

# Smart Metering Implementation Programme

## Joint Test Strategy

<b>Dave Norman</b>
<b>V3.5</b>
<b>09/04/15</b>

#### Document History

Version	Date	Comment
0.1	22/10/13	Initial draft
0.2	24/10/13	DSP review comments applied
0.3	04/11/13	Further DSP review comments, plus review comments from DCC Licensee/CSP workshop 24/10/13
0.4	12/11/13	Further DSP, CSP, DCC Licensee comments
1.0	12/11/13	Up-issue
1.1	15/11/13	Review comments from DSP, CSP, DCC Licensee workshop 14/11/13
1.2	21/11/13	Review comments from CSP and DCC Licensee
1.3	25/11/13	Review comments from DCC Licensee
2.0	26/11/13	Up-issue
2.1	13/12/13	Approved draft Strategy by DCC Licensee
2.3	26/02/14	Approved Test Strategy by DCC Licensee
3.1	21/10/14	Updated for SEC 3, OAT and other Service Providers
3.2	28/11/14	Updated with Service Provider and DCC Licensee comments
3.3	13/01/15	Updated with Service Provider and DCC Licensee comments
3.4	05/03/15	Updated with DCC Licensee comments
3.5	09/04/15	Updated with CSP and TSP comments

#### Document Approval

Version	Date	Approved By	Title
2.1	21/01/14	M Roderick	DCC Design & Assurance Director
2.3	27/02/14	M Roderick	DCC Design & Assurance Director

#### References

Ref	Title	Source	Date	Version
[1]	Test Strategy	CGI	Jun 2013	v0.1
[2]	Test Strategy	Arqiva	Jun 2013	001
[3]	Test Strategy	Telefonica	Jun 2013	v.6
[4]	Smart Meter Programme – Testing Strategy	DECC	May 2013	v1.2
[5]	Smart Meter Programme – Testing	DECC	May 2013	v1.0

	Approach			
[6]	Glossary of Testing terms	ISTQB	Oct 2012	v2.2
[7]	Schedule 6.2 (DSP version)	CGI	Sept 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]	Smart Energy Code Stage 3 Legal Drafting	DECC	Jul 2014	
[11]	Common Test Scenarios Document	DCC Licensee	Aug 2014	v0.7
[12]	SMKI and Repository Entry Process Test Scenarios Document	DCC Licensee	Nov 2014	v0.1
[13]	Test Issue Resolution Process	DCC Licensee	Nov 2014	v0.2
[14]	Resetting the DCC Delivery Programme	DCC Licensee	Nov 2014	
[15]	Device Selection Methodology	DCC Licensee	Sept 2014	v1.1
[16]	DCC Release Management Strategy	DCC Licensee	March 2015	1
[17]	SMKI PIT Approach	BT	Aug 2014	v1.0

#### Readership

This document is primarily for internal DCC consumption but published online for the purposes of transparency and clarity of the DCC testing strategy. It is recommended that the readership of this document is familiar with common testing terms, tools, best practice, procedures and strategies.

## Contents

<b>1</b>	<b>Introduction .....</b>	<b>8</b>
1.1	General .....	8
1.2	Change Forecast.....	9
1.3	Reviews and Approvals.....	10
1.4	Terminology .....	10
1.5	Out of Scope .....	12
<b>2</b>	<b>Test Strategy Objectives.....</b>	<b>14</b>
<b>3</b>	<b>Test Overview .....</b>	<b>15</b>
3.1	Introduction .....	15
3.2	DCC Readiness Testing.....	16
3.3	Service User Readiness Testing .....	16
3.4	Informal Testing .....	16
<b>4</b>	<b>DCC Readiness Testing .....</b>	<b>18</b>
4.1	Introduction .....	18
4.2	Test Phases and Test Stages .....	19
4.3	Pre-Integration Test Phases.....	20
4.3.1	Introduction .....	20
4.3.2	Variations.....	20
4.3.3	Outline .....	21
4.4	Systems Integration Test Phase.....	22
4.5	Interface Test Stage.....	24
4.6	Operational Acceptance Test Phase .....	25
4.7	SMKI and Repository Testing.....	27
4.8	Test Focus Areas .....	27
4.9	Post go-live DCC testing .....	29
4.9.1	Introduction .....	29
4.9.2	Major releases .....	29

4.9.3	Minor releases .....	30
4.9.4	Emergency releases .....	30
4.9.5	Test Plans.....	30
<b>5</b>	<b>Service User Readiness Testing .....</b>	<b>31</b>
5.1	UEPT .....	31
5.2	SREPT.....	31
<b>6</b>	<b>Informal Testing .....</b>	<b>32</b>
6.1	Pre-SIT .....	32
6.2	Pre-UIT .....	33
6.3	End to End Testing.....	33
6.4	Enduring Testing.....	34
6.5	GBCS Integration Testing .....	34
<b>7</b>	<b>Testing Services.....</b>	<b>35</b>
7.1	General.....	35
7.2	Test Issues.....	35
<b>8</b>	<b>Test Organisation, Management and Assurance.....</b>	<b>37</b>
8.1	Test Organisation.....	37
8.2	Test Governance and Management .....	38
8.2.1	Test Governance.....	38
8.2.2	Management of Pre-Integration Testing .....	38
8.2.3	Management of Systems Integration Testing .....	38
8.2.4	Management of Operational Acceptance Testing.....	40
8.2.5	Management of Testing involving Service Users.....	41
8.3	Progress Reporting .....	43
8.3.1	Summary .....	43
8.3.2	Test Readiness Reports.....	43
8.3.3	Test Execution Reports.....	44
8.3.4	Test Stage Completion Report .....	45

8.4	Acceptance and Test Assurance .....	46
8.4.1	Acceptance .....	46
8.4.2	Test Assurance .....	46
<b>9</b>	<b>Test Process.....</b>	<b>53</b>
9.1	Testing and Solution Risk.....	53
9.1.1	Test Coverage .....	53
9.1.2	Test Prioritisation .....	55
9.2	Test Pass and Fail .....	55
9.3	Test Activities and Responsibilities.....	56
9.4	Test Entry and Exit Criteria .....	59
9.4.1	Introduction .....	59
9.4.2	Generic Entry and Exit Criteria for all Test Phases.....	59
9.4.3	Generic Entry and Exit Criteria for all Test Stages.....	60
9.4.4	Specific Entry and Exit Criteria for Test Phases .....	61
9.4.5	Specific Entry and Exit Criteria for Test Stages .....	61
9.5	Test deliverables .....	62
9.5.1	General.....	62
9.5.2	By Test Phase.....	62
9.5.3	By Test Stage .....	62
9.5.4	Maintenance .....	63
9.5.5	Approvals.....	63
<b>10</b>	<b>Test Data, Stubs, Environments, Labs and Tools .....</b>	<b>64</b>
10.1	Test Data .....	64
10.2	Test Stubs.....	65
10.3	Test Environments .....	66
10.3.1	General.....	66
10.3.2	Connectivity .....	67
10.3.3	Sandpit Environment.....	67

10.4	Environment Control .....	68
10.5	Test Labs .....	69
10.6	Test Tools .....	69
<b>11</b>	<b>Test Issue Management .....</b>	<b>70</b>
11.1	General .....	70
11.2	Classification and Lifecycle .....	70
11.3	Test Issue Severities and Priorities .....	73
<b>12</b>	<b>Dependencies .....</b>	<b>77</b>
12.1	Introduction .....	77
12.2	Test Phases .....	77
12.3	Test Stage Preparation .....	77
12.4	Test Stage Execution .....	77

# 1 Introduction

## 1.1 General

This document sets out how the DSP (CGI), the CSPs (Arqiva and Telefonica) and all other Service Providers (e.g. BT, Critical Software Solutions, Capita IT ES) will conduct testing for the Smart Metering Implementation Programme.

The Smart Metering eco-system is depicted in the following diagram.

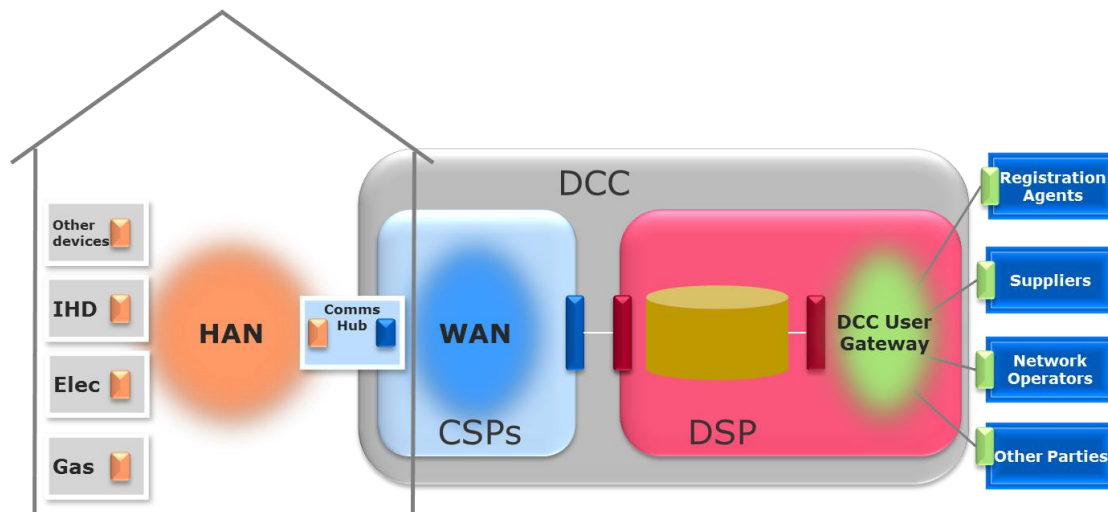


Figure 1 – DCC Solution

This Test Strategy is based on and supersedes the following documents:

- the separate Test Strategy documents submitted by the DSP and CSPs as part of the final Invitation to Submit Final Tenders (References [1], [2], [3])
- the DECC documents 'Smart Meter Programme - Testing Strategy', Version 1.2 dated May 2013 and 'Smart Meter Programme - Testing Approach' v1.0, dated May 2013 (References [4], [5]).

This Test Strategy is also based on, is compliant with, but does not supersede:

- the DSP and CSP Service Provider Contracts (References [7], [8], [9])
- the Smart Energy Code (Reference [10]).

In the event of any discrepancy between these documents, the SEC will take precedence and, where necessary, the DCC Licensee will raise Change Requests with the relevant organisations so that the discrepancy can be resolved.

The diagram below demonstrates how this Joint Test Strategy (shown in dark blue) fits in with the hierarchy of test documents that will be produced for the programme.



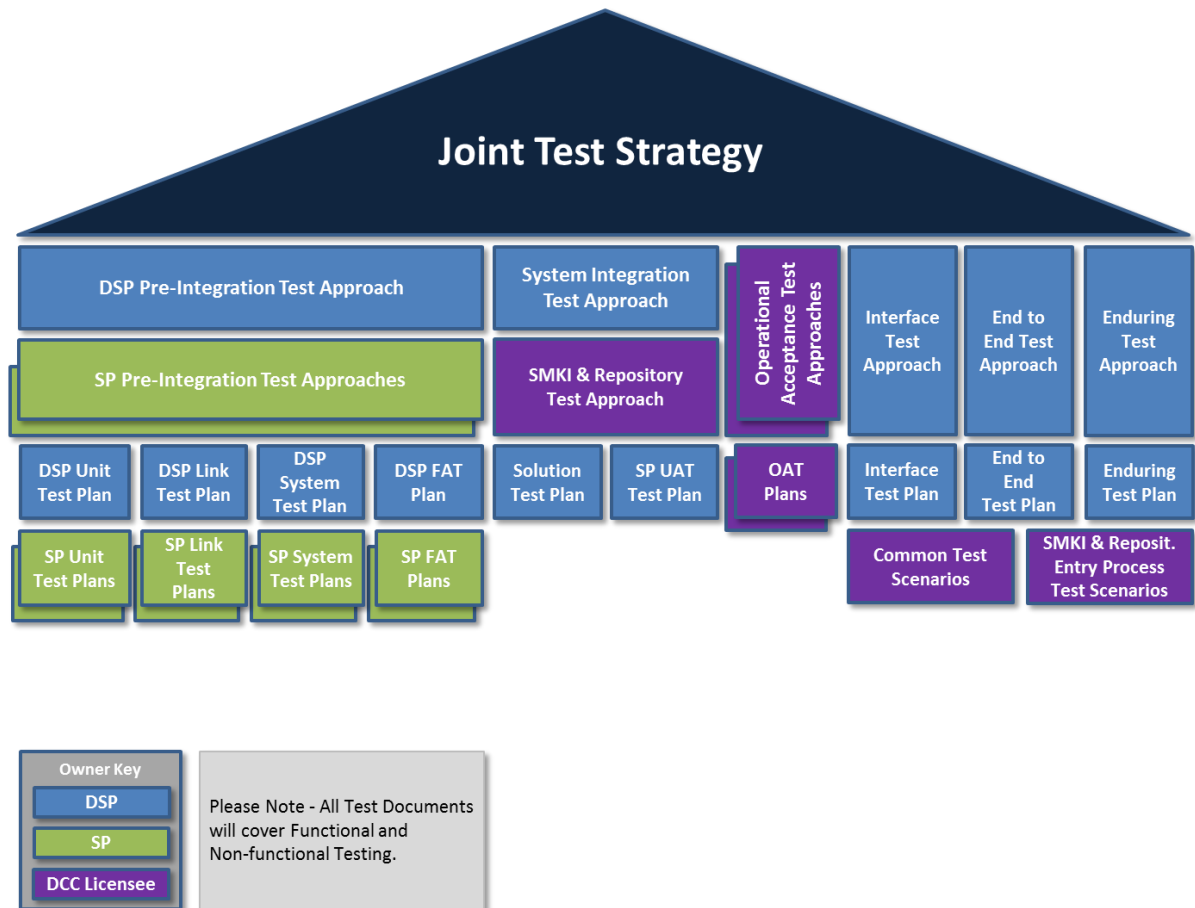


Figure 2 – Test Documentation Hierarchy

The testing described in this document will be further elaborated in the Test Approach and Test Plan documents shown on the diagram.

## 1.2 Change Forecast

This document will be reviewed and, where applicable, updated when approved versions of the following documents are available:

- revised Integrated Solution Delivery Plan, following conclusion of Consultation on Resetting the DCC Delivery Programme [14]
- Common Test Scenarios Document [11]
- SMKI and Repository Entry Process Test Scenarios Document [12]
- revised High Level Design for Service Management, and associated delivery plan
- Operational Acceptance Strategy
- further versions of SEC.

The DSP will keep this document up to date. Each new version supersedes the previous version in its entirety.

Updates to this document will follow the review and approval process outlined below.

### 1.3 Reviews and Approvals

This document will be subject to internal DSP review prior to it being issued for external review and approval.

Version 3.4 will be issued to the Service Provider Test Managers and the DCC Licensee for review.

The document will be updated with relevant review comments and then issued to the DCC Licensee for review.

The document will be updated with relevant review comments and then issued to the DCC Licensee's Design Assurance Board (DAB) for approval.

The DCC Licensee will publish the DAB-approved version of this document on its website.

### 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
- Critical Software, supplier of the Parse & Correlate system
- 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 term "User Integration Testing" (UIT) refers to the test phase that comprises Interface Testing and End to End Testing.

The term "Test Stub" means the systems and actions which simulate the behaviour of Devices, solution elements (e.g. the DSP system) and systems external to the solution (e.g. Service User systems).

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.

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.

The term "RDP Systems" means any Systems:

- a) which are operated by or on behalf of an Electricity Distributor or Gas Transporter responsible for providing (or procuring the provision of) Registration Data in respect of a particular MPAN or MPRN; and
- b) which are used wholly or partly for the collection, storage, Back-Up, processing or communication of that Registration Data prior to, or for the purposes of, its provision to the DCC over the Registration Data Interface.

St Clements Services Ltd provides the Electricity RDP System (Meter Point Registration System).

Xoserve provides the Gas RDP System. Xoserve is also the Gas RDP and is included in any unqualified reference to “RDPs” (unlike St Clements Services Ltd, which is not an RDP).

The term “the Authority” means the Gas and Electricity Markets Authority.

This document uses standard testing terminology, a glossary (Reference [6]) of which can be found on the International Software Testing Qualification Board website, [www.istqb.org](http://www.istqb.org).

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

Abbreviation	Meaning
BAT	Business Acceptance Testing
BI	Business Intelligence
Comms Hub	Communications Hub
CPA	Commercial Product Assurance
CSP	Communication Service Provider
DAB	Design Assurance Board
DCC	Data Communications Company
DECC	Department of Energy and Climate Change
DLMS	Device Language Message Specification
DSM	Device Selection Methodology
DSP	Data Service Provider
DUGIDS	DCC User Gateway Interface Design Specification
E2E	End to End
FAT	Factory Acceptance Test
GBCS	Great Britain Companion Specification
GFI	GIT for Industry
GIT	GBCS Integration Testing
HAN	Home Area Network
HHT	Hand Held Terminal
IHD	In Home Display
IRB	Issues Resolution Board

Abbreviation	Meaning
IT	Interface Testing
MI	Management Information
MPAN	Meter Point Administration Number
MPRN	Meter Point Reference Number
MPRS	Meter Point Registration System
OAT	Operational Acceptance Testing
PIT	Pre-Integration Testing
RDP	Registration Data Provider
SEC	Smart Energy Code
SIT	Systems Integration Testing
SMETS	Smart Metering Equipment Technical Specifications
SMKI	Smart Meter Key Infrastructure
SMWAN	Smart Metering Wide Area Network
SP	Service Provider
SRT	SMKI and Repository Testing
SREPT	SMKI and Repository Entry Process Testing
TAB	Test Assurance Board
TAG	Test Advisory Group
TBDG	Technical Business Design Group
TDEG	Test Design Execution Group
TDF	Test Design Forum
TP	Triage Panel
TSP	Trusted Service Provider
UAT	User Acceptance Testing
UEPT	User Entry Process Testing
UIT	User Integration Testing

**Table 1 - Abbreviations**

## 1.5 Out of Scope

The following aspects are outside the scope of this Test Strategy:

- Certification of Meter Device Models
- Certification of Comms Hubs
- testing of Meter Device Models other than:
  - the interaction of those Devices that are selected via the Device Selection Methodology (DSM) [15] with the DCC solution, and

- provision of an environment against which relevant parties can test the interoperability of their own Meter Device Models
- testing of In Home Displays (IHD) and Hand Held Terminals (HHT) other than their interaction with the DCC solution
- testing the inter-changeability<sup>1</sup> of Devices connected to the Home Area Network (HAN)
- testing of any pre-SMETS2 solutions or their interaction with the DCC solution
- testing of the Service Users own systems other than their interaction with the DCC solution.

---

<sup>1</sup> The ability to exchange one device with another without affecting the original functionality

## 2 Test Strategy Objectives

The objectives of this Test Strategy are to:

- define the testing and assurance activities necessary to demonstrate that the DCC Solution meets the requirements set out in the SEC
- mitigate the risks of poor quality components and systems being introduced into live operation
- ensure that the level of assurance meets the requirements of key stakeholders (including Service Users, the Secretary of State and the Authority)
- establish the governance arrangements for the assurance activities
- identify the responsibilities and obligations of those involved in testing
- act as the primary point of reference for all testing and assurance questions, with further details being provided in the Test Approach and Test Plan documents.

### 3 Test Overview

#### 3.1 Introduction

There are three broad categories of testing within the programme:

- **DCC Readiness:** a series of formal Test Phases and Test Stages conducted by the DCC to confirm that the DCC solution is ready for live operation (see Section 4)
- **Service User Readiness:** a series of test scenarios executed in one or more Test Stages by Service Users, to confirm that Service Users are ready to use the DCC solution (see Section 5)
- **Informal/Voluntary:** a series of less structured<sup>2</sup>, optional Test Stages to support DCC Readiness testing, Service User Readiness testing, and testing of the interoperability of Devices and Service User Systems (see Section 6).

The following diagram shows the component parts of these three categories.

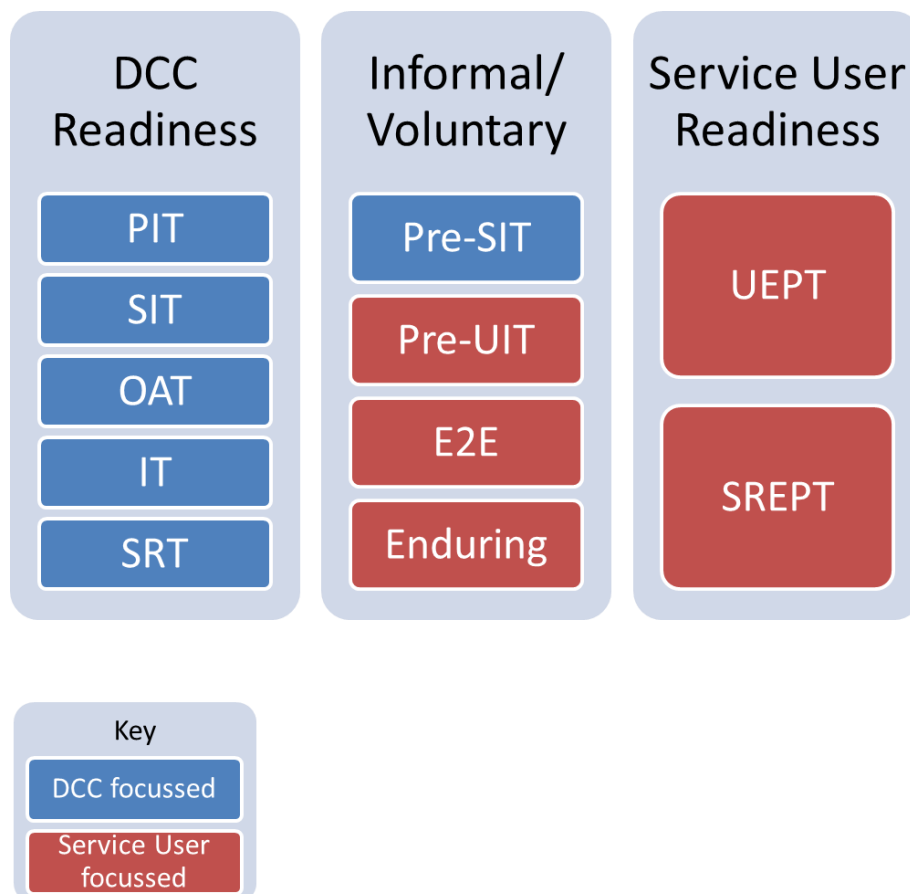


Figure 3 – Test Categories

<sup>2</sup> For example, there are no requirements for Assurance by the DCC Licensee, test participants measure their performance against their own success criteria

## 3.2 DCC Readiness Testing

In DCC Readiness Testing, the Service Providers first build and test their solution elements in isolation. This is the Pre Integration Test (PIT) phase, and is described in each Service Provider's PIT Approach document and supporting Test Plan documents (for each of the Unit, Link, System and Factory Acceptance Test Stages).

These solution elements are then integrated and tested together, along with the Registration Data Provider (RDP) systems and Devices, in the Systems Integration Test (SIT) phase. This is described in the Systems Integration Test Approach document and supporting Test Plan documents (one for each of the Solution and Service Provider User Acceptance Test Stages).

The end to end DCC solution is tested for operational readiness in the Operational Acceptance Test (OAT) phase, which is described in the OAT Approach and Test Plan documents.

Finally, before being declared ready, the interoperability of the DCC solution and Service User systems is tested in the Interface Test (IT) stage, as described in the Interface Test Approach and Test Plan documents.

The Smart Meter Key Infrastructure (SMKI) solution element is central to the overall DCC solution and is given special attention via SMKI and Repository Testing (SRT), described in the SMKI and Repository Test Approach.

Note that DCC Readiness Testing is formalised through a set of Service Provider test documentation (e.g. Test Specifications, Test Readiness Reports, Test Completion Reports), processes (e.g. Entry and Exit Criteria) and a test assurance regime operated by the DCC Licensee (e.g. witnessing, Quality Gate Reviews, Inspections), as set out in this Joint Test Strategy.

## 3.3 Service User Readiness Testing

In Service User Readiness Testing, test participants have to demonstrate their eligibility to act as Service Users by preparing and undertaking a series of User Entry Process Tests (UEPT), as described in the Common Test Scenarios Document [11]. Test participants can undertake UEPT during the Interface Test Stage, the End to End Test Stage or the Enduring Test Stage. Test participants need to install the Parse & Correlate software (either the DCC-supplied version or an equivalent) on their systems in order to conduct UEPT and act as a Service User. Test participants also have to demonstrate their eligibility to obtain Certificates (both Organisation and Device) and to access the SMKI Repository, as described in the SMKI and Repository Entry Process Test Scenarios Document [12].

Note that Service User Readiness Testing is formalised through a set of Service User test documentation, processes and a test assurance regime operated by the DCC Licensee, as set out in the Common Test Scenarios Document and the SMKI and Repository Entry Process Test Scenarios Document.

## 3.4 Informal Testing

To de-risk SIT, SPs can undertake Pre-SIT, which comprises:

- DSP and CSP testing of the southern end of the "Motorway" part of the DCC solution (see Section 6)



- SPs and RDPs (or their representatives) testing of interfaces between their respective solution elements through the manual exchange and desk-checking of sample interface files.

To de-risk Interface Testing and UEPT, the DSP and Service Users can undertake Pre-UIT to test the northern end of the “Motorway” part of the DCC solution, using a Test Stub at the southern end.

The third element of Informal Testing is End to End Testing (as described in the End to End Test Approach and Test Plan documents), whereby:

- Service Users can test Devices of their own choice (subject to confirmation that the Devices are SMETS-compliant and safe) and can test their own User Systems (aka back office systems) with the DCC solution
- Meter Manufacturers and Test Houses can test their own Devices (subject to confirmation that the Devices are SMETS-compliant and safe) with the DCC solution
- Service Users who did not demonstrate their readiness in earlier Test Stages (e.g. new market entrants) can carry out their UEPT and SREPT
- Service Users can test modifications to the DCC solution after the solution has been implemented.

End to End Testing will last for 12 months, and may be extended for a further 6 months subject to the SEC Panel approving a recommendation from the DCC Licensee. Once expired, it will be replaced by Enduring Testing, as described in the Enduring Test Approach and Test Plan documents. The purpose of Enduring Testing is the same as End to End Testing.

The final element of Informal Testing is GBCS Integration Testing (GIT). This is not a Test Stage (and hence not listed in Figure 3), but a process whereby Service Users, Meter Manufacturers and Test Houses can verify their interpretation of and implementation of the GBCS protocol with a test tool supplied by the DCC Licensee.

## 4 DCC Readiness Testing

### 4.1 Introduction

The relationship between DCC Readiness Testing and the DCC eco-system is illustrated in the following diagram.

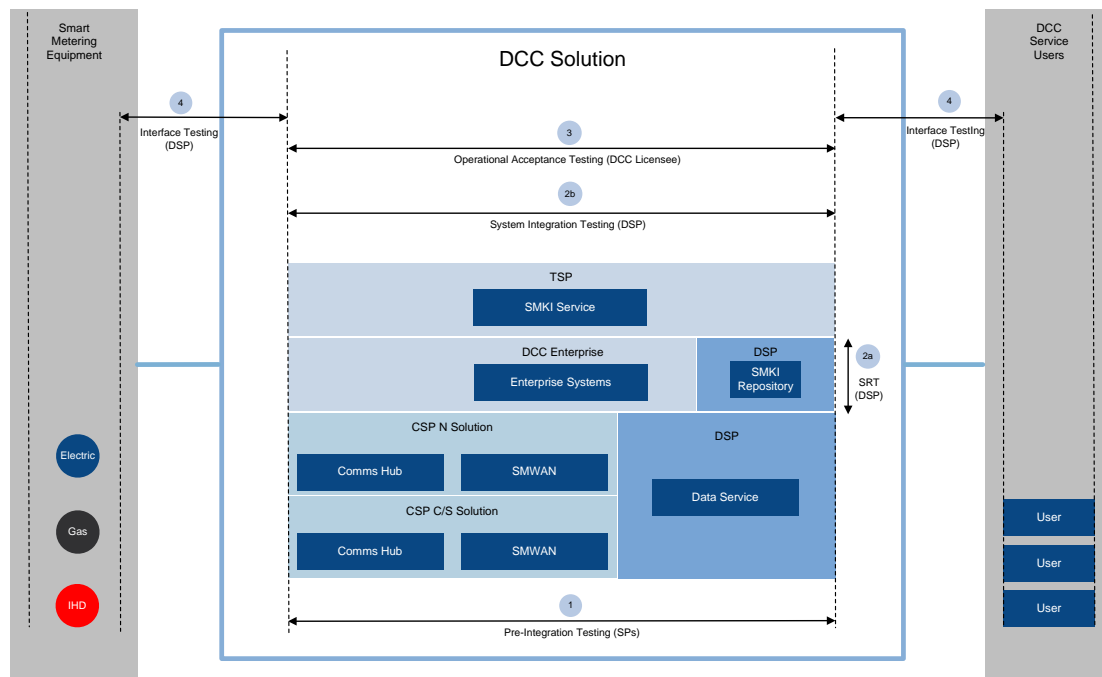


Figure 4 – Sequence and lead responsibilities for Test Phases/Stages

Note that circled numbers denote the sequence of Test Phase/Stages, and an organisation name in parentheses denotes lead responsibility, e.g. Systems Integration Testing happens second and is led by the DSP.

The Service Providers (SPs) will each build their solutions in parallel and will each carry out Pre-Integration testing in isolation (1).

Integration Test activities begin with SMKI & Repository Testing (SRT). Part 1 of SRT (see Section 4.7) covers the interface between the SMKI Service and the SMKI Repository (2a), led by the DSP. Once this is complete:

- Service Users can carry out their SREPT tests
- the DSP (in its role as Systems Integrator) will lead Part 2 of SRT, covering the interfaces between the SMKI Service, the SMKI Repository and the rest of the DCC solution.

Part 2 of SRT is conducted during Systems Integration Testing (2b), also led by the DSP, whereby all SPs will bring their solutions together, in conjunction with the Registration Data Providers (RDPs) and the Devices selected through the Device Selection Methodology.

As the SP solutions mature during Systems Integration Testing (SIT), Operational Acceptance Testing (3) will commence, led by the DCC Licensee.

Once the Solution Test Stage of SIT is concluded, the Interface Test Stage of the User Integration Testing (UIT) Phase will start with the DSP (working closely with the DCC Licensee and supported by the SPs) leading testing at the outer edges of the DCC solution to Service Users' systems (which include the Parse & Correlate software) on the right hand side of the above Figure and to the same Devices as used in SIT on the left hand side (4). Service Users participating in IT will carry out their UEPT and SREPT tests, to measure that they are ready to use the DCC solution (Service Users who do not demonstrate their readiness during Interface Testing will carry out their UEPT and SREPT tests in either End to End or Enduring Testing).

Once the DCC solution has completed its Readiness Testing and been put into live operation, subsequent modifications will undergo the following test regime:

- PIT
- SIT
- OAT
- End to End Testing (or Enduring Testing if the End to End Test period has expired).

Additional information on the above Test Phases and Test Stages is given below, and further detail will be provided in the relevant Test Approach and Test Plan documents.

## 4.2 Test Phases and Test Stages

The following diagram illustrates the full set and sequence of Test Phases and constituent Test Stages for the programme, covering DCC Readiness Testing and Informal Testing.

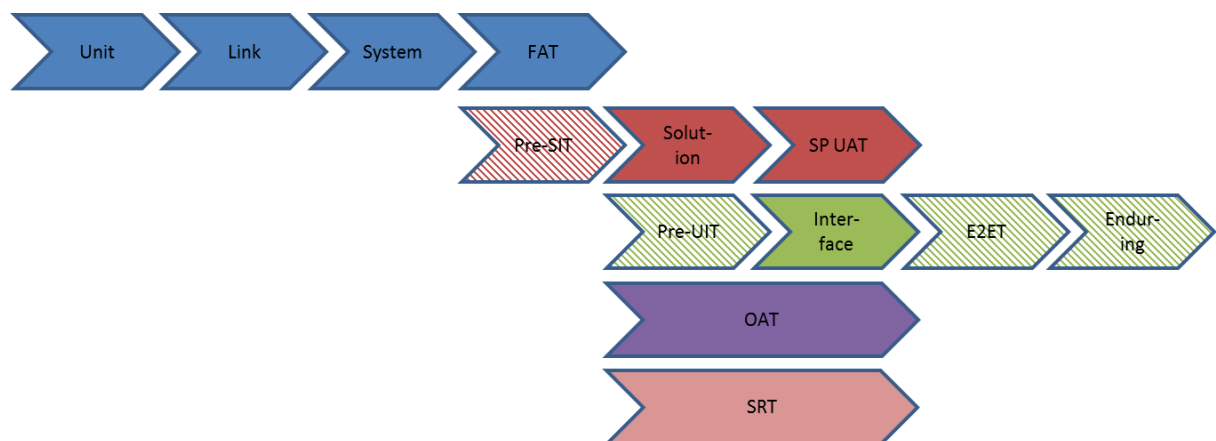


Figure 5 – Test Phases and Test Stages

The diagram uses the following conventions:

- the PIT phase is shown in blue
- the SIT phase is shown in terracotta
- the UIT phase is shown in green

- the OAT phase is shown in purple
- SRT is shown in salmon
- informal Test Stages (Pre-SIT, Pre-UIT, E2E, Enduring) are shown with diagonal striping. Note that, whilst not part of DCC Readiness Testing, these informal Test Stages are included on the diagram to aid overall understanding, and are described in Section 6.

Note that E2E Testing is shown as commencing on completion of Interface Testing, but it may commence in parallel with Interface Testing if the SEC Panel approves a recommendation from the DCC Licensee.

## 4.3 Pre-Integration Test Phases

### 4.3.1 Introduction

Shown in the red oval on the following diagram, Pre-Integration is the first part of DCC Readiness Testing.

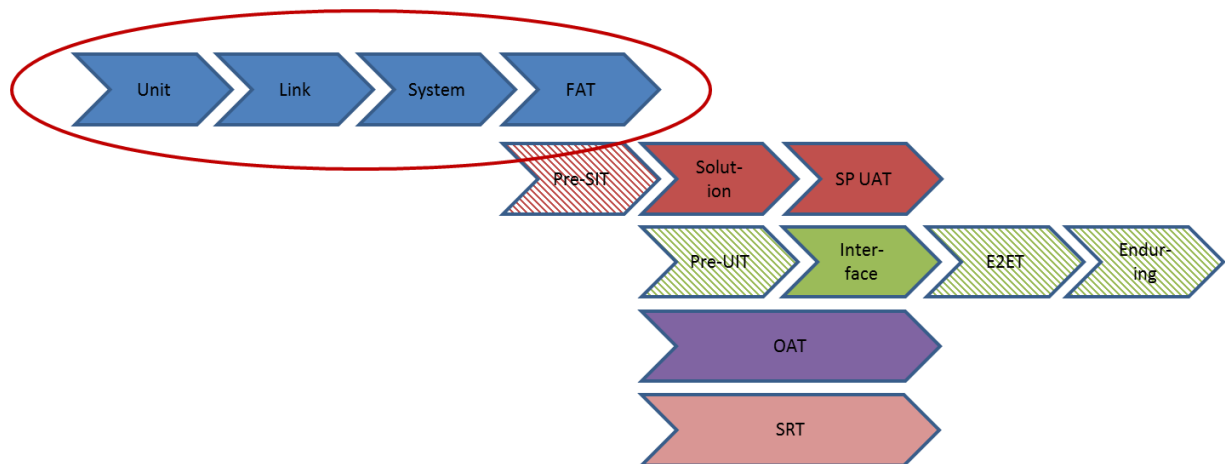


Figure 6 – Pre-Integration Test Phases

The SPs will each conduct Pre-Integration Testing of their solutions in isolation. The four standard test stages within Pre-Integration Testing are:

- Unit Testing
- Link Testing
- System Testing
- Factory Acceptance Testing (FAT).

### 4.3.2 Variations

The SPs may choose to:

- combine Unit Testing and Link Testing into a single stage
- split a test stage into separate elements (e.g. Functional System Test and Non-Functional System Test)

- adopt an Agile process.

Any such variations will:

- be described in the Test Approach and Test Plan documents
- need to follow the process laid out for Quality Gates Reviews (see Section 8.4.2.1.1.)
- need to comply with the overall testing timescales.

Note that some Test Stages may overlap, for example:

- Link Testing for related components may start before Unit Testing of all components has completed
- System Testing of subsets of functionality may start before build, Unit Testing and Link Testing of the entire solution has completed.

### 4.3.3 Outline

Unit Testing will follow a modular approach to verify the functional and non-functional quality of components within sub-systems, prior to Link Testing of these component areas.

Where the SP solutions incorporate components supplied by third parties, these components will be subject to an acceptance test before undergoing further Pre-Integration testing at the Link or System Test stages. This acceptance process also applies to Test Stubs, test environments and Devices.

On completion of Link Testing, the components will be integrated together to form individual sub-systems thereby enabling System Testing to start.

Once System Testing reaches an appropriate level of test coverage and solution stability, system-level non-functional testing will be undertaken including performance, security and initial operational testing to a level appropriate to:

- the capability of the solution, and
- the features of the test environment being used.

Security Testing will comprise both technical tests (e.g. Penetration Testing to an appropriate level) and testing of Security Controls.

The SPs will use a series of Test Stubs (see Section 10.2) during Pre-Integration Testing to emulate the interfaces between each other's systems.

The Communications Hubs will be tested with Devices should suitable equipment be available. Otherwise, Test Stubs will be used.

System Testing will culminate in a Factory Acceptance Test event that will inform the final Quality Gate Review (see Section 8.4.2.1.1) for exiting the Pre-Integration Testing phase. The DCC Licensee will agree the approach to FAT with each Service Provider, which will focus on a subset of the System Tests. The Service Provider will

either supply the results of this subset of System Tests during System Testing, or re-execute them during FAT in front of DCC Licensee witnesses, or a combination of the two. Once the FAT Exit criteria have been met (see Section 8.4.2.1.1 Quality Gate Reviews), the DCC Licensee will:

- accept the individual SP's solutions by issuing a Test Stage Complete Certificate for the FAT Test Stage, and
- also issue a Test Phase Complete Certificate for the Pre-Integration Test Phase.

Further details of PIT are provided in each SP's PIT Approach document.

#### 4.4 Systems Integration Test Phase

Shown in the red oval on the following diagram, Systems Integration is the second part of DCC Readiness Testing.

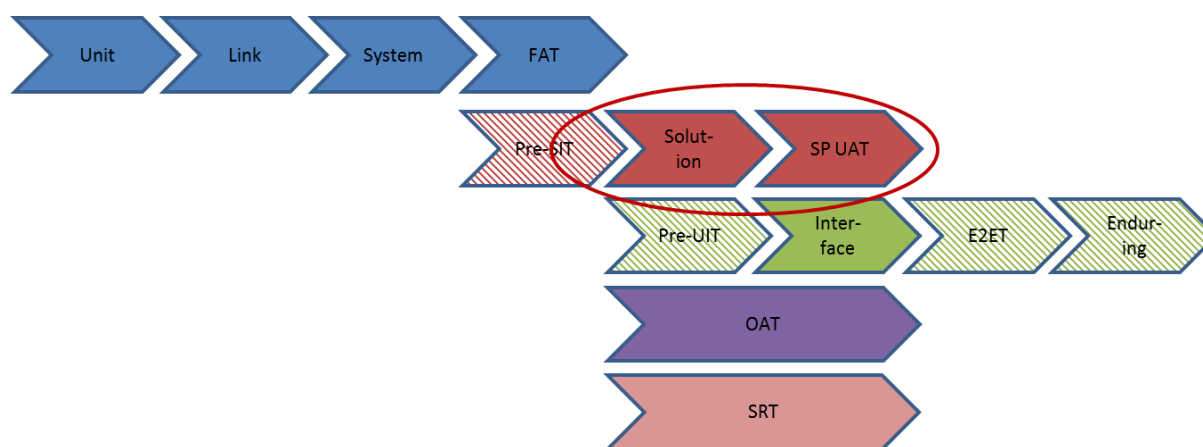


Figure 7 – Systems Integration Test Phase

The DSP will manage Systems Integration Testing, supported by the SPs, RDPs and St Clements Services Ltd. The DSP will provide assistance to the SPs, RDPs and St Clements Services Ltd in their assigned test preparation, test execution and test issue resolution activities, ensuring that they have the requisite information and access.

The two test stages within Systems Integration Testing are:

- Solution Testing
- Service Provider User Acceptance Testing (SP UAT).

Solution Testing will verify that the SP solutions (including the Comms Hubs) operate correctly with each other and with the RDP Systems, and that the DCC Licensee (with its Service Providers) is capable of meeting the obligations set out in SEC, specifically in relation to:

- Registration Data (section E)
- Security (Section G)
- DCC Services (Section H), and

- Non-Gateway Communications (Section O).

The SP solutions will have been fully tested in PIT for all stand-alone functional and non-functional requirements, and there is no need to repeat all such testing in Solution Testing. Instead, the primary focus will be on the dynamic interaction between solution elements that span SP/RDP boundaries, to a level appropriate to:

- the capability of the integrated solution, and
- the features of the test environments being used.

The SP solutions may be introduced into SIT on an incremental basis (i.e. SIT may start without full functionality). Each such increment will be subject to a Quality Gate Review 3, as described in Section 8.4.2.1.1

During Solution Testing, the Comms Hubs will be tested with Devices selected according to the DCC Licensee's DSM [15]. 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. The DCC Licensee will relax the Device Selection criteria in accordance with the DECC and the DSM, if certified Devices are not available. Should no Devices be available, then Test Stubs will be used.

All Comms Hub variants will be subject to testing as set out in the DSM [15]. The SEC requires that each Comms Hub is tested with at least two Electricity Devices and two Gas Devices from Device manufacturers that are not the manufacturer (or an Affiliate of the manufacturer) of the Comms Hub.

Solution Testing will be undertaken on a CSP Region by Region basis, and on an RDP System by RDP System basis, with CSP Regions and RDP Systems being tested in parallel wherever it is efficient to do so. The technical solution for CSP Regions Central and South is identical, and so only one of these Regions will be tested.

Following successful Solution Testing, the DSP will lead Service Provider User Acceptance Testing, which informs the final Quality Gate Review for exiting the Systems Integration Testing phase. Service Provider User Acceptance Testing will be the opportunity for the DCC Licensee to witness the execution of an agreed subset of the Solution Tests. Once the SIT Exit criteria have been met (see Section 8.4.2.1.1 Quality Gate Reviews), the DCC Licensee will:

- accept the SP solutions by issuing a Test Stage Complete Certificate for the Service Provider UAT Test Stage,
- accept the Xoserve and St Clements Services Ltd solutions, and also
- issue a Test Phase Complete Certificate for the Systems Integration Test Phase.

In accordance with the SEC, Systems Integration Testing shall not end in respect of any CSP Region or RDP system before the following reports for that CSP Region or RDP system have been provided to the Authority, SEC Panel and Secretary of State:

- report from the DCC Licensee demonstrating that the Exit Criteria in the SIT Approach have been met, and



- report from the independent auditor confirming that the Exit Criteria in the SIT Approach have been met.

Further details of SIT are provided in the SIT Approach document.

## 4.5 Interface Test Stage

Shown in the red oval on the following diagram, Interface Testing is the third part of DCC Readiness Testing.

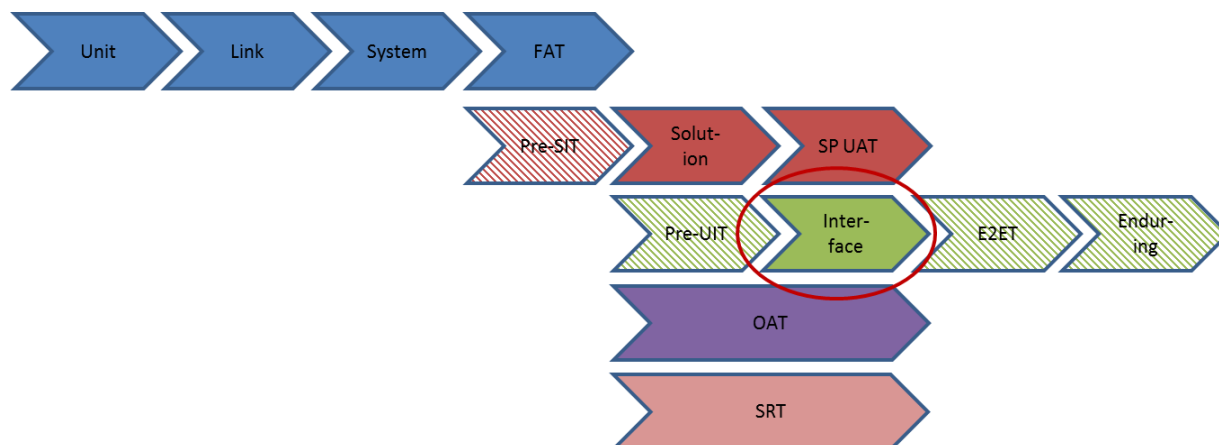


Figure 8 – Interface Test Stage

The DSP, working closely with the DCC Licensee, will manage Interface Testing, supported by the SPs and Service Users. The DSP will provide assistance to the SPs, RDPs and St Clements Services Ltd in their assigned test preparation, test execution and test issue resolution activities, ensuring that they have the requisite information and access.

Interface Testing will demonstrate, on a CSP Region by Region basis, that the DCC solution verified in Solution Testing operates correctly with Service User systems<sup>3</sup>, up to but not beyond the interface of these systems with the DCC solution.

There are three elements to Interface Testing:

- an initial Connectivity Test, to ensure that Service Users can establish a successful connection with the DCC solution
- User Entry Process Testing, based on the Common Test Scenarios [11]
- Additional Functionality Tests<sup>4</sup>, for areas of Service User interaction not covered in User Entry Process Testing (e.g. the Change of Supplier Process).

<sup>3</sup> Note that interaction between the DCC solution and Non Gateway Supplier systems is covered in Business Acceptance Testing (see Section 4.6) rather than Interface Testing, since there is no system-to-system interface between the DCC solution and Non Gateway Supplier systems,

<sup>4</sup> Details of which can be found in the Interface Testing Approach document



Interface Testing does not stretch beyond the DCC User Gateway into the Service Users' own systems. The Devices that were selected for Systems Integration Testing via the DSM will be used in Interface Testing, in order to provide a known baseline. The Devices with which the DCC Licensee exits SIT will be used to conduct UEPT and these Devices will be configured in the manner prescribed by the DCC Licensee. Test Stubs will be used as the basis for UEPT if the DCC Licensee exits SIT with Test Stubs, unless Devices become available and the SEC Panel agrees with a recommendation from the DCC Licensee that they can be used in UEPT. The "Install and Commission" Common Test Scenario (set out in [11]) cannot be executed using Test Stubs and Service Users will be required to conduct this test when Devices become available for use in testing.

Interface Testing will start when Solution Test has completed for at least one CSP Region and one RDP System. The SEC requires that large Suppliers (and Network Parties if so directed by the Secretary of State) are ready to commence UEPT at the start of the Interface Test Stage.

Interface Testing will end when the SEC Panel has confirmed, based on a report provided by the DCC Licensee, that the Exit Criteria in the Interface Test Approach have been met, including:

- SIT has completed successfully for CSP North and CSP Central/South
- at least two Large Supplier Parties who are not an Affiliate of one another in respect of the "Import Supplier" User Role, and at least two Large Supplier Parties who are not an Affiliate of one another in respect of their "Gas Supplier" User Role have successfully completed Connectivity Testing and UEPT in each CSP region.

Further details of Interface Testing are provided in the Interface Testing Approach document.

## 4.6 Operational Acceptance Phase

Shown in the red oval on the following diagram, Operational Acceptance is the fourth part of DCC Readiness Testing.

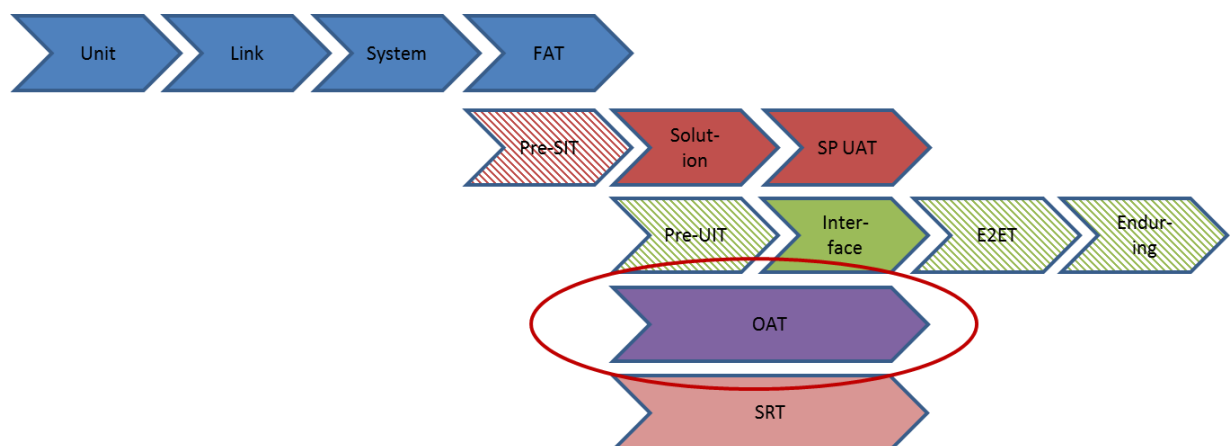


Figure 9 – Operational Acceptance Test Phase

Operational Acceptance encompasses Operational Acceptance Testing and Business Acceptance Testing (BAT). The DCC Licensee will manage and control

Operational Acceptance Testing and Business Acceptance Testing, with support from the SPs. The DCC Licensee will provide assistance to the SPs, RDPs and St Clements Services Ltd in their assigned test preparation, test execution and test issue resolution activities, ensuring that they have the requisite information and access.

Operational Acceptance will not be treated as a separate test phase from a Regulatory perspective, and the test results will be reported in the Interface Test Stage Completion Report.

Operational Acceptance overlaps with SIT and IT, and requires extensive use of the Pre-Production/Production environments. It is de-risked by early proving activities (referred to as “operational testing” in Sections 4.3.3 and 4.4 above) in the Pre-Integration and Systems Integration Test Phases.

The purpose of Operational Acceptance Testing is to verify that the DCC solution:

- can be installed and configured in the live environment
- can be operated by the Service Management function under normal and exceptional conditions
- complies with the non-functional requirements
- will meet its Service Level Agreements.

Such verification includes but is not limited to:

- installation and configuration testing
- rollback testing
- functional testing of Service Management tools
- testing of Service Management business processes
- verifying that Service Desk staff have been adequately trained
- resilience and failover testing of solution components (e.g. equipment, networks, databases)
- Disaster Recovery testing
- backup and restore testing
- end to end security testing, including penetration testing and the Security Operation Centres
- audit logging and alerting
- service monitoring and reporting
- Business Continuity Planning testing
- performance testing.

Further details will be provided in the Operational Acceptance Strategy, OAT Approach document and the BAT Approach document.

## 4.7 SMKI and Repository Testing

Shown in the red oval on the following diagram, SMKI and Repository Testing (SRT) is the fifth part of DCC Readiness Testing.

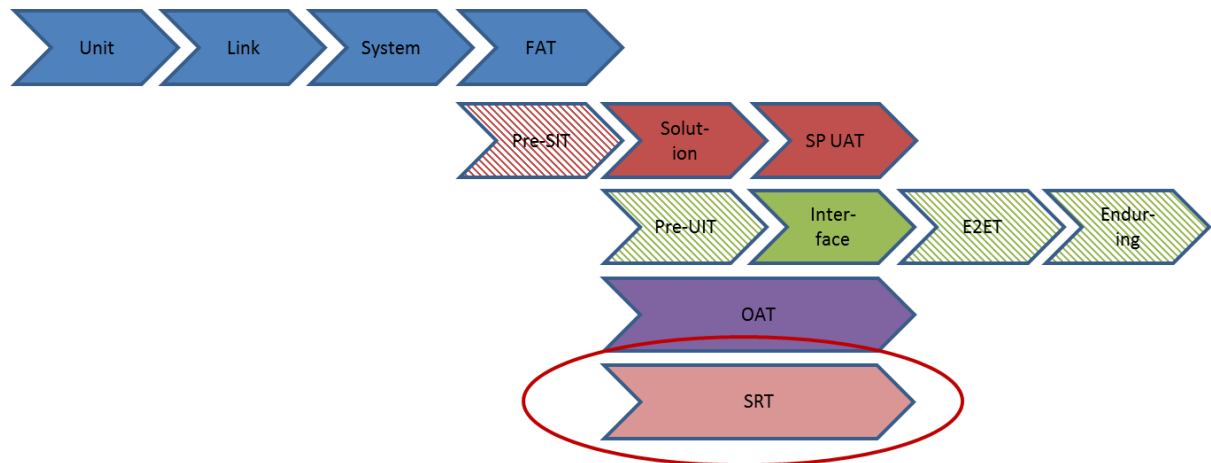


Figure 10 – SMKI and Repository Testing

The DSP will manage SRT, supported by the TSP and Service Users. The two elements of SRT are:

- Part 1: testing the interface between the SMKI Service and the SMKI Repository
- Part 2: testing the interface between the SMKI Service, the SMKI Repository and the rest of the DCC solution.

Part 1 will commence once:

- the TSP has successfully completed its PIT
- the DSP has successfully completed its testing of the SMKI Repository in isolation.

At the end of Part 1, Service Users can carry out their SREPT.

Part 2 is conducted during SIT.

Service Users are not involved in either Part 1 or Part 2 of SRT.

Further details of SRT will be provided in the SRT Approach document.

## 4.8 Test Focus Areas

As more elements of the Solution are delivered into Test and as more live-like environments become available, the range and breadth of features that can be tested will grow. The following table provides an indicative summary of how the test focus areas will develop as DCC Readiness Testing progresses.

Area	PIT	SIT	OAT	IT
Service Request processing (functional and scheduling)	✓	✓		✓
Service Request performance	✓		✓	
Database performance	✓		✓	
<b>Self-Service Portal</b>				
Performance	✓		✓	
Usability	✓			
Accessibility	✓			
Browser compatibility	✓			
Data Warehouse functionality	✓			
Billing	✓	✓		✓
BI/MI	✓	✓		✓
Batch functionality	✓			
Business Processes	✓		✓	✓
Service Management (Remedy)	✓	✓	✓	✓
System Management	✓	✓	✓	
Audit logging and Alerting	✓	✓	✓	
Data Service Resilience	✓	✓	✓	
Backup and Restore	✓	✓	✓	
Role-Based Access Control	✓	✓		✓
Penetration Testing	✓	✓	✓	
Identity Management	✓	✓		✓
Authentication	✓	✓		✓
Key Management	✓	✓		✓
Protective Monitoring	✓	✓		✓
<b>SMWAN infrastructure</b>				
Functionality	✓	✓		✓
Performance	✓		✓	
Resilience	✓	✓	✓	
<b>Comms Hub infrastructure</b>				
Functionality	✓	✓		✓
Performance	✓		✓	
Resilience	✓	✓	✓	
Firmware upgrade	✓	✓	✓	✓
Network accreditation	✓	✓		✓
Meter firmware upgrade		✓		✓
Safety Testing	✓	✓		
Disaster Recovery Testing			✓	

Area	PIT	SIT	OAT	IT
Protocol Certification	✓	✓		
Coverage Modelling	✓			
Installation, Configuration and Rollback	✓	✓	✓	

**Table 2 - Test Focus Areas**

Note that SRT is included within SIT in the above table.

These test focus areas will be refined as key artefacts (e.g. Design documents) become available, and the results will be documented in the relevant Test Approach and Test Plan documents.

## 4.9 Post go-live DCC testing

### 4.9.1 Introduction

Once the DCC solution has completed its Readiness Testing and been put into live operation, system modifications (including those triggered by Modification Proposals and internal DCC system change requests) will be subject to the testing regime described below.

System modifications will be assembled, tested and implemented as a Release. There are three categories of release:

- a major release of new/upgraded software and/or hardware
- a minor release of new/upgraded software and/or hardware
- one or more emergency software and hardware fixes, to resolve urgent problems.

### 4.9.2 Major releases

Major releases comprise large scale solution enhancements and change requests with a significant impact. They will be subject to the following set of Test Phases/Stages:

- PIT: isolated testing of the components being modified by the relevant SPs
- SIT: testing of the components within the full, integrated DCC solution by the relevant SPs, led by the DSP
- End to End Testing (or Enduring Testing if End to End Testing has expired): testing of the revised integrated solution with Service Users, led by the DCC Licensee
- OAT: testing of the revised integrated solution on live-like environments prior to implementation, led by the DCC Licensee.

In addition, Service Users may be required to repeat some aspects of their UEPT and SREPT to confirm Service User Readiness.

### **4.9.3 Minor releases**

Minor releases comprise small scale solution enhancements and change requests, along with low priority operational defect fixes and minor operational enhancements. They will undergo a foreshortened version of the above, based on the SPs' assessment of the technical and business risks inherent in the modifications to the solution.

### **4.9.4 Emergency releases**

Emergency releases will undergo a foreshortened version of the above, based on:

- the SPs' assessment of the technical and business risks inherent in the fixes
- the DCC Licensee's assessment of the operational impact of the live problem.

### **4.9.5 Test Plans**

A master Test Plan will be produced for each Release, detailing the extent of the testing to be carried out and the responsibilities of SPs and Service Users. Each master Test Plan will be supported by a set of lower level Test Plans.

### **4.9.6 Release Management**

Further details of release management can be found in the DCC Licensee's Release Management Strategy [16].

## 5 Service User Readiness Testing

### 5.1 UEPT

To demonstrate their eligibility to act as Service Users, test participants are required to prepare and undertake a series of User Entry Process Tests, as described in the Common Test Scenarios Document [11].

This Document [11] sets out:

- the Common Test Scenarios that must be conducted by the Service User with regard to each User Role that it may want to fulfil
- the UEPT test procedure, including
  - responsibilities for defining test scripts and test data
  - responsibilities for executing the test scripts and reporting the results to the DCC Licensee
  - operation of Entry and Exit Criteria, and Quality Gate Reviews
  - issue of Test Completion Certificates.

A Service User will conduct UEPT in either the Interface Test Stage, the E2E Test Stage or the Enduring Test Phase.

UEPT will be conducted with the Devices that were selected for SIT, via the DSM. Should Devices not be available, Test Stubs will be used.

### 5.2 SREPT

To demonstrate their eligibility to obtain Organisation and Device Certificates relevant to their User Roles and to access the SMKI Repository, Service Users are required to prepare and undertake a series of SMKI and Repository Entry Process Tests, as described in the SMKI and Repository Entry Process Test Scenarios Document [12].

This Document [12] sets out:

- the SMKI and Repository Entry Process Test Scenarios that must be conducted by the Service User with regard to each User Role that it may want to fulfil
- the SREPT test procedure, including
  - responsibilities for defining test scripts and test data
  - responsibilities for executing the test scripts and reporting the results to the DCC Licensee
  - operation of Entry and Exit Criteria, and Quality Gate Reviews
  - issue of Test Completion Certificates.

A Service User will conduct SREPT in either the SMKI and Repository Test Phase, the Interface Test Stage, the E2E Test Stage or the Enduring Test Phase.

## 6 Informal Testing

### 6.1 Pre-SIT

To de-risk Solution Testing, SPs can undertake Pre-SIT, which comprises:

- DSP and CSP testing of the southern end (i.e. CSP Gateway) of the “Motorway” part of the DCC solution, denoted by the yellow rectangle on the left-hand side of the diagram below
- SPs, Xoserve and St Clements Services Ltd testing of interfaces between their respective solution elements through the manual exchange and desk-checking of sample interface files.

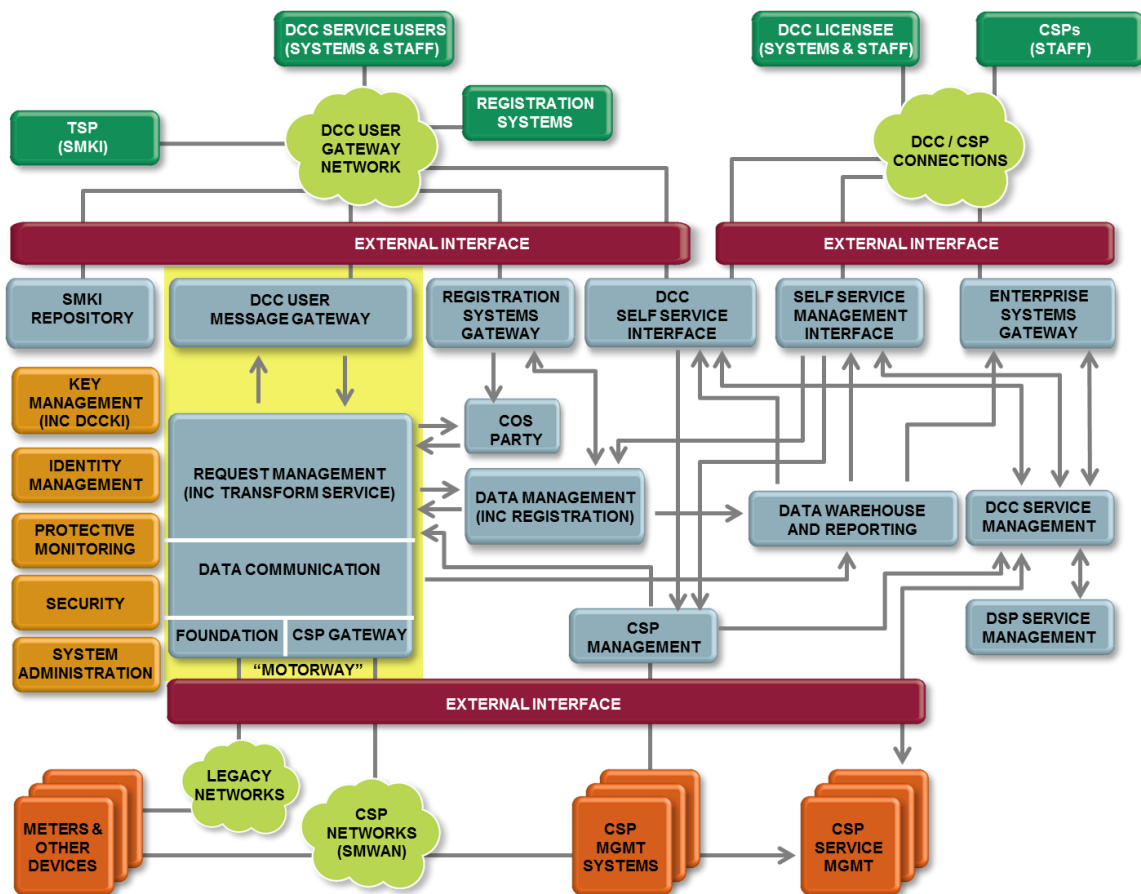


Figure 11 – DCC Solution and the Motorway

The DSP will take a version of the “Motorway” part of the DSP solution that is still undergoing System Testing and install it in its Sandpit environment, which will connect to test environments in each of the CSPs. The DSP and CSPs will then test sample Service Requests and Responses in order to expose mis-interpretations of the Smart Metering Wide Area Network (SMWAN) Interface.

The DSP will lead Pre-SIT.



## 6.2 Pre-UIT

To de-risk Interface Testing and UEPT, the DSP and Service Users can undertake Pre-UIT to test the northern end (i.e. DCC User Message Gateway) of the “Motorway” part of the DCC solution.

The DSP will take a version of the “Motorway” part of the DSP solution that is still undergoing System Testing and install it in its Sandpit environment, which will connect to test environments in each of the participating Service Users. Note:

- the Sandpit environment is segregated into a CSP partition (used for Pre-SIT) and a Service User partition (used for Pre-UIT) – see Section 10.3.3
- the Service User partition terminates in a Test Stub at the southern end of the “Motorway”, as a result of which no Devices (or Meter Stubs) will be used in Pre-UIT.

The DSP and Service Users will then test sample Service Requests and Responses in order to expose mis-interpretations of the DCC User Gateway Interface Design Specification (DUGIDS).

The DSP will lead Pre-UIT.

Further details of Pre-UIT will be provided in the “Guide for Testing Participants” document produced by the DCC Licensee.

Note that Pre-UIT is a voluntary Test Stage for Service Users.

## 6.3 End to End Testing

The third element of Informal Testing is End to End Testing whereby:

- Service Users can test Devices of their own choice (rather than those used in SIT and IT) and can test their own User Systems with the DCC solution, once they have completed UEPT and SREPT
- Meter Manufacturers and Test Houses can test their own Devices with the DCC solution. The DCC licensee is required to provide a service to these test participants to support interoperability testing of Devices and the DCC solution (see Section 7.1)
- Service Users who did not demonstrate their readiness to become users of the DCC solution during Interface Testing will carry out their UEPT and SREPT tests
- Service Users test modifications made to the DCC solution after the solution has been implemented.

The DCC Licensee will manage End to End Testing, supported by the SPs.

End to End Testing will last for a 12 month period, with the option to extend the test stage for an additional 6 months subject to the SEC Panel approving a recommendation from the DCC Licensee. End to End Testing can be undertaken within:

- CSP Test Labs

- Remote Test Labs (which will be available from the start of the End to End Test Stage).

Note that End to End Testing is a voluntary Test Stage for Service Users. However, Suppliers have a licence obligation to ensure that any Devices they install in consumer premises are interoperable with the DCC solution, and End to End testing is the means by which this interoperability may be verified.

In accordance with the SEC, the DCC Licensee may recommend to the SEC Panel that End to End Testing should be provided from the commencement of or at some point during Interface Testing.

Further details will be provided in the End to End Test Approach document.

## 6.4 Enduring Testing

Once End to End Testing has expired it will be replaced by Enduring Testing, as described in the Enduring Test Approach and Test Plan documents. The purpose of Enduring Testing is the same as End to End Testing.

## 6.5 GBCS Integration Testing

The GB Companion Specification (GBCS) sets out the communications protocol between Service Provider systems and Devices (including Comms Hubs and meters). The DCC Licensee is conducting electronic proving of this protocol and may enhance the test tool it is using for this purpose so that it can be provided to Device manufacturers and other interested parties, on condition that:

- the enhanced tool (known as GFI – GIT for Industry) can be provided within the timescales required to support the development of Devices
- development of the tool does not adversely impact the formal Test Stages
- the requirement for the tool (and scope of functionality) is agreed with industry.

Use of GFI is voluntary and other equivalent test tools may be available (e.g. from product vendors and technology companies).

## 7 Testing Services

### 7.1 General

The DCC Licensee will provide authorised Test Participants with the requisite facilities (e.g. environments, support) to undertake UEPT, SREPT, E2E Testing, as well as testing of Modification Proposals and internal DCC system change requests, and will support the completion of such tests. The facilities will be available between 08:00 and 18:00 hours Monday to Friday, excluding public holidays (unless otherwise agreed with the DCC Licensee).

The DCC Licensee will publish guidance in the form of the “Guide for Testing Participants” document, describing:

- which persons are eligible for which services and on what basis (including any applicable charges)
- responsibilities for provision of the network connection to the DCC environments.

The DCC Licensee will publish this document on its website.

Where practical, the DCC Licensee will allow Testing Participants to test concurrently; otherwise the DCC Licensee will determine in a non-discriminatory manner the order in which Testing Participants will be allowed to undertake such tests. Where any Testing Participant disagrees with the manner in which they have been scheduled, they may refer the matter to the SEC Panel and thence the Authority.

Test Participants undertaking tests will comply with:

- Good Industry Practice
- DCC Licensee procedures and instructions
- Terms and Conditions equivalent to Sections H14.5, H14.33, J1 (Payment of Charges) and M2 (Limitations of Liability) laid out in the SEC.

### 7.2 Test Issues

Test Participants participating in Testing Services are entitled to raise Test Issues in respect of their tests, provided they have taken reasonable steps to diagnose and resolve such issues. These Test Issues will be handled under the DCC Licensee’s Testing Issue Resolution Process (to be published on its website), whereby the relevant Triage Panel will:

- triage the Test Issues
- set their Severity and Priority
- advise the Testing Participant of the resolution timetable and remedial actions.

The Testing Participant is entitled to raise objections to the Triage Panel’s determinations with the DCC Licensee. These objections will be reviewed by the Issues Resolution Board (IRB) as described in the Testing Issues Resolution Process

[13]. The DCC Licensee will consult with the Testing Participant, DCC technical advisors and other relevant organisations and either:

- propose a resolution decision, or
- request the resolving SP to accelerate its remediation plans, or
- undertake its own investigation and notify the SEC Panel and Secretary of State of its conclusions. The SEC Panel will publish such results on its website.

If the Testing Participant objects to the DCC Licensee's determinations, it may refer the matter to the SEC Panel. In this case, the SEC Panel will investigate the matter and advise the relevant organisations of its decision on the actions required to resolve the testing issue, being one of:

- refer the matter to the Secretary of State
- amend the SEC
- amend the DCC solution
- amend one or more Devices
- amend a User System
- amend an RDP System.

The SEC Panel will publish its decision on its website.

The Testing Issue Resolution Process will provide for sharing details of testing issues relevant to other Test Participants, subject to confidentiality and security constraints.

Note that during the Transitional Testing Stage, the SEC Panel will forward all Test Issues to the Secretary of State for resolution.

## 8 Test Organisation, Management and Assurance

### 8.1 Test Organisation

The DCC Licensee Project Director (Testing), SP Test Managers and the DSP Integration Test Manager are responsible for all their respective test activities outlined in this document.

The SP Test Managers have a dotted line of responsibility to the DCC Licensee Project Director (Testing), as shown in the following diagram.

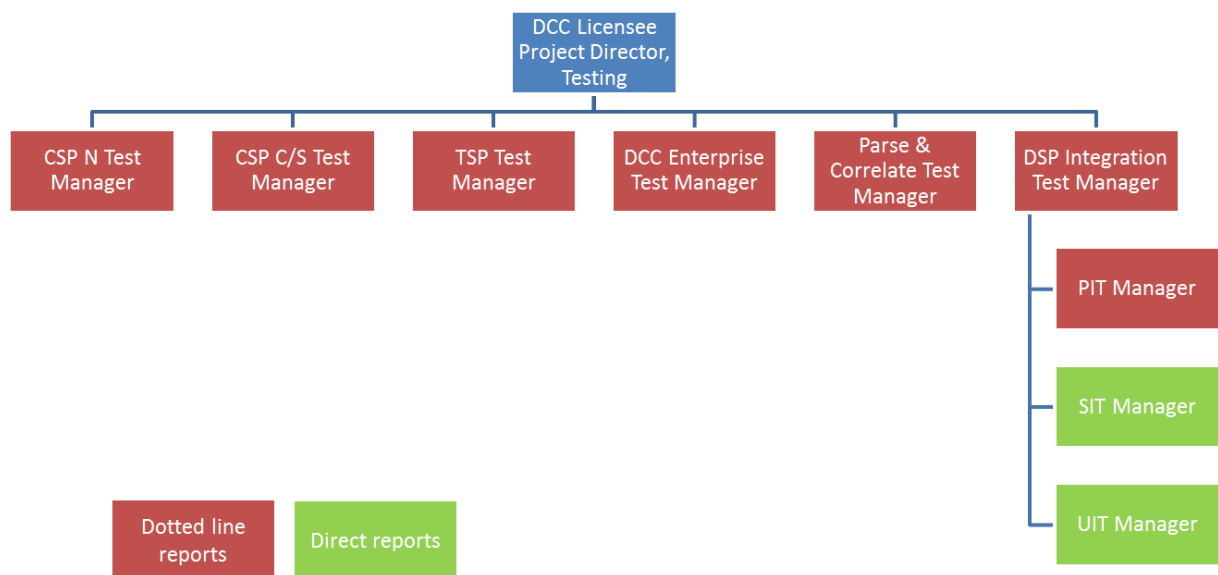


Figure 12 – Test Organisation

Organisation structures for each Service Provider will be described in the respective PIT Approach documents.

## 8.2 Test Governance and Management

### 8.2.1 Test Governance

The DCC Licensee will provide overall governance of testing on the programme, as outlined in the following diagram.

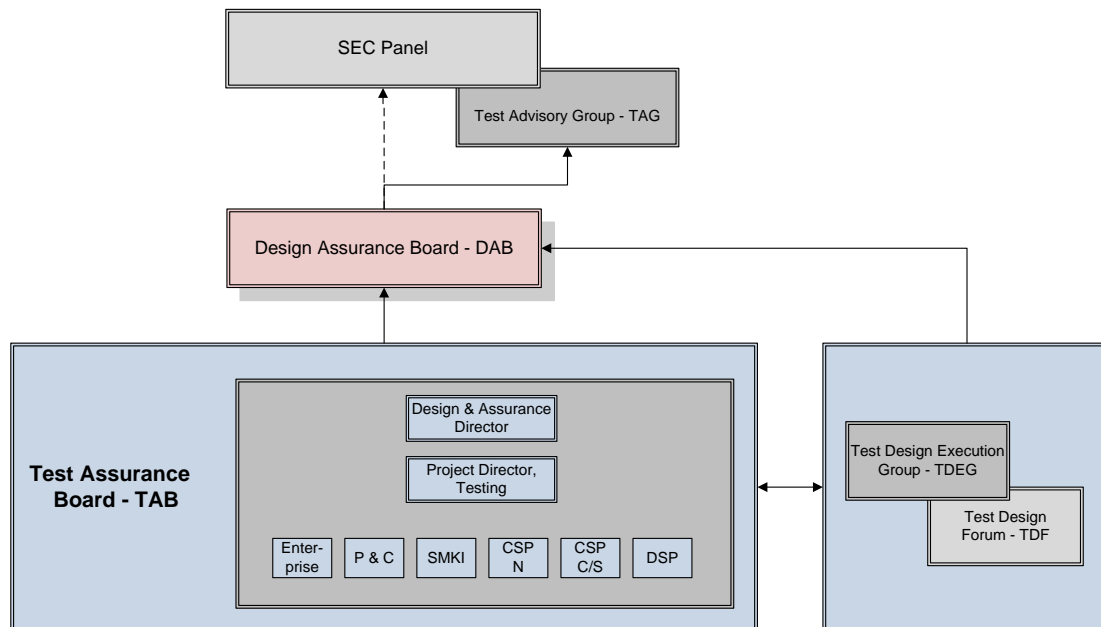


Figure 13 – Test Governance

### 8.2.2 Management of Pre-Integration Testing

Each SP will manage its own Pre-Integration Test Phase.

The SPs will each use and manage their own processes, staff, test environments, test data, test tools and test labs for Pre-Integration Testing.

The SPs will each provide the DCC Licensee with:

- Test Approach and Test Plan documents ahead of test execution
- regular progress reports in the run-up to and during test execution for System Test and FAT
- a Test Completion Report at the end of each stage of test execution.

The DCC Licensee will assure Pre-Integration Testing, as detailed in Section 8.4.2.

Quality Gate Reviews will operate as detailed in Section 8.4.2.

### 8.2.3 Management of Systems Integration Testing

The DSP will manage the Systems Integration Test Phase, with support from the SPs, RDPs and St Clements Services Ltd.

Systems Integration Testing will require test environments, test data, test tools and test labs to be shared across the SPs under a common set of processes using staff

from all parties. To ensure that Systems Integration Testing is planned and controlled efficiently, the DSP will run workshops with the SPs to devise a high level approach to Systems Integration Testing, focussing on:

- roles and responsibilities
- definition of Test Success criteria
- Entry and Exit Criteria
- set up and operation of the Test Management tool
- tracking and reporting of test progress
- identification and design of the test scenarios to be covered
- design and sourcing of the supporting test data
- re-use of test scripts and test data from Pre-Integration Testing
- participation in test script preparation and execution
- co-ordination of joint test preparation and execution activities
- staffing levels required for test preparation, test execution and issue resolution
- plans for establishing connectivity between SP test environments
- procedures and privilege rights for the cross-SP access to test environments/labs
- scheduling the usage of test environments and test labs
- the Test Stubs to be used
- the Devices to be used.

The results of the workshops will be documented in the Systems Integration Test Approach document, and further elaborated in the Solution Test Plan and User Acceptance Test Plan.

The DSP will provide the DCC Licensee with:

- the Systems Integration Test Approach and Test Plan documents ahead of test execution
- regular progress reports in the run-up to and during test execution
- the Test Completion Report at the end of each stage of test execution.

The DCC Licensee will:

- assure Systems Integration Testing, as detailed in Section 8.4.2
- appoint an independent auditor to review the activities that are undertaken in SIT and provide confirmation that all Exit Criteria have been met.

Quality Gate Reviews will operate as detailed in Section 8.4.2.

## 8.2.4 Management of Operational Acceptance

The DCC Licensee, working closely with the SPs, will manage Operational Acceptance Testing and Business Acceptance Testing.

Operational Acceptance Testing (OAT) and Business Acceptance Testing (BAT) will require production-like environments, test data, test tools and test labs to be shared across the SPs and Registration Data Providers under a common set of processes using staff from all parties. To ensure that OAT and BAT are planned and controlled efficiently, the DCC Licensee will run workshops with the SPs to devise a high level approach to this testing, focussing on:

- roles and responsibilities
- definition of Test Success criteria
- Entry and Exit Criteria
- tracking and reporting of test progress
- identification and design of the test scenarios to be covered
- design and sourcing of the supporting test data
- re-use of test scripts and test data from Systems Integration Testing
- participation in test script preparation and execution
- co-ordination of joint test preparation and execution activities
- staffing levels required for test preparation, test execution and issue resolution
- plans for establishing connectivity between SP and RDP production environments
- procedures and privilege rights for cross-SP access to production environments/labs
- scheduling the usage of production environments and test labs
- the Devices to be used.

The results of the workshops will be documented in the OAT and BAT Approach documents and further elaborated in the associated Test Plans.

The DCC Licensee will provide the SPs and RDPs with:



- the OAT Approach, BAT Approach and Test Plan documents ahead of test execution
- regular progress reports during OAT and BAT execution
- the Test Completion Reports at the end of OAT and BAT execution.

Quality Gate Reviews will operate as detailed in Section 8.4.2.

## 8.2.5 Management of Testing involving Service Users

### Interface Testing

The DSP, working closely with the DCC Licensee, will manage Interface Testing, with support from the SPs, RDPs, St Clements Services Ltd and Service Users.

Interface Testing will require test environments, test data, test tools and test labs to be shared across the SPs, Service Users and Registration Data Providers under a common set of processes using staff from all parties. To ensure that Interface Testing is planned and controlled efficiently, the DSP will run workshops with the SPs and nominated Service Users to devise a high level approach to Interface Testing, focussing on:

- roles and responsibilities
- definition of Test Success criteria
- Entry and Exit Criteria
- set up and operation of the Test Management tool
- tracking and reporting of test progress
- identification and design of the test scenarios to be covered
- design and sourcing of the supporting test data
- re-use of test scripts and test data from Systems Integration Testing
- participation in test script preparation and execution
- co-ordination of joint test preparation and execution activities
- staffing levels required for test preparation, test execution and issue resolution
- plans for establishing connectivity between SP and Service User test environments
- procedures and privilege rights for cross-SP access to test environments/labs
- scheduling the usage of test environments and test labs
- the Devices to be used.

The results of the workshops will be documented in the Interface Test Approach document.

The DSP will provide the DCC Licensee with:

- the Interface Test Approach and Test Plan documents ahead of test execution
- weekly progress reports during Interface test execution
- the Test Completion Report at the end of Interface test execution.

The DCC Licensee will assure Interface Testing, as detailed in Section 8.4.2.

Quality Gate Reviews will operate as detailed in Section 8.4.2.

### **End to End Testing**

The DCC Licensee will manage End to End Testing, supported by the SPs, RDPs, St Clements Services Ltd and Service Users.

As with Interface Testing, a series of workshops will be conducted with the relevant organisations and the results will be documented in the End to End Test Approach document.

The DSP will provide the DCC Licensee with the End to End Test Approach and Test Plan documents ahead of test execution.

### **Enduring Testing**

The DCC Licensee will manage Enduring Testing, supported by the SPs, RDPs, St Clements Services Ltd and Service Users.

As with Interface Testing, a series of workshops will be conducted with the relevant organisations and the results will be documented in the Enduring Test Approach document.

The DSP will provide the DCC Licensee with the Enduring Test Approach document ahead of test execution.

### **UEPT**

The DCC Licensee will manage UEPT, supported by the SPs, RDPs, St Clements Services Ltd and Service Users.

The Common Test Scenarios document [11] describes how this management will operate, in terms of for example:

- evaluation of Entry Criteria
- approval of test artefacts
- supply of test results
- operation of Quality Review Gates
- issue of Test Completion Certificates.

## SREPT

The DCC Licensee will manage SREPT, supported by the SPs, RDPs, St Clements Services Ltd and Service Users.

The SMKI and Repository Entry Process Test Scenarios Document [12] describes how this management will operate, in terms of for example:

- evaluation of Entry Criteria
- approval of test artefacts
- supply of test results
- operation of Quality Review Gates
- issue of Test Completion Certificates.

## 8.3 Progress Reporting

### 8.3.1 Summary

The progress of each formal Test Stage will be reported by the SPs to the DCC Licensee at three levels:

- Pre test execution, via weekly Test Readiness Reports
- Test execution, via weekly Test Execution Reports
- Post test execution, via the Test Stage Completion Report.

Service User progress reporting is defined in the Common Test Scenarios document [11] and the SMKI and Repository Entry Process Test Scenarios Document [12].

### 8.3.2 Test Readiness Reports

Commencing twenty working days prior to the start of test execution for each Test Stage, the SPs will provide the DCC Licensee with a weekly report showing:

- Actual number of test scripts written, in progress and not started
- Requirements Traceability Matrix coverage achieved with the test scripts written to date
- State of readiness for:
  - Test Data
  - Test Environment
  - Test Stubs
  - Devices
  - Staff

- Progress against Test Stage Entry Criteria defined in Test Plan
- Top three<sup>5</sup> Risks and Issues
- Overall RAG status.

These reports are a key element to the “Glide Path” element of the Quality Gate Review process (see Section 8.4.2).

### 8.3.3 Test Execution Reports

Once test execution for each Test Stage has started, the SPs will provide the DCC Licensee with a regular progress report. This report will be issued weekly during the Unit and Link Test Stages, and daily thereafter. The report will show:

- Actual number of test scripts executed vs. planned, cumulative trend
- Actual number of test scripts passed vs. planned, cumulative trend
- Actual number of open and closed test issues vs. planned, cumulative trend
- Actual number of test issues outstanding, split by Severity
- Progress against Test Exit Criteria defined in Test Stage Plan
- Progress against any Work Off Plan from previous Test Stage
- Top three Risks and Issues
- Overall RAG status.

The following graph is an example of the test scripts passed vs. planned, cumulative trend metric.

---

<sup>5</sup> Risk and Issue registers will be supplied to the DCC Licensee via the standard programme reporting procedures

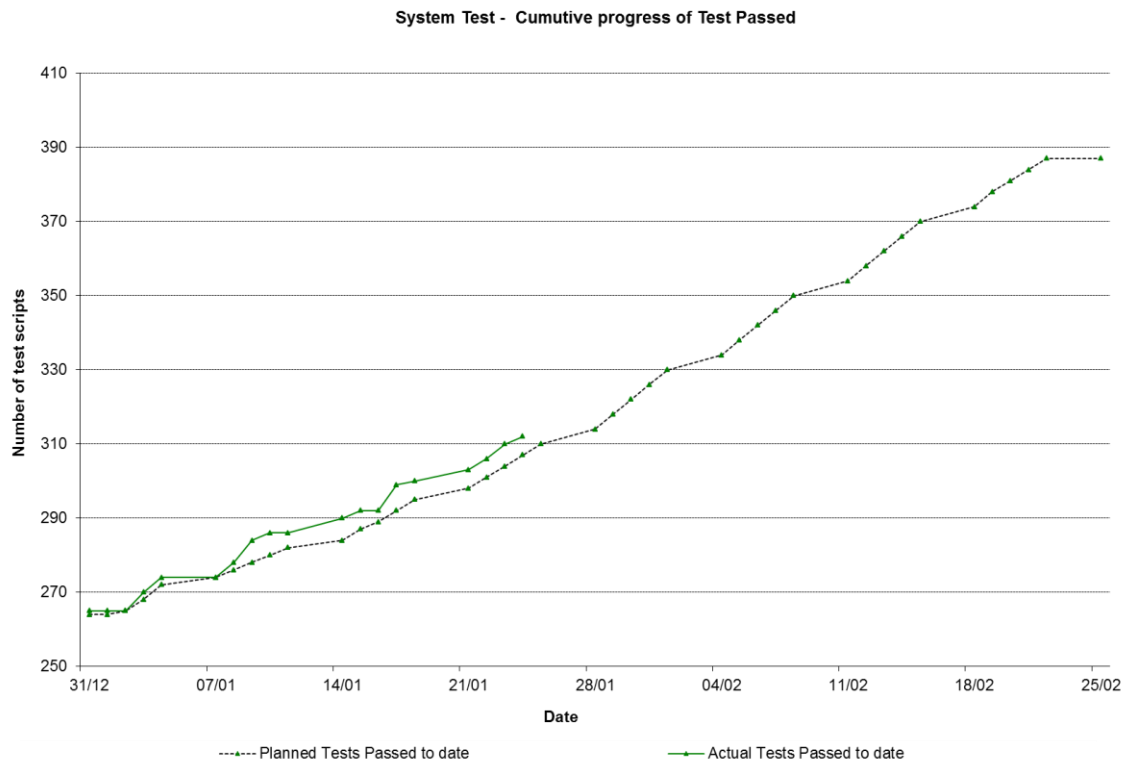


Figure 14 – Test Pass Progress graph - illustrative

### 8.3.4 Test Stage Completion Report

Once test execution for each Test Stage has completed, the SPs will provide the DCC Licensee with a final Test Completion Report showing:

- Overview of testing undertaken
- Actual number of tests run, passed, failed, not run
- Explanation for any tests not run
- Test issue ids for failed tests
- Number of test issues outstanding, split by Severity
- Work off Plan for outstanding test issues
- Number and severity of test issues raised
- Specification of test environment used
- Recommendations for tests to be included in the next Test Stage.

A draft of the Test Completion Report will be issued 10 working days before the planned end of test execution.

## 8.4 Acceptance and Test Assurance

### 8.4.1 Acceptance

Each formal Test Stage and Phase will be considered complete when all relevant Exit Criteria have been achieved, including:

- in respect of SIT: the DCC Licensee has provided a report to the Authority, SEC Panel and Secretary of State demonstrating that the Exit Criteria in the Systems Integration Test Approach have been met, and a report from the independent auditor confirming that the Exit Criteria have been met
- in respect of IT: the SEC Panel has confirmed, based on a report provided by the DCC Licensee, that the Exit Criteria in the Interface Test Approach have been met.

On completion of the Test Stage/Phase, the DCC Licensee will issue a Test Stage/Phase Complete Certificate. Such Test Stage/Phase Complete Certificates will lead to the issue of the relevant Milestone Certificate.

Issue of a Test Stage Complete Certificate for FAT constitutes the DCC Licensee's acceptance of the relevant individual SP solutions.

Issue of the Test Stage Complete Certificate for UAT constitutes the DCC Licensee's acceptance of the joint SP solutions.

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

### 8.4.2 Test Assurance

#### Summary

Test Assurance for formal testing operates at multiple levels across the DSP, SP, Service User and DCC Licensee, as illustrated in the following diagram.

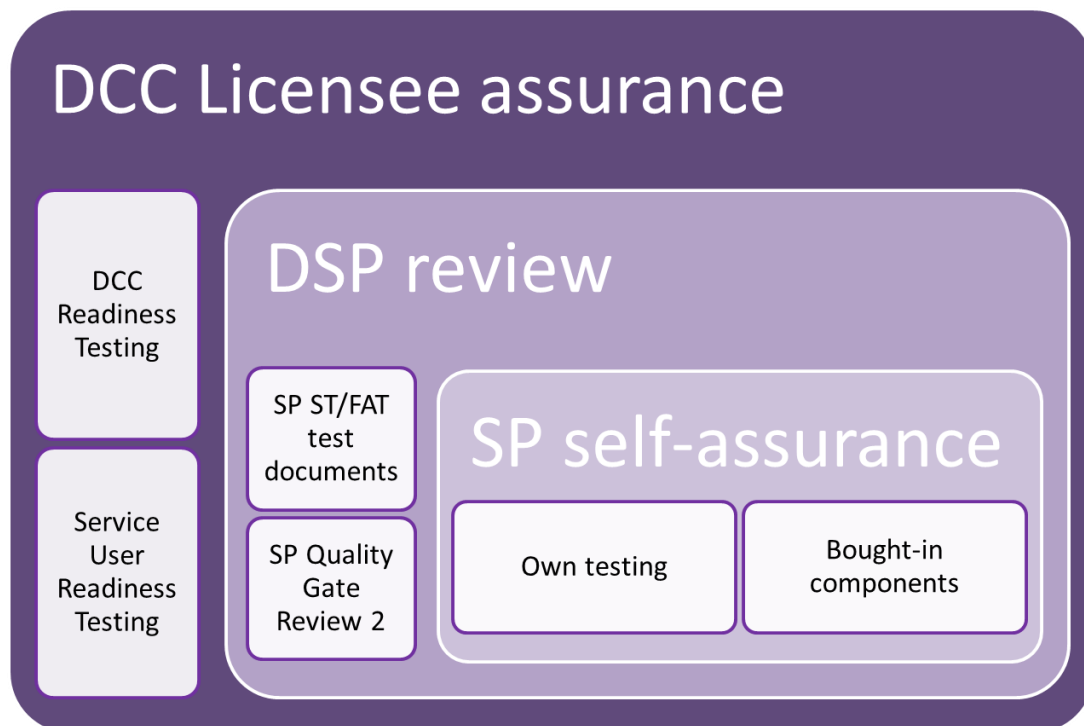


Figure 15 – Assurance Levels

### SP self-assurance and DSP review

The SPs will establish procedures to assure their own Pre-Integration Testing and confirm compliance with the Joint Test Strategy (this document), the Pre-Integration Test Approach and the Test Plans. This assurance will include reviewing the testing undertaken by third parties supplying components of their service solutions, and performing acceptance testing of such components.

Service Providers will make their relevant testing deliverables available to the other Service Providers and exchange constructive comments to ensure solution and testing compatibility.

In respect of the DSP's role as System Integrator, the DSP will assure the SPs' Pre-Integration testing using the following methods:

- review of SP Pre-Integration Test Approach and Test Plans for System Test and FAT
- review of SP Requirements Traceability Matrix
- review of SP FAT scenarios and data
- review of SP Test Completion reports and Work Off Plans for System Test and FAT
- review of SP Test Completion report for Pre-Integration Testing
- attendance at SP Quality Gate Review 2 (see Section 8.4.2.1.1).

## Test Assurance by the DCC Licensee

The DCC Licensee will assure SP testing using the following methods at agreed points in the lifecycle:

- Quality Gate Reviews
- Test Witnessing
- Test Observation
- Test Quality Audits
- Product Inspections
- Document Review.

### 8.4.2.1.1 Quality Gate Reviews

A series of Quality Gate Reviews will be held between Test Stages to confirm that the Exit Criteria of the preceding Test Stage and the Entry Criteria of the upcoming Test Stage have been met (see Section 9.4 for details of the Exit and Entry Criteria).

Quality Gate Reviews for Service User testing are defined in the Common Test Scenarios document [11] and the SMKI and Repository Entry Process Test Scenarios Document [12].



Quality Gate Reviews for SP testing are defined in the following table:

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
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	Between SRT Part 1 and SREPT	DSP	DCC Licensee	TSP
9	Prior to commencement of End to End Testing	DCC Licensee	DCC Licensee	SPs

**Table 3 - Quality Gate Reviews**

Note that for Quality Gates 3 – 6, St Clements Services Ltd will represent the electricity RDPs.

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

Where SP solutions are introduced into SIT on an incremental basis, each such increment will each by subject to a Quality Gate Review 3.

The SPs may elect to make an early, informal start to System Testing (e.g. on an initial drop of functionality) and/or the DSP may elect to make an early, informal start to Solution Testing, in consultation with the DCC Licensee. Such starts will be subject to an informal Quality Gate Review and followed up by a formal Quality Gate Review once the Exit Criteria for the preceding Test Stage have been met.

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 Pre-Integration Test Phase and the Entry of the Systems Integration 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 stage and start the next stage. The SP/DSP Test Manager has a key role to play in monitoring and controlling the glide path towards Exit and Entry Criteria ahead of the Quality Gate Review meeting itself (and reporting progress to stakeholders through Test Readiness Reports), and in following up completion of any actions arising from the review. The following diagram summarises the process.

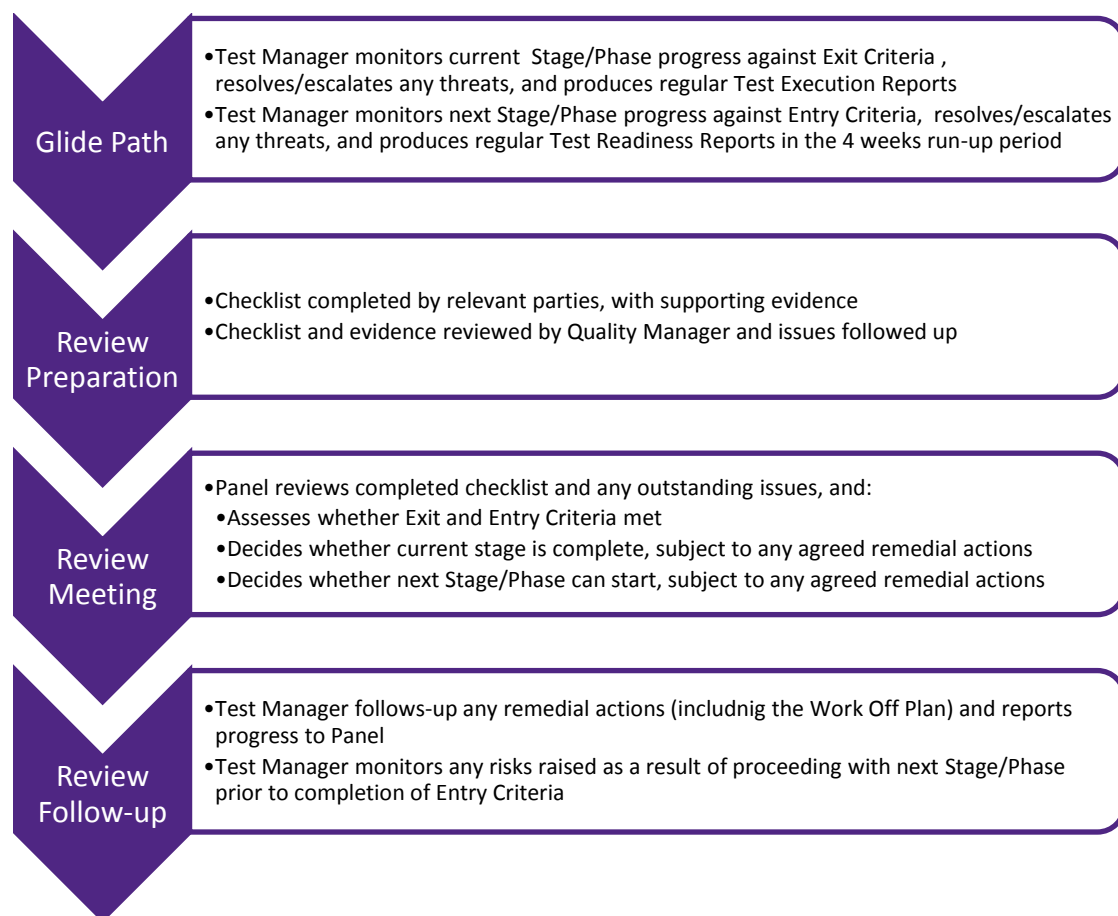


Figure 16 – Quality Gate Review process

The current 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 Stage/Phase.

#### **8.4.2.1.2 Test Witnessing**

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

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

- no deviation from the scripts (e.g. in response to “what if” questions raised by witnesses)
- no hands-on execution by witnesses.

Test Issues raised during witnessing will be entered in to the relevant Test Issue Management tool and progressed through the Test Issue Management process (see Section 11).

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

Note that the DCC Licensee may elect to receive System/Solution Test execution evidence as a substitute for some tests nominated for witnessing. The FAT/SP UAT Test Plans will define which of these two methods will be used for the agreed subset of tests.

#### **8.4.2.1.3 Test Observation**

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

- be carried out at the normal workstation of the relevant SP staff
- be informal
- not disrupt the normal work of Service Provider teams (i.e. there will be no extended demonstrations or explanations of the work being observed)
- cover whatever test scripts and test issues happen to be in hand at the time of the visit (i.e. there is no pre-selection of tests or issues).

#### 8.4.2.1.4 Test Quality Audits

By prior agreement with the SPs on the timing, duration and scope, the DCC Licensee may perform Test Quality Audits of SP testing. The focus of these Audits will be on:

- confirming adherence to agreed methods and processes
- reviewing of test status, risks and issues.

The DCC Licensee will discuss the outcome of such Audits with the SP at the time of the Audit, and agree any actions arising (including completion dates) with the SP.

This method will be used by the independent auditor for SIT.

#### 8.4.2.1.5 Product Inspections

By prior arrangement with the SPs on the timing, duration, scope and level, the DCC Licensee will be entitled to conduct on-site product inspections. The scope of these inspections will be:

- physical infrastructure
- Release Notes
- infrastructure build
- the assurance process
- configuration verification
- asset tagging, cabling and racking
- build scripts
- configuration identification.

The DCC Licensee will discuss the outcome of such Inspections with the SP at the time of the Inspection, and agree any actions arising (including completion dates) with the SP.

#### 8.4.2.1.6 Documentation Review

The DCC Licensee may undertake a review of any documents (including Design documents) used in testing by the SPs.

The DCC Licensee will discuss the outcome of such Reviews with the SP on completion of the Review, and agree any actions arising (including completion dates) with the SP.

## 9 Test Process

### 9.1 Testing and Solution Risk

#### 9.1.1 Test Coverage

The test scripts in each formal Test Stage will be mapped back to the corresponding design document and the requirements document by means of a Requirements Traceability Matrix, so that the breadth of test coverage can be measured and verified.

The depth of test coverage (i.e. how “thoroughly” each solution element is tested) will be determined by a risk assessment of:

- the business importance of the various solution elements
- the technical probability of test issues being present in each solution element.

This approach applies to:

- all types of testing (e.g. functionality, security, performance)
- initial testing of solution elements during the Pre-Integration, Systems Integration, Operational Acceptance and User Integration Test Phases
- testing of fixes and enhancements to these elements during the Pre-Integration, Systems Integration, Operational Acceptance, User Integration and Enduring Test Phases
- Regression Testing of these elements.

The following table provides an example set of “high risk” areas which will be used to inform decisions on the depth of testing. This will be achieved by running a series of risk workshops attended by the relevant SP stakeholders:

- Design Authority
- Development Manager
- Security Manager
- DCC Licensee.

Solution element/risk	Test Mitigations
End to End security of smart metering data and access to functionality	This will be mitigated by SP security testing during Pre-Integration Testing, by Systems Integration Testing and by OAT
Security of Change of Supplier function	This will be mitigated by security testing during Systems Integration Testing, Interface Testing and OAT

Solution element/risk	Test Mitigations
Delivery of meter alerts and critical commands	This will be covered by SP functional testing during Pre-Integration Testing and Systems Integration Testing. Particular attention will be paid to safety-related meter alerts and critical commands, identified via the DSP's Hazard Analysis
Speed of processing Service Requests	This risk has already been partially mitigated by Proof of Concept work pre-contract.  Further mitigation will be via performance testing during Pre-Integration, Systems Integration and Operational Acceptance Testing
Scalability of the solution to meet planned growth in Service Request volumes	This risk has already been partially mitigated by Proof of Concept work pre-contract.  Further mitigation will be via SP performance testing during Pre-Integration and Operational Acceptance Testing
Correct operation of the interfaces between the SP solutions	This will be mitigated by: - DSP assurance of SP Pre-Integration Testing - pre-SIT - Systems Integration Testing
Correct operation of the Comms Hubs	This will be mitigated by CSP functional and non-functional testing during Pre-Integration Testing, by Systems Integration Testing and Interface Testing. It will also be mitigated by CSP assurance of suppliers' testing of bought-in components
Correct operation of the interface between the Comms Hubs and Devices	This will be partially mitigated by: - via the DSM, DCC Licensee stipulation of the test evidence required from equipment manufacturers for their equipment to be considered for inclusion in Systems Integration Testing - CSP verification of the interface between the Comms Hubs and Devices during Pre-Integration Testing, should it be available - DSP verification of the interface between the Comms Hubs and at two sets of Devices during Systems Integration Testing, should they be available - verification of the interfaces between the Comms Hubs and any additional sets of Devices selected by Service Users during the End to End Test Stage of User Integration Testing.
Performance of Comms Hub enrolment during mass rollout	CSP performance testing of the SMWAN infrastructure
Reputational damage caused by incorrect operation of the Self Service Portal	This will be mitigated by DSP and Service User functional testing during Systems Integration and User Integration Testing
Speed with which Devices or Service Users can be suspended from the service	This will be mitigated by Systems Integration Testing

Table 4 - Test and Risk

### 9.1.2 Test Prioritisation

The risk assessment will also be used to prioritise test preparation and test execution activities. Each test will be prioritised by the relevant stakeholders in terms of its business impact (i.e. if the solution element covered by the test failed in live use, what would be the impact on the solution) and technical probability (i.e. how likely is it that test issues will be present in the solution element). This prioritisation will use a High, Medium, Low scale in order to group tests into three categories:

- 1 – tests which cover solution elements that a) are very likely to contain test issues and/or b) would cause major business impact if they failed
- 2 – tests which cover solution elements that a) are likely to contain test issues and/or b) would cause significant business impact if they failed
- 3 – tests which cover solution elements that a) are unlikely to contain test issues and/or b) would cause only minor business impact if they failed.

The following diagram illustrates this, using a Red/Amber/Green scheme.

<b>Importance</b>	High	2	1	1
	Medium	3	2	1
	Low	3	3	2
		Low	Medium	High

**Probability**

Figure 17 – Test Prioritisation

Category 1 tests will be written ahead of Category 2 tests, which will be written ahead of Category 3 tests.

Category 1 tests will be executed ahead of Category 2 tests, which will be executed ahead of Category 3 tests.

### 9.2 Test Pass and Fail

A test will pass if the actual result matches the expected result. Where this is not the case, a test issue will be raised (see Section 12) and the test will be set to “fail”. If the subsequent triage process determines that the test issue has been raised in error (e.g. due to a misunderstanding), then the test result will be reset from “fail” to “pass”.

### 9.3 Test Activities and Responsibilities

The following activities will be performed for the Programme:

- Preparation and maintenance of the Joint Test Strategy
- Support of preparation and maintenance of the Joint Test Strategy
- Preparation and maintenance of an Environment Plan.

The following activities will be performed per Test Phase:

- Preparation and maintenance of Test Phase Approach
- Support Test Approach preparation and maintenance
- Design of testing infrastructure (e.g. Environments)
- Implementation of testing infrastructure
- Test Phase planning:
- Support Test Phase planning
- Identify Test Scenarios
- Support Test Scenario identification.

The following activities will be performed per Test Stage:

- Preparation and maintenance of Test Plan
- Support of Test Plan preparation and maintenance
- Design of Test Scripts, and production of Test Specification document and Requirements Traceability Matrix
- Support of Test Script Design
- Design and preparation of Test Data
- Support of Test Data design and preparation<sup>6</sup>
- Preparation of Test Execution Schedule
- Support of Test Execution Schedule preparation

---

<sup>6</sup> Including loading of Test Data to the test environment)



- Perform Quality Gate Reviews
- Support Quality Gate Reviews
- Execution of testing
- Test Issue Management
- Support of Test Issue Management
- Test Issue resolution
- Support of Test Issue resolution
- Release Management
- Support of Release Management
- Configuration Management
- Support of Configuration Management
- Test Progress Reporting
- Support of Test Progress Reporting
- Test Assurance of Third Party components
- Test Assurance of SP testing
- Compliance of Test Activities with Joint Test Strategy, Test Approach, Test Plan.

Responsibilities for the test activities throughout the Test Phases are shown in the following table:

Activity	Responsibility			
	PIT	SIT	OAT	UIT
<b>Per the Programme:</b>				
Preparation and maintenance of Joint Test Strategy	DSP	DSP	DSP	DSP
Support preparation and maintenance of Joint Test Strategy	SPs	SPs	SPs	SPs
Preparation and maintenance of Environment Plan	DSP	DSP	DSP	DSP
<b>Per Test Phase:</b>				
Preparation and maintenance of Test Phase Approach	SPs	DSP	DCC Licensee	DSP

Activity	Responsibility			
	PIT	SIT	OAT	UIT
Support Test Approach preparation and maintenance	n/a	SPs	SPs	SPs, DCC Licensee and SUs
Design of testing infrastructure	SPs	SPs	SPs	SPs
Implementation of testing infrastructure (e.g. Environments)	SPs	SPs	SPs	SPs
Test Phase planning	SPs	DSP	DCC Licensee	DSP and DCC Licensee
Support Test Phase planning	n/a	SPs	SPs	SPs and SUs
Identify Test Scenarios	SPs	DSP	SPs	DSP and DCC Licensee
Support Test Scenario identification	n/a	SPs, RDPs, St Clements	n/a	SPs
<b>Per Test Stage Preparation:</b>				
Preparation and maintenance of Test Plan	SPs	DSP	DCC Licensee	DSP
Support of Test Plan preparation and maintenance	n/a	SPs, RDPs, St Clements	SPs	SPs, DCC Licensee
Design of Test Scripts and production of Test Specification document and Requirements Traceability Matrix	SPs	DSP	DCC Licensee	DCC Licensee & SUs
Support of Test Script design	n/a	SPs, RDPs, St Clements	SPs	SPs
Design and preparation of Test Data	SPs	DSP	DCC Licensee	DCC Licensee & SUs
Support of Test Data design and preparation	n/a	SPs, RDPs, St Clements	SPs	SPs
Preparation of Test Execution schedule	SPs	DSP	DCC Licensee	DCC Licensee
Support of Test Execution schedule preparation	n/a	SPs, RDPs, St Clements	SPs	SPs
<b>Per Test Stage Execution:</b>				
Perform Quality Gate Reviews	SPs	DSP	DCC Licensee	DSP
Support Quality Gate Reviews	n/a	CSPs	SPs	SPs & DCC Licensee
Execution of testing	SPs	SPs, RDPs, St Clements	SPs	Service Users & SPs
Test Issue management	SPs	DSP	DCC Licensee	DCC Licensee

Activity	Responsibility			
	PIT	SIT	OAT	UIT
Support of Test Issue management	n/a	SPs, RDPs, St Clements	SPs	SPs
Test Issue resolution	SPs	DSP	DCC Licensee	DCC Licensee
Support of Test Issue resolution	n/a	SPs, RDPs, St Clements	SPs, RDPs, St Clements	SPs, RDPs, St Clements
Release Management	SPs	DSP	DCC Licensee	DCC Licensee
Support of Release Management	n/a	SPs, RDPs, St Clements	SPs, RDPs, St Clements	SPs, RDPs, St Clements
Configuration Management	SPs	DSP	DCC Licensee	DCC Licensee
Support of Configuration Management	n/a	SPs, RDPs, St Clements	SPs, RDPs, St Clements	SPs, RDPs, St Clements
Test Progress Reporting	SPs	DSP	DCC Licensee	DCC Licensee
Support of Test Progress Reporting	n/a	SPs, RDPs, St Clements	SPs	SPs & Service Users
Test Assurance of Third Party components	SPs	n/a	n/a	n/a
Test Assurance of SP testing	DCC Licensee	DCC Licensee	n/a	DCC Licensee
Compliance of Test Activities with Joint Test Strategy, Test Approach, Test Plan	SPs	DSP	DCC Licensee	DCC Licensee
Acceptance of individual/joint SP solutions	DCC Licensee	DCC Licensee	n/a	n/a

Table 5 - Activity Responsibilities by Test Phase

## 9.4 Test Entry and Exit Criteria

### 9.4.1 Introduction

Formal testing will be gated by a set of generic and specific Entry and Exit Criteria operating at the Test Phase and Test Stage levels.

### 9.4.2 Generic Entry and Exit Criteria for all Test Phases

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

- Test Approach for Test Phase signed-off
- Test Phase Complete Certificate for preceding Test Phase issued, unless the plan is to overlap Test Phases

- Approval to Proceed Certificate issued by the DCC Licensee.

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

- production of agreed Work Off Plans for any outstanding Test Issues that occurred in the Test Phase
- compliance with DCC Requirements and Test Requirements
- Test Stage Complete Certificates issued for all Test Stages in the Test Phase.

### 9.4.3 Generic Entry and Exit Criteria for all Test Stages

The following generic Entry Criteria will gate the entry of all Test Stages:

- Test Stage Plan signed-off
- Test Specification prepared, including traceability to Requirements/Design documents
- Test Labs, Devices, Test Stubs, Test Environment, Test Data ready
- Test Stage Complete Certificate for preceding Test Stage issued, unless the plan is to overlap Test Stages.
- DCC Licensee and all relevant Third Parties have confirmed they have resources with the requisite skills and accesses available to support the Test Stage.

The following generic Exit Criteria will gate the exit of all Test Stages:

- all tests run, or any exceptions documented and agreed
- all Test Success Criteria (e.g. test pass rate) achieved, or any exceptions documented and agreed
- the number and severity of any outstanding Test Issues relating to core SMIP components is at or below the target thresholds, or any exceptions documented and agreed (see Table 6)
- Work Off Plan for any outstanding Test Issues has been produced
- test results documented and evidence captured
- set of test issue logs has been produced
- regression testing successfully completed
- Regression Test Pack has been prepared or updated.

The following table lists the standard target thresholds for outstanding Test Issues in each Test Stage, as defined in the SP Contracts [7], [8], [9].

Test Issue Severity	Pre-Integration Test				Systems Integration Test		OAT	User Integration Test	
	Unit	Link	System	FAT	Solution	UAT	OAT	Interface	End to End
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	15	15	15	15	15	15	15	5	5
4	30	30	30	30	30	30	30	15	15
5	60	60	60	60	60	60	60	30	30

Table 6 - Test Issue Thresholds

Note that:

- for Solution Testing and UAT, the figures shown above are per Service Provider (including Registration Data Providers), i.e. 15 Severity 3s for the DSP, 15 for CSP N and 15 for CSP C/S
- for Interface Testing, the figures shown above are per Service Provider and per large Supplier, i.e. 5 Severity 3s for Service Provider 1, 5 Severity 3s for Service Provider 2, 5 Severity 3s for large Supplier 1, 5 Severity 3s for large Supplier 2 etc.
- the SPs may set more stringent thresholds for Unit, Link, System and FAT in the Exit Criteria in their Test Stage Plans (e.g. no more than 10 Severity 3 test issues)
- Quality Gate Reviews may judge that the next Test Stage can start even if the target thresholds set in the Exit Criteria for the Test Stage Plan have not been achieved, provided that an agreed Work Off Plan is in place.

#### 9.4.4 Specific Entry and Exit Criteria for Test Phases

Specific Entry and Exit Criteria for each Test Phase will be listed in the relevant Test Approach document.

#### 9.4.5 Specific Entry and Exit Criteria for Test Stages

Specific Entry and Exit Criteria for each Test Stage will be listed in the relevant Test Plan document.

## 9.5 Test deliverables

### 9.5.1 General

The following sections list the Test deliverables for the programme.

### 9.5.2 By Test Phase

The table below lists the Test Phase deliverables.

Deliverable	Timing
PIT Approach	Final version to be submitted to DCC Licensee no later than 40 days before commencement of PIT
SIT Approach	Final version to be published (following approval by the SEC Panel, and allowing 14 days for appeal of the document) no later than 3 months before commencement of SIT
OAT Approach	Final version to be submitted no later than 40 days before commencement of OAT
IT Approach	Final version to be published (following approval by the SEC Panel, and allowing 14 days for appeal of the document) no later than 6 months before commencement of IT
E2E Test Approach	Final version to be published (following approval by the SEC Panel, and allowing 14 days for appeal of the document) no later than 6 months before commencement of E2E Testing
Enduring Test Approach	Final version to be submitted to the Secretary of State no later than 3 months before commencement of Enduring Testing
SRT Approach	Final version to be published (following approval by the SEC Panel, and allowing 14 days for appeal of the document) no later than 3 months before commencement of SIT
Test Phase Completion Report	Draft version to be submitted to DCC Licensee no later than 10 working days before planned end of test execution for the final test stage in the phase. Final version to be submitted on completion of test execution.

**Table 7 - Test Phase Deliverables**

### 9.5.3 By Test Stage

The table below lists the deliverables for each formal Test Stage.

Deliverable	Timing
Test Plan	Final version to be submitted to DCC Licensee no later than 30 working days before commencement of test execution
Test Execution Schedule	To be submitted to the DCC Licensee with the Test Plan
Test Specifications (includes test scripts and Requirements Traceability Matrix)	To be submitted to DCC Licensee no later than 20 working days before commencement of test execution
Test Readiness Reports	Issued weekly to the DCC Licensee, to start 20 working days before commencement of test execution

Deliverable	Timing
Test Execution Reports	Issued weekly for Unit and Link and daily thereafter to the DCC Licensee, for the duration of test execution
Test Results	Available for inspection by the DCC Licensee throughout test execution
Test Issue Log	Available for inspection by the DCC Licensee throughout test execution
Regression Test Pack	To be submitted to the DCC Licensee with the final Test Stage Completion Report
Test Stage Completion Report	Draft version to be submitted to the DCC Licensee no later than 10 working days before the planned end of test execution. Final version to be submitted to the DCC Licensee on completion of test execution.
Work-Off Plan	To be submitted to the DCC Licensee with the final Test Stage Completion Report

**Table 8 - Test Stage Deliverables**

#### 9.5.4 Maintenance

Updated versions of the Test Approach, Test Plans, Test Specifications and Regression Test Pack will be supplied to the DCC Licensee on the anniversary of the completion of End to End Testing, and on Contract Exit.

#### 9.5.5 Approvals

The SPs will submit test documents to the DCC Licensee for review and approval. The DCC Licensee will provide review comments (or approval) within 10 working days of receipt, and the SP will submit a version which addresses the comments within 10 working days of receipt.

## 10 Test Data, Stubs, Environments, Labs and Tools

### 10.1 Test Data

The SP managing each Test Phase is responsible for designing and sourcing the test data needed for that phase, and the relevant details will be included in the respective Test Approach or Test Plan documents. The following principles will apply to all Phases:

- no current live customer data will be used for any Test Stage, but anonymised or old live data is permitted (e.g. Xoserve's old live MPRN data will be used for SIT)
- where necessary, test data will be live-like
- each type of message will be covered
- sequences of messages of each type will be covered, in stateful or stateless protocols
- test data will be sourced in an efficient manner (e.g. generated by tools, or copied from live and anonymised).

Where a requirement is identified for Service Users, RDPs or St Clements Services Ltd to provide test data, the SP will inform the DCC Licensee in a timely manner so that the DCC Licensee can liaise with the relevant organisation to supply the data.



## 10.2 Test Stubs

A set of test stubs is required for both Pre-Integration and Systems Integration Testing, as listed in the following table.

Test Stub Name	Designed by	Created by	Used by	in which Test Phases	Comment
Meter stub	DSP/CSP	CSP	CSP	PIT, SIT	SIT will either use Devices or a significantly enhanced version of the PIT stub
Comms Hub stub	CSP	CSP	CSP	PIT, SIT	SIT will use Comms Hubs for functional testing, and a stub for performance testing
Parse & Correlate Software stub	DSP/Critical Software	DSP	DSP	PIT	
CSP SMWAN Gateway stub (aka CSP Simulator)	DSP/CSP	DSP	DSP	PIT	
DSP SMWAN Gateway stub (aka DSP Simulator)	DSP	DSP	CSP	PIT	Separate versions required for CSP N and CSP C/S
CSP Management Gateway stub	DSP/CSP	DSP	DSP	PIT	Implemented via Soap UI
DCC User Message Gateway stub (aka Service User Simulator)	DSP	DSP	DSP	PIT, SIT	
SMKI Repository stub	DSP/TSP	DSP	TSP	PIT	A SIT version will be required if the SMKI Repository is not available at the start of SIT
SMKI Services stub	TSP/DSP	TSP	DSP	PIT	

**Table 9 - Test Stubs**

These stubs will be specified and built during the design phase of the programme, during which time requirements for further stubs may emerge. For each test stub, the DCC Licensee will approve the design and conduct FAT. Note the following:

- there is no Registration Interface stub, because the interface is via SFTP
- there is no Enterprise Systems Gateway stub, because the interface is via SFTP.

## 10.3 Test Environments

### 10.3.1 General

The SPs each have their own set of test environments for performing functional and non-functional testing, and the environments in each set will become more live-like (in terms of features, integration and controls) as the DCC solution moves from Pre-Integration Testing through Systems Integration Testing and Operational Acceptance Testing to User Integration Testing.

A subset of these environments will be retained for Enduring Testing.

The following table demonstrates which Environment Types (i.e. logical environments) will be used and by whom during each stage of testing:

Environment Type	Pre-Integration Test				Systems Integration Test		OAT	User Integration Test	
	Unit	Link	System	FAT	Solution	UAT	OAT	Interface	End to End
Development	SPs	SPs	SPs	SPs					
System Test			SPs	SPs					
Systems Integration					DSP SPs	DSP SPs	DSP SPs	DSP SPs SUs	DSP SPs SUs
User Integration								DSP SPs SUs	DSP SPs SUs
Pre-Production			SPs	SPs	SPs	SPs	SPs		
Production			SPs	SPs	SPs	SPs	SPs		
Disaster Recovery							SPs		
Internal Test Labs	CSP	CSPs	CSPs	CSPs	CSPs	CSPs		SUs	SUs
Remote SU Test Labs									SUs Third Parties

**Table 10 - Test Environment Usage**

Note that the DSP's Sandpit environment will be used to support Pre-SIT with the CSPs, and Pre-UIT with the Service Users. It is not shown in the above table, but is described in Section 10.3.3.

Within each SP there will typically be multiple instances of each Environment Type, to facilitate parallel test activities.

Further details of test environments will be provided in:

- the Integrated Environment Plan
- the Test Approaches for each Test Phase
- the Test Plans for each Test Stage.

### **10.3.2 Sandpit Environment**

The DSP Sandpit environment will be used for Pre-SIT and Pre-UIT. It hosts only the Motorway elements of the DSP solution, and its logical architecture is shown in the following diagram.

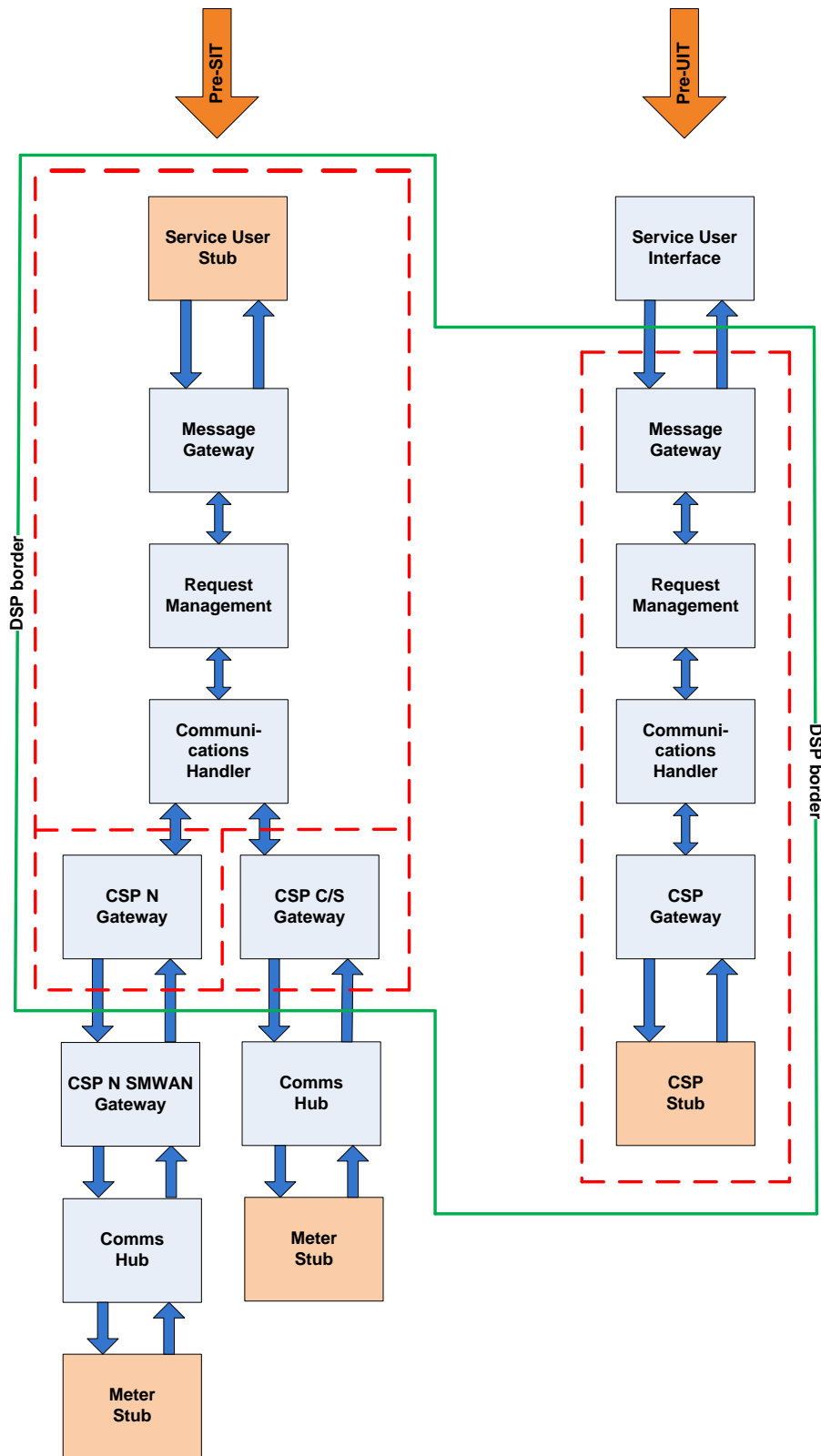


Figure 18 – Sandpit Environment

## 10.4 Environment Control

Each SP will control their own test environments, in terms of software/hardware configuration, access control and scheduling.

The environments for Systems Integration, User Integration and Operational Acceptance Test will span the SPs, and will be under the overall control of:

- the DSP for SIT and Interface Test
- the DCC Licensee for End to End Test, Enduring Testing and OAT.

The DSP will agree and implement the connectivity required across these environments, with support from all the parties involved.

The DSP will co-ordinate the scheduling of test environments and test labs owned by all parties involved in Systems Integration Testing and Interface Testing.

## 10.5 Test Labs

CSPs will establish Internal Test Labs containing multiple sets of Devices which provide the ability to simulate electricity load and gas flow and test the solution on all versions of Communications Hub. The Internal Test Labs will be used for CSP Pre-Integration Testing, as well as Systems Integration and Interface Testing.

From End to End Testing onwards, Service Users will be able to connect their own Remote Test Labs to the DCC test environment.

## 10.6 Test Tools

The following tool types will be used by the SPs across all Test Phases:

- test traceability
- test management
- progress reporting
- test issue management
- screen/log capture
- automated test execution
- performance test
- configuration management.

From Systems Integration Testing onwards the DSP will establish, manage and support a shared instance of a test issue management tool (e.g. HP's Application Lifecycle Management tool, aka Quality Center) for use by SPs, the DCC Licensee and Service Users, and supply up to 50 royalty-free licences in total. Further licences will be made available subject to commercial agreement between the DSP and DCC Licensee.

Details of the particular tools to be used in a particular Test Phase will be provided in the respective Test Approach and Test Plan documents.

## 11 Test Issue Management

### 11.1 General

The standard process for management of test issues is defined in the Test Issue Resolution Process [13], which also describes:

- the process for escalation (aka referral) where there is disagreement on the resolution of a test issue
- details of underpinning processes such as how to identify an impacted organisation, how/when to redact, share and publish information on test issues.

Test Phase variations to this standard process will be described in the relevant Test Approach document.

All Test Phases will have the following test issue management features in common:

- test issues will be logged in a repository by the person running the test
- full details of each test issue will be recorded in the repository, to enable speedy resolution and, where relevant, traceability back to requirements, design, build and test artefacts
- test issues will be triaged by the Triage Panel on a regular basis, in order to:
  - classify them
  - ensure sufficient information has been collected
  - set their Severity and Priority
  - assign them to the relevant resolver group
- a Test Issue Manager will regularly review outstanding test issues to ensure that they are resolved at the requisite speed, and will report progress to stakeholders.

Where a test issue impacts the SEC or any subsidiary documents, it will be confirmed in the Issue Resolution Board and referred to the SEC Panel (Secretary of State during Transition) to be reviewed and managed in accordance with the Issue Resolution Procedure set out in the SEC.

If the SEC is amended following Panel (or Secretary of State) review, the relevant subsidiary documents and any other documents referring to that part of the SEC will be re-aligned.

### 11.2 Classification and Lifecycle

The Triage Panel (TP) will classify each new test issue as one of:

- a test issue:
  - that prevents execution of a test
  - that causes an unexplained or unexpected outcome or response to a test

- not a test issue (e.g. a misunderstanding)
- duplicate
- change
- need more information.

The basic lifecycle for a test issue is shown in the diagram below.

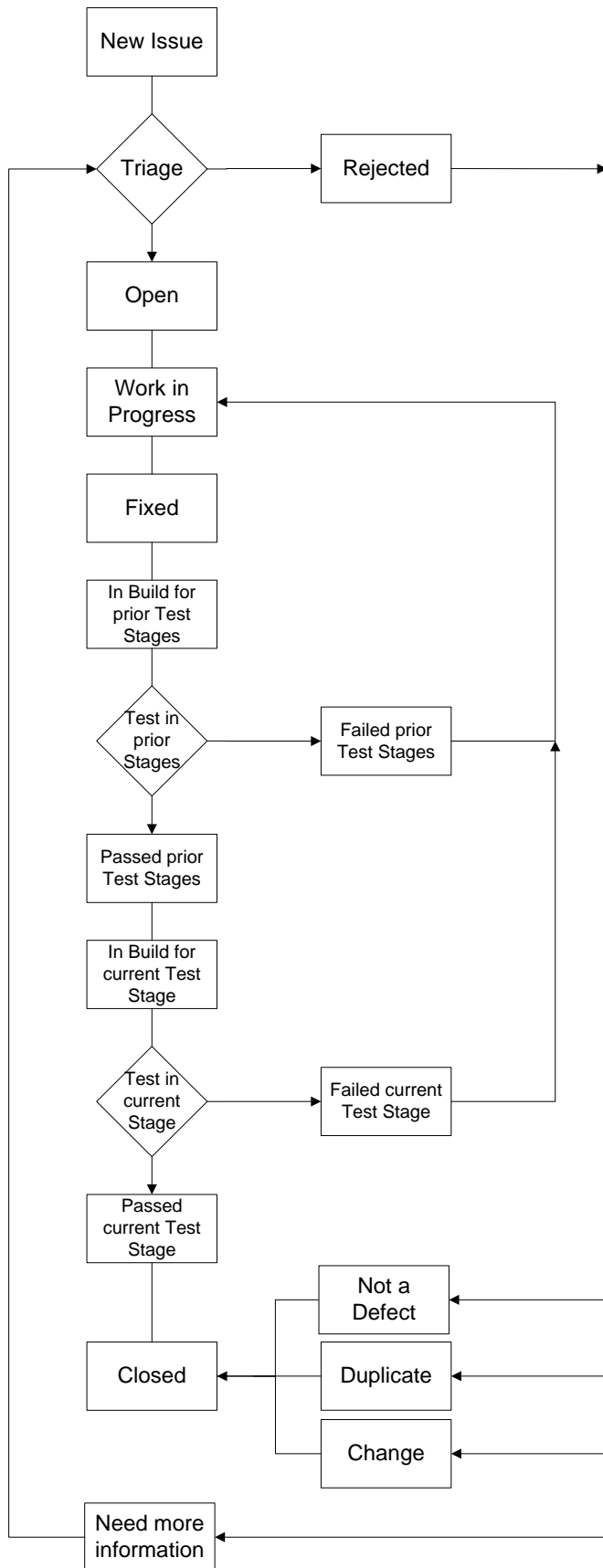


Figure 19 – Test Issue Lifecycle



Note that test issues can be passed back to “Triage” from various steps (e.g. “Failed previous Test Stages”), 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).

### 11.3 Test Issue Severities and Priorities

The following table lists the standard test issue Severities, as defined in the DSP and CSP contracts.

Test Issue Severity	Description
1	<p>An Issue which:</p> <ul style="list-style-type: none"> <li>prevents a Service User or large group of Service Users from using the Service User Systems;</li> <li>has a critical adverse impact on the activities of the DCC;</li> <li>could cause significant financial loss and/or disruption to the DCC services or Service Users; or</li> <li>results in any material loss or corruption of Data.</li> </ul> <p>Non-exhaustive examples:</p> <ul style="list-style-type: none"> <li>An Issue leading to Non-availability of the DCC Data Services;</li> <li>An Issue leading to Non-availability of the CSP Core solution element(s); or</li> </ul>
2	<p>An Issue which:</p> <ul style="list-style-type: none"> <li>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</li> <li>causes limited financial loss and/or disruption to the DCC</li> </ul> <p>Non-exhaustive examples:</p> <ul style="list-style-type: none"> <li>An Issue leading to Non-availability of the Network Management Centre;</li> <li>An Issue leading to loss of resilience of the SMWAN Gateway;</li> <li>Large areas of functionality will not be able to be tested; or</li> </ul>
3	<p>An Issue which:</p> <ul style="list-style-type: none"> <li>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</li> <li>has a moderate adverse impact on the activities of the DCC.</li> </ul>

Test Issue Severity	Description
4	<p>An Issue which:</p> <ul style="list-style-type: none"> <li>has a minor adverse impact on the activities of the DCC.</li> </ul> <p>Non-exhaustive examples:</p> <ul style="list-style-type: none"> <li>Minor service interruptions in the business process or functionality of the DCC Systems and / or service.</li> </ul>
5	<p>An Issue which:</p> <ul style="list-style-type: none"> <li>has minimal impact to the activities of the DCC.</li> </ul> <p>Non-exhaustive example</p> <ul style="list-style-type: none"> <li>Trivial issues with workarounds which are noted for future releases but minimal impact of running existing services</li> </ul>

**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**

Draft target response times for test issues raised in SIT onwards are listed in the following table, to be measured from the point at which the test issue is logged in the test issue management tool. The timings:

- assume that the Triage Panel (TP) and Issue Resolution Board each meet once a day
- are in working hours
- assume the working day is 08:00 to 18:00
- are for in-house supported system elements only: system elements supported by third parties are subject to the timings defined in the relevant contracts
- need to be adjusted for cases where a resolver group is not working to UK time.

Note that the targets are not binding and there are no penalties associated with non-achievement. Actual times will be reviewed and adjusted by the DSP after two months of SIT, and after one month of UIT.

Priority	Initial response completed	Triage completed	Assessed by resolver group	Fix time assessed
1	1 hour	4 hours	6 hours	18 hours
2	1 hour	Next TP	Next TP + 2 hour	Next TP + 14 hours
3	4 hours	Next TP	Next TP + 4 hour	Next TP + 22 hours
4	4 hours	Next TP	Next TP + 6 hour	Next TP + 30 hours

**Table 13 - Target Issue Response Times**

The checkpoints in the above table are defined as follows:

- Initial response completed: acknowledgement sent to the person raising the test issue
- Triage completed: the Triage Panel (either scheduled or emergency) has triaged the test issue and either a) assigned it to a resolver group, or b) escalated it to the Issue Resolution Board
- Assessed by resolver group: the resolver group has either accepted or rejected the test issue
- Fix time assessed: the resolver group has estimated how much effort it will take to fix the test issue.

Note also that there are no target fix times because:

- in a complex, bespoke system such as the DCC solution, there will be an extensive variation in fix times

- any such targets would be inconsistent with the existing Service Provider contracts
- Service Providers are already sufficiently incentivised to exit SIT and IT in a timely manner.

## 12 Dependencies

### 12.1 Introduction

This section describes the dependencies that need to be satisfied by teams/organisation outside the Test Team conducting the testing. Standard Entry Criteria (see Section 9.4) are not repeated here.

### 12.2 Test Phases

The following table lists the dependencies that need to be satisfied before each Test Phase can be started.

No.	Description	Test Phases	Dependent Upon
1	Device Selection Methodology agreed	SIT	DCC Licensee
2	Great Britain Companion Specification finalised	PIT	DECC
3	Devices available from meter manufacturers	SIT	DCC Licensee
4	Operational Acceptance Strategy	PIT	DCC Licensee
5	High Level Design for all solution elements agreed (including Service Management and SMKI)	PIT	Design Teams

Table 14 - Test Phase Dependencies

### 12.3 Test Stage Preparation

The following table lists the dependencies that need to be satisfied before Test Preparation of each Test Stage can be started.

No.	Description	Test Stages	Dependent Upon
1	Test Basis (i.e. the documents used to design test scripts) agreed	All	Design Teams
2	Test Stub design agreed	All	Design Teams
3	Test Environment design agreed	All	Design Teams
4	Code of Connection between SPs and SUs agreed	Pre-SIT	Security Team
5	Shared instance of HP ALM available	SIT	DSP
6	Schedule for delivering solution elements into Test published	All	Development Teams
7	Schedule for delivering test environments into Test published	All	Infrastructure Teams

Table 15 - Test Stage Preparation Dependencies

### 12.4 Test Stage Execution

The following table lists the dependencies that need to be satisfied before Test Execution of each Test Stage can be started.

No.	Description	Test Stages	Dependent Upon
1	Approval to proceed granted at Quality Gate Review	All	See Section 8.4.2.1.1
2	Release Management process agreed	All	DSP and SPs
3	Service User readiness assessed	Interface Test	DCC Licensee
4	Co-ordination of Service Users' involvement	Interface Test	DCC Licensee

**Table 16 - Test Stage Execution Dependencies**