subset of SRs which will be addressed first to give an early view of the integration issues to be encountered and with SRs sequenced in a meaningful way. This subset will be repeated for each of electricity and gas, and for CSP N and CSP C/S.

Each SR scenario (over 100 have been identified) could have multiple variations (e.g. 9 User Roles, 8 Command Variants). It is not practical to test every combination but all SRs will be tested against each Comms Hub variant, with a pragmatic spread of User Roles, Command Variants and Modes of Operation across the Comms Hub variants (see Risk-based testing sub-section below). The sets of Smart Meters resulting from the Device Selection Methodology (a minimum of two) will be distributed across the five Comms Hubs variants (two sets per Comms Hub variant), but not all combinations will be tested. Approximately 100 Meter Points will be required, with some Smart Meters being credit, some pre-pay and some export. The spreadsheet of test scenarios will make it clear which tests *could* be developed and which *will* be.

Examples of how the overall number of tests will be reduced include:

- Not testing the On Demand and Future Dated versions of the *same* Service Request on the *same* Comms Hub, although each Comms Hub will have a mix of On Demand, Future Dated and Scheduled SRs applied to it; and
- Not testing the Command Variant for Local and WAN delivery combined and the Command Variant which generates these individually on the same Comms Hub.

Later in testing a further subset of these tests will be repeated but with the system artificially broken to generate Service Level violations and incidents.

Billing and BI/MI

The list of SR tests above has been enhanced with other tests derived from the Billing and BI/MI interface to ensure that sufficient variation exists to adequately test Billing and BI/MI.

Self-Service Interface

The list of SR tests above has been enhanced with other tests derived from the self-service interface to ensure that sufficient variation exists to adequately test the various options in the Self Service Interface.

Housekeeping

Again, later in testing, a further repetition of a subset of SR tests will be repeated but the system altered to ensure that unprocessed messages exist to which various housekeeping rules can be applied.

Exceptions

Generally it is expected that exception processing will be tested in PIT, e.g. the identification of invalid SRs. However, where an error message is required to pass between SPs (e.g. RDPs generating an ERROR file to return to the DSP where the file supplied by the DSP is found to be invalid), such tests will be included.

Risk-based testing

The Test Scenarios will be prioritised using a risk assessment of:

- the business importance of the various solution elements being tested; and
- the technical probability of defects being present in each solution element.

A draft assessment of these characteristics is included in the Section 12 spreadsheet, and will be ratified by discussions with the DCC Licensee End to End Architects and Service Provider Design Authorities. The confirmed priorities will be used to set:

- the depth of coverage for each Test Scenario (e.g. how many test specifications aka test scripts will be generated for a given Test Scenario);
- the sequence in which Test Scenarios are elaborated into test scripts; and
- the sequence in which test scripts are executed.

Further work

These scenarios are a work in progress and continue to be elaborated in the Solution Test stage by the DSP (with support from the other SPs, Xoserve and St Clements Services Ltd), and documented in the Solution Test Plans for Releases R1.0, R1.1, R1.2 and R1.3.

5.10.2 Test Data

Test data will be designed to support the SIT test scenarios, and all test data used in SIT will comply with the UK Data Protection Act. Xoserve's "old live" MPRN data will be used for SIT.

Should a requirement for data from external parties be identified, the DSP will notify the DCC Licensee to allow the DCC Licensee to liaise with the party concerned. Should a requirement for data anonymisation (aka obfuscation) be identified, appropriate security approval will be sought.

All test data will be prepared in time for loading to the SIT test environments during the Technical Readiness stage (see Section 5.3.4).

An analysis of the main data stores across the DCC eco-system has been started in order to identify the sources and volumes of data required. The work in progress

results are detailed in the spreadsheet below, and the DSP data stores from the spreadsheet are shown on the following pages to illustrate the content.

Data Service Provider Data Stores

Data Store Type (Functional)	Short Form	Data Store	Description	Approximate No of Records Needed for Testing	Static Data	Data Created by Registration Process	Data Created by Service Requests	Data Created by CSP Responses	Data Created by Data W'house Process	Data Created by Key Generation.	Comments
Registration	**ENPT**	Energy Participant Role	The established energy industry Market Participant in a particular Energy Role as contained within Registration Data. This defines the Energy Participant in an Energy Role with the status and contact details on the DCC Data Systems. All DCC Service Users operating in SEC User Roles except those designated as Other User (OU) will have corresponding Energy (Market) Participants. Instances of this entity are deemed reference data. They will change infrequently and only through a controlled, centrally-coordinated process.	Tens	✓	✓					Data created for PIT may be used, may need to be augmented or replaced.
	ENRO	Energy Role	An Energy Participant operating in a particular Energy Role as contained within Registration Data. This defines the Energy Participant to an Energy Role on the DCC Data Systems. Instances of this entity are deemed reference data. They will change infrequently and only through a controlled, centrally-coordinated process.	Single figures	✓	✓					Data created for PIT may be used, may need to be augmented or replaced.
	MPRO	Meter Point Registration	The Energy Participant in a given Energy Role that is registered to a Meter Point as contained within Registration Data for any given date (past, present or future). For the avoidance of doubt this will include Supplier, Network Party (also known as Electricity Distributor or Gas Transporter), Meter Asset Manager and Meter Operator registrations to a Meter Point.	Tens of thousands		✓					Populated with an initial load of data from St Clements and Xoserve. Requires the 2 data stores above (ENPT, ENRO) to be already populated.
Schedules	**PISR**	Pre-installation Service Request	Service Requests which may be sent to the DSP prior to the installation and commissioning of a device. The whole Service Request is stored and pertains to a smart metering Device.	Hundreds			✓				Populated by testing.
	SCHD	Schedules	These are the schedules for meter readings. A Service Request which is scheduled at the DSP. The whole Service Request is stored with schedule frequency and pertains to a smart metering Device.	Hundreds			✓				Populated by testing.
Capabilities	**SURM**	SEC User Role Mapping	Links a SEC User role to a Service Request thus controlling access to Service Request creation. The Service Reference Variants that can be transmitted by DCC Service Users that have been granted a SEC User Role which authorises those Service Reference Variants. This is primarily used for DCC access control purposes. This is also known as the User Role Matrix.	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	SUSP	Suspension Profile	The link between DCC Service Users and Service Reference Variants. Allows fine grained authorisation between these entities, similar to a negative role.	Hundreds	✓						Data created for PIT may be used, may need to be augmented or replaced.
	SRTP	Service Reference Variant	The Service Request types listed in the DCC User Gateway Interface Specification	Hundreds	✓						Populated by testing.
	GBCS	GBCS Use Case	Description and Energy Type of each Use Case. There will be at least one of these for each Service Request.	Hundreds	✓						Data created for PIT may be used, may need to be augmented or replaced.
	GUCD	GBCS Use Case Device Compatibility	Links a GBCS Use Case to the device models and firmware versions capable of supporting that use case.	Hundreds	✓						Data created for PIT may be used, may need to be augmented or replaced.
	DSRC	Device SR Compatibility	Links a Service Request to the device models and firmware versions capable of supporting that use case.	Hundreds	✓						Data created for PIT may be used, may need to be augmented or replaced.

Devices	**MPDV**	Meter Point Mapping	Links a device to the MPxNs that are served by that device	Hundreds				✓			Populated by testing.
	DVCE	Device	All Smart Metering devices attached to the DCC Network or pending commissioning	Hundreds				✓			Populated by testing.
	SMS	SMS	Groups devices according to the SMWAN Communications Hub through which they communicate.	Hundreds				✓			Populated by testing.
	DMDL	Device Model	The model name and approval status of each type of device	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	DFWV	Firmware Versions	The firmware versions linked to each device model	Tens	✓		✓				Data created for PIT may be used, It need to be augmented or replaced. Additional entries populated by testing.
	DMFR	Manufacturer	The manufacturer id description and details for each device model	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	DMDL	Device Type	The device type and description, with many device models belonging to each type	Single figures	✓						Data created for PIT may be used, may need to be augmented or replaced.
	JNDV	Joined Device	Devices which are linked to each other, e.g. a GPF is always linked to a CHF, other devices can be linked to CHF's, for example HAN or IHD	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	DKM	Device Key Mapping	The linking of a key to a particular device, and the date the link was made.	Tens	✓			✓			Data created for PIT may be used, may need to be augmented or replaced.
	KEY	Key	Details of a Key that is in use (or has been used) within the DSP system	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	DLWH	Device Log Whitelist	Used to store device log whitelists provided via update HAN device log service requests for CHF and GPF device types.	Tens	✓						
Meter Points	**PREM**	Premises	The address and postcode where a Meter Point is located	Tens of thousands		✓					Populated with an initial load of data from St Clements and Xoserve. Requires the 3 data stores above (ENPT, ENRO, PTRO) to be already populated.
	MPRO	Meter Point	Holds every MPxN notified by the registration data providers regardless of whether a smart metering system has been commissioned	Tens of thousands		✓					Populated with an initial load of data from St Clements and Xoserve. Requires the 3 data stores above (ENPT, ENRO, PTRO) to be already populated.
	RDP	Registration Data Provider	The RPD id and their details	Single figures	✓						Data created for PIT may be used, may need to be augmented or replaced.
DCC/SEC Party	**SPTY**	SEC Party	The legal entity that has acceded to the SEC (can be a person or company) in one or more SEC User Role(s). To be able to distribute Gas, distribute Electricity, supply Gas or supply Electricity companies must hold a licence. The licences contain conditions which, among other things, require companies to accede to the SEC in corresponding SEC User Roles. Equally some SEC Parties may be unlicensed and accede voluntarily - including energy service companies and managed service companies, amongst others.	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	SRTP	SEC User Role	This is the User Role as defined in SEC. The category of DCC Service User used for structuring DCC User Gateway Service Request, Response and Alert definitions and for access control purposes in respect of DCC Services (DCC User Gateway Services and DCC Self Service Interface Services). For licensed SEC Parties, SEC User Roles correspond to license categories except for Electricity Import and Export Suppliers, which have discrete SEC User Roles. Instances of this entity are deemed reference data. They will change infrequently and only through a controlled, centrally-coordinated process.	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	CORP	Corporation	A group of SEC Parties that share access to DCC User Gateway Services and DCC Self Service Interface Services. Typically the SEC Parties within a group belong to the same controlling entity or "Corporation", although they do not necessarily have to be related in this way. This will be used to allow multiple SEC parties to share one physical connection to the User Gateway network and to enforce access controls at the Self Service Interface.	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	SPRO	DCC Service User	A particular SEC Party operating in a particular SEC User Role. This defines a DCC Service User in respect of DCC Services (DCC User Gateway Services and DCC Self Service Interface Services).	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.
	PPRM	Party Participant Role Mapping	This maps the DCC Service User (a SEC Party in a given SEC User Role) to a Participant Role (an Energy Participant in a given Energy Role). This is used to map between DCC Service User and the Registration Data for access control purposes. Instances of this entity are deemed reference data. They will change infrequently and only through a controlled, centrally-coordinated process.	Tens	✓						Data created for PIT may be used, may need to be augmented or replaced.

CSP Mapping	**CSP**	CSP	The CSPs identity and associated details	2	✓						Data created for PIT may be used, may need to be augmented or replaced.
	CSPR	CSP Region	The regional details linked to the CSP id	3	✓						Data created for PIT may be used, may need to be augmented or replaced.
	CSHW	CSP Schedule Window	The schedule window(s) allocated to the CSP. The schedule windows are allocated to the CSP and are not region based.	2	✓						Data created for PIT may be used, may need to be augmented or replaced.
	CAGW	CSP Address Gateway	The addressing used by a Communication Services Provider to send messages to the Device. This is specific to Arqiva as CSP North.	2				✓			Populated by testing.
Security Data		Entrust IdentityGuard	The IdentityGuard software from Entrust is an authentication and identity assurance platform. It is used within the DCC Data Systems to authenticate users and provide two factor authorisation.								
		Entrust GetAccess	The GetAccess software from Entrust is a Single Sign On (SSO) and control solution. It is used within the DSP to protect web access for the self service and service management portals (SSI and SSMI) and to enforce access control.								
Data Store Type (Data Warehouse, Reporting)		**Data Store**	**Description**	**Approximate No of Records Needed for Testing**							**Source**
		Inventory and Reporting Database	A subset of the device inventory data stored in the functional data stores above.	Hundreds					✓		Created from the datastores above and updated by certain of the test scenarios.
		Audit Database	Created from the transaction logs that are created as Service requests are processed.	Thousands					✓		Each Service Request created during testing should create an entry on the audit database.
Data Store Type (PKI)		**Data Store**	**Description**	**Approximate No of Records Needed for Testing**							**Source**
		SMKI PKI Repository	Certificates containing the public keys of all Service Users and Smart Meters.	Tens						✓	Organisational certificates will be requested by Service Users, these are sent by the Certificate Authorities (CAs) to the PKI repository. Service Users will supply batch requests for Smart Meter Certificates, these are also sent by CAs to the PKI repository.

Table 4 - DSP Data Stores and their derivation

5.11 Regression Testing

SPs, Xoserve and St Clements Services Ltd will perform a regression test on each new release of their solution elements according to the principles laid out in their PIT Test Approach document, prior to the new release being accepted into and installed in the SIT environment.

Testing completed during Release R1.0 will be fully regression tested during Release R1.2 or R1.3, as determined by the release that implements the revised functionality.

Once installed, the new release will be subject to a SIT smoke test prior to it undergoing detailed functional and non-functional testing. The release will also undergo a SIT regression test which will be a selection of tests from the full SIT regression test set, based on an assessment of the risk that the new release will cause features previously verified in SIT to stop working. This assessment will be undertaken by the SP Architect, SP Development Team Leader and the SIT Test Manager.

The full SIT regression test set will be developed by the DSP with support from the SPs, Xoserve and St Clements Services Ltd and cover all solution elements to an appropriate depth, and will be maintained in line with:

- changes in the scope of the system under test
- experiences of earlier regression failures.

The regression test approach will be elaborated in the Solution Test Stage Plan.

The Regression Test Pack (test scripts, test data and documentation) will be submitted to the DCC Licensee at the end of the Solution Test Stage and the SP UAT Test Stage. Any agreed omissions will be rectified promptly.

5.12 Requirements Traceability

The SPs 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 the DCC Licensee with a PIT Requirements Traceability Matrix (RTM), extracted from these separate tools.

The scope of testing will be validated by use of a Test Traceability Matrix (TTM), setting out how each requirement within SEC Sections E, G and H and the Testing Baseline Requirements Document is met, which supersedes the RTM developed and used for PIT.

At the end of SIT, any new tests which have been created during SIT will be added to the TTM and the TTM will be used by the DCC to demonstrate the completion of SIT.

6 Test Procedure

6.1 Test Stages

6.1.1 Introduction

There are two test stages in each of SIT and Additional SIT:

- Solution Test; and
- SP User Acceptance Test.

Release R1.0 and Release R1.1 will undergo Solution Test only.

Releases R1.2 and R1.3 will each undergo Solution Test and SP User Acceptance Test.

6.1.2 Solution Test

The testing described in Sections 5.1 through 5.11 above will take place in the Solution Test stage.

6.1.3 Service Provider UAT

The purpose of the SP User Acceptance Test stage is to allow the DCC to witness (in addition to any witnessing that may take place ahead of SP UAT) an agreed subset of the tests carried out in the Solution Test stage as part of its overall Acceptance Activities, details of which can be found in the Joint Test Strategy. This subset of tests will be described in the SP UAT Test Plan.

Giving at least 10 working days' notice, the DSP will provide the DCC with a schedule of when and where these tests will be executed and invite the DCC Licensee to witness either on-site or remotely. Ahead of this witnessing, each SP/RDP will invite the DCC to participate in a series of familiarisation visits to their premises so that the witnesses can acquaint themselves with the SP/RDP systems, processes and personnel.

Execution of the agreed set of tests will be managed by the SIT Test Manager and performed by the relevant SP/RDP 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 into HP ALM (aka Quality Center) and progressed through the Test Issue Management process (see Section 8).

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

6.2 Test Stage overlap

6.2.1 SP UAT Test Stage with Interface Test Stage

As part of the programme re-plan in February 2014, the decision was taken to overlap the SP UAT Test Stage of SIT with the Interface Test Stage of UIT in order to minimise the impact of Great Britain Companion Specification (GBCS) delays on the go-live date. This overlap introduces a risk that any significant defects found in SP UAT will cause re-work and delay in Interface Testing, however this risk is small given that SP UAT is a merely a repeat of a subset of the tests run in the Solution Test Stage. This risk will be mitigated by scheduling the high risk tests for the start of SP UAT.

6.2.2 Further Overlap of Solution Test Stage with Interface Testing and End-to-End Testing Stages

On 20 May 2016, DCC published a consultation seeking Parties' views on proposals to request the further overlapping of elements of Systems Integration Testing (SIT) and Interface Testing (IT), in a manner which would not affect the ability of a User to conduct:

i. User Entry Process Testing (UEPT),
ii. other User facing activities in Interface Testing and End-to-End Testing, or
iii. the ability of the DCC to conduct SIT UAT (User Acceptance Testing).

On 14 June 2016 DECC gave approval of the DCC's recommendation for the overlapping of SIT and IT pursuant to Section T3.7 of the SEC, regarding the continuation of additional elements of Systems Integration Testing after Interface Testing has commenced.

The approval, dated 14 June 2016, agreed that elements of SIT Solution Test would complete after the start date of Interface Testing and End-to-End Testing.

The R1.2 functional areas of the DCC solution that will overlap with IT are set out below:

- Testing of Non-Prioritised meters;
- Threshold Anomaly Detection Testing;
- DCC Service Management System (DSMS);
- Certified Product List Testing with SECAS;
- Telefonica – Toshiba 'Cellular and Mesh' Communication Hub SKU2 and SKU3 variants;
- DCC Enterprise Solution (BI/MI, Billing); and
- RDP Testing.

The R1.2 functional areas of the DCC solution that will be available at the start of IT / UEPT are:

- Processing of DUIS Service Requests and Responses;
- Self-Service Interface.

6.2.3 Releases R1.2 and R1.3

The direction of the DECC Senior Responsible Officer, dated 18 December 2015, regarding the SMIP Contingency Request submitted by DCC accepted the establishment and overlapping development of Releases R1.2 and R1.3. This introduces a similar risk of issues in one release impacting the other. However, this risk is also determined to be fairly minor as Release R1.3 is 'additive' to R1.2 (i.e. issues should be contained to a single release) and separate teams have been established to manage and develop each release.

6.3 Division of work

The Test Scenarios referenced in Section 5.9.1 will be divided between the SPs and RDPs for test preparation and test execution work according to the following criteria:

- the part of the end to end system where the majority of the test processing take place;
- the skills and expertise are needed to design and run the test; and
- the availability of re-usable testware from PIT.

A draft division of these Test Scenarios between SPs and RDPs is provided in column G ("Responsibility for Preparation and Execution") of the spreadsheet in Section 12. The division of work will be discussed and agreed with the SPs, Xoserve, St Clements Service Ltd and the Electricity RDPs.

The DSP will support the other SPs, Xoserve, St Clements Services Ltd and the Electricity RDPs in their assigned test preparation and test execution activities, ensuring that they have access to the relevant information and resources.

The DCC will support the DSP in the planning, control and operation of SIT.

6.4 High Level Plan

The diagram below shows an indicative high level plan for SIT for Release R1.2, based on the evolving Integrated Solution Delivery Plan [10].

At the time of writing, the DSP and other SPs are working together to develop this plan down to the next level of detail and validate both the sequencing and duration of the various testing activities.

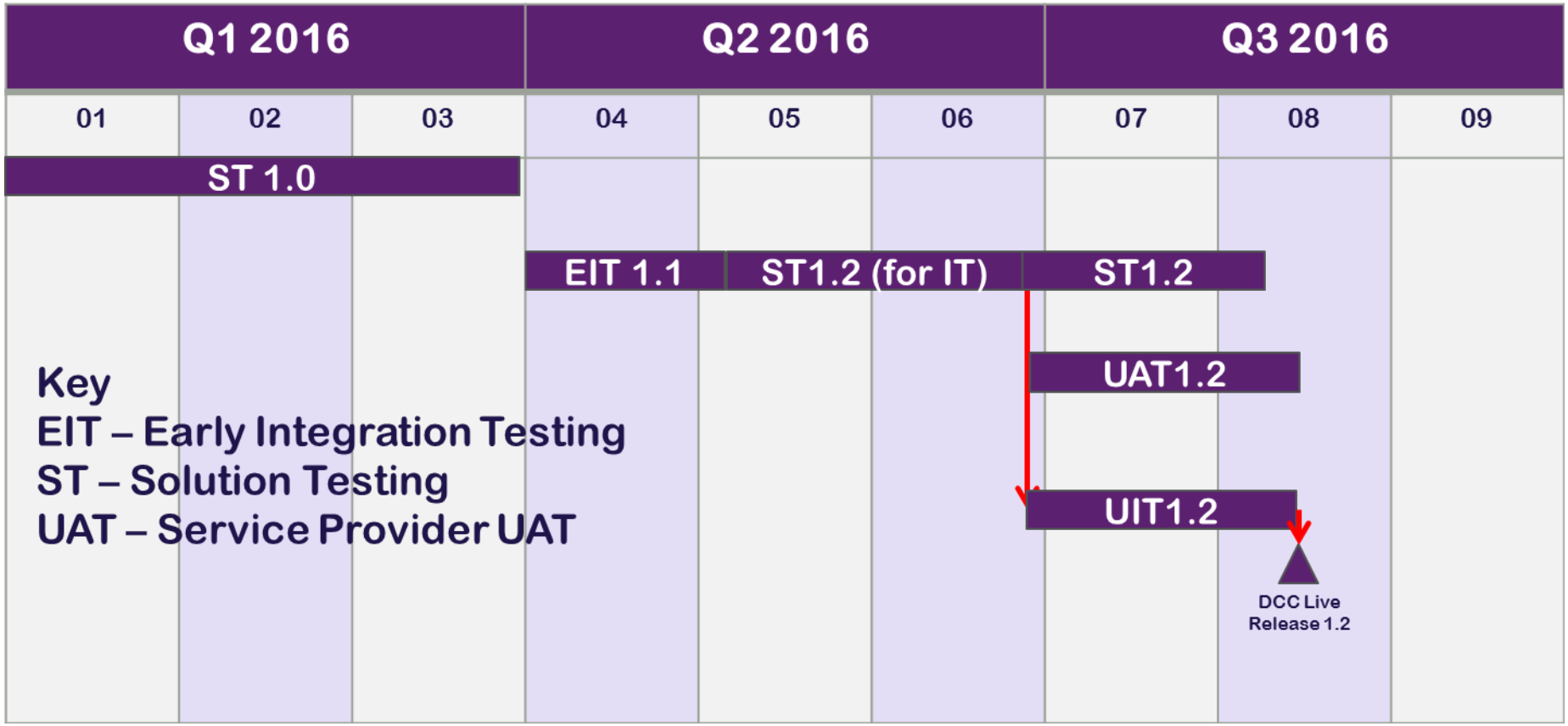

Figure 6 – High level plan for SIT

The high level plan for Release R1.3 will be in line with future direction from DECC.

6.5 Dependencies and Assumptions

The following table describes the dependencies that need to be satisfied by parties outside the SP/RDP Test Teams involved in SIT.

Note: the table below is correct at the time of issue, changes in dependencies are tracked via the DCC Programme Plan.

No.	Description	Dependent Upon
1	Test Environment design agreed	DSP
2	Shared instance of HP ALM available	DSP
3	Completion of SP PIT and RDP testing – R1.2	
3a	DSP, CSP N, CSP C/S, TSP, DCC Enterprise, RDP, SECAS (CPL), CSW (P&C)	SP, RDP, SECAS
4	Completion of SP PIT – R1.3	
4a	DSP, CSP N, CSP C/S	SP
5	Set up of DCC User Gateway between DCC and each RDPs	RDPs
6	DCC Key Infrastructure (DCCKI) Test service ready for use	DCC Licensee

Table 5 - Dependencies

The following table describes the assumptions that underpin this Test Approach.

No.	Description
1	All solution elements will be fully PIT tested before being subjected to SIT i.e. defects will fall within agreed thresholds and any Work Off Plans will be agreed with the DCC Licensee

Table 6 - Assumptions

6.6 Entry & Exit Criteria

6.6.1 General

The Entry and Exit Criteria below relate to both SIT and Additional SIT with the exception of those relating to RDPs and their service providers which only applies in relation to SIT. Entry and Exit Criteria for the Solution Test Stage and the SP UAT Test Stage for each formal Release (i.e. R1.2 and R1.3) will be detailed in the relevant Test Stage Plans.

The Entry and Exit Criteria listed below apply to all SPs and, in the case of SIT, to St Clements Services Ltd and the RDPs. The DSP will assess whether SPs meet these Criteria and the DCC Licensee will assess St Clements Services Ltd and the RDPs. Exit Criteria will be evaluated per Region and, in the case of SIT only, per RDP Region also.

With the support of its Network Operator, each RDP shall:

- co-operate with the DCC Licensee in its assessment of the Entry Criteria applying to it;
- take all reasonable steps to meet these Entry Criteria by the one month prior to commencing testing; and
- notify the SEC Panel and the DCC Licensee if it considers it will not meet the Entry Criteria by the date required.

The DCC will report the DSP's assessment of each RDP to the SEC Panel. In line with SEC section T2.14, any disagreement between an RDP and the DCC over this assessment will be referred to the SEC Panel. The RDP and DCC can each appeal the Panel's ruling to the Authority, whose decision is final.

6.6.2 Entry Criteria

The Entry Criteria for each RDP to participate in SIT are:

- Technical Readiness Assessments completed (see Section 5.3.4); and
- St Clements Services Ltd and RDP resources are available to support the testing (see Section 10.2)
- appropriate evidence of security controls (as will be set out in the Enduring Test Approach) has been supplied to the DCC
- SMKI Registration Authority Policies and Procedures completed in order to gain the necessary test security credentials.

Note that for the purposes of gaining Test Certificates, RDPs should refer to the Enduring Test Approach document.

The Entry Criteria for SIT and Additional SIT are:

- SIT Test Approach (this document) approved by the SEC Panel;
- RTM (initial version of Iteration 4) prepared;
- Approval to Proceed certificates issued by the DCC for the DSP, at least one CSP, at least one RDP system, the TSP, and the Parse and Correlate SP;
- Solution Test Plan approved by the DCC;
- Solution Test Specifications (and supporting test data) prepared;
- Technical Readiness Assessments completed for each SP(see Section 5.3.4);
- at least one "protocol-certified" Comms Hub prototype is available for each Region;
- at least one set of certified Devices for each fuel type is available (or a DSP/CSP-approved Test Stub);
- other Test Stubs required for SIT are available (see Section 9.3);
- test environments prepared;

- SMKI certificates and keys are available;
- SP resources are available to support the testing (see Section 10.2).

6.6.3 Exit Criteria

Release R1.0 is an internal release (i.e. it will not progress further than SIT) and exit criteria and reporting for Release R1.0 will be discussed separately with the SEC Panel.

Release R1.1 is also an internal release and will not be subject to formal exit criteria or reporting.

SIT will have completed when the Exit Criteria for each Region and each RDP system have been met. Additional SIT will have been completed when the Exit Criteria for each Region have been met.

The Exit Criteria for SIT for an RDP, which are applicable only for R1.2, are:

- the RDP system meets the test success criteria for tests run, tests passed and defects as listed below;
- 100% of the tests listed in the Test Specifications have been executed, or any exceptions documented and agreed with the DCC, and reported to the SEC Panel;
- at least 85% of planned tests have been passed, or any exceptions documented and agreed with the DCC;
- the level of defects is within the thresholds set out in section 6.8;
- Work-Off Plans have been produced (see Section 6.8), where applicable;
- Test Traceability Matrix prepared (where it relates to SEC Section E);
- test results have been documented and evidence captured. DCC will agree the level of evidence required to support the exit criteria with each individual RDP;
- a complete set of test issue logs produced;
- regression testing is complete;
- test completion reports have been produced and test completion certificates have been issued by the DCC.

The Exit Criteria for SIT in a Region are:

- The Region concerned meets the test success criteria listed below;
- the DSP, TSP and DCC Enterprise meet the test success criteria for tests run, tests passed and defects as listed below;
- in the case of SIT (but not Additional SIT), RDP systems meet the test success criteria for tests run, tests passed and defects as listed below and each RDP meets the exit criteria applying to it set out in this document;

- all certified Comms Hub variants required for go-live have been tested (save that CPA Certificates are not required and need not (where the Secretary of State so directs) have a ZigBee Alliance Assurance Certificate);
- DCC has been tested using actual Devices for each fuel type, selected in accordance with the Device Selection Methodology, or using Test Stubs together with an explanation of how such arrangements will provide sufficient assurance that the SIT Objective has been met;
- 100% of the tests listed in the Test Specifications for Releases R1.2 or R1.3 (as applicable) have been executed, or any exceptions documented and agreed with the DCC, and reported to the SEC Panel;
- at least 85% of planned tests for Releases R1.2 or R1.3 (as applicable) have been passed, or any exceptions documented and agreed with the DCC;
- the level of defects for each SP and, in the case of SIT, each SP/RDP, is within the thresholds set out in section 6.8;
- the Test Stage Completion Reports for Solution Test and SP UAT for Releases R1.2 or R1.3 (as applicable) have been issued by the DSP;
- the Test Phase Completion Report has been issued by the DSP;
- the Work-Off Plans for Solution Test and SP UAT for Releases R1.2 or R1.3 (as applicable) have been produced (see Section 6.8);
- test results have been documented and evidence captured;
- a complete set of test issue logs produced;
- Test Traceability Matrix prepared;
- regression testing is complete;
- the Regression Test Pack has been produced;
- Test Stage Completion Certificates for the Solution Test Stage and the SP UAT Test Stage for Releases R1.2 or R1.3 (as applicable) issued by the DCC; and
- Test Phase Completion Certificate for SIT or Additional SIT (as applicable) issued by the DCC.

The DCC will produce its own Test Completion Report when it considers that the Exit Criteria have been achieved for a Region or RDP System and provide evidence in the report, in the case of SIT, having first consulted with each RDP in relation to the exit criteria applicable to the RDP.

The DCC will also procure an independent auditor to confirm that the Exit Criteria have been met for a Region or RDP system, and will publish the auditor's report on its website (the approach for implementing and operating this auditing is defined in Section 15).

The DCC will then:

- notify the Secretary of State, the Authority, the SEC Panel, the SEC Parties and (in the case of SIT) the RDPs that SIT or Additional SIT (as applicable) for the Region or RDP system in question has ended;
- provide the Authority, the SEC Panel and (on request) the Secretary of State with copies of the Test Completion Report and the auditor's report, along with a list of those sections of such reports that it considers should be redacted
- on direction from the SEC Panel, provide the SEC Parties, RDPs and SPs with copies of the Test Completion Report and the auditor's report, having first redacted any sections specified by the SEC Panel.

The Exit Criteria for SIT Solution Testing Complete for the purposes of commencing IT for a Region are:

- DCC Service Request processing has been tested using actual Devices for each fuel type, selected in accordance with the Device Selection Methodology, or using Test Stubs together with an explanation of how such arrangements will provide sufficient assurance they support the conduct of UEPT;
- 100% of the tests for Release R1.2 Service Requests and SSI have been executed, or any exceptions documented and agreed with the DCC and reported;
- at least 85% of planned tests for Release R1.2 Service Requests and SSI have been passed, or any exceptions documented and agreed with the DCC;
- the level of defects for each SP for Release R1.2 Service Requests and SSI and, is within the thresholds set out in section 6.8;
- test results have been documented and evidence captured;
- a complete set of test issue logs produced;
- a Test Completion Report confirming the above criteria are met has been produced.

6.7 Quality Gates

A series of Quality Gate Reviews will be held between Test Stages within the PIT, SIT and Additional SIT Phases, to confirm that the Exit Criteria of the preceding Test Stage and the Entry Criteria of the upcoming Test Stage have been met. The following table describes these Quality Gate Reviews:

No.	Quality Gate Review	Chair	Approver	Attendees
1a	Between CSP Link and System Test	CSP	CSP	DCC Licensee
1b	Between DSP Link and System Test	DSP	DSP	DCC Licensee
1c	Between DCC Enterprise Link and System Test	DCC Enterprise	DCC Enterprise	DCC Licensee
1d	Between TSP Link and System Test	TSP	TSP	DCC Licensee
2a	Between CSP System Test and FAT	CSP	CSP	DSP, DCC Licensee

No.	Quality Gate Review	Chair	Approver	Attendees
2b	Between DSP System Test and FAT	DSP	DSP	DCC Licensee
2c	Between DCC Enterprise System Test and FAT	DCC Enterprise	DCC Enterprise	DSP, DCC Licensee
2d	Between TSP System Test and FAT	TSP	TSP	DSP, DCC Licensee
2e	Between Critical Software System Test and FAT	Critical Software	Critical Software	DSP, DCC Licensee
3	Between FAT and Solution Test	DSP	DCC Licensee	SPs, RDPs
4	Between Solution Test and Service Provider UAT	DSP	DSP	SPs, RDPs, DCC Licensee
5	Between Solution Test and Interface Test	DSP	DCC Licensee	SPs, RDPs
6	Between OAT and go-live	DCC Licensee	DCC Licensee	SPs, RDPs
7	Between TSP PIT and SRT Part 1	DSP	DSP	DCC Licensee, TSP
8	On completion of SIT	DCC Licensee	DCC Licensee	SPs, RDPs

Table 7 - Quality Gate Reviews

Note that for Quality Gates 3 - 6 during SIT, St Clements Services Ltd will represent the Electricity RDPs.

Note that references to RDPs are applicable to SIT only (and not Additional SIT).

The “Approver” of each Quality Gate Review Meeting will set the outcome as one of the following:

- preceding Test Stage can close, upcoming Test Stage can start, only minor (if any) remedial actions required;
- preceding Test Stage cannot close until remedial actions have been completed, upcoming Test Stage can start;
- preceding Test Stage can close, upcoming Test Stage cannot start until remedial actions have been completed;
- preceding Test Stage cannot close, upcoming Test Stage cannot start, until remedial actions have been completed

In its role as Systems Integrator, the DSP will attend each SP’s Quality Gate 2.

Quality Gate Review 3 also covers the Exit of the PIT Phase and the Entry of the SIT Phase or Additional SIT Phase.. Quality Gate 5 covers the Exit of the SIT Phase or Additional SIT Phase and the Entry of the User Integration Phase or the Additional Interface Testing Phase.

Each Quality Gate Review meeting will be a short, checklist-driven event at which previously assembled and validated evidence relating to the Exit and Entry Criteria is considered and decisions made to close the current Test Stage and start the next Test Stage. It is expected that Quality Gate Review meetings will be dry-run to enable issues to be identified and resolved in a timely manner, and thereby avoid impacting the start date for the upcoming Test Stage.

The current Test Stage/Phase will complete (and achieve its Milestone) on attainment of its Exit Criteria. The next Stage/Phase will commence (and achieve its Milestone) on attainment of its Entry Criteria. The Quality Gate Review meeting will take place during the transition from the current to the next Test Stage/Phase.

To facilitate the operation of Quality Gate Reviews and the timely achievement of Test Stage Entry Criteria within SIT or Additional SIT, the DSP will publish weekly Test Readiness Reports for the Solution Test Stage and SP UAT Test Stage, as described in the Joint Test Strategy.

6.8 Work-Off Plans

A Work-Off Plan will be produced at SIT Solution Testing Complete for the purposes of commencing IT and at the end of the Solution Test Stage for Release R1.2, detailing the defects that are outstanding and the plan for resolving them. The level of defects for each Service Provider and Registration Data Provider must fall within the following thresholds (or any exceptions are documented and agreed with the DCC) at each point:

- 0 Severity 1s
- 0 Severity 2s
- 15 Severity 3s
- 30 Severity 4s
- 60 Severity 5s.

Each Service Provider/Registration Data Provider must resolve all their Severity 3 defects within 20 working days of the end of the Solution Test Stage, all Severity 4s within 40 working days, and all Severity 5s within 60 working days. If the Work-Off Plan is not achieved, the Service Provider/Registration Data Provider will produce and agree a Correction Plan with the DCC. In the event that the Work-Off Plan is not achieved, the total number of Testing Issues for each Severity shall not exceed the threshold that would apply if the Work-Off Plan had been met.

This Work-Off Plan will be updated at the end of the Service Provider User Acceptance Test Stage to include defects that are outstanding from that Stage. Such defects will be subject to the same threshold and resolution times as defects from the Solution Test Stage, but will be counted and managed separately.

The same process will be used for Release R1.3 (but ignoring references to Registration Data Providers).

7 Test Result Management & Reporting

7.1 Tracking

HP's ALM Test Management tool will be used to manage SIT testing and SIT test issues. The DSP will establish, maintain and support a shared instance of this tool for local and remote use by SPs/RDPs in support of SIT preparation and execution activities, and supply up to 50 royalty-free licences in total for this purpose (further licences will be available at a charge). The proposed allocation of these licences during the SIT phase is shown in the following table.

Organisation	Licence count
DSP	18
CSP N	11
CSP C/S	11
TSP	2
DCC Enterprise	2
DCC Licensee	2
RDPs	4[15]

Table 8 - Proposed allocation of HP ALM licences

RDPs will not require access to the test management tool for Additional SIT (as they will not be a Testing Participant for Additional SIT).

Note that these licences will be re-distributed at the start of the UIT phase to cater for the participation of Users in test preparation and execution activities.

HP ALM will be used to maintain:

- 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).

A guideline for the use of HP ALM will be developed.

[15] RDPs will share the 4 HP ALM Licences. The intent is no more than 4 RDPs will be tested at any one time

7.2 Reporting

Data held in HP ALM will be used to populate the weekly Test Execution reports and the Test Completion reports sent to the DCC, the contents of which are described in the Joint Test Strategy. Significant test failures will be notified to the DCC once they have been confirmed.

The DCC will provide the SEC Panel and the Secretary of State with a copy of the weekly Test Execution Reports for information, with details of any test issues anonymised and redacted as required in accordance with Section H14.44 of SEC 4.2 [2].

At the end of each Test Stage, the DSP will provide the DCC Licensee with a Test Completion Report, the contents of which are described in the Joint Test Strategy.

8 Test Issue Management

8.1 RDPs

RDPs are considered to be SIT "Test Participants" as defined by SEC [2], and will undertake tests as directed by the DSP. RDPs shall take reasonable steps to diagnose and resolve test issues before raising them with the DSP.

8.2 Logging and triage of Test Issues

All test issues relating to the DCC solution, including RDP elements, will be logged in HP ALM by the person executing the test. Full details will be recorded in HP ALM to enable speedy resolution. New test issues will be reviewed at least daily by the relevant SP/RDP Test Manager, who will:

- classify them as one of:
  - testing issue:
    - that prevents execution of a test; or
    - that causes an unexplained or unexpected outcome or response to a test
  - not a testing issue (e.g. a misunderstanding)
  - duplicate
  - change
  - need more information, and
- set their Severity and Priority (see Section 13 for definitions)
- assign the test issue to the relevant resolver group. Should this lie outside the SP's or RDP's organisation, the test issue will be assigned to the DSP Test Issue Manager.

8.3 Resolution of Test Issues

The DSP Test Issue Manager will:

- regularly review all outstanding test issues to ensure that they are resolved at the requisite speed
- involve the Gas RDP and St Clements Services Ltd as required in the triage and resolution of defects associated with Registration Data
- agree with the relevant SP/RDP Test Managers the defect fixes to be included in each Release to the SIT environment
- report progress directly to stakeholders.

Target response times for test issues will be documented in v3.5 of the Joint Test Strategy.

8.4 Assurance and Disputes

8.4.1 Assurance

The Triage Panel, comprising each SP's Design Authority, Xoserve and St Clements Services Ltd[16]' Design Authorities and the DCC Licensee, and chaired by the DSP Test Issue 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 sampling, that test issues are being given the correct Severity by the local triage process; and
- confirm, by a process of sampling, that Priority 1 and 2 defects are being resolved at the requisite speed.

8.4.2 RDP Dispute

Where an RDP is dissatisfied with the triage (assigned severity/priority, expected resolution timetable, resolution actions assigned to itself) results of any test issues it has raised, it may refer the matter to the DCC's Issue Resolution Board, the attendees of which will be determined by the DCC.

If the RDP disagrees with the DCC's findings, it may request that the DCC refers the matter to the Secretary of State, who can choose to ask the SEC Panel to consider the testing issue further, or can choose to resolve it in some other way.

The SEC Panel will publish dispute decisions on its website.

8.4.3 DCC Dispute

The severity of unresolved test issues listed in the Test Completion Reports will be agreed with the DCC. If the parties are unable to agree the severity, the Issue Resolution Procedure defined in the SEC will be followed.

8.5 Reporting of Test Issues

Information on the status of test issues will be reported by the DSP to the DCC Licensee in the weekly Test Execution reports described in the Joint Test Strategy and reported to the SEC Panel in accordance with a schedule to be agreed with the SEC Panel.

DCC will report information regarding Testing Issues that have the potential to impact testing undertaken by Testing Participant during Interface Testing, or later stages.

8.6 Test Issue Management Process

A detailed Test Issue Management process will be developed in conjunction with the creation of the Solution Test Plan.

[16] St Clements will invite Electricity RDP representatives as and when required

The high level lifecycle for test issues raised during SIT is shown in the following diagram.

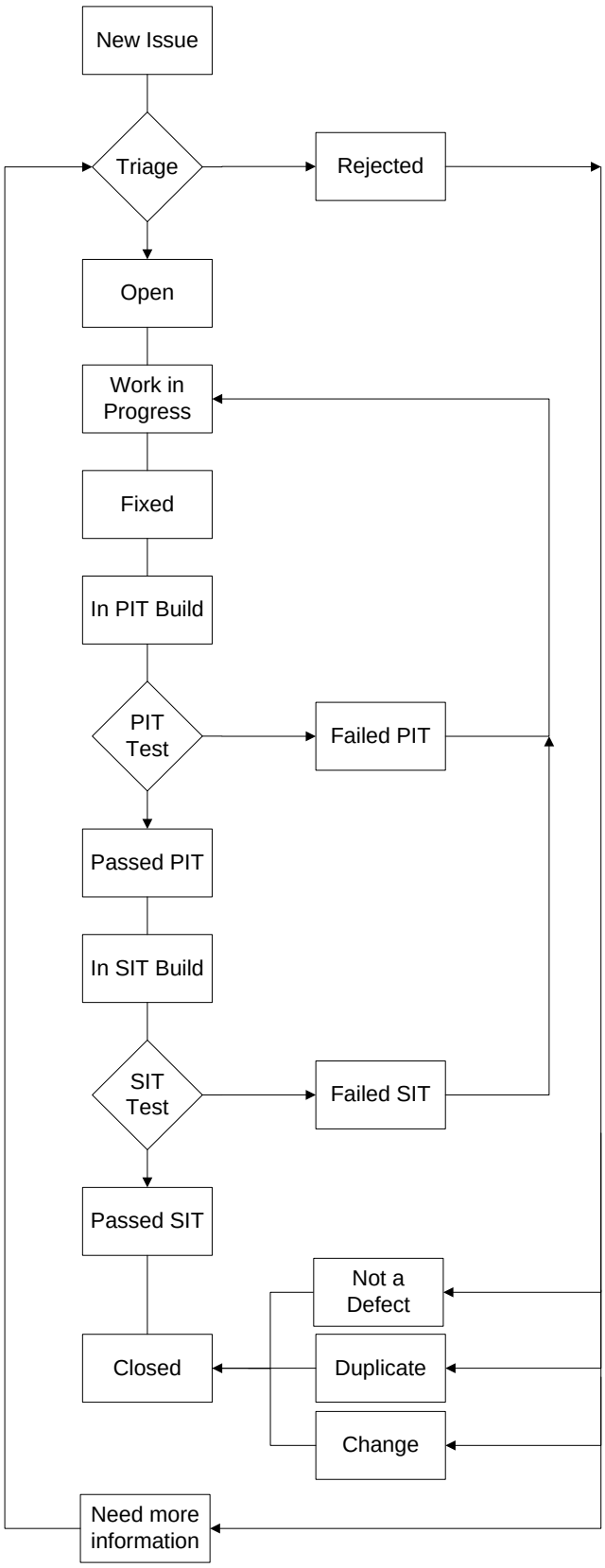

Figure 7 – Test Issue Lifecycle

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 During Transition will apply during SIT, 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

9 Test Resources

9.1 Test Team

The diagram below shows the structure of the Test Team. The team will evolve as necessary.

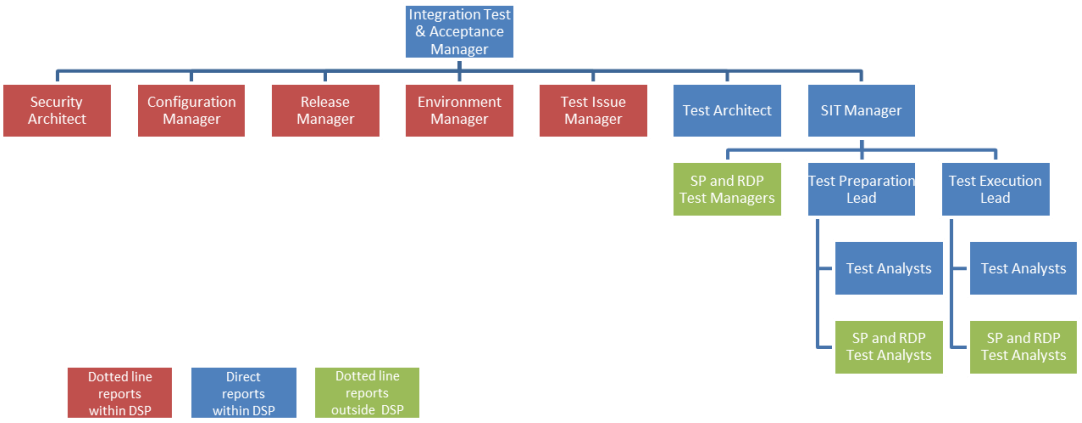

Figure 8 – Structure of Test Team

The roles in this structure are as follows:

- Integration Test and Acceptance Manager
  - responsible for all DSP Integration Test activities, including User Integration Testing
- SP and RDP Test Managers
  - responsible for PIT testing of their solution elements
  - single point of contact for all design, development and technical queries on their solution elements
  - provides “local” management of preparation and execution for SIT tests within their agreed test boundary
- Security Architect
  - responsible for advising on all Security aspects of testing
- Configuration Manager
  - owns the master Configuration Plan which defines a) the Configuration Items (CIs) comprising the Smart Meter eco-system and b) the inter-dependencies between these CIs
  - responsible for configuration management of DSP CIs
- Release Manager

- owns the master Release Schedule which shows a) when the various SP/RDP Releases are deployed to the SIT environments and b) the inter-dependencies between these releases
- responsible for releases of DSP solution elements

- Environment Manager
  - owns the master Environment Plan which shows a) the architecture of the various SP/RDP SIT environments and b) the communications links between these environments
  - responsible for the DSP SIT environment
- Test Issue Manager
  - responsible for chairing the Triage Panel, expediting the resolution of outstanding test issues, agreeing which defect fixes go into which SIT Releases, and reporting progress to stakeholders
- Test Architect
  - responsible for designing Integration test scenarios and test data, supporting Integration test Planning, designing and assuring Integration test procedures
- SIT Test Manager
  - responsible for planning and control of SIT
- Test Preparation Lead
  - responsible for designing and building SIT test scripts
- Test Execution Lead
  - responsible for execution of SIT test scripts
- Test Analysts
  - responsible for writing and executing SIT test scripts
  - sourced from each SP/RDP, to work on tests within their agreed test boundary
  - numbers and profile to be determined as part of the “Estimating and Scheduling” activity shown on the High Level Plan in Section 6.2.

9.2 Test Tools

HP's ALM Test Management tool will be used to manage SIT testing and SIT test issues.

The following table lists the other test tools that may be used in SIT.

Tool	Type	Service Provider
JMeter	Performance	DSP
Gatling	Performance	DSP
Selenium	Automation	DSP
Bespoke tools from Sensus	Performance	CSP N
Bespoke tools from Sensus	Automation	CSP N
SilkPerformer	Performance	CSP C/S
LoadRunner	Performance	CSP C/S
JMeter	Performance	CSP C/S
QuickTestPro	Automation	CSP C/S
Selenium	Automation	CSP C/S
Thucydides	Automation	TSP
Jira	Collaboration	DCC Enterprise
Selenium	Automation	DCC Enterprise
Pragmatic Testrunner	Automation	DCC Enterprise
Lettuce	Automation	DCC Enterprise

Table 9 - Test Tools

9.3 Test Stubs and Prototypes

The following table lists the Test Stubs and prototypes that will be used in SIT, along with the organisations that are responsible for their design and for their development.

Test Stub	Design responsibility	Development responsibility	Comment
Service User Test Stub – functional	DSP	DSP	The DSP PIT Test Stub will act as the basis, but will need to be enhanced (e.g. to deal with SMKI). The real Parse & Correlate software will be used
Smart Meter Test Stub	CSPs	CSPs	The CSP PIT Test Stubs could act as the basis, but will need significant enhancement (e.g. to deal with SMKI)
Protocol-certified Comms Hub prototype	CSPs	CSPs	

Table 10 - Test Stubs and Prototypes

10 Roles & Responsibilities

10.1 General

All parties involved in SIT are expected to:

- follow the SEC guidelines 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 SIT Objective.

10.2 DSP as Systems Integrator

In its role as Systems Integrator, the DSP will manage SIT and is responsible for the following activities:

- producing and maintaining the SIT Approach, the Solution Test Plan and the SP UAT Test Plan (with the exception that this document is now maintained by the DCC Licensee);
- ensuring that the SIT Approach, the Solution Test Plan and the SP UAT Test Plan align with the Joint Test Strategy;
- ensuring that SIT activities are carried out in line with the SIT Approach, the Solution Test Plan and the SP UAT Test Plan;
- overall planning and control of SIT, including chairing Quality Gates 3 (between FAT and Solution Test), 4 (between Solution Test and SP UAT) and 5 (between Solution Test and Interface Test);
- maintaining Risk, Assumption, Issue and Dependency Logs;
- leading the design and creation of test scenarios, test scripts, test data and test environments;
- preparing test execution and environment usage schedules;
- supporting the other SPs and the RDPs in their assigned test preparation and execution activities;
- managing test issue resolution, and supporting SPs and RDPs in the resolution process;
- producing the Test Stage Plans, Test Specifications, Test Traceability Matrices, Progress Reports and Test Completion Reports;
- operating the master Configuration Management Plan (see Section 9.1);
- operating the master Release Schedule (see Section 9.1); and
- operating the Environment Plan (see Section 9.1).

10.3 Service Providers

The SPs (including the DSP in its role as provider of the DSP system elements, and the DCC in its role as provider of Enterprise systems such as Billing and BI/MI) will:

- support the DSP as Systems Integrator in:
  - planning and control of SIT;
  - design and creation of test scenarios, test scripts, test data and test environments;
  - preparing test execution and environment usage schedules;
  - diagnosing test issues;
  - producing the Test Stage Plans, Test Specifications, Requirements Traceability Matrices, Progress Reports and Test Completion Reports;
  - contributing to the master Configuration Management 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 Systems Integrator:
  - execute and monitor test scripts
  - capture evidence
  - report progress
- resolve test issues for their solution elements and undertaking PIT testing (including regression testing) of any fixes required.

The CSPs will:

- establish, maintain and control their own Test Labs;
- procure and install Comms Hubs in their Test Labs for use in SIT;
- install sets of Smart Metering equipment in their Test Labs for use in SIT;
- procure, install, maintain and support Comms Hub Test Stubs and Smart Meter Test Stubs (if required) for use in SIT; and
- in conjunction with their Comms Hub manufacturers, obtain Comms Hub certifications from the relevant authorities.

10.4 DCC

The DCC will:

- comply with its obligations under the approved SIT Approach (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 is completed as soon as is reasonably practicable to do so;
- obtain sets of Devices from Device Manufacturers for use in SIT;
- support the DSP in the planning, control and operation of SIT;
- assure SIT planning, preparation and execution activities undertaken by the Systems Integrator, Service Providers and RDPs as detailed in the Joint Test Strategy and through the Test Traceability Matrix;
- review and approve the relevant Test Documents, and issue the Approval to Proceed certificates as described in Schedule 6.2 ([7] [8] [9]). This includes the need to approve the SIT Phase and Stage Completion Reports promptly ;
- participate in Quality Gate Reviews as described in Section 6.6;
- agree with the DSP, other Service Providers and RDPs a subset of the Solution Tests to be witnessed in the UAT stage;
- witness the execution of these tests in UAT;
- define and implement a process to audit the achievement of SIT Exit Criteria;
- produce the Device Selection Methodology in collaboration with DSP and CSPs, and issue;
- produce and issue the DCC Licensee Business Processes; and
- perform the role of Service Provider for DCC Enterprise systems such as Billing and BI/MI.

10.5 RDPs

The RDPs will, for SIT but not for Additional SIT:

- support the Systems Integrator in:
  - planning and control of SIT;
  - design and creation of test scenarios, test scripts, test data and test environments (note that Electricity RDPs will perform only the non-functional tests described in Section 5.5.2);
  - preparing test execution and environment usage schedules;
  - diagnosing test issues;

- contributing to the master Configuration Management Plan;
- contributing to the master Release schedule; and
- 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 Systems Integrator:
  - execute and monitor test scripts;
  - capture evidence; and
  - report progress
- resolve test issues for their solution elements and undertaking PIT testing (including regression testing) of any fixes required.

10.6 St Clements Services Ltd

St Clements Services Ltd will, for SIT but not for Additional SIT:

- act as the representative of Electricity RDPs in testing discussions with the DSP and DCC;
- help co-ordinate test planning, preparation and execution required of the Electricity RDPs;
- undertake the initial functional testing with the DSP, prior to testing by Electricity RDPs;
- support the Systems Integrator in:
  - planning and control of SIT;
  - design and creation of test scenarios, test scripts, test data and test environments;
  - preparing test execution and environment usage schedules;
  - diagnosing test issues;
  - contributing to the master Configuration Management Plan;
  - contributing to the master Release schedule; and
  - 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 Systems Integrator:

- execute and monitor test scripts;
- capture evidence; and
- report progress

- resolve test issues for their solution elements and undertaking PIT testing (including regression testing) of any fixes required.

10.7 Network Operators

Each Network Operator will:

- ensure that the relevant RDP complies with its obligations under the SEC and the published SIT Approach.

10.8 SECAS

SECAS by arrangement with SECCo, on behalf of the Panel will work with the DCC and Systems Integrator to appropriately test the process of establishing and maintaining the Certified Products List.

11 Environments and Labs

11.1 Environments

Each SP/RDP is responsible for establishing, maintaining and controlling its own Test Environments.

Note that planning of environment usage continues in the Solution Test Stage.

11.2 Test Labs

Each CSP will provide a Test Lab housing Smart Meters, Comms Hubs and Smart Metering equipment for use during SIT.

11.2.1 CSP N

CSP N will use the Internal Arqiva Test Lab that will be individually connected to the Pre-Production environment for SIT (and the Dev 2 environment for Pre- SIT).

The Internal Test Lab will provide an environment that smart devices such as the Comms Hub and meters may be tested with the SMWAN Infrastructure. It will be possible to configure each Comms Hub separately so that it connects to a specific Access Network base station, and Access Networks for each Test Environment that will be within radio range of the Test Labs.

This will allow flexibility in the number of Devices connected within each Test Environment.

The Internal Test Lab will provide two mechanisms for loading metering Devices within the facility. A limited number of metering Devices will be connected to adjustable loads, which will allow the power consumption of the metering Device to be varied to a preconfigured setting. The remaining metering Devices will be connected to static loads.

11.2.2 CSP C/S

Telefonica's Test Lab will host various Smart Metering equipment sets. These equipment sets will be configurable in order that various environments can be connected and the configuration for dual fuel, single fuel, communications hubs variants etc. can all be amended as necessary for any combination required for testing. Note that once set up for a given environment, these sets of equipment cannot be switched between environments.

12 Test Scenarios

The spreadsheet below contains the list of Test Scenarios originally identified for SIT. It is a work in progress and will evolve with the Solution Test Stage.

The following key information is recorded for each Test Scenario:

- Description
- Responsibility for developing
- Type (Normal, Exception, Alternative)
- Verification method
- Final Test with Certified Comms Hub
- Final Test with Certified Smart Meter (if available)
- Mode of operation
- Test variations
- Pre-requisites
- Comments
- Command Variants/Test Conditions.

DT.0034_System_Integration_Test_Scena

13 Test Issue Severities and Priorities

The following table lists the standard Test Issue Severities:

Issue Severity	Description
1	An Issue which: • prevents a DCC User or large group of DCC Users from using the DCC User Systems; • has a critical adverse impact on the activities of the DCC; • could cause significant financial loss and/or disruption to the DCC services or DCC Users; or • results in any material loss or corruption of Data. Non-exhaustive examples: • An Issue leading to Non-availability of the DCC Data Services; • An Issue leading to Non-availability of the CSP Core solution element(s).
2	An Issue which: • has a major (but not critical) adverse impact on the activities of the DCC but the service is still working at a reduced capacity; or • causes limited financial loss and/or disruption to the DCC Non-exhaustive examples: • An Issue leading to Non-availability of the Network Management Centre; • An Issue leading to loss of resilience of the SMWAN Gateway; • Large areas of functionality will not be able to be tested.
3	An Issue which: • has a major adverse impact on the activities of the 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 the DCC.
4	An Issue which: • has a minor adverse impact on the activities of the DCC. Non-exhaustive examples: • Minor service interruptions in the business process or functionality of the DCC Systems and / or service.
5	An Issue which: • has minimal impact to the activities of the DCC. Non-exhaustive examples • Trivial issues with workarounds which are noted for future releases but minimal impact of running existing services.

Table 11 - Test Issue Severities

The following table lists the standard Test Issue Priorities:

Issue Priority	Description
1	All test progress is blocked by the Issue.
2	Testing not completely blocked by the Issue but the impact on test progress is significant.
3	Testing can proceed but the work-around for the Issue has moderate impact on test progress.
4	Testing can proceed and the Issue has little/no impact on test progress.

Table 12 - Test Issue Priorities

14 Device Selection Methodology

Devices were selected for use in SIT in accordance with the Device Selection Methodology (DSM), published on the DCC website on 13th November 2014 following a period of consultation.

A meter Device will be de-selected at the discretion of the DCC as set out in the Device Selection Methodology. Devices will be de-selected where the potential impact on the testing activity and overall smart metering programme warrants de-selection. For example: de-selection will not occur if a single unit of a specific Device model does not respond to a Service Request. If a Device is de-selected then all of the units of that meter Device Model will be removed from testing.

15 Auditing of SIT Exit Criteria

15.1 Procurement of Independent Test Auditor

The DCC is required to appoint an auditor (that is sufficiently independent of DCC Licensee, the Service Providers and the Registration Data Providers) to monitor SIT activities and to confirm that the exit criteria have been met for each Region and RDP system.

The DCC will appoint the auditor at least 1 month before the start of SIT via an Audit and Assurance Framework Agreement. The audit will be procured against the scope that is set out below and tender responses assessed by the DCC against criteria that will include:

a) independence from the DCC Licensee and it Service Providers;
b) proposed Audit Approach;
c) relevant experience; and
d) cost.

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

15.2 Audit Scope

The scope of the audit will encompass activities that are undertaken in Solution Testing and SP UAT, and provide confirmation that all exit criteria have been met including that:

- testing had been conducted in accordance with this SIT Approach document;
- devices have been used during testing in accordance with the Device Selection Methodology (or that appropriate stubs have been used where actual metering Devices are not available);
- 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 R1.0 but will not be required to confirm that the exit criteria have been achieved for a Region or an RDP System. The SIT Auditor will be required to confirm that the exit criteria have been met for each Region and RDP System for Release R1.2 and that the criteria have been met for each Region for Release R1.3 (as applicable).

15.3 Approach to Audit

The audit will be undertaken on a Region by Region, RDP system by RDP system[17] basis.

[17] Testing with RDP systems completes during R1.2. There will be not audit of RDP activities for R1.3.

The auditor will be required to produce an audit approach document for review by the DCC Licensee 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; and review of issue resolution logs. The auditor may also attend selected IRB and Triage Panel meetings.

The auditor will inform the DCC Licensee of any observations that are raised during Solution Test within 1 working day, such that the DCC Licensee can initiate corrective action at the earliest possible opportunity. 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 the DCC Licensee no later than 2 working days prior to the scheduled date for completion of SP UAT for that Region.

Annex 1: SIT functionality (R1.0)

SIT1 test baseline

Table 14 below, sets out the functionality to be tested in the first release into SIT (referred to as "SIT1").

The complete SIT test requirements baseline constitutes the arrangements set down in Sections E, G and H of the SEC, as set out in Section T2 of the SEC. Further, in accordance with Section T2.3 of the SEC, the Secretary of State specifies the versions of all the procedural and technical documents, including SEC Subsidiary Documents, that are the reference versions during SIT and against which a successful exit from SIT will be measured. It is understood that the Secretary of State will publish the list of the versions of these documents to be used shortly.

SIT1 is the first of three releases into SIT which, taken together, will be designed to fulfil the complete SIT test requirements baseline described above. For the purposes of SIT1, functionality is aligned to SMETS v1.58, CHTS v1.46 and GBCS v0.8.1. Meter stubs will be used for SIT1 testing in addition to GBCS v0.8.1 compliant meters when available. The User Simulator is being used; there will be no involvement from prospective Users in SIT.

	Technical readiness	SIT1
Aim of release into SIT	Link test of connection points between systems (DSP, CSP, TSP) Confirmation of load of registration data and test data check on all systems to ensure readiness for SIT start. 'Smoke test' communication between the DSP and a CSP.	Test the install and commission process.
Functionality	Link testing of connections between DSP and: Service User Simulator, CSPs, TSP, DCC licensee. Mutual authentication will be tested using DCCKI signed certificates. Test of load of Registration data files generated from St Clements and Xoserve and sent by appropriately secured electronic means to DSP. The file format and DSP loader functionality will be tested.	DSP (SIT1) 38 out of 115 Service Requests and Service Request Variants. Please see below for a list of Service Requests included in SIT1 Installation and commission of CHF, ESME, GSME, GPF.

	Technical readiness	SIT1
	Test of CSRs submitted by Service User Simulator to TSP and associated generation and issuing of device and organisational certificates. A sample service request will be processed during technical readiness to prove connectivity between the DSP and CSP. All required static test data will be checked in DSP, CSP TSP and Service User Simulator systems and confirmed ready to start SIT testing.	
Limitations	File transport of registration files is via appropriately secured electronic means and not using DUGN and file transfer protocols. DCCKI processes for submission and distribution of certificates will need to be manual and have yet to be agreed. ESI interfaces not available for technical readiness testing	Only small Service Requests (no use of General Block Transfer (GBT) messages as defined by GBCS), for example update tariff not supported. Prepayment not supported. Update and management of security credentials not supported. Read/Delete schedules by device ID not supported. File transport of registration files is via appropriately secured electronic means and not using DUGN and file transfer protocols.

Table 13 - SIT1 functionality

Service Requests included in SIT1

Service Request	Service Request Variant	Service Request Name	Notes
1.1	1.1.1	Update Import Tariff	Simple Gas Tariffs only in SIT1 - must fit inside small message (<1200 bytes)
1.2	1.2.1	Update Price	Simple Gas Tariffs only in SIT1 - must fit inside small message (<1200 bytes)
1.5	1.5	Adjust Meter Balance	
4.1	4.1.1	Read Instantaneous Import Registers	
4.1	4.1.2	Read Instantaneous Import Registers (TOU)	
4.1	4.1.3	Read Instantaneous Import Registers (TOU with blocks)	
4.1	4.1.4	Read Instantaneous Import Registers (Blocks)	
4.2	4.2	Read Instantaneous Export Registers	
4.8	4.8.1	Read Profile Data (Active Import)	Limited date/time range in SIT1 - must fit inside small message (<1200 bytes)
4.8	4.8.2	Read Profile Data (Reactive Import)	Limited date/time range in SIT1 - must fit inside small message (<1200 bytes)
4.8	4.8.3	Read Profile Data(export)	Limited date/time range in SIT1 - must fit inside small message (<1200 bytes)
4.11	4.11.1	Read Tariff	Simple Gas Tariffs only in SIT1 - must fit inside small message (<1200 bytes)
4.16	4.16	Read Active Power Import	

Service Request	Service Request Variant	Service Request Name	Notes
5.1	5.1	Create Schedule	
5.2	5.2	Read Schedule	
5.3	5.3	Delete Schedule	
6.2	6.2.3	Read Device Configuration (Billing Calendar)	
6.2	6.2.4	Read Device Configuration (CHF Identity, Identify exc MPxN)	
6.2	6.2.7	Read Device Configuration (MPxN)	
6.4	6.4.1	Update Device Configuration (Load Limiting General Settings)	
6.4	6.4.2	Update Device Configuration (Load Limiting Counter Reset)	
6.8	6.8	Update Device Configuration (Billing Calendar)	
6.11	6.11	Synchronise Clock	
6.13	6.13	Read Event or Security Log (CHF)	
8.1	8.1.1	Commission Device (Time)	
8.2	8.2	Read Inventory	
8.3	8.3	Decommission Device	
8.4	8.4	Update Inventory	
8.7	8.7.2	Join Non-Critical (GSME-GPF)	

Service Request	Service Request Variant	Service Request Name	Notes
8.8	8.8.2	Unjoin Non-Critical (GPF-GSME)	
8.9	8.9	Read Device Log	
8.11	8.11	Update HAN Device Log	
9.1	9.1	Request Customer Identification Number	
11.1	11.1	Update Firmware	
11.2	11.2	Read Firmware Version	
11.3	11.3	Activate Firmware	
12.1	12.1	Request WAN Matrix	
12.2	12.2	Device Pre-Notification	

Table 14 - Service Requests included in SIT1

SIT2 test baseline

Table 16 below, sets out the functionality planned to be tested in the second release into SIT (referred to as "SIT2").

The complete SIT test requirements baseline constitutes the arrangements set down in Sections E, G and H of the SEC, as set out in Section T2 of the SEC. Further, in accordance with Section T2.3 of the SEC, the Secretary of State specifies the versions of all the procedural and technical documents, including SEC Subsidiary Documents, that are the reference versions during SIT and against which a successful exit from SIT will be measured[18].

SIT2 is the second of three intended releases into SIT which, taken together, will be designed to fulfil the complete SIT test requirements baseline described above. For the purposes of SIT2, functionality is aligned to SMETS v1.58 and CHTS v1.46 and GBCS v0.8.1. Meter stubs will be used for SIT2 testing in addition to GBCS v0.8.1 compliant meters when available. The User Simulator is being used; there will be no involvement from prospective Users in SIT.

Functionality planned to be tested in SIT2

	SIT2
Aim of release into SIT	End-to-end testing of the remaining Release 1.0 Service Requests including large messages using General Block Transfer (GBT) protocol as defined in GBCS and including devices on the CSP North network. Retest of Install and Commission utilising additional functionality delivered in SIT2 Integration with DCC Service Management. Testing of production of DCC Enterprise reports from DSP.
Functionality	Functionality will be delivered into SIT2 on an incremental basis to accommodate phased releases of functionality from each of the Service Providers. 80 of 80 Service Requests variants which are supported in R1.0 will be available for testing in SIT2. The Install and

[18] SMIP Testing Baseline Requirements Document, 10 August 2015: https://www.smartenergycodecompany.co.uk/docs/default-source/sec-documents/developing-sec/testing-baseline-requirements-document-v1-0.pdf?sfvrsn=2

	SIT2
	commission process will be regression tested by installing and commissioning new Communications Hubs at Arqiva and Telefonica. A sample report will be generated via Enterprise Systems Interface (ESI). Test files produced from DSP will be manually passed to DCC Enterprise to enable the testing of some billing functionality. Functional testing of DCC Service Management System via SSI, SSMI and CSPs. Exchanging ESI files (via manual process) and generating many BI/MI Reports and Billing Invoices. Performance testing will be carried out within the timeline of SIT2.
Limitations	Read/Delete schedules by device id not supported. File transport of registration files is via appropriately secured electronic means and not using DUGN and file transfer protocols

Table 15 - SIT2 functionality

Note: There are no change requests included in SIT2

Service Requests included in SIT2 and SIT3

Service Request	Service Request Variant	Service Request Name	Notes
1.1	1.1.1	Update Import Tariff	Including complex tariffs and GBT messages
1.1	1.1.2	Update Import Tariff (Secondary Element)	
1.2	1.2.1	Update Price	Including complex tariffs and GBT messages
1.5	1.5	Adjust Meter Balance	
1.7	1.7	Reset Tariff Block Counter Matrix	
3.1	3.1	Display Message	
3.2	3.2	Restrict Access For Change Of Tenancy	

Service Request	Service Request Variant	Service Request Name	Notes
3.4	3.4	Update Supplier Name	
3.5	3.5	Reset Customer PIN	
4.1	4.1.1	Read Instantaneous Import Registers	
4.1	4.1.2	Read Instantaneous Import Registers (TOU)	
4.1	4.1.3	Read Instantaneous Import Registers (TOU with blocks)	
4.1	4.1.4	Read Instantaneous Import Registers (Blocks)	
4.2	4.2	Read Instantaneous Export Registers	
4.4	4.4.2	Retrieve Billing Data Log (Change of Mode and Tariff triggered)	
4.4	4.4.3	Retrieve Billing Data Log (Billing calendar triggered)	
4.6	4.6.1	Retrieve Import Daily Read Log	
4.6	4.6.2	Retrieve Export Daily Read Log	
4.8	4.8.1	Read Profile Data (Active Import)	Including GBT messages
4.8	4.8.2	Read Profile Data (Reactive Import)	Including GBT messages
4.8	4.8.3	Read Profile Data(export)	Including GBT messages
4.10	4.10	Read Network Data	
4.11	4.11.1	Read Tariff	Including GBT messages

Service Request	Service Request Variant	Service Request Name	Notes
4.11	4.11.2	Read Tariff (secondary element)	
4.12	4.12.1	Read Maximum Demand Registers (Import)	
4.12	4.12.2	Read Maximum Demand Registers (export)	
4.16	4.16	Read Active Power Import	
4.17	4.17	Retrieve Daily Consumption Log	
5.1	5.1	Create Schedule	
5.2	5.2	Read Schedule	
5.3	5.3	Delete Schedule	
6.2	6.2.1	Read Device Configuration (Voltage)	
6.2	6.2.2	Read Device Configuration (Randomisation)	
6.2	6.2.3	Read Device Configuration (Billing Calendar)	
6.2	6.2.4	Read Device Configuration (Identity exc MPxN)	
6.2	6.2.7	Read Device Configuration (MPxN)	
6.2	6.2.8	Read Device Configuration (Gas)	
6.2	6.2.9	Read Device Configuration (Payment Mode)	Not available for GSME devices because the ZigBee command cannot be constructed for GBCS v0.8.1

Service Request	Service Request Variant	Service Request Name	Notes
6.4	6.4.1	Update Device Configuration (Load Limiting General Settings)	
6.4	6.4.2	Update Device Configuration (Load Limiting Counter Reset)	
6.5	6.5	Update Device Configuration (Voltage)	
6.6	6.6	Update Device Configuration (Gas Conversion)	
6.7	6.7	Update Device Configuration (Gas Flow)	
6.8	6.8	Update Device Configuration (Billing Calendar)	
6.11	6.11	Synchronise Clock	
6.13	6.13	Read Event Log Read Security Log Read Event Log (CHF) Read Security Log (CHF) Read Event Log (Power)	
6.15	6.15.1	Update Security Credentials (remote party)	
6.15	6.15.2	Update Security Credentials (device)	
6.17	6.17	Issue Security Credentials	
6.18	6.18.1	Set Maximum Demand Configurable Time Period	

Service Request	Service Request Variant	Service Request Name	Notes
6.18	6.18.2	Reset Maximum Demand Registers	
6.20	6.20.1	Set Device Configuration (Import MPxN)	
6.20	6.20.2	Set Device Configuration (Export MPAN)	
6.21	6.21	Request Handover Of DCC Controlled Device	
6.24	6.24.1	Retrieve Device Security Credentials (Remote Party)	
6.24	6.24.2	Retrieve Device Security Credentials (Device)	
7.4	7.4	Read Supply Status	
7.12	7.12	Set Randomised Offset Limit	
8.1	8.1.1	Commission Device (Time)	
8.2	8.2	Read Inventory	
8.3	8.3	Decommission Device	
8.4	8.4	Update Inventory	
8.6	8.6	Service Opt In	
8.7	8.7.2	Join Non-Critical (GSME-GPF) (SIT1)	
8.8	8.8.2	Unjoin Non-Critical (GPF-GSME) (SIT1)	
8.9	8.9	Read Device Log (All excl GPF)	
8.11	8.11	Update HAN Device Log (Add)	

Service Request	Service Request Variant	Service Request Name	Notes
8.13	8.13	Return Local Command Response	
8.14	8.14.1	Communications Hub Status Update- Install Success	
8.14	8.14.2	Communications Hub Status Update - Install No SM WAN	
8.14	8.14.3	Communications Hub Status Update. – Fault Return	
8.14	8.14.4	Communications Hub Status Update – No Fault Return	
9.1	9.1	Request Customer Identification Number	
11.1	11.1	Update Firmware	
11.2	11.2	Read Firmware Version	
11.3	11.3	Activate Firmware (ESME/GSME)	
12.1	12.1	Request WAN Matrix	
12.2	12.2	Device Pre-Notification	
14.1	14.1	Record Network Data (GAS)	

Table 16 - Service Requests to be ready for SIT2 and SIT3 (including de-scoped SRs)

SIT3 test baseline

Table 17 - SIT3 functionality, below, sets out the functionality to be ready for testing in the third release into SIT (referred to as "SIT3").

The complete SIT test requirements baseline constitutes the arrangements set down in Sections E, G and H of the SEC, as set out in Section T2 of the SEC. Further, in accordance with Section T2.3 of the SEC, the Secretary of State specifies the versions of all the procedural and technical documents, including SEC Subsidiary Documents, that are the reference versions during SIT and against which a successful exit from SIT will be measured[19]. No further Service Request Variants are made available for SIT3 – only Change Requests are delivered as part of SIT3.

SIT3 is the third of three intended releases into SIT for DCC R1.0. For the purposes of SIT3, functionality is aligned to SMETS v1.58 and CHTS v1.46 and GBCS v0.8.1. Meter stubs will be used for SIT3 testing in addition to GBCS v0.8.1 compliant meters when available. The User Simulator is being used; there will be no involvement from prospective Users in SIT.

Functionality planned to be tested in SIT3

	SIT3
Aim of release into SIT	Completion of SIT2 Service Requests against all Communication Hub variants Integration with DCC Service Management. Integration of DCC Enterprise. Integration of CSPs with SMKI. CSPN Communication Hub lifecycle management
Functionality	Testing of replacement of Root and Recovery certificates on SIT devices, replacing certificates associated with TSP generated keys with certificates based on Apex and Root keys generated by DSP as per production.

[19] SMIP Testing Baseline Requirements Document, 10 August 2015: https://www.smartenergycodecompany.co.uk/docs/default-source/sec-documents/developing-sec/testing-baseline-requirements-document-v1-0.pdf?sfvrsn=2

	SIT3
	The new Update Comms Hub Status Service Request (DCC only request) will be tested to inform CSPs of updates to Comms Hubs for example Comms Hub return (DCC Service fault), Comms Hub Successfully Installed, Comms Hub Install No WAN (Abort). Integration with DSMS via SSI/SSMI interface will be tested including integration of CSPs, TSP and Users to the DSMS. CSP integration with SMKI CA and SMKI Repository to submit CSRs and retrieve Certificates needed to populate anchor slots on devices will be tested. Direct TLS connections to SSI/SSMI no need for PEP to PEP will be tested.
Limitations	

Table 17 - SIT3 functionality

Change requests to be ready for SIT3

Release into SIT	Change Request number	Description
SIT3	CR032a	Communications Hub Status Update Information
SIT3	CR063a	Amendments to scope of SMKI requirements
SIT3	CR063c	Amendments to scope of SMKI requirements
SIT3	CR078	Communications Hub Manager to Support GBCS v0.8
SIT3	CR099	User requested additional functionality to DUGIS Scheduling Service Requests
SIT3	CR108	Direct FTPS Access with the DSP
SIT3	CR110a v2.0 (ITES)	DSP Reporting Architecture
SIT3	CR115a.2	Amendment of CSP requirements to align with SMKI solution

SIT3	CR126	Telefonica DNS
SIT3	CR127	BI/MI Integration Environment Build
SIT3	CR129	DSP Recovery Environment Certificate Validation Requirements
SIT3	CR135	Communications Hub Life-Cycle
SIT3	CR146	EDMI CH development non critical commands
SIT3	CR146.1	CHM Non-Critical Commands
SIT3	CR156 part A	Extension of IKI to support file signing credentials

Table 18 - Change Requests to be ready for SIT3

Annex 2: Overview of Releases

SIT is being conducted on a series of releases. This section provides an explanation of the purpose of each release.

Release R1.0:

Based on GBCS v0.8.1 comprising core functionality and not intended as a consumable release.

R1.0 was the first time that the DCC Systems were integrated.

Functionality in R1.0 was introduced incrementally, as described in Annex 1 of this document.

The main objective of SIT R1.0 was to provide confidence in the integration of DCC Systems whilst the systems were being uplifted to comply with GBCS v0.8.2, the first candidate for release.

Release R1.1:

The first version of DCC Systems based on GBCS v0.8.2.

R1.1 was an internal release and not intended as a consumable release.

This release was used for Early Integration Testing using systems that had undergone a foreshortened PIT test cycle.

The main objective of SIT R1.1 was to identify and resolve integration issues affecting DCC Systems conforming to GBCS v0.8.2 at the earliest opportunity. No formal objectives were set for this phase, although formal reporting of progress and testing issues identified continued.

Release R1.2:

The first production-candidate release, comprising the minimum functionality required for go-live (Credit functionality).

R1.2 is based on GBCS v0.8.2 and will progress for use in later test phases (Interface Testing and End-to-End Testing) and will be the first version of DCC to go live.

The scope of R1.2 is defined by the transition variations to the SEC, which are summarised in Annex B of the Testing Baseline Requirements Document, which can be found here.

Release R1.3:

The second production-candidate release, R1.3, comprising the full functionality for go-live (including Pre-Payment functionality).

R1.3 is based on GBCS v0.8.2 and will also progress for use in later test phases (Interface Testing and End-to-End Testing) and will go live.

The scope of R1.3 is defined by the SEC.

Annex 3: SIT R1.2 Incremental Release

Release R1.2 was introduced incrementally. This annex describes the content of each increment.

Overview by Service Provider: CSP C/S:

- Increment 1
    - Components of the solution that were updated
        - CH Tosh and WNC – GBCS 0.8.2
        - SmartM2M
        - Security Validator
        - Access Gateway
        - BMC Remedy
        - CHDB
        - Order Management
    - All SRs except those related to firmware download and GBT (see table below)
    - CR061a – Remote test lab support
    - CR094a – Post-commissioning obligations
    - CR106 – web-based DCCKI repository
    - CR120 – Unlock CH
- Increment 2:
    - Remaining SRs
    - CR085 – CPL – additional firmware checks
    - Firmware download
    - GBT

Overview by Service Provider CSP N:

- Increment 1:
    - Components of solution that were updated
        - SMWAN CB5a.1.1F
        - Business SS iteration 3
        - Operational Support System configuration changes
        - CHM
    - No CRs
    - 53 SRs (see table below)
- Increment 2 & 3: (implemented as single release)
    - GSME join HAN (implemented in next CH firmware version)

- CR085 – CPL – additional firmware check
- Firmware download
- Remaining SRs

Overview by Service Provider DSP:

- Increment 1:
  - All components of the solution were updated in this release
  - CR106 – web-based DCCKI repository
  - CR109 – SMKI keys for RDP file signing; and
  - CR112 – IKI support for file signing (TAD, CPL)
  - 50 SRs, incl I&C capability (see table below)
- Increment 2:
  - 13 remaining SRs
  - CR085 – CPL – additional firmware checks
  - CR143 - DCC billing reports for combined supplier Users
  - CR147 - Supporting E2E and enduring CoS testing
  - CR159 - Change MPxN associations
  - CR004- Reporting for Telefonica
  - CR092 - Supplier User IDs

Service Requests implemented in each increment:

Increment 1 SRs marked "1“, Increment 2 marked “2”.

SR	Service Request Name	CSP C/S	CSP N	DSP
1.1.1	Update Import Tariff (Primary Element)	1	1	1
1.2.1	Update Price (Primary Element)	1	1	1
1.7	Reset Tariff Block Counter Matrix	1	1	1
3.2	Restrict Access For Change Of Tenancy	1	2/3	2
3.4	Update Supplier Name	1	1	1
3.5	Disable Privacy PIN	1	1	1
4.1.1	Read Instantaneous Import Registers	1	1	1
4.1.2	Read Instantaneous Import TOU Matrices	1	1	1
4.1.3	Read Instantaneous Import TOU With Blocks Matrices	1	1	1
4.4.2	Retrieve Change Of Mode / Tariff Triggered Billing Data Log	1	1	1
4.4.3	Retrieve Billing Calendar Triggered Billing Data Log	1	1	1
4.6.1	Retrieve Import Daily Read Log	1	1	1
4.11.1	Read Tariff (Primary Element)	1	2/3	1

SR	Service Request Name	CSP C/S	CSP N	DSP
4.16	Read Active Power Import	1	1	1
4.17	Retrieve Daily Consumption Log	1	1	1
5.1	Create Schedule	n/a	n/a	1
5.2	Read Schedule	n/a	n/a	1
5.3	Delete Schedule	n/a	n/a	1
6.2.2	Read Device Configuration (Randomisation)	1	1	1
6.2.3	Read Device Configuration (Billing Calendar)	1	1	1
6.2.4	Read Device Configuration (Identity Exc MPxN)	1	2/3	1
6.2.7	Read Device Configuration (MPxN)	1	1	1
6.6	Update Device Configuration (Gas Conversion)	1	2/3	1
6.7	Update Device Configuration (Gas Flow)	1	1	2
6.8	Update Device Configuration (Billing Calendar)	1	1	2
6.11	Synchronise Clock	1	1	2
6.13	Read Event Or Security Log	1	1	2
6.15.1	Update Security Credentials (KRP)	1	2/3	2
6.15.2	Update Security Credentials (Device)	1	1	2
6.17	Issue Security Credentials	1	2/3	2
6.20.1	Set Device Configuration (Import MPxN)	1	1	2
6.21	Request Handover Of DCC Controlled Device	2	2/3	2
6.23	Update Security Credentials (CoS)	2	2/3	2
6.24.1	Retrieve Device Security Credentials (KRP)	2	1	2
6.24.2	Retrieve Device Security Credentials (Device)	2	1	2
6.25	Set Electricity Supply Tamper State	1	1	2
7.1	Enable Supply	1	1	2
7.2	Disable Supply	1	1	2
7.3	Arm Supply	1	1	2
7.4	Read Supply Status	1	1	1
8.1.1	Commission Device	1	1	1
8.2	Read Inventory	n/a	n/a	2
8.3	Decommission Device	n/a	n/a	2
8.4	Update Inventory	n/a	n/a	2
8.6	Service Opt In	n/a	n/a	2
8.7.1	Join Service (Critical)	1	2/3	1
8.7.2	Join Service (Non-Critical)	1	1	1
8.8.1	Unjoin Service (Critical)	1	2/3	1
8.8.2	Unjoin Service (Non-Critical)	1	2/3	1
8.9	Read Device Log	1	1	1
8.11	Update HAN Device Log	1	1	1
8.12.1	Restore HAN Device Log	1	2/3	2
8.12.2	Restore Gas Proxy Function Device Log	1	2/3	2
8.13	Return Local Command Response	n/a	n/a	1
8.14.1	Communications Hub Status Update- Install Success	n/a	n/a	2

SR	Service Request Name	CSP C/S	CSP N	DSP
8.14.2	Communications Hub Status Update - Install No SM WAN	n/a	n/a	2
8.14.3	Communications Hub Status Update. – Fault Return	n/a	n/a	1
8.14.4	Communications Hub Status Update – No Fault Return	n/a	n/a	1
11.1	Update Firmware	n/a	n/a	2
11.2	Read Firmware Version	2	1	1
11.3	Activate Firmware	2	2/3	1
12.1	Request WAN Matrix	n/a	n/a	2
12.2	Device Pre-notification	n/a	n/a	1

Acronyms

Term	Meaning
CHF	Communications Hub Function
CSP	Communications Service Provider
CSR	Certificate Signing Request
DCC	Data Communications Company
DCCKI	DCC Key Infrastructure
DSMS	DCC Service Management System
DSP	Data Service Provider
DUGN	DCC User Gateway Network (also known as DCC Gateway)
ESI	Enterprise Systems Interface
ESME	Electricity Smart Metering Equipment
GPF	Gas Proxy Function
GSME	Gas Smart Metering Equipment
IKI	Infrastructure Key Infrastructure
PEP	Policy Enforcement Point
SIT	Systems Integration Testing
SIT1	First release into Systems Integration Testing (for SIT R1.0)
SIT2	Second release into Systems Integration Testing (for SIT R1.0)
SIT3	Third release into Systems Integration Testing (for SIT R1.0)
SIT R1.2	Systems Integration Testing for Release R1.2 of DCC Systems. First formal and consumable Release and subject to all requirements of Section T2 of the SEC.
SIT R1.3	Systems Integration Testing for Release R1.2 of DCC Systems. Also known as Additional SIT.
Smoke Test	The Smoke Test consists of a series of tests to verify connectivity between the DSP system and CSP systems via the DUGN. A sample Service Request will be processed as part of Smoke Testing to prove connectivity between the DSP and CSP. Smoke Testing will highlight any serious connectivity issues between the DSP and CSP systems, for example as a result of network layer configuration failures or syntactically invalid data formats sent in messages between the two systems.
TLS	Transport Layer Security
TSP	Trusted Service Provider

Table 19 - Acronyms