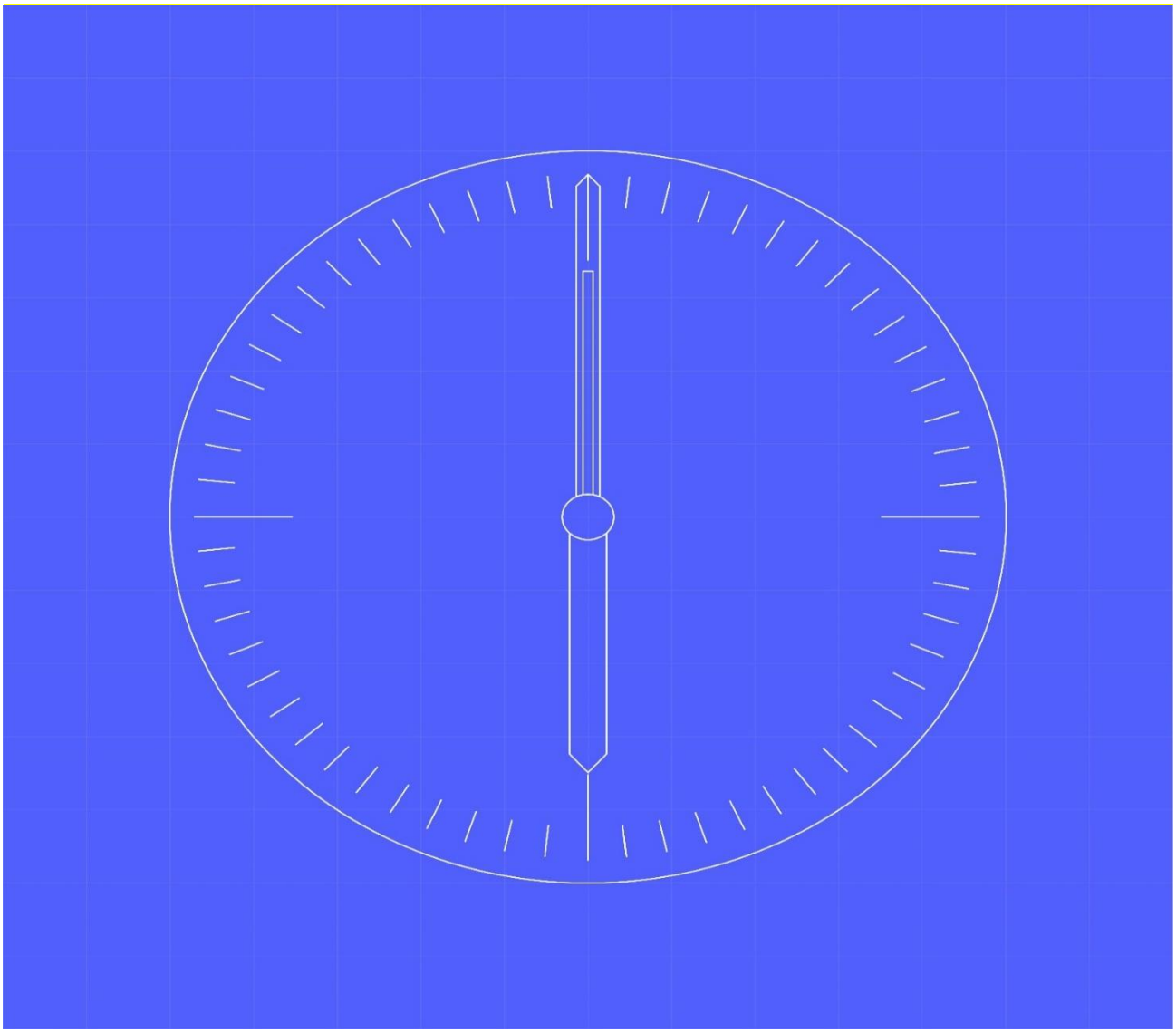
MHHS PROGRAMME
Industry-led, Elexon facilitated

Pre-Integration Testing Guidance



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1.1 Change Record

Date	Author	Version	Change Detail
23/12/22	Rakhee Shah	0.1	Initial structure and draft for LDP peer review. Content contributions from: • Dominic Mooney, LDP SIT Lead • Kate Goodman, Test Architect • Jason Brogden, Industry Programme Expert • Nigel Hunt, LDP Test Manager.
13/01/23	Rakhee Shah	0.2	Updated following comments from LDP review.
31/01/23	Rakhee Shah	0.3	Updated following comments from SRO and Code Delivery Bodies review.
31/01/23	Rakhee Shah	1.0	Approved version ready to be published on Programme Collaboration Base.
29/03/23	Rakhee Shah	1.1	Based on the PIT test deliverables templates, the following section no. have been updated: 5.3, 5.3.1, 5.5, 6.4, 7.1 and 8.1.
30/03/23	Rakhee Shah	1.2	Updated details on: Execution summary, change forecast, summary of changes, assumptions, PIT introduction, scope of PIT testing, PIT deliverables, test harnesses, test evidence and test assurance.
03/04/2023	Rakhee Shah	1.3	Updated following SRO review.
01/06/2023	Rakhee Shah	1.4	Updated additional information on: Test harness, PIT deliverable timelines for SIT participants, test assurance, layout changes and failure to exit PIT.
28/06/2023	Rakhee Shah	1.5	Updated DBT2 section based on Code Delivery Bodies walkthrough session and internal LDP review comments.
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18/08/2023	Rakhee Shah/Lee Cox	2.1	Section 1.2 – REF-18 added Section 5.7.2 – Revised to reflect IR2 aligned to CIT and IR5 to SIT Functional Updates throughout on DBT2 regarding change in position to remove DBT2 testing from Qualification obligations.
15/01/2024	MHHSP LDSO QT Team	2.2	Updates for qualification testing
15/01/2024	MHHSP LDSO QT Team	2.3	Version shared with QWG
03/04/2024	Code Bodies	2.4	Updates post QWG feedback
04/04/2024	MHHS NFT Team	2.5	Updates for NFT PIT + Section 5.1 PoaP Updated
08/07/2024	Lee Cox	2.6	Updates for Operational PIT
03/09/2024	MHHS NFT Team/Code Bodies	2.7	PIT NTF evidence guidance, suggested approach diagram for PIT NFT, REC NFR guidance for volumes. Additional guidance on evidence anonymisation/obfuscation to align with Data Protection standards

11/12//2024	Code Bodies/MHHSP SIT Team	2.8	Updates for CR55 and additional clarity of DIP Manager's Role

1.2 Reviewers

Reviewer	Role
Roger Robar	LDP Test Manager
Kevin Davis	Test Architect
Dominic Mooney	LDP SIT Manager
Jason Brogden	Industry Programme Expert
Code Delivery Bodies (BSC and REC)	Various
Adrian Ackroyd	SRO Client Programme Test Manager
Smitha Pichrikat	SRO Client Delivery Manager
James Stokes	DIP Manager Team

1.3 References

Reference	Document/Link	Publisher	Published	Additional Information
REF-01	MHHS-DEL315 E2E Testing & Integration Strategy	SI Testing	29th April 2022	
REF-02	MHHS-DES189 Design Artefact Matrix	Design Team	21st February 2023	
REF-03	MHHS-DEL872 SIT Scope for Voluntary Participant's Planning	SI Testing	06th March 2023	
REF-04	Baseline Design Artefacts	Design Team		
REF-05	MHHS-DEL1258 SIT Component Integration Testing Approach & Plan	SI Testing	19th July 2023	
REF-06	MHHS-DEL1118 Qualification Approach & Plan	BSC and REC Code Bodies	6th December 2024 2024	
REF-07	MHHS-DEL1049 PIT Approach and Plan Template	SI Testing	03rd April 2023	
REF-08	MHHS-DEL1050 PIT Requirements To Test Traceability Matrix Template (SIT)	SI Testing	03rd April 2023	
REF-09	MHHS-DEL1051 PIT Scenarios Template	SI Testing	03rd April 2023	
REF-10	MHHS-DEL1052 PIT Test Completion Report Template	SI Testing	03rd April 2023	
REF-11	MHHS-DEL1053 PIT Test Readiness Report Template	SI Testing	03rd April 2023	
REF-12	MHHS-DEL1054 PIT Test Execution Progress Report Template	SI Testing	03rd April 2023	
REF-13	MHHS-DEL1064 Placing Reliance Policy	SI Testing	27th April 2023	
REF-14	MHHS-DEL466 Defect Management Plan	SI Testing	29th February 2024	
REF-15	Simulators and Emulators	Sims & Ems		
REF-16	MHHS Outline Plan	PMO		
REF-17	MHHS-DEL1259 SIT Functional Test Approach & Plan	SI Testing	16th August 2023	

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Reference	Document/Link	Publisher	Published	Additional Information
REF-18	MHHS-DEL1275 Design Interim Release 2.3 Notes	Design Team	29th November 2023	
REF -19	Annex 1 - Non-SIT LDSO MHHS QT Approach & Plan	MHHSP	6th December 2024	
REF-20	Annex 2: Non-SIT Supplier and Agent MHHS Qualification Testing Approach and Plan	Code Bodies	6th December 2024	
REF-21	Annex 3: New Entrant Non-SIT LDSO MHHS Qualification Testing	Code Bodies	In development	
REF-22	MHHS-DEL1662 SIT Migration Test Approach and Plan	SI Testing	20th December 2023	
REF-23	MHHS-DEL2127 SIT Non-Functional Test Approach & Plan	SI Testing	19th April 2024	
REF-24	MHHS-DEL2417 SIT Operational Test Approach and Plan	SI Testing	12th April 2024	
REF-25	MHHS-DEL2437 Non-Functional Test Policy	SI Testing	18th March 2024	
REF-26	MHHS-DEL2128 NFR Categorisation	SI Testing	18th March 2024	
REF-27	BSC Assessment Criteria	Code Bodies	26th September 2024	
REF-28	REC Assessment Criteria	Code Bodies	25th June 2024	
REF-29	DIP Assessment Criteria	DIP Manager	Under Development	
[REF-30]	MHHS-DEL2667 PIT to Qualification Testing Requirements to Test Traceability Matrix LDSO, UMSO, REGS (Non-SIT)	Code Bodies	November 2024	
[REF-31]	MHHS-DEL2665 PIT to Qualification Testing Requirements to Test Traceability Matrix Supplier (Non-SIT)	Code Bodies	November 2024	
[REF-32]	MHHS-DEL2666 PIT to Qualification Testing Requirements to Test Traceability Matrix UMSDS (Non-SIT)	Code Bodies	November 2024	
[REF-33]	MHHS-DEL2991 PIT to Qualification Testing Requirements to Test Traceability Matrix MOA MSS (Non-SIT)	Code Bodies	November 2024	
[REF-34]	MHHS-DEL2668 PIT to Qualification Testing Requirements to Test Traceability Matrix SDS (Non-SIT)	Code Bodies	November 2024	

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Reference	Document/Link	Publisher	Published	Additional Information
[REF-35]	MHHS-DEL2992 PIT to Qualification Testing Requirements to Test Traceability Matrix MOA MSA (Non-SIT)	Code Bodies	November 2024	
[REF-36]	MHHS-DEL2669 PIT to Qualification Testing Requirements to Test Traceability Matrix ADS (Non-SIT)	Code Bodies	November 2024	

1.4 Terminology

Term	Description
Various	For terminology, see Programme glossary on the MHHS portal: Programme Glossary (sharepoint.com)

2 Executive Summary

The Market-wide Half Hourly Settlement programme (MHHS) when completed will contribute to a more cost-effective electricity system, encouraging more flexible use of energy and helping consumers lower their bills.

This document describes what is expected of all Programme participants with regard to Pre-Integration Testing (PIT), where each component Service (e.g. Load Shaping Service, Supplier's system, etc.) is tested in isolation by its owning organisation. PIT will include functional, migration, non-functional and operational testing.

All Market Participants intending to operate within the new MHHS arrangements are required to perform Pre-Integration Testing (PIT) to validate every system or service that is included in the full MHHS Design for compliance with the MHHS functional, migration, non-functional, and operational requirements. This includes back-office systems if affected. The system/service may have several components and PIT for Qualification refers to the testing conducted when those components have all been internally integrated and where all components are tested to ensure the Market Participant can perform all steps for their Market Role as defined within the MHHS Business Processes. This should include interfaces with any system within their architecture that generates or ingests information required as part of the MHHS Business Processes that may come from or go to systems not defined within the MHHS Design.

PIT is the responsibility of each Programme participant, using their own systems, test environments, test data, test artefacts (scenarios and test cases), test processes, test tools (apart from programme provided tools which are set out in section 5.6.1), test management tool and defect management process. Programme Participants may place reliance on PIT testing completed by a third party provider, subject to agreement. Please see section 5.4.2

Programme participants can follow either the SIT or non-SIT route for each of their roles to become MHHS Qualified. SIT Programme participants will execute SIT on an End-to-End basis to prove the MHHS design. Qualification Testing will be defined on a role-by-role basis and executed on an individual organisation level to assure the robust operation of Programme participants before they are allowed to start operating in the live MHHS arrangements.
Please note that this document has been updated to incorporate the PIT guidance for Non-SIT Programme Participants. For reading clarity, where PIT test phases have been completed by SIT Programme Participants (CIT and SIT Functional) then the information related to these test phases has been removed from the main body of this document and retained in an appendix.

3 Introduction

3.1 Document Purpose

This document sets out what is expected of all Programme participants regarding their own testing (PIT) whether the Programme participant chooses to go through the SIT or non-SIT route.

This document should be read in conjunction with the SIT Test Approach and Plan documents and in conjunction with [REF06] – Qualification Approach and Plan and its annexes, if a participant is completing qualification testing [REF-19, REF-20 and REF-21]. Qualification Participants should also refer to the BSC and REC Assessment Criteria [REF-27, REF-28. Participants should also refer to the DIP Manager Assessment Criteria [REF-29]. In this document, readers will also be sign posted to other documents where relevant.

Note: Some of the documents which are sign posted may be produced at a later stage or further information will be available in future iterations.

The PIT guidance covers:

- Scope and objectives;
- PIT section covering:
    - PIT overview;
    - PIT stages including:
        - PIT for SIT Programme participants;
        - PIT for non-SIT Programme participants;
    - Scope and test coverage for PIT;
    - PIT preparations including:

        - Programme participants adopting the Placing Reliance Policy; and
        - PIT entry criteria.
    - PIT deliverables for:
        - SIT Programme participants (including phased approach for entry into SIT);
        - Non-SIT Programme participants;
    - PIT execution including test harnesses;
    - PIT completion including:
        - Test evidence (how to provide, where to store and retention period of test evidence);
        - PIT exit criteria; and
        - Failure to exit PIT.
    - Test assurance including:
        - Assurance overview;
        - Test assurance scope;
        - Test assurance approach;
        - Assurance criteria;
        - Engagement;
        - Outputs; and
        - Roles and responsibilities.

3.2 Intended Audience

This document is intended to be read by the following groups:

- Lead Delivery Partner (LDP)
- SRO Function (SRO)
- Code Bodies
- DIP Manager
- MHHS Programme participants who are required to participate in SIT and Qualification Testing
- Any Programme participant who intends to become a DIP User (as defined by the DIP Rules)
- Software providers to the above Programme participants
- Independent Programme Assurance (IPA).

3.3 Reviews and Approvals

The Pre-Integration Testing Guidance document will go through an initial formal review by the drafting team. Upon completion of initial review, it will then go through a formal review by the SRO, LDP, DIP Manager and Code Bodies teams as well as industry review.

3.4 Change Forecast

The MHHS SI Test Team, in conjunction with Code Bodies and DIP Manager, will own this document and keep it up to date, with review and approval by MHHS Programme governance as appropriate. Each new version supersedes the previous version in its entirety. Updates to this document will follow the review and approval process outlined above in Section 3.3 - Reviews and Approvals.

3.5 Summary of Changes

The updates incorporated into V2.8 of this document are as follows:

- Updates to align dates to CR55
- Additional guidance on role of DIP Manager

3.6 Assumptions

The following assumptions have been made in this document, which may be revised in later versions:

- Any further information required for entry into SIT will be specified (current or future versions) in SIT Approach & Plan (per stage); and

Any further information required for entry into Qualification Testing will be specified in [REF-06] MHHS-DEL1118 Qualification Approach and Plan and supporting annexes.

4 Scope and Objectives

4.1 Objectives

The objective of this PIT guidance is to define the principles of what is expected of Programme Participants regarding their PIT including successful PIT exit. It also describes the related obligations and activities of the MHHS Programme , Code Bodies and DIP Manager.

4.2 Scope

The scope of this document covers:

- The requirements for PIT which refers to the design, build and test activities required to enter either SIT or Qualification Testing, depending on the path the Programme participant intends to take;
- Phased approach for PIT for SIT Programme participants; and
- Exit from PIT which will be assured by the MHHS SI Test Team (for SIT Programme participants) and Code Bodies, and DIP Manager where applicable with evidence provided through access to RTTM and evidence of materials, in conjunction with Qualification Testing test managers (non-SIT Programme participants).

4.3 Out of Scope

The following is not within the scope of this document:

- For those Programme participants conducting SIT, details of the entry requirement criteria will be specified in the following separate deliverables:
  - SIT Approach & Plan (per test stage) - produced by the MHHS SI Test Team with the Code Bodies consulted and industry review through Programme governance. The separate documents per stage are:
    - [REF-05] SIT Component Integration Testing Approach & Plan;
    - [REF-17] SIT Functional Testing Approach & Plan;
    - [REF-22] SIT Migration Testing Approach & Plan;
    - [REF-23] SIT Non-Functional Testing Approach & Plan; and
    - [REF-24] SIT Operational Testing Approach & Plan.
- For those Programme participants conducting Qualification Testing, details of the entry requirement criteria will be specified in the following separate deliverables:
  - [REF-06] MHHS-DEL1118 Qualification Approach & Plan and supporting annexes - produced by the Code Bodies and DIP Manager with the MHHS SI Test Team consulted and industry review through Programme, BSC and REC PAB governance.

5 Pre-Integration Testing

PIT refers to the Design, Build and Test activities required to enter into either Systems Integration Testing (SIT) or Qualification Testing (QT), depending on the path the Programme participants intends to take. PIT will be performed by all participants, whether this is via the SIT route or non-SIT Qualification route. PIT testing should include all participant systems and processes required to support the MHHS requirements which fall within the scope of the BSC, REC and DIP Rules.

Please note that as DUoS reports (REP900 and REP901) are part of the MHHS design they are not considered consequential change but the accuracy of those reports would be e.g. LDSO PIT should include tests to show they can generate a REP900 and REP901 report and the format is in line with the MHHS design but PIT activity to confirm the values within the report are being generated in line with the DCUSA would be considered consequential change as such an LDSO would not be expected to provide information on this within their submitted PIT deliverables.

5.1 Pre-Integration Testing Overview

The PIT phase is focused on the Programme participants' own testing, proving that they have designed, developed and tested their systems and that their systems align to the requirements within the MHHS E2E Design. Programme participants will be required to provide testing results that demonstrates their compliance with their systems functional, non-functional, operational and migration requirements relevant to their role in the market and specified in the MHHS E2E Design.

The PIT test phase will comprise the following different types of testing:

- Functional including negative testing:
- Migration covering elements of the migration design to be delivered by MHHS Qualified participants only;
    - Please note, there are legacy activities all parties need to deliver for go live (M10) to support migration which are being managed under BSC and REC performance assurance frameworks and not covered by MHHS Qualification. Parties may choose to test these elements alongside their MHHS PIT activities if they can achieve this whilst still meeting the required deadline; however, the MHHS Programme / Code Bodies will not be assuring these elements through MHHS Programme activities.
- Non-Functional:
    - Operational SLAs/Performance Efficiency: Performance testing of each programme participant's solution at expected loads, defined within the NFR, Message Modelling documents based on participant MPAN co-efficient (% of MPANs a participant has Vs the network total). Consisting of a Full Performance/Capacity/Load Test Suite:
        - Low volume initial testing
        - Peak volume - including migration and Operational Choreography throughput
        - Full stack assurance – all areas of participant infrastructure
        - Extended soak - including migration, Operational Choreography, effectively a day(s) in the life of a Participants system, including scheduled jobs/batches etc.
        - Spike (where applicable to design)
    - Component Resilience (Component defined as server/interface/container/adapter levels of infrastructure)
    - Recoverability (Data Loss) - Error handling (simulation of DIP issues at volume/buffering NFRs)
    - Migration and Operational Choreography - processing within defined windows of activity as defined for this area of processing, additional testing of message handling when inbound/outbound traffic misses set processing windows. With the inclusion of a viable set of ballast data for processing; and
    - Observability.
    - Security – As the majority of current NFRs around security are related to levels 1 through 4 validation this area will be covered during SIT/QT phases, where a DIP instance is available
- Operational;
    - Review and, where practicable, exercise Business Continuity & Disaster Recovery Processes

  - Message System Error Handling and Fault Management Processes
  - Inclusion of the relevant Business Requirements documented in Paragraph 5.9 of the [REF - 24] MHHS-DEL2417 SIT Operational Test Approach and Plan or BSC or REC or DIP Manager Assessment Criteria for non-SIT participants [REF- 27, REF-28 and REF-29], noting this should be a minimum and each participant should be fully testing all Operational Requirements associated with their Market Role
  - For non-SIT participants, Operational Choreography if not part of non-functional test scope
- Regression.

PIT is the responsibility of each individual participant using their own:

- Systems;
- Test Environments;
- Test Data;
- Test Scenarios;
- Test Cases;
- Test Processes;
- Test Tools including any additional test harnesses outside of the programme provided tools described in section 5.6.1;
- Test Management Tool; and
- Defect Management Process.

PIT must be performed by each individual Participant using their own system, or if they are placing reliance on a third party software or IT provider and the enduring solution is being hosted elsewhere, testing will take place in the host environment.

5.2 Scope for PIT

In PIT, each component system (e.g. Data Integration Platform – DIP, Load Shaping Service, and Supplier's system) is tested in isolation by its owning organisation. This testing demonstrates the systems work as designed when running in a standalone manner and comply with the MHHS E2E Design.

Programme participants are expected to use the [REF-04] Baseline Design Artefacts and the [REF-02] MHHSP-DES189 Design Artefact Matrix on the Programme Collaboration Base to identify their scope of testing based on their market role especially to support identifying role specific business requirements,

Further, for information regarding all Programme Testing, Programme participants are encouraged to visit MHHS Website or Programme Collaboration Base to enhance their ability to identify the scope of their PIT.

For both SIT and non-SIT Participants, we will expect Programme Participants as part of their PIT to demonstrate that the processes have been tested in their environment in an end-to-end manner as they will operate in the live system. For participants who are placing reliance on service providers and as such some elements are being carried out within service provider's test environments, it is expected there will be further PIT testing to show that software has been successfully deployed and integration into the enduring host environment. If this element of PIT cannot happen prior to Qualification Testing due to participant being dependant on their service provider completing testing, this should be documented with a participants' PIT Test Approach and Plan so that this can be agreed with Code Bodies and where applicable DIP Manager.

Existing market participants who are incorporating the new MHHS requirements into existing systems and processes should demonstrate that the outcome from business processes previously assessed through code qualification is not impacted by MHHS. For example, Code Bodies will require evidence from Suppliers that their customer gains process has been updated to recognise the new DIP interactions and the new agent appointment process. Existing Metering Equipment Managers (MEMs) will need to demonstrate that their process for managing Meter Technical Details (MTDs) and sharing with other market participants have been updated to recognise the new DIP interfaces and the new market roles within DTN messages.

5.2.1 Test Coverage for PIT

To define test coverage, Programme participants are expected to reference the MHHS E2E Design available on the Programme Collaboration Base to enable each Programme participant to produce a Requirements to Test Traceability Matrix (RTTM) for PIT. Participants are expected to test the full elements of MHHS design that are applicable to their market role. These artefacts are sign-posted in [REF-02] MHHSP-DES189 Design Artefact Matrix (where all the MHHS Design Artefact Types are referenced).
This approach applies to all types of testing (e.g. functional, migration, non-functional, operational). Programme participants are responsible for producing PIT test scenarios and cases based on their market role.

The test scenarios in the PIT test phase should be mapped back to the corresponding MHHS Design so that the breadth of test coverage can be measured and verified. This should be done by the Programme participant responsible for producing the test cases. Programme participants as a minimum should consider all role specific requirements, all role relevant interfaces (including any business validation requirements) and business processes. As such, PIT coverage should be wider than exchange of messages with DIP. PIT test coverage should also consider negative testing.

Test coverage must be demonstrated by Programme participants prior to test execution commencing and any subsequent changes must be updated at test completion. We expect the scope of PIT testing and therefore PIT evidence to reflect the scope of testing that will be required to be executed in either SIT or Qualification Testing. Please note, as programme participants are expected to test the full elements of MHHS design that are applicable to their market role, PIT scope may be wider than agreed test coverage for Qualification Testing.

Please see section 5.4.1 for placing reliance considerations.

For Programme Participants' NFT coverage, where DIP Connection Provider (DCP) are planned to be utilised, these must fall within the PIT infrastructure under test as a means of providing the necessary evidence for meeting Data Loss, Time Behaviour and Availability based NFRs.

5.3 PIT Stages

PIT relevant to entry into SIT may be carried out in several stages i.e. PIT in readiness for CIT, SIT Functional, SIT Migration, SIT Non-Functional, SIT Operational, as shown in the figure below.

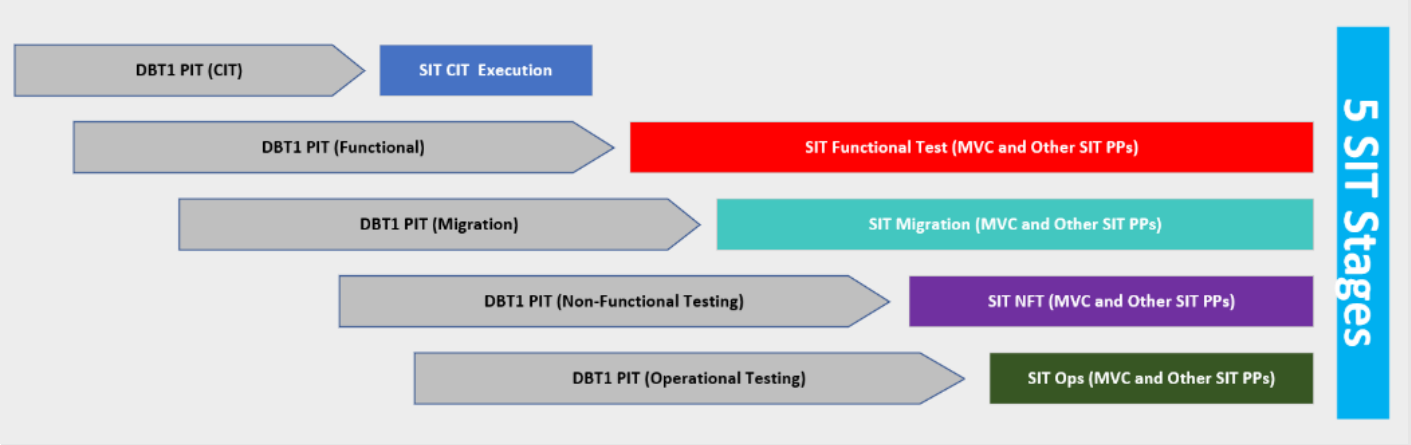

Figure 1 PIT Phased Approach for Entry into SIT

Participants will then be required to provide successful PIT completion for each phase of SIT. Please see further details in section 5.5**Error! Reference source not found.**

Participants choosing the Qualification Testing route, apart from non-SIT LDSOs, will be expected to meet a single PIT completion date which should cover functional, migration, non-functional and operational PIT in readiness for Qualification Testing. For Non-SIT LDSOs, there will be two PIT completion dates, with one set of activities to cover functional and migration and a second set to cover non-functional and operational.

Where a participant identifies this is not possible and some elements of PIT may need be completed in parallel or following Qualification Testing, the participant must document this within their PIT Approach and Plan to enable this to be agreed with Code Bodies and the DIP Manager where applicable. An example of this may be where a

participant is reliant on system functionality being proven through functional testing before it can be deployed / integrated into a participant's enduring environment.

5.4 PIT Preparations

PIT is the responsibility of each individual Programme participant, using their own systems[1], test environments, test data, test scenarios, test cases, test processes, test tools (apart from programme provided test harnesses which are set out in 5.6.1), and test management tool and defect management process.

Programme participants are expected to produce test preparation deliverables such as Test Approach and Plan, Requirements to Test Traceability Matrix (RTTM), Test scenarios, Test Readiness Report, Test Execution Progress Report and Test Completion Report. See Section 5.5 PIT Deliverables for further details.

5.4.1 Programme Participant's adopting the Placing Reliance Policy

The MHHS 'Placing Reliance Policy' [REF-13] can be adopted where Programme participants conducting PIT can either:

1. Intend to delegate some or all their PIT testing to a 3rd Party Software/IT Provider; or
2. Intend to conduct PIT as a group and delegate or place reliance within that group.

In either case, the accountability remains with the Programme participant's market role defined organisation to declare, organise the execution of and evidence their completed test coverage.

How Programme participants choose to delegate PIT obligations may differ between participants. The details associated with a Programme participant's proposal along with how it would be practically delivered needs to be documented in the Programme participant's PIT Approach and Plan.

We expect the scope of PIT testing and therefore PIT evidence to reflect the scope of testing that will be required to be executed in Qualification Testing, given any agreed Placing Reliance Policy submission.

If a Programme Participant is Placing Reliance on functional testing carried out by a third-party software / IT provider, there may be additional testing requirements to evidence that the software has been successfully deployed within the Programme Participant's environment including any internal integration with the third-party software / IT solution. It is expected that for some Programme Participant that this may not be possible prior in timeline set out in section 5.5 as they are reliant on system functionality being proven through functional testing before it can be deployed / integrated into a participant's enduring environment. As set out in section 5.5, this should be documented in the PIT Test Approach & Plan so that this can be agreed with Code Bodies and where applicable, DIP Manager.

Subject to the level of placing reliance agreed, there may be some scenarios in which the PIT deliverables expected for participants may vary. For example, if it is agreed that a participant may place full reliance on functional testing, including PIT, then it may be agreed that PIT deliverables to be submitted should only cover migration, non- functional and operational aspects. This would be agreed on a case-by-case basis.

Subject to the level of placing reliance agreed, there may be some scenarios in which the PIT deliverables expected for participants may vary. For example, if it is agreed that a participant may place full reliance on functional and non-functional testing, including PIT, then it may be agreed that PIT deliverables to be submitted should only cover migration and operational aspects. This would be agreed on a case-by-case basis.

Please refer to section 10.3 in [Ref 19] MHHS-DEL1118 Qualification Approach and Plan for more information on Placing Reliance for non-SIT Programme Participants.

5.4.2 PIT Entry Criteria for All Programme Participants

Programme participants can define their own PIT entry criteria, however all test deliverables detailed in Section 5.5 - PIT Deliverables must be provided.

[1] Please see section 5.4.1 for more guidance on the expectations where placing reliance has been agreed.

5.5 PIT Deliverables

Programme participants are responsible for managing their own testing process and will be required to demonstrate completion of their own internal PIT.

MHHS SI Test Team acknowledge that Programme participants will be using different methodologies and frameworks but how Programme participants deliver their testing should be aligned with the MHHS Programme's PIT Guidance. Each Programme participant undertaking PIT will be expected to provide the following test deliverables to the MHHS SI Test Team and/or Code Bodies/DIP Manager.

- PIT Approach and Plan;
- Requirements to Test Traceability Matrix (RTTM) for PIT [2]– to assist Programme Participants in this area, the SI has created [REF-24] for guidance on evidencing NFRs and viable phases these should be tested in;
    - Please note: for non-SIT participants there is a separate PIT RTTM template for each role they are expected to be used [REF-30, REF-31, REF-32, REF-33, REF-34, REF-35 and REF-36].
- PIT Test Scenarios; and
- PIT Test Completion Report.

Additionally, SIT participants, during PIT preparation and PIT test execution, Programme participants will also be expected to provide regular progress reports (including Test issues & defects):

- PIT Test Readiness Report; and
- PIT Test Execution Progress Report.

SIT Participants will have to produce the above PIT deliverables for CIT, Functional, Migration, Non-Functional and Operational testing. Any PIT activities related to each phase must be evidenced and assured before the appropriate SIT Phase commences.

Whilst Programme Participants are expected to complete PIT ahead of QT (in line with the below timeline), if a Programme Participants identifies that there may be some elements of PIT that need to be completed in parallel or following SIT / QT then Programme Participants should follow the guidance set in section 5.3.

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MHHS SI Test Team have provided templates for the above test deliverables which are held in the Programme Collaboration Base. As far as possible, it is expected that participants make use of the provided templates. Please see table below:

Please note: for Qualification Testing there is a specific RTTM per role that non-SIT participants are expected to use.

Reference	MHHS Reference Number	Template Name
[REF-07]	MHHS-DEL1049	PIT Approach and Plan Template
[REF-08]	MHHS-DEL1050	PIT Requirements to Test Traceability Matrix Template (SIT only)
[REF-09]	MHHS-DEL1051	PIT Test Scenarios Template
[REF-10]	MHHS-DEL1052	PIT Test Completion Report Template
[REF-11]	MHHS-DEL1053	PIT Test Readiness Report
[REF-12]	MHHS-DEL1054	PIT Test Execution Progress Report
[REF-30]	MHHS-DEL2667	PIT to Qualification Testing Requirements to Test Traceability Matrix LDSO, UMSO, REGS (Non-SIT)
[REF-31]	MHHS-DEL2665	PIT to Qualification Testing Requirements to Test Traceability Matrix Supplier (Non-SIT)

[2] Code Bodies will be producing an updated RTTM template for Non-SIT participants to complete

[REF-32]	MHHS-DEL2666	PIT to Qualification Testing Requirements to Test Traceability Matrix UMSDS (Non-SIT)
[REF-33]	MHHS-DEL2991	PIT to Qualification Testing Requirements to Test Traceability Matrix MOA MSS (Non-SIT)
[REF-34]	MHHS-DEL2668	PIT to Qualification Testing Requirements to Test Traceability Matrix SDS (Non-SIT)
[REF-35]	MHHS-DEL2992	PIT to Qualification Testing Requirements to Test Traceability Matrix MOA MSA (Non-SIT)
[REF-36]	MHHS-DEL2669	PIT to Qualification Testing Requirements to Test Traceability Matrix ADS (Non-SIT)

Table 1 PIT test deliverables templates

Note 1: For SIT, Programme participants are expected to supply the PIT Requirements to Test Traceability Matrix using the template provided. For all other test deliverables, Programme participants can choose to use their own templates provided all the required information specified in the MHHS templates is included.

Note 2: For non-SIT Programme participants, are expected to supply all PIT test deliverables using the templates provided.

5.5.1 Timescales for PIT Deliverables for SIT CIT Programme Participants

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.1 Timescales for PIT Deliverables for SIT CIT - Interval 1

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.2 Timescales for PIT Deliverables for SIT CIT - Interval 2

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.3 Timescales for PIT Deliverables for SIT CIT - Interval 3

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.4 Timescales for PIT Deliverables for SIT CIT - Interval 4

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.5 Timescales for PIT Deliverables for SIT CIT - Interval 5

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.1.6 Timescales for PIT Deliverables for SIT CIT - Interval 6

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.2 Timescales for PIT Deliverables for SIT Functional Programme Participants

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.3 Timescales for PIT Deliverables for SIT Migration Programme Participants

Pre-Integration Testing Guidance

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.5.4 Timescales for PIT Deliverables for SIT Non-functional Programme Participants

This section describes the details of activities and deliverables associated to PIT for SIT Programme participants for their readiness to enter SIT Non-Functional stage.

Table below shows the PIT deliverable milestones associated to PIT Non-Functional Testing for both MVC and all other SIT Programme participants in readiness to enter SIT Non-Functional. Please note the table below has been updated to reflect the CR055 timelines:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	27th Sep 24 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	11th Oct 24 24***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	01st Nov 24*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	01st Nov 24
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	22nd Nov 24**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	29th Nov 24
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	08th Nov 24
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	29th Nov 24**
SIT Non-Functional Ready to Start (SITAG Milestone)	SITAG Milestone - 1 week prior to SIT NFT Start for all SIT Programme participants (MVC and other SIT Programme participants)	10th Jan 25
SIT Non-Functional Start	SIT NFT Start (MVC and Other SIT Programme participants)	13th Jan 25 ****

Table 2 PIT Deliverable Milestones for SIT Non-Functional Testing

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT Non-Functional.

Note 2** – For the purpose of this plan, this is the final PIT Test Execution Progress Report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT Test Readiness Report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Note 4**** - This date is as per the current Programme Plan (v6.13) and does not incorporate any changes to Settlement Testing.

5.5.5 Timescales for PIT Deliverables for SIT Operational Programme Participants

This section describes the details of activities and deliverables associated to PIT for SIT Programme participants for their readiness to enter SIT Operational stage.

Table below shows the PIT deliverable milestones associated to PIT Operational Testing for both MVC and all other SIT Programme participants in readiness to enter SIT Operational. Please note that the table below has been updated to reflect the CR055 timelines:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	27th Sep 24 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	11th Oct 24 ***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	1st Nov 24 *
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	1st Nov 24*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	22nd Nov 24**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	29th Nov 24 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	08th Nov 24 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	29th Nov 24 (No later than*)
SIT Operation Ready to Start (SITAG Milestone)	SITAG Milestone - 1 week prior to SIT Operation Start for all SIT Programme participants (MVC and other SIT Programme participants)	17th Jan 25
SIT Operation Start	**SIT Operation Start (MVC and Other SIT Programme participants)**	03rd Feb 25 ****

Table 3 PIT Deliverable Milestones for SIT Operational Testing

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT Operational.

Note 2** – For the purpose of this plan, this is the final PIT Test Execution Progress Report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT Test Readiness Report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.
Note 4****** - This date is as per the current Programme Plan (v6.13) and does not incorporate any changes to Settlement Testing.

5.5.6 Timescales for PIT Deliverables for Non-SIT Programme Participants

This section describes the details of activities and deliverables associated to PIT for Non-SIT Programme participants for their readiness to enter Qualification Testing. Please also refer to [REF-06] MHHS-DEL1118 Qualification Approach & Plan and associated annexes.

Deliverable Submission Timeline						
Activity Milestone	**Action**	**Non-SIT LDSO QT**	**Wave 1**	**Wave 2**	**Wave 3**	**Wave 4**
PIT Approach and Plan (functional and migration)		26 April 2024	26 April 2024	26 April 2024	26 April 2024	26 April 2024
PIT Approach and Plan (Non-functional and Operational)		1 July2024	26 April 2024	26 April 2024	26 April 2024	26 April 2024
Final PIT Approach and Plan		N/A	25 October 2024	29 November 2024	31 January 2025	28 March 2025
PIT Requirements to Test Traceability Matrix (functional and migration)	At least 3 months before PIT completion. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	3 June 2024	14 April 2025	16 June 2025	11 August 2025	6 October 2025
PIT Test Scenarios (functional and migration)	PIT Test Scenarios issued same day as RTTM	3 June 2024	14 April 2025	16 June 2025	11 August 2025	6 October 2025
PIT Requirements to Test Traceability Matrix (Non Functional and Operational)	At least 3 months before PIT completion. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	12 July 2024	14 April 2025	16 June 2025	11 August 2025	6 October 2025
PIT Test Scenarios (Non Functional and Operational)	PIT Test Scenarios issued same day as RTTM	12 July 2024	14 April 2025	16 June 2025	11 August 2025	6 October 2025
Programme participants issue draft-PIT Test Completion Report (Functional and Migration)	At least 2 months before PIT completion, ~~draft~~ PIT Test Completion Report submitted.	26 July 2024	14 May 2025	8 July 2025	10 September 2025	26 October 2025

PIT Execution (Functional and Migration)	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	30 August 2024	14 July 2025	8 September 2025	10 November 2025	9 Januaryr 2026*
PIT Execution (Non- Functional and Operational)	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	30 September 2024	14 July 2025	8 September 2025	10 November 2025	9 January 2026
Programme participants issue final PIT Test Completion Report (Functional and Migration)	Final PIT Test Completion Report submitted and allowing for any test completion delta	~~2~~ 30 September2024	14 July 2025	8 September 2025	10 November 2025	9 January 2026
Programme participants issue final PIT Test Completion Report (Non-Functional and Operational)	Final PIT Test Completion Report submitted and allowing for any test completion delta	30 September 2024*	14 July 2025	8 September 2025	10 November 2025	9 January 2026

* As it is expected that non-SIT LDSO participants may not complete functional PIT for MPRS by the final functional PIT TCR submission date, this TCR submission should also include MPRS aspects

Table 4: Deliverable Submission Timeline

5.6 PIT Execution

Each Programme participant will use and manage its own test processes, resources, test environments, test data, test tools (apart from programme provided test harnesses which are set out in 5.6.1 and test labs for PIT, noting the need to report progress to the MHHS SI Test Team and/or Code Delivery Bodies. Regardless of the development methodology used, there will be an activity performed towards the end of development, where the Programme participant performs business and/or acceptance testing of its integrated solution.

The PIT NFT environment must be representative of the planned production infrastructure, ideally, scaled to the planned size of the production environment to be implemented as part of this programme. This will ensure that results and analysis taken from this phase of testing will be representative of the system once live, if this is not the case, this will be resolved via bi-lateral meetings with the SI team where this is related to SIT, in the case of Qualification Testing, these meetings will be handled via Code Bodies and/or DIP Manager and relevant Test Manager for the qualification pathway.

As part of NFT delivery within PIT, where there are specific NFRs around data growth or processing timings, for example the 84 day timeline for the Final Reconciliation Run within the Operational Choreography, Message volume growth of 25% over 5 years etc., evidence of these being taken into consideration during PIT execution, namely by increases in both the volumes of messages being processed and data storage will also form part of the expected assurance being carried out during the NFT PIT phase.

5.6.1 Test Harnesses

In principle, each Programme participant will be testing its own system(s) in a stand-alone manner and each party needs to develop any test harnesses/stubs it needs to adequately test its own systems. These mechanisms need to exercise the proving of the message sending and receipt. Please reference [REF-01] MHHS-DEL315 E2E Testing Integration Test Strategy.

However, the Programme has produced a test stub for use by participants, for functional testing, in order to aid and evidence PIT – DIP Simulator
Please note, currently the programme is not scheduled to provide any test stubs for PIT above that listed above.

Each Programme participant must provide test evidence of a final test execution run covering all applicable IF messages and receipts of PUB messages using the DIP Simulator. The DIP Simulator will provide logging of the success or failure of IF messages received by the DIP Simulator. These DIP Simulator logs must be used as part of evidence for PIT completion, together with logs showing full details of the messages sent and received (the full details will be provided by the Programme participant and not by the DIP Simulator functionality). Please see section 5.7.3 - Test Evidence. Please note, the DIP Simulator has not been built to support volume testing and should not be used for this purpose.

As stated, the DIP Simulator has been built around functional requirements only, no testing of this simulator has been carried out at volume, meaning that for performance testing to be carried out during this phase. Programme Participants would require creating their own Test Stubs/Harnesses for this area of their solution. However, where DIP Adapter vendors have carried out their own capacity testing using similar tools, re-use of these is acceptable.

There is a centrally hosted version of the DIP simulator. There is also an option to locally host the DIP simulator.

The Programme's and Code Bodies' preference is for the centrally hosted version of the DIP simulator to be used for the provision of PIT evidence due to the complexity of security configurations. It has been deemed that usage of locally hosted DIP SIM instances shall also be permissible for the provision of test evidence to support PIT phase testing activities.
In the case of locally hosted versions, the Programme and Code Bodies would like an assertion from the Programme Participants as to why they feel confident that the security configuration has been appropriately implemented – in order to provide confidence that there will not be issues encountered when it comes to full integration for the SIT or QT phase

- The key security parameters that form part of such an assertion are use of API Keys, mTLS implementation and evidence of message signing
- For example, in the 'Test Run' feature, whose screenshots are currently used for PIT evidence, there is an indicator called 'Signature Provider' which shows as valid or not to indicate whether Message Signing is turned on. Participant Participants could also screenshot their settings showing that these parameters are turned on/implemented.

Programme participant may also wish to make use of the CSS PIT simulator, as above, it should be noted that this has not been designed and build for Non-Functional Testing volumes of network traffic.

Programme participants can find further information regarding the DIP Simulator and Consumption Data Generator on the Programme Collaboration. Please see [REF-15] Simulators and Emulators.

Please see reference further information about DIP Simulator versions on section 5.7.2.3 DIP Simulator Versions.

5.6.2 Suggested approach for LDSO Non-Functional PIT Volume testing

Please find following an outline for a suggested approach to PIT volume testing setup that should allow participants to correctly exercise their DIP adapter ingress point and connected end-point systems.

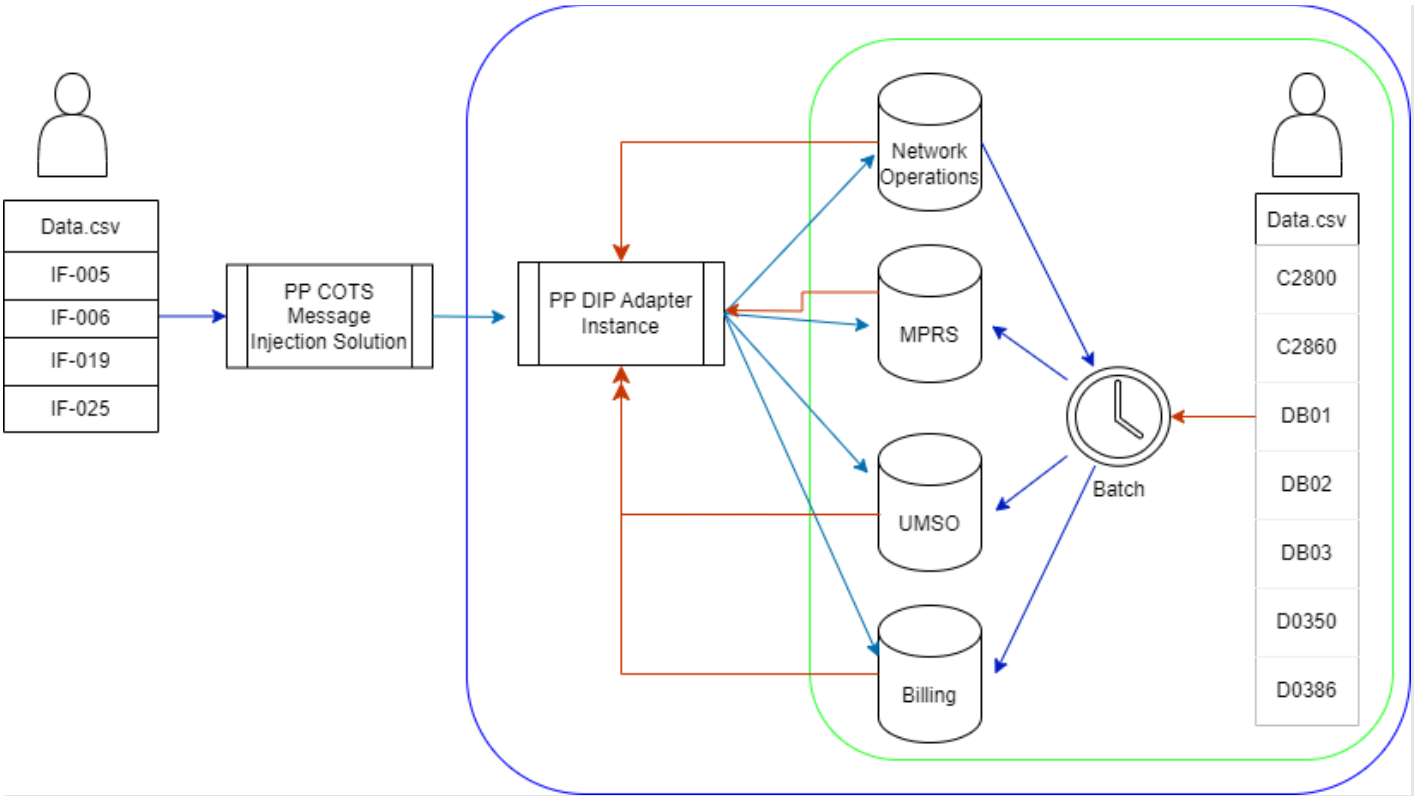


Figure 2 Suggested design for LDSO PIT volume testing setup

The following must be taken into account regarding the above;

- Blue flows represent PP initiated inbound messages/data. Orange flows represent outbound messages generated in response from the PPs system(s)
- The blue outline shows expected scope of test evidence capture for adapter providers and PPs not placing reliance. The green outline shows the expected scope of test evidence capture for PPs placing reliance on an adapter provider (In both cases the entire flow is still required to apply load)
- Inbound message generation should be data driven based on templated expected message formats and parameterized internal MPAN data specific to each PP (Can be completely synthetic if this is easiest)
- Each PP shall implement a bespoke message injection solution based on COTS tooling to interface with and directly inject generated inbound messages at the required volumes/throughput levels onto their DIP adapter instance
- The above will require implementation in code/scripts of functionality that delivers the correct message format for the adapter layer, encryption of the message contents, correct message signing etc.
- In addition, the PPs respective adapter provider shall have to allow for direct connection to each PPs specific adapter instance from each related PPs own estate (Presently all DIP Adapter connections are established and managed through the DIP SIM – this is not a viable approach for volume)
- To simulate all expected concurrent load on the system it will also be necessary for PPs to data drive expected inbound volumes of C-flow and D-flow messages. Any batch processes/jobs required to deal with these messages should be orchestrated/executed concurrently with the inbound IF message injection if this is the typical expectation during the currently defined processing windows
- As a result of the processed inbound data outbound responses are expected. The PP's systems should submit these to their adapter instance as normal and post the test execution a reconciliation activity should be carried out between the submitted number of inbound messages and expected number of generated outbound messages

5.6.3 Guidance regarding volumes for LDSO PIT NFT execution

- Switching Performance volumes
  - REC Code Manager recommendation would be to use your individual peak maximum demand volume for switching (as defined in ERDS Service Definition) as the base to add the MHHS migration volumes to.

  - We understand that for some participants it is not likely during live operations that you will hit individual peak maximum demand volume for switching at the same time as hitting peak migration volumes. Participants can therefore decide to make a reasonable adjustment to use a lower base for switching volumes to align with expected volumes during live operations. If Participants need individual guidance on these principles, they can reach out to MHHS LDSO QT Team who can facilitate engagement with REC Code Manager as required.
  - However, it would be beneficial for participants to test to a higher threshold; when operating in live operations if they are unable to respond to market message volumes, and experience service degradation, they will be subject to PATs/PAB intervention. Therefore, as mentioned, REC Code Manager would strongly recommend participants use individual peak maximum demand volume for switching.
- Key business processes/interactions to cover
  - Both REC and BSC Code Managers state there are not any business processes that they would specifically ask LDSOs to prioritise for this e.g. “secondary MPAN migrations”, but given that different switching/migration flows have different processing/resource requirements, they recommend that it would be sensible to include a variety.
  - They would recommend that Participants make a reasonable model of the frequency of the different switching/migration flows they expect to process and include a similar proportion in the NFR Performance Testing.

5.6.4 PIT Validation of Programme Recovery Time Objective (RTO) and Recovery Point Objective (RPO)

During the PIT phase it is expected that all programme participants should demonstrate compliance with the programme mandated RTO and RPO requirements. These requirements apply for all systems within the scope of Participants MHHS Design, whether existing systems or completely new/updated deliverables required for MHHS. For clarity these are as per the below NFRs:

- E2E1002 - "In the event of an unplanned outage each service shall be able to resume operation within one hour" (This is RTO - one hour)
- E2E0011 - "There shall be no data loss in the event of a single component failing" (This is RPO - zero data loss)

While seeking to prove compliance with the above objectives there is an acceptance from the Programme and Code Bodies that for current Qualified Industry participants with existing Business Continuity and Disaster Recovery (BCDR) procedures that it would be unrealistic to carry out full DR process execution and validation within the PIT testing window (expecting that such participants will have existing periodic and scheduled DR testing cycles which they already adhere to which may not be aligned with programme milestones). As a result, for such participants the below would be considered as acceptable evidence to validate compliance with the RTO/RPO objectives.

- Architectural diagrams showing the details of implementations of failover/disaster recovery mechanisms in the participant infrastructure and how they meet the RTO/RPO objectives at a technical level e.g. active-active redundancy, usage of queueing/buffering, message replay capability etc.
- In the case of reliance on third party hosted infrastructure it may be that compliance is achieved/evidenced through contractual BCDR SLAs with the supplier in question (e.g. Azure, AWS etc.) and can be supported by copies of such SLAs

For new Industry entrants there is an expectation that full validation of their new BCDR processes and procedures would be required to be carried out in an executable fashion where appropriate (e.g. evidence of actual DR mechanisms being executed in test).

5.7 PIT Completion

5.7.1 PIT Completion Overview

The exit criteria for completing PIT are set out in section 5.7.7– PIT Exit Criteria for Programme Participants. PIT exit criteria for non-SIT participants is set out in section 10.4.2 of the QA&P [REF-006]. This requires that all test scenarios executed are passed successfully (within thresholds), that test results and evidence (including interface testing evidence) are submitted for assurance and that any agreed work-off plan if required is provided to the MHHS

Pre-Integration Testing Guidance

Programme (SI Test Team) and/or to the Code Delivery Bodies (functional, migration and operational) and DIP Manager (non-functional) for Qualification Testing.

The PIT Test Completion Report serves as a crucial document. It must include evidence and details about any work-off plans as per template provided in section 5.5 (Table 2.). This report is submitted by all Programme Participants as below

- SIT Programme Participants will submit the report to MHHS SI test team
- Non-SIT LDSOs Programme Participants will submit the report to MHHS Non-SIT LDSO Test Team
- Non-SIT Supplier and Agent and new entrant LDSOs (post M10) Programme Participants will Submit the report to Code Bodies and DIP Manager

This Report purpose is to record the outcome of their PIT. Additionally, this report forms part of the exit criteria from PIT.

5.7.2 Interim Design Release Plan for SIT and QT Entry

The following figure shows the interim design release plan for SIT Programme participant's entry into SIT Functional:

Figure 3 Interim Design Release Plan for SIT Entry

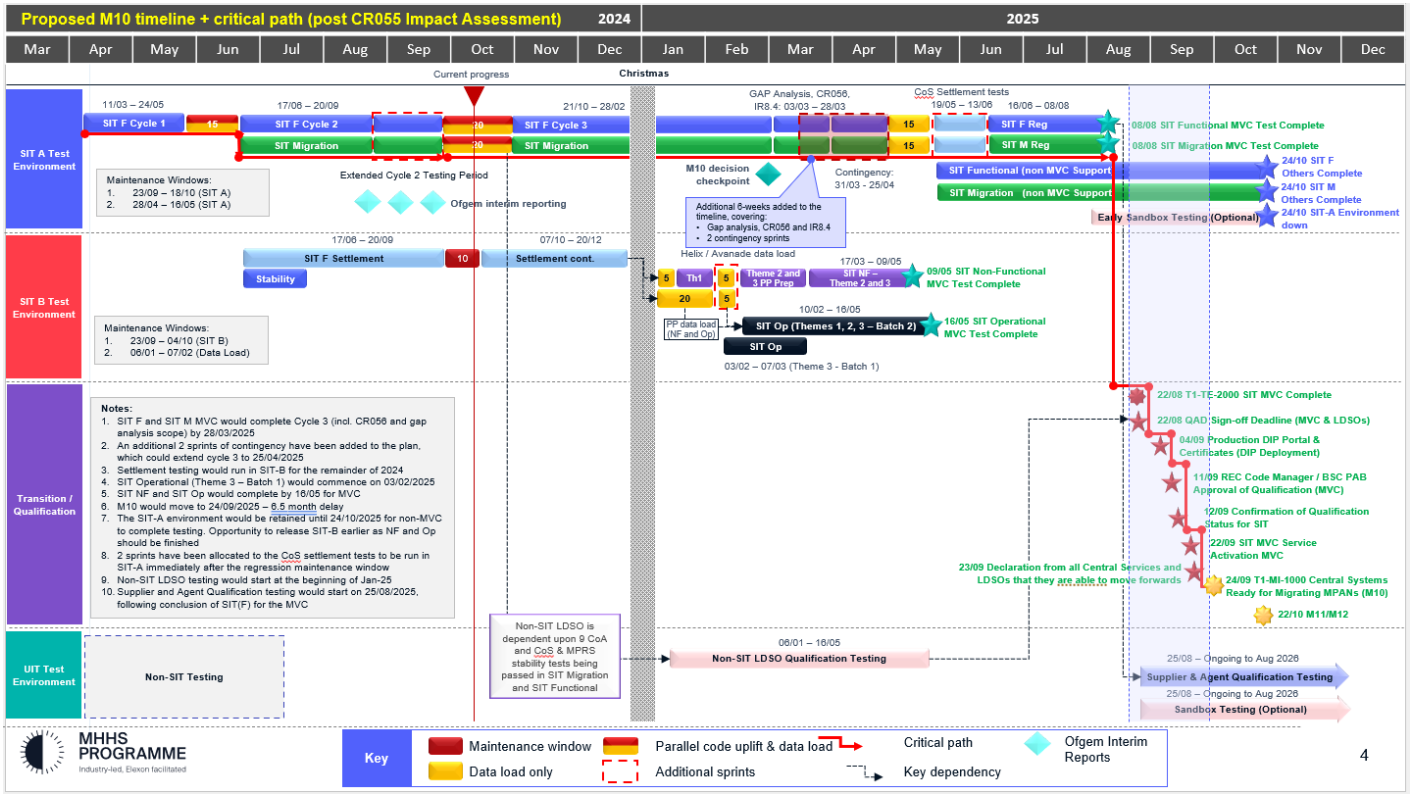


Figure 3 Interim Design Release Plan for SIT Entry

5.7.2.1 SIT CIT (All Intervals)

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.7.2.2 SIT Functional

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.7.2.3 Qualification Testing

Qualification Testing will be conducted against Interim Release 8.x as this is expected to be the last design release prior to MHHS go live. As such, this is the release that non-SIT participants are expected to conduct their PIT activities against.

5.7.2.4 DIP Simulator Versions

The DIP Simulator is available to all participants for their use in PIT Testing. The DIP Simulator will simulate some basic functionality of the DIP such as format validation and routing which means that it will be a useful addition to a participant's suite of testing tools.

Please visit MHHS Programme Collaboration Base for more information on DIP Simulator and the timeline of DIP Simulator uplifts and version releases.

5.7.2.5 Managing Interim Release Version Changes for Non-SIT Parties

As stated in QWG on 12 November 2024, all Participants should evaluate the release notes to determine if there is a direct impact on their market role.

For those Participants impacted, the following is advised:

- Targeted regression testing should be carried out against any functionality directly impacted by the release.

In all cases regardless of whether direct impact is found:

- General regression testing should be carried out against high-priority requirements identified as part of the Participant's risk assessment in accordance with the Participant's role.
- The level of testing needed is at the discretion of the Participant provided that the risk assessment has been carried out and adherence to the high-priority requirements identified by the risk assessment can be sufficiently demonstrated through testing.
- There is no requirement to re-submit the PIT RTTM provided risk assessments and associated test results are retained for the duration of the programme.

5.7.3 4Test Evidence

Programme participants choosing the SIT route will have to provide evidence for PIT conducted for CIT, Functional, Migration, Non-Functional and Operational Testing. Programme participants completing their QT via a wave are expected to submit PIT test evidence once and this is expected to cover Functional, Migration, Non-Functional and Operational Testing. Non-SIT LDSO Participants are expected to submit their PIT test evidence in two submissions, with one submission covering Functional and migration and a second covering migration and operational.

When submitting test evidence, where test data has not been used, all Programme participants should ensure that PIT evidence such as Test Reports, Logs or screen captures have been anonymised/obfuscated to remove Personal Identifiable Information (PII). Programme participants are responsible for ensuring that they comply with data protection standards and should liaise with their respective Data Protection Officer (DPO) to ensure compliance with DPA. Please refer to section 5.7.3.4 "PIT Evidence Obfuscation" of this document for further guidance.

5.7.3.1 PIT Evidence for CIT

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.7.3.2 PIT Evidence for SIT Functional

This section has been removed as test phase has completed. Please see appendix B for removed material.

5.7.3.3 PIT Evidence for SIT Operational Testing

Programme participants conducting PIT in readiness for SIT Operational, need to provide test evidence against the correct functioning of each PIT Operational test conducted, including providing access to relevant Process Documents that were verified/assured.

5.7.3.4 PIT Evidence for SIT NFT

As part of the route to SIT NFT, Programme Participants will have to provide evidence of NFT PIT completion to enter the integrated phases of test execution. As part of this guidance section, the MHHS SI would expect evidence of the following:

- Suitable PIT NFT environment build and configuration.
- Points of ingress and egress from the solution have been exercised at NFR defined volumes.
- Suitable data storage design.
- Solution resilience, reliability and zero data loss NFRs have been met.
- Where forming part of the solution design, that processing throttling has been validated.
- Migration and Operational Choreography have been taken into consideration as part of the load testing solution.
- Demonstration that Industry Best Practice has been utilised as part of PIT evidence.
- Where placing reliance on a 3rd party, that this 3rd party has delivered NFT evidence based on their range of participants, namely that they can scale from their smallest client through to their largest one, with no degradation in solution performance.

Please see below for a list of the different types of evidence that could be presented at the NFT execution stage:

- DIP Adapter logs/state captures that may be used for reconciliation purposes between inbound and outbound message volumes
- In the case of any required/involved batch jobs evidence of successful execution of these - these may be log files etc.
- Any observability/monitoring metrics that may be available regarding resource utilisation by the system during the test execution window - Disk, CPU, memory etc.
- If MQ based systems are involved in the processing, then any relevant monitoring metrics that may be available from these
- Snapshots/screen grabs from any relevant dashboarding systems that can assist with the interrogation of log files and/or machine data generated by the system in the course of its execution - e.g. Splunk/Grafana dashboards etc.
- Any logged alerts and/or warning messages that were flagged up during the course of the test execution(s)

Participants should also consult [REF-25] MHHS Non-Functional Test Policy and [REF-23] MHHS-DEL2127 SIT Non-Functional Test Approach & Plan while planning and reporting against NFRs.

5.7.3.5 PIT Evidence for non-SIT Programme Participants

Programme participants choosing the non-SIT route, will have to provide evidence of PIT completion to enter Qualification Testing which will prove specific functional, non-functional and migration-related characteristics of systems and processes.

- Evidence of successful IF and PUB messages relevant to their market role using the DIP Simulator. Please note, if DIP PUB messages are optional and a Participant is not making use of this functionality, Participants are not expected to provide evidence of this.
    - For **IF messages sent outward** from the application - links to the DIP Simulator test logs of tests successfully executed plus files showing the contents of each message used; and
    - For **PUB messages sent inward** to the application, a file of the messages and record of their successful receipt (as shown by a http response sent out from the application) and screenshots showing the same information.

Pre-Integration Testing Guidance

- Evidence that end-to-end processes have been successfully tested and the messages generated from the back-office systems. Successfully test the receipt and processing of the messages arriving at the appropriate destination point(s), which demonstrates the correct functioning of the system for each market role. This should include evidence of negative testing to validate the system functionality against the business validation included in MHHS design as well as evidence of exception handling testing.
- Evidence of successful testing of changes to existing data flows and new data flows. Evidence of a correctly formatted dataflow .usr formatted file, as would be received in production.
- If a Programme Participant is Placing Reliance on Functional, Non-Functional, migration and Operational testing carried out by a third-party software / IT provider, they should provide evidence that the software has been successfully deployed within the Programme Participant's environment and that any internal integration with the third-party software / IT solution has been successfully updated. Where Participant back-office (end-point) systems are distinct (e.g. CRM/Billing/other), the Participant must provide evidence of the outbound requests and inbound responses from third-party systems where partial reliance has been applied, as well as examples of initial and resting states of the end-point system where an outbound request has been initiated and the corresponding inbound response has been processed.
- Evidence of migration processes (including forward, reverse migration) have been successfully tested and the messages generated from the back-office systems. Successfully test the receipt and processing of the messages arriving at the appropriate destination point(s), which demonstrates the correct functioning of the system for each market role.
- For non-functional evidence of the following would be expected:
    - Suitable PIT NFT environment build and configuration.
    - Points of ingress and egress from the solution have been exercised at NFR defined volumes.
    - Suitable data storage design.
    - Solution resilience, reliability and zero data loss NFRs have been met.
    - Where forming part of the solution design, that processing throttling has been validated.
    - Migration and Operational Choreography have been taken into consideration as part of the load and volume testing solution.
    - Demonstration that Industry Best Practice has been utilised as part of PIT evidence.
    - Where placing reliance on a 3rd party, that this 3rd party has delivered NFT evidence based on their range of participants, namely that they can scale from their smallest client through to their largest one, with no degradation in solution performance.
- Please see below for a list of the different types of evidence that could be presented at the NFT execution stage:
    - DIP Adapter logs/state captures that may be used for reconciliation purposes between inbound and outbound message volumes
    - In the case of any required/involved batch jobs evidence of successful execution of these - these may be log files etc.
    - Any observability/monitoring metrics that may be available regarding resource utilisation by the system during the test execution window - Disk, CPU, memory etc.
    - If MQ based systems are involved in the processing, then any relevant monitoring metrics that may be available from these
    - Snapshots/screen grabs from any relevant dashboarding systems that can assist with the interrogation of log files and/or machine data generated by the system in the course of its execution - e.g. Splunk/Grafana dashboards etc.
    - Any logged alerts and/or warning messages that were flagged up during the course of the test execution(s)

- For Operational, evidence of volumetric testing in PIT to evidence that MHHS Operational Choreography timing requirements can be met at expected processing volumes. As well as evidence that message System Error Handling and Fault Management Processes have been tested.
    - Provision of Load Test/Batch reports stating tested volumes, processing times and tolerances
    - Demonstration of negative testing to prove resilience where errors or faults may occur.

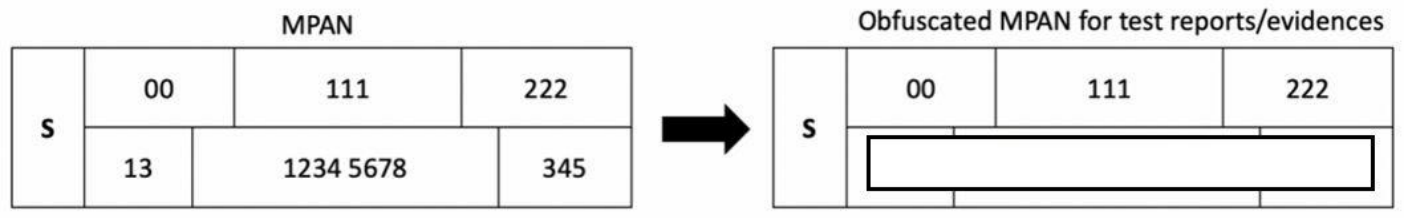
5.7.3.6 PIT Evidence Obfuscation

It is the Programme participant's responsibility to ensure all evidence shared with MHHS Test Teams, Code Bodies and DIP Manager is properly anonymised/obfuscated. Before providing evidence, participants should verify obfuscation standards with their respective DPO.

Pre-Integration Testing Guidance

Code Bodies, DIP Manager and the Programme are aware that Live MPANs and Customer data may be used by participants for PIT Testing. However, Code Bodies would like to remind Participants that MPANs and Customer data are considered Personal Identifiable Information (PII) and cannot be shared in Test Reports, Evidence, Logs, or Images shared for PIT evidence review.

As an example, the Programme participant must remove or obfuscate the MPAN core as per the diagram below. For image files, the Programme participant can blur or overlay the unique identifier with any colour graphic shape (e.g. a white rectangle).



The same obfuscation approach shall be applied for Domestic and Non-Domestic MPANs.

Any additional Personal Identifiable information such as names, addresses or energy consumption data should also be redacted/obfuscated/anonymised.

Please note there is guidance on test data anonymization for test reports and test evidence in the SIT Functional Test Data Approach & Plan or the Non-SIT LDSO Qualification Test Data Approach & Plan.

5.7.4 How to Provide Evidence

All evidence provided by the Programme participant must be traceable by reference back to the specific test case and test scenario. The evidence for a completed PIT test must show the expected result, the actual result and pass or fail status. Screenshots of messages and or electronic logs of messages must be provided as appropriate. The evidence requested is standard for any test assurance process and should be similar to that required by the Programme participants' own quality gate and internal audit.

For Qualification Testing, non-SIT Programme Participants are expected to provide test evidence to support the Code Bodies' assurance and DIP Manager's assurance of PIT. Participants should also place copies of all the test evidence, as per section 5.7.3, in the given PPs' teams channel location in Zipped files format. If a participant is not using test data then data should be obfuscated or redacted. Please see guidance in section 5.7.3.6.

5.7.5 Where to Store Test Evidence

MHHS SI Test Team recognises that each Programme participant will have its own test management tool which they will use to manage their testing and test evidence. To facilitate the monitoring of test execution and test assurance, all Programme participants are expected to store copies of test evidence in their own test tools locally within the confines of their own DPIA.

5.7.6 Retention Period for Test Evidence

Programme participants will have to store and retain test evidence in their own test tools till the end of the MHHS Programme. This evidence will be used during test assurance to validate actual vs. expected results of the test. Participants may be requested copies of test evidence on an exception basis when a particular test scenario requires detailed research. Additionally, test evidence will be critical for triaging PIT defects which impacts SIT or Qualification Testing.

5.7.7 PIT Exit Criteria for Programme Participants

- All planned tests have been run to completion or any exceptions are documented and agreed with Programme participants internal stakeholders, MHHS SI Test Team and/or Code Delivery Bodies (functional, migration or operational testing) or DIP Manager (non-functional);
- All Priority 1 and 2 tests have passed, and the overall test pass rate is 85% or above, or any exceptions are documented and agreed with Programme participants internal stakeholders, MHHS SI Test Team and/or Code Delivery Bodies (functional, migration or operational testing) or DIP Manager (non-functional);
- There are no outstanding severity 1 or 2 defects, or any exceptions are documented and agreed with Programme participants internal stakeholders, MHHS SI Test Team and/or Code Delivery Bodies/ (functional, migration or operational testing) or DIP Manager (non-functional);
- Work-off plan for any outstanding defects has been produced and agreed with internal stakeholders, MHHS SI Test Team and/or Code Delivery Bodies (functional, migration or operational testing) or DIP Manager (non-functional)
- Test results and evidence have been submitted and assurance completed by MHHS SI Test Team and/or Code Delivery Bodies (functional, migration or operational testing) or DIP Manager (non-functional);
- All scope and coverage specified in section 5.2 Scope of PIT and 5.7.3. Test Evidence has been achieved and the test evidence specified in section - 5.7.3 Test Evidence submitted;
- All open defects at the end of PIT that have been assessed as materially impacting SIT or Qualification Testing have been captured in the MHHS defect management tool; and
- PIT test completion report produced and assured to record the outcome of Programme participants PIT.

Note: For Work-off plan and understanding the definition of severity for any PIT defects impacting entry into SIT or Qualification testing, please reference [REF14] MHHS-DEL466 Defect Management Plan.

5.7.8 Failure to Exit PIT

Failing to successfully complete PIT will prevent Programme participants from progressing into subsequent test phases i.e. SIT or Qualification Testing. In the case of a failure, the Programme participant will be asked to remedy the cause for failure and re-submit the request to exit.

When a Programme participant fails to exit PIT successfully, the MHHS SI Test Team (for SIT Participants) or Code Bodies (for Qualification Participants) will work with the Programme participant to agree a remediation plan. Where the failure to exit PIT has the potential to impact a Programme milestone, this will be presented by the MHHS SI Test Team/Code Bodies/DIP Manager to MHHS Programme governance for assessment of the impact to the Programme plan.

6 Test Assurance

PIT assurance covering all testing-related deliverables and activities will be conducted in 2 stages:

- 1st line assurance - Self-assurance will be carried out by Programme participants;
- 2nd line assurance (SIT) - MHHS SI Test team will assure all SIT Programme participants; and
- 2nd line assurance (Non-SIT) – This will be assured by the MHHS Programme (for Non-SIT LDSOs) and Code Bodies (for Non-SIT Suppliers, Agents and LDSOs entering the market after M10).
- 2nd line assurance for NFRs within the DIP Rules will be assessed by the DIP Manager

The PIT assurance delivered by the programme, Code Bodies and or DIP Manager will be limited to the scope of BSC and REC Qualification, and DIP Rules.

6.1 Assurance Overview

Test assurance covers all testing-related deliverables and activities, with the purpose of identifying significant risks and issues and ensuring high standards of quality. The risks and issues are those which impact the start and completion of testing and therefore the readiness for the start of the migration period. These risks and issues can have knock-on effects on overall programme timelines and market confidence in the end-to-end solution and are therefore important to identify and mitigate.

The test assurance adheres to the standard 3 lines of defence model. For 1st-line testing assurance, there will be self-assurance carried out by the party conducting the activity or producing the deliverable. This will be the Programme participant. 2nd-line testing assurance is carried out by the MHHS SI Test team and/or Code Bodies/DIP Manager and 3rd-line assurance (where relevant) is conducted by the Independent Programme Assurance (IPA).

6.2 Test Assurance Scope for SIT

The scope of test assurance, for SIT, will be as follows:

- **Assurance of approach and plan** – This will be carried out as soon as the PIT Approach & Plan document is available (at the time agreed between the assurer and the Programme participant) and in any case before the start of test execution;
- **Assurance of coverage** – This will be carried out as soon as the RTTM and test scenarios are available (at the time agreed between assurer and the Programme participant) and must be completed before the start of test execution;
- **Assurance of readiness** - The Programme participant undertaking the testing will produce a Test Readiness Report which will be assured in time to feed into the Programme participant's decision point which initiates a test stage; and
- **Assurance of execution** – The Programme participant undertaking the testing will produce, during test execution, Test Execution Progress Reporting. On completion, a Test Completion Report (in both draft and final versions) which will be reviewed to inform the test assurance position associated with a Programme participant's completion.
- **Additional assurance** – The above may be supplemented by additional activities. These could include:
    - Interviews;
    - Test execution progress report reviews;
    - Test witnessing;
    - Test evidence reviews;
    - Defects reviews;
    - Quality gate attendance; and
    - Review of Programme participant's 1st-line assurance output.

Programme participants that are selected for additional assurance will be notified at least 10 working days prior to the activity taking place.

6.3 Test Assurance Scope for non-SIT

The scope of test assurance, for Qualification Testing, will be as follows:

- **Assurance of approach and plan** – This will be carried out after the PIT Approach & Plan document is available;
- **Assurance of coverage** – This will be carried out after the RTTM and test scenarios are available.
- **Assurance of execution** – The Programme participant undertaking the testing will produce, a Test Completion Report including workoff, with associated test evidence, which will be reviewed to inform the test assurance position associated with a Programme participant's completion.
- **Additional assurance** – The above may be supplemented by additional activities. These could include:
    - Test evidence reviews;
    - Defects reviews;
    - Quality gate attendance; and

6.4 Assurance Criteria

- Review of Programme participant's 1st-line assurance output.
- **Assurance of approach and plan** – The Test Approach & Plan document will be examined for the fitness for purpose of the following:
    - Planning and scheduling (including planned resources);
    - Architectural assurance (where the way the systems and test stubs are assembled for testing is examined);
    - Defect triage and management;
    - Regression and re-test approach;
    - Test environments and release and configuration management;
    - Test case specification approach;
    - Test data allocation and management approach;
    - Test stubs provided;
    - Test coverage (functional and non-functional);
    - Approach to risk-based testing; and
    - Test basis.
- **Assurance of coverage** – The Requirements to Test Traceability Matrix (RTTM) and Test Scenarios are subject to review for:
    - Test coverage – do the scenarios collectively address the coverage defined in the PIT Approach and Plan;
    - Test quality – are the scenarios fit for purpose, complete and accurate to the scope defined; and
    - Traceability – can the scenarios be mapped to requirements and agreed scope.
- **Assurance of readiness** – The Test Readiness Report will be assured for completeness and accuracy. Attendance at the quality gate may also be included and feedback provided for:
    - Any risks and issues that are still outstanding; and
    - Whether agreed criteria have been met.

- **Assurance of execution** – The Test Execution Progress Report and Test Completion Report (both draft and final versions) will be assured for completeness and accuracy. This will include:
    - Test evidence – tests performed should be supported by auditable evidence. Selected test evidence will be reviewed;
    - Test quality – test findings (including defects) should be accurate and complete, providing good quality information to support analysis and resolution; and
    - Progress – actuals in high priority/risk areas; key areas of the solution.
- **Assurance of work off plans** – The work off plans will be reviewed to assess:
    - Risks carried forward due to testing not completed or due to open defects; and
    - Viability of plans to close residual items.

6.5 Engagement

Where the MHHS SI Test Team are assuring a Programme participant, they (together with the PPC) will first obtain from the participant a plan for the deliverables and activities to be assured and make the participant aware of the material the MHHS SI Test Team expects to see. The MHHS SI Test Team will maintain a tracker of documentation and planned dates and will request the relevant material close to the planned date. The MHHS SI Test Team will then conduct the review and may request a meeting with the Programme participant for clarifications.

The MHHS SI Test Team will ensure full transparency and buy-in from the Programme participants being reviewed. Draft reports will be submitted to the Programme participant for comments before being concluded. Engagement for non-SIT participants will be as document in the Qualification Approach and Plan [REF-06] and associated annexes.

6.6 Outputs

For 1st-line assurance of deliverables, the outputs will be the review comments generated, together with the audit trail of the acceptance of the responses. For 1st-line assurance of activities, the output will be a short report or records of a Quality Gate meeting, an email will be sent to the Programme participant to confirm.

For 2nd-line assurance, the MHHS SI Test Team will send feedback for each piece of assurance work conducted. If an important shortcoming is identified, then a risk or issue is raised. For a shortcoming that needs remediating but does not warrant a programme risk or issue, then an action is recommended in the report and a completion date assigned. The MHHS SI Test Team will then track such actions via a central register to ensure that they are addressed in a timely manner.

Records of quality assurance activities conducted by the MHHS SI Test Team will be stored centrally and used to drive Management Information (MI) reporting. This will assign a RAG status for quality to each Programme participant for the relevant stage of the programme plan. The RAG status may not be present (if no assurance has been carried out).

7 Appendix A - Illustrative examples of PIT Scope

Code Bodies have developed examples of how the PIT definition should be applied by Programme Participants for each role.

When interpreting the examples provided, the following principles should be considered:

- Any market messages listed are for illustrative purposes and is not expected to be a full list.
- Market Messages sent via DIP or DTN are undergoing changes and therefore should form a part of PIT evidence. CSS messages may be required to complete the Business Process steps as part of the test case but are not subject to assurance as there are no changes to CSS messages.
- Interactions with other Market Participant are depicted to illustrate how Market Messages will flow in live operation and are not expected to be covered in PIT.
- Each example illustrates the chosen Business Process from the perspective of one Market Role under test, which has been specified. The same Business Processes may require testing from the perspective of other Market Roles than those depicted in the examples, in which case, their PIT scope would differ. For example, for a Supplier requesting metering works and receiving meter updates, the PIT Scope will differ from example 4.
- The examples shared are not a full list of Business Processes that various Market Roles will need to demonstrate coverage of.
- For the purpose of the Pre-Qualification Submission (PQS) (and for Placing Reliance), the expectation is a similar approach will be followed by Participants, as outlined in the examples, to identify systems to be covered within their System Architecture.
- When Placing Reliance, Programme Participants must ensure they can demonstrate full coverage of PIT as defined, i.e. ensuring coverage of any integration between various systems which may be hosted by different third parties or internally.

7.1 Supplier

PIT Scope for Supplier for the following Business Processes:

- Change of Supplier (CoS) coincidental with Change of Agent (CoA) (BP001, BP002, BP003)
- Change of Registration Data (BP010)

7.1.1 Example 1 - Change of Supplier (CoS) coincidental with Change of Agent (CoA) (BP001, BP002, BP003)

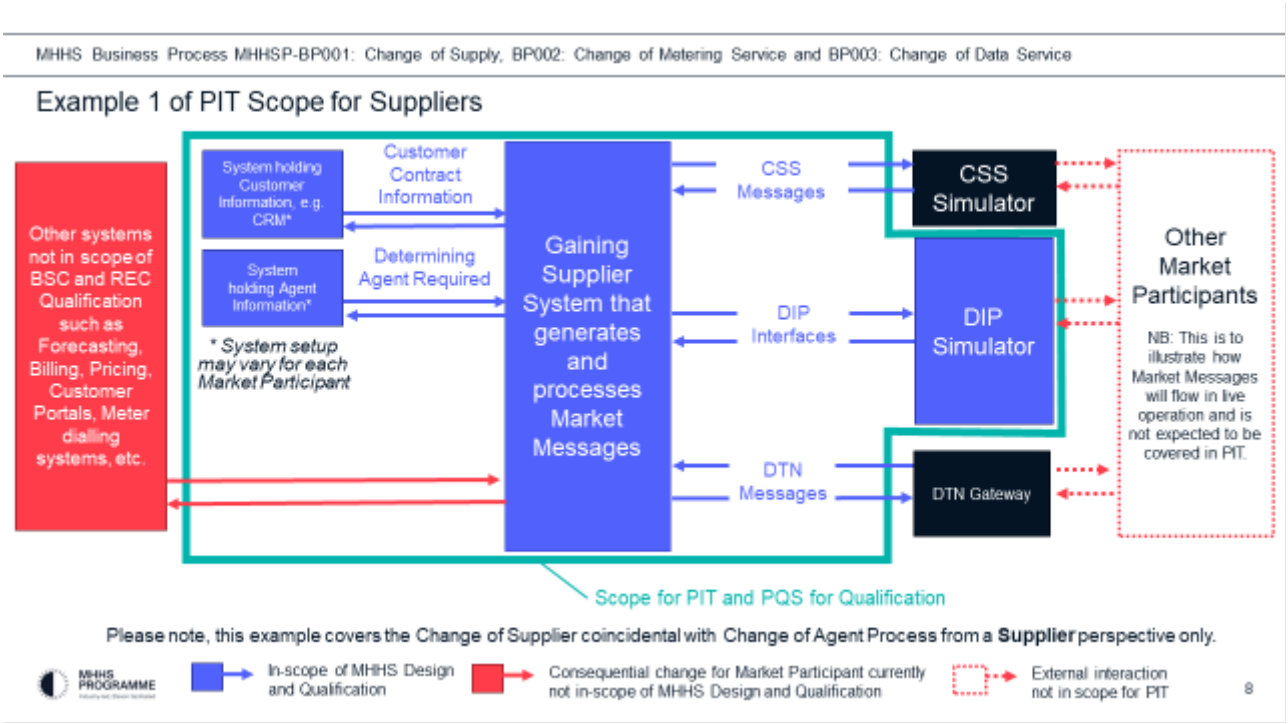


Figure 5 Example 1

7.1.2 Example 2 - Change of Registration Data (BP010)

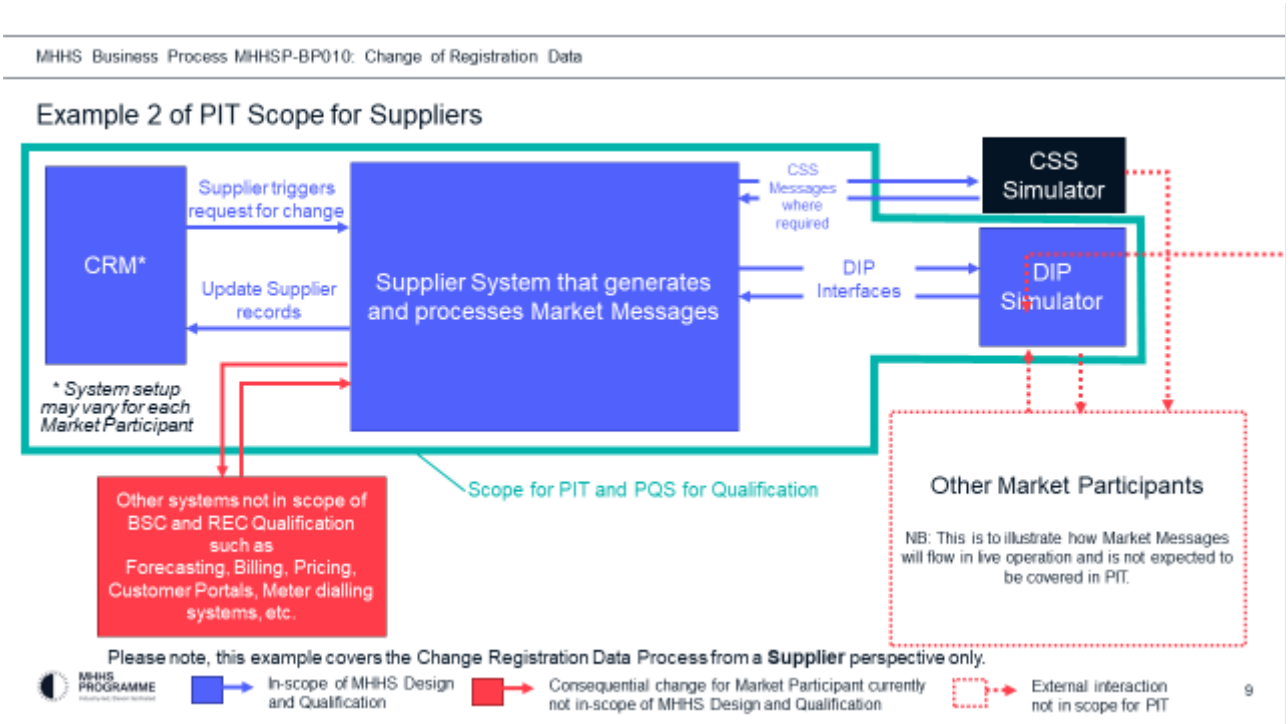


Figure 6 Example 2

7.2 Metering Service

PIT Scope for Metering Service for the following Business Processes:

- Change of Energisation Status (BP008)
- Change of Metering (BP009)

7.2.1 Example 3 - Change of Energisation Status (BP008)

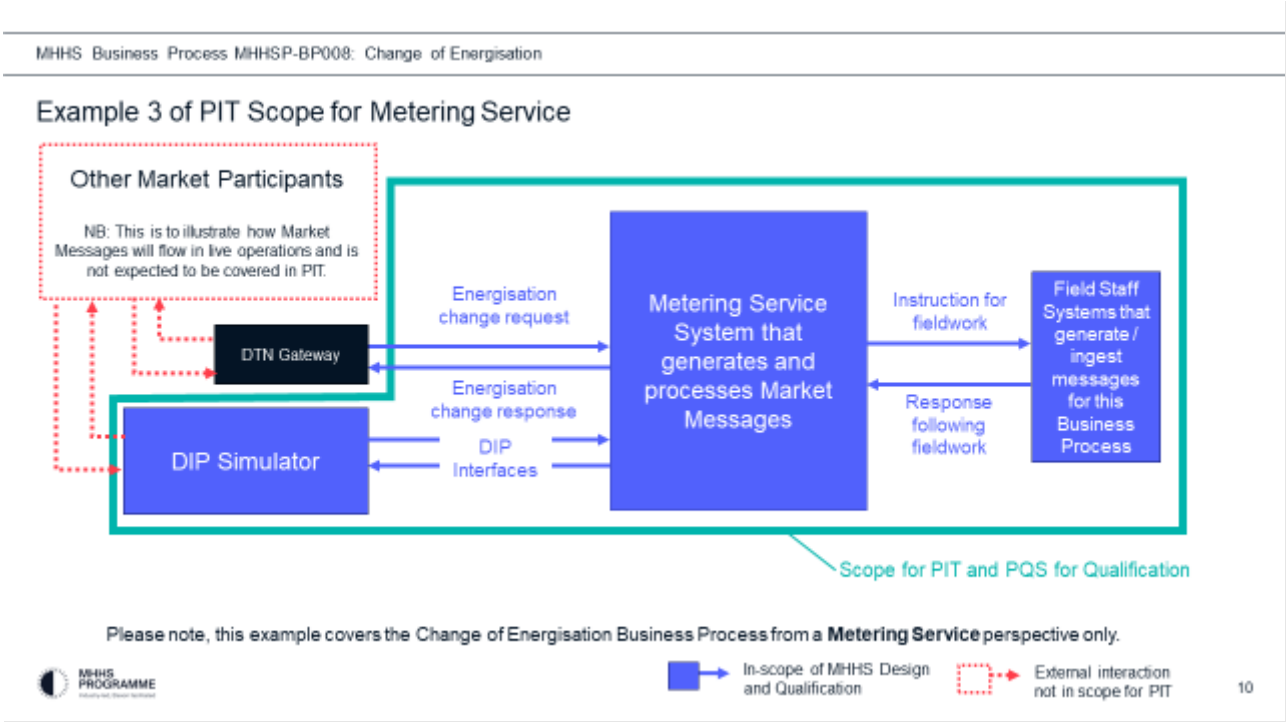


Figure 7 Example 3

7.2.2 Example 4 – Change of Metering (BP009)

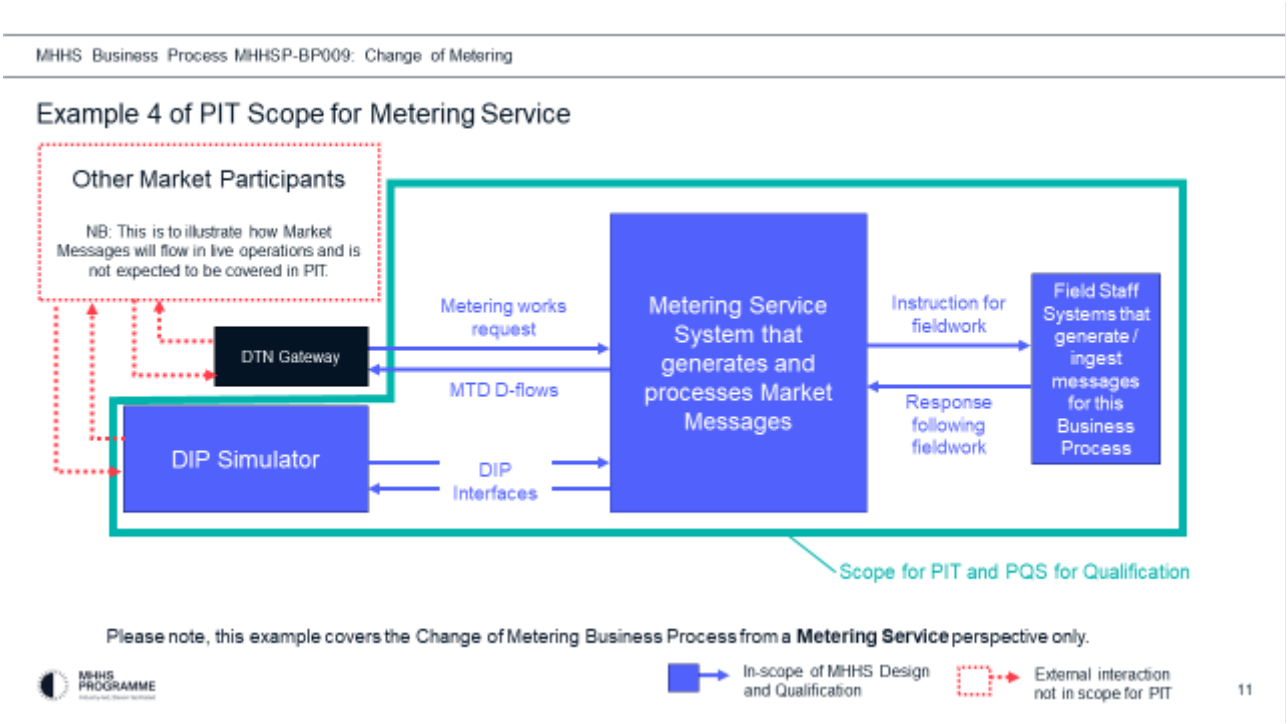


Figure 8 Example 4

7.3 Data Services

PIT Scope for Data Service for the following Business Processes:

- Data Collection (BP004)

7.3.1 Example 5 – Data Collection (BP004)

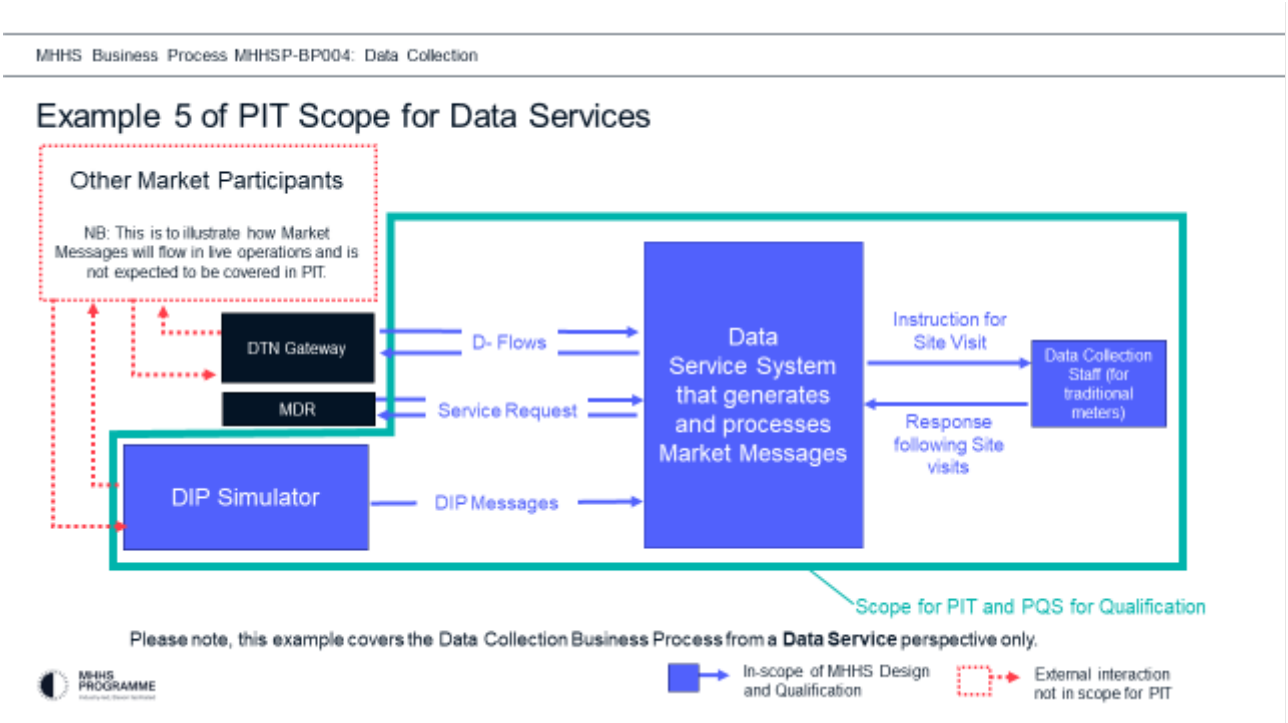
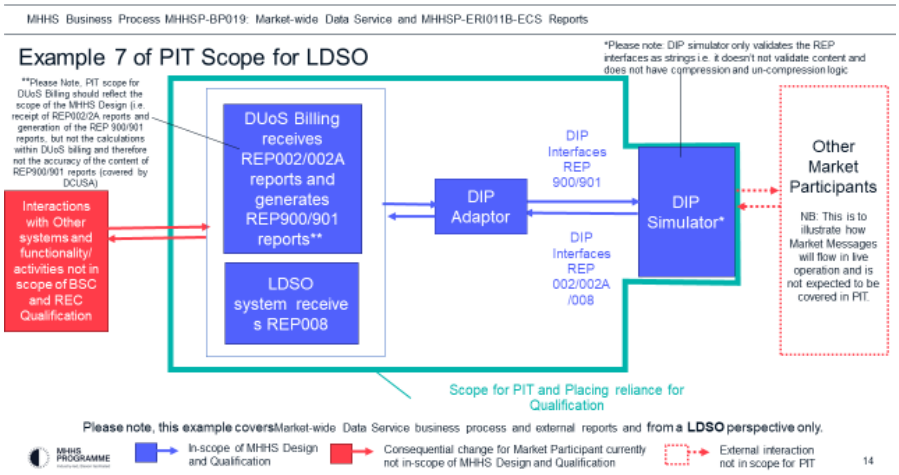


Figure 9 Example 5

7.4 LDSO, UMSO and Registration Services



PIT Scope for LDSO for the following Business Processes:

- Disconnection (BP007)
- Market-wide Data Service (BP019) and MHHSP-ERI011B-ECS ReportS

7.4.1 Example 6 – Disconnection (BP007)

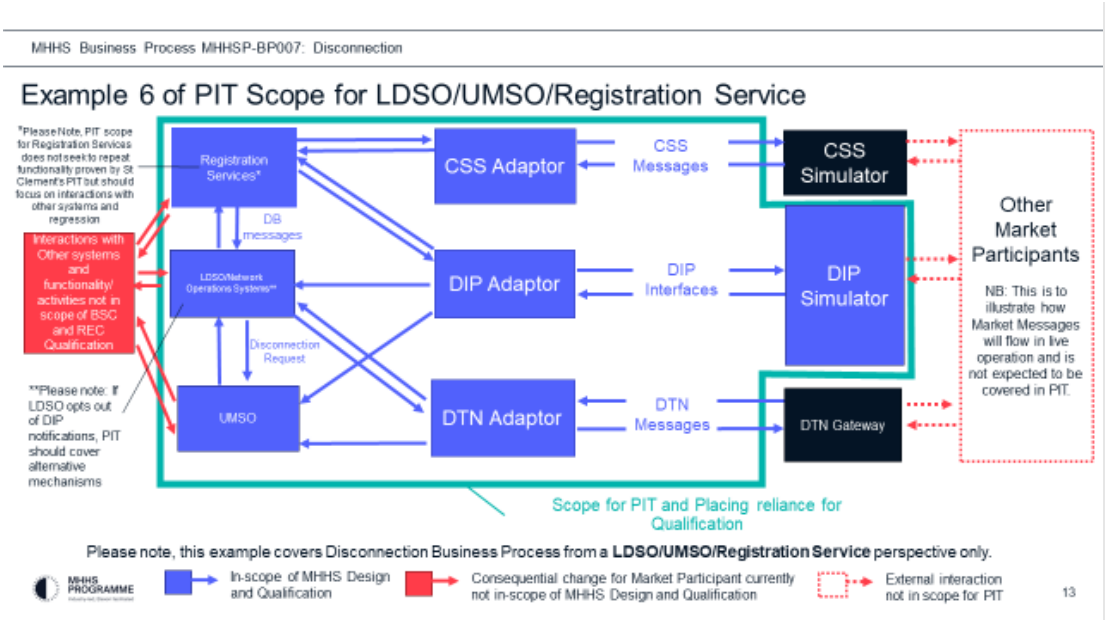


Figure 10 Example 6

7.4.2 Example 7 - Market-wide Data Service (BP019) and MHHSP-ERI011B-ECS Reports

Figure 11 Example 7

8 Appendix B – Archived Sections

As this document has been updated at various stages of the MHHS Programme, material related to test phase that have already completed have been removed from the main body of the document and have been retained in this appendix.

8.1 PIT Stages

The below section has been removed from many body of the document as the phasing of PIT deliverables for the different stages for SIT is now a well understood concept.

8.1.1 PIT for SIT Programme Participants

The MHHS Programme has considered a request from the Large Supplier Constituency (LSC) to phase the PIT approach and has accepted an option that allows all SIT Volunteers to split PIT test scope across multiple tranches of PIT i.e. MHHS Programme has adopted a model for a phased approach for Programme participant's entry into 5 Stages of SIT:

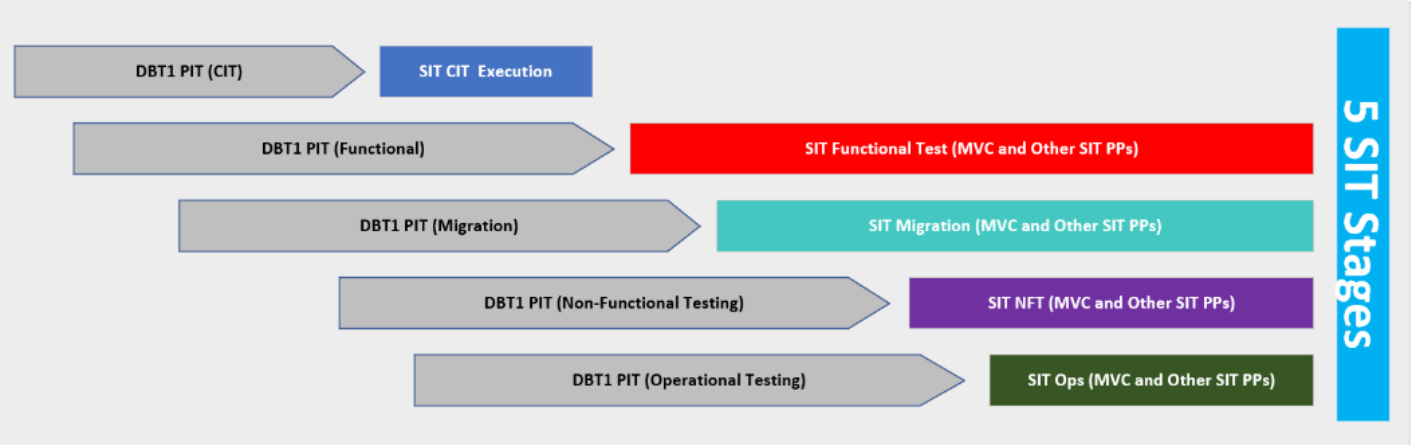


Figure 12 PIT Phased Approach for Entry into SIT

With this approach, LSC SIT Volunteers have the option to complete:

- PIT (CIT) - completed one month prior to the LSCs entry into appropriate CIT Intervals;
- PIT (Functional) – completed one month prior to the Programme start of SIT Functional Testing;
- PIT (Migration) – completed one month prior to the Programme start of SIT Migration Testing;
- PIT(NFT) – completed one month prior to the Programme start of SIT Non-Functional Testing; and
- PIT (Operational) – completed one month prior to the Programme start of SIT Operational Testing.

This approach applies to the SIT Volunteer Participants only. The delivery approach for Central Parties remains unchanged. SIT Programme participants retain the ability to manage an appropriate amount of iterative PIT Test Phases to support their own needs, aligned to entry into the 5 stages of SIT i.e. a Programme participant could 100% complete PIT scope for all 5 stages in readiness for CIT Entry or be fully functionally complete for CIT and have a 2nd PIT activity for Migration, Non-Functional and Operational ahead of those activities or have 5 stages of PIT ahead of 5 stages of SIT.

It remains in the control of each Programme participant to decide what they want to do. Programme participants will be required to inform MHHS SI Test Team via bi-lateral meetings in conjunction with issuance of the first PIT Test Approach & Plan.

Based on which PIT phased approach a Programme participant chooses, MHHS SI Test Team expect a full set of PIT deliverables for each PIT phase to be delivered and subsequently assured.

8.2 Timescales for PIT Deliverables

These section has been removed from the main body of the document and contains information on what the expected timescales for the PIT test deliverables for CIT and SIT functional.

8.2.1 Timescales for PIT Deliverables for SIT CIT Programme Participants

This section describes the details of activities and deliverables associated to PIT for SIT Programme participants for their SIT CIT readiness dates within each CIT interval.

Participants can reference MHHS website for the [REF-16] MHHS Outline Plan

Timescales for PIT Deliverables for SIT CIT - Interval 1

Systems/Services/Market Roles for Interval 1 are:

- DIP;
- LSS; and
- MDS.

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 1:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	07th July 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	21st July 23***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	4th Aug 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	4th Aug 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	22nd Sep 23**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	29th Sep 23 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	8th Sep 23 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	29th Sep 23 (No later than*)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	23rd Oct 23
SIT CIT Start	CIT Interval 1 Start = PSG Milestone (M9)	30th Oct 23

Table 5 PIT Deliverable Milestones for entry into SIT CIT- Interval 1

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3* – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Timescales for PIT Deliverables for SIT CIT - Interval 2

Systems/Services/Market Roles for Interval 2 are:

- MPRS (Drop 1).

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 2:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	28th July 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	10th Aug 23***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	1st Sep 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	1st Sep 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	13th Oct 23**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	20th Oct 23 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	29th Sep 23 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	20th Oct 23 (No later than*)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	6th Nov 23
SIT CIT Start	**CIT Interval 2 Start = PSG Milestone (M9)**	13th Nov 23

Table 6 PIT Deliverable Milestones for entry into SIT CIT- Interval 2

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3* – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Timescales for PIT Deliverables for SIT CIT - Interval 3

Systems/Services/Market Roles for Interval 3 are:

- Smart Data Services; and
- Advanced Data Services.

Pre-Integration Testing Guidance

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 3:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	11th Aug 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	25th Aug 23***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	8th Sep 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	8th Sep 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	27th Oct 23**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	3rd Nov 23 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	13th Oct 23 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	3rd Nov 23 (No later than*)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	20th Nov 23
SIT CIT Start	**CIT Interval 3 Start = PSG Milestone (M9)**	27th Nov 23

Table 7 PIT Deliverable Milestones for entry into SIT CIT- Interval 3

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Timescales for PIT Deliverables for SIT CIT - Interval 4

Systems/Services/Market Roles for Interval 4 are:

- Metering Services.

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 4:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	25th Aug 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	8th Sep 23***

Pre-Integration Testing Guidance

Activity Milestone	Action	Deliverable Submission Timeline
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	15th Sep 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	15th Sep 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	10th Nov 23**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	17th Nov 23 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	27th Oct 23 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	17th Nov 23 (No later than*)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	4th Dec 23
SIT CIT Start	**CIT Interval 4 Start = PSG Milestone (M9)**	11th Dec 23

Table 8 PIT Deliverable Milestones for entry into SIT CIT- Interval 4

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Timescales for PIT Deliverables for SIT CIT - Interval 5

Systems/Services/Market Roles for Interval 5 are:

- Suppliers;
- Network Operations; and
- UMSO

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 5:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	15th Sep 23 (No later than**)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	29th Sep 23****
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	06th Oct 23**
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	06th Oct 23**

Activity Milestone	Action	Deliverable Submission Timeline
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	01st Dec 23***
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	8th Dec 23 (No later than**)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	17th Nov 23 (No later than**)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	8th Dec 23 (No later than**)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	8th Jan 24
SIT CIT Start	**CIT Interval 5 Start = PSG Milestone (M9)**	15th Jan 24*

Table 9 PIT Deliverable Milestones for entry into SIT CIT- Interval 5

Note 1* – There is an extended period between CIT Intervals 4 and 5 allowing for the Xmas and New Year period. Some readiness dates have also been adjusted accordingly for CIT Intervals 5 and 6.

Note 2** – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 3*** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 4**** – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

Timescales for PIT Deliverables for SIT CIT - Interval 6

Systems/Services/Market Roles for Interval 6 are:

- MPRS (Drop 2);
- EES; and
- UMSDS

Table below shows the DBT1 PIT deliverable milestones for Programme participants in readiness to enter SIT CIT – Interval 6:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	13th Oct 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	27th Oct 23***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	10th Nov 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	10th Nov 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	29th Dec 23**

Activity Milestone	Action	Deliverable Submission Timeline
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	5th Jan 24 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	1st Dec 23 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	5th Jan 24 (No later than*)
SIT CIT Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to CIT Start for each CIT Interval	22nd Jan 24
SIT CIT Start	**CIT Interval 6 Start = PSG Milestone (M9)**	29th Jan 24

Table 10 PIT Deliverable Milestones for entry into SIT CIT- Interval 6

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT CIT.

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

8.3 Timescales for PIT Deliverables for SIT Functional Programme Participants

This section describes the details of activities and deliverables associated to PIT DBT1 for SIT Programme participants for their readiness to enter SIT Functional stage.

Table below shows the DBT1 PIT deliverable milestones associated to PIT Functional Testing for both MVC and all other SIT Programme participants in readiness to enter SIT Functional:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	17th Nov 23 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	01st Dec 23***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	15th Dec 23*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	15th Dec 23*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	02nd Feb 24**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	09th Feb 24 (No later than*)
Programme participants issue draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	19th Jan 24 (No later than*)
Programme participants issue final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	9th Feb 24 (No later than*)

SIT Functional to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to SIT Functional Start for all SIT Programme participants (MVC and other SIT Programme participants)	04th Mar 24
SIT Functional Start	**SIT Functional Start (MVC and Other SIT Programme participants)**	11th Mar 24

Table 11: PIT Deliverable Milestones for entry into SIT Functional Testing

Note 1 – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT Functional.*

Note 2** – For the purpose of this plan, this is the final test execution progress report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT test readiness report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

8.4 Timescales for PIT Deliverables for SIT Migration Programme Participants

This section describes the details of activities and deliverables associated to PIT for SIT Programme participants for their readiness to enter SIT Migration stage.

Table below shows the PIT deliverable milestones associated to PIT Migration Testing for both MVC and all other SIT Programme participants in readiness to enter SIT Migration:

Activity Milestone	Action	Deliverable Submission Timeline
PIT Approach and Plan	At least 12 Weeks before Programme Participant's Final Test Completion Report	16th Feb 24 (No later than*)
PIT Test Readiness Report	To be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution	01st Mar 24***
PIT Requirements to Test Traceability Matrix	At least 4 weeks after PIT Approach and Plan. The Requirements to Test Traceability Matrix (RTTM) will also be updated during test execution	15th Mar 24*
PIT Test Scenarios	PIT Test Scenarios issued same day as RTTM	15th Mar 24*
PIT Test Execution Progress Report	Every month following start of PIT test execution and on a weekly basis in the last 4 weeks before completion of testing	03rd May 24**
PIT Execution	Assumption that PIT test execution runs up to PIT Test Completion Report is submitted	10th May 24 (No later than*)
Programme participants issue Draft PIT Test Completion Report	A draft of the PIT Test Completion Report to be submitted no later than 15 working days before the planned end of test execution	19th Apr 24 (No later than*)
Programme participants issue Final PIT Test Completion Report	Final PIT Test Completion Report submitted and allowing for any test completion delta	10th May 24 (No later than*)
SIT Migration Ready to Start (TMAG Milestone)	TMAG Milestone - 1 week prior to SIT Migration Start for all SIT Programme participants (MVC and other SIT Programme participants)	03rd June 24
SIT Migration Start	**SIT Migration Start (MVC and Other SIT Programme participants)**	10th June 24

Table 12: PIT Deliverable Milestones for SIT Migration Testing

Note 1* – MHHS SI Test Team will agree timelines for prior PIT deliverables with individual SIT Programme participants in line with their delivery plans, allowing for test assurance activities in the lead up to SIT Migration.

Pre-Integration Testing Guidance

Note 2** – For the purpose of this plan, this is the final PIT Test Execution Progress Report for the final month. In the final month, the requirement is to provide a weekly report and the monthly report is required to be provided once a month.

Note 3*** – For the purpose of this plan, this is the first PIT Test Readiness Report we will be expecting from Programme participants. This will be submitted every two weeks on a Friday after issuing PIT Approach and Plan, until the start of PIT test execution.

8.5 Interim Release Design Release

These section has been removed from the main body of the document and contains information on what interim design release SIT participants were expected to be aligned to for CIT and SIT functional.

8.5.1 SIT CIT (All Intervals)

The following are key points for entry into SIT CIT for all intervals:

- SIT CIT will be conducted against Design - Interim Release 2 only. This will include all the design updates from Interim Release 1;
- Programme participants are expected to be PIT complete against Design – Interim Release 2 prior to entry into their respective CIT Interval;
- Programme participants are expected to provide:
    - An integrated Test Environment, built to Interim Release 2 to conduct CIT Testing; and
    - A separate isolated Test Environment, built to Interim Release 2 in support of any CIT Defect Retesting.

  Note 1: Programme participants can choose to continue their development against Interim Release 3 and Interim Release 4. However, this must be in a separate Test Environment using branched code.

  Note 2: In addition, PIT test activities in readiness for SIT Functional also needs to be in separate Test Environments.
- Interim Release 2 published on 05th July 2023. Please see [REF-18] MHHS-DEL1275 Design Release 2 Notes for further information; and
- Interim Release 2 compatible DIP Simulator will be available on 11th August 2023.

8.6 SIT Functional

The following are key points for entry into SIT Functional:

- SIT Functional will commence against Design – Interim Release 5 only. This will include all the design updates from Interim Release 3 and Interim Release 4;
- Programme participants are expected to be PIT complete against Design – Interim Release 5 prior to entry into SIT Functional Test Phase;
- Programme participants are expected to provide:
    - An integrated Test Environment, built to Interim Release 5 to conduct SIT Functional Testing; and
    - A separate isolated Test Environment, built to Interim Release 5 in support of any SIT Functional Defect Retesting.

  Note 1: Programme participants can choose to continue their development against Interim Releases beyond Interim Releases 5. However, this must be in separate Test Environment using branched code.

Note 2: In addition, PIT test activities in readiness for SIT Migration also needs to be in separate Test Environments.

- Interim Release 5 will be published on 05th October 2023; and

Interim Release 5 compatible DIP Simulator will be available on 03rd November 2023

8.7 PIT Test evidence

These section has been removed from the main body of the document and contains information on what PIT evidence was expected for CIT and SIT functional.

8.7.1 PIT Evidence for CIT

For SIT CIT, all Programme participants need to provide test evidence to validate that testing has taken place on each system or service included in the MHHS E2E Design. Evidence to be provided is as follows:

1. Evidence of successful messaging in and out of **all IF and PUB messages relevant to the market role** under test must be provided.
2. Evidence of a **sample of other tests as selected and agreed** between the assurer and the Programme participant must also be provided. NOTE that the Programme participant must collect **evidence of all tests run**. The assurer will agree which evidence is to be provided for assurance purposes, but the Programme participant is responsible for ensuring that, if necessary, all evidence can be provided; and
3. For the final test run with the DIP Simulator, the test evidence can take the form of DIP Simulator logs.

Evidence for (3) above must be:

- For **IF messages sent outward** from the application - links to the DIP Simulator test logs of tests successfully executed plus files showing the contents of each message used; and
- For **PUB messages sent inward** to the application, a file of the messages and record of their successful receipt (as shown by a http response sent out from the application) and screenshots showing the same information.

8.7.2 PIT Evidence for SIT Functional

Programme participants conducting PIT in readiness for SIT Functional, need to provide test evidence against the correct functioning of each Service (according to its market role) as follows:

1. Evidence of successful IF and PUB messages relevant to their market role using the DIP Simulator (repeat of what was conducted for CIT). Please reference section 5.7.3.1 DBT1 PIT Evidence for CIT; and

2. End-to-end processes have been successfully tested and the messages generated from the back-office systems. Successfully test the receipt and processing of the messages arriving at the appropriate destination point(s), which demonstrates the correct functioning of the system for each market role