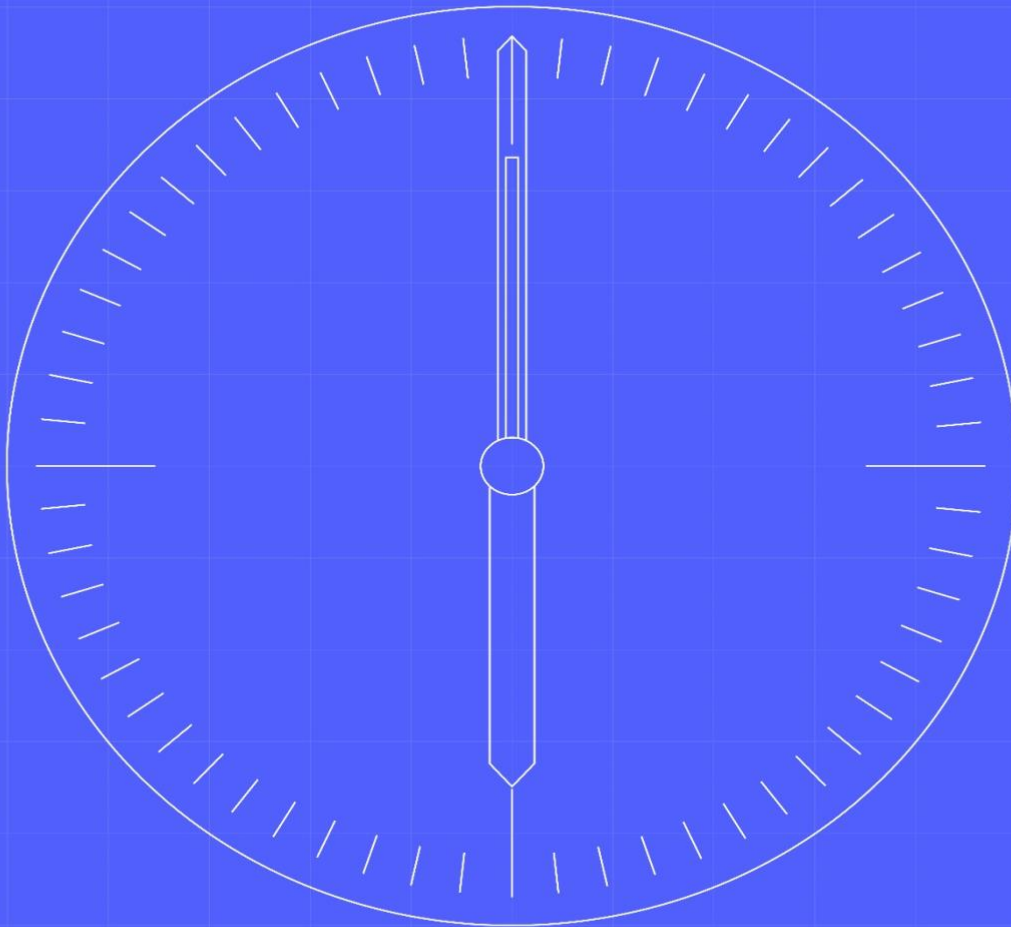


SIT Non-Functional Test Data Approach & Plan



Document owner

Cesar Lopes

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1.1 Change Record

Date	Author(s)	Version	Change Detail
13/03/2024	Cesar Lopes	0.1	Initial Draft
26/03/2024	Cesar Lopes	0.2	Updates following SRO and Code Body review
12/04/2024	Cesar Lopes	0.3	Updated following industry consultation
15/05/2024	Cesar Lopes	1.0	Baselined at v1.0 following May SITAG approval

1.2 Reviewers

Reviewer	Role
Lee Cox	SI Test Manager
Richard Puddephatt	SI Test Data Manager
Iain Smith	SI Non-Functional Test Manager
Kevin Davis	SI Test Architect
Simon Berry	SI Environments and Release Manager
John Wiggins	SI Data Migration Manager
Adrian Ackroyd	SRO Function Programme Test Manager
Smitha Pichrikat	SRO Function Client Delivery Manager
Phil Heiton	SRO SIT NFT/Operational Test Manager
Code Bodies (BSC and REC)	Various

1.3 References

Ref No.	Document/Link	Publisher	Published	Additional Information
REF-01	MHHS-DEL-315E2E Testing & Integration Strategy	SI Testing	29 th April 2022	
REF-02	MHHS-DEL-2117 SIT Non-Functional Test Approach & Plan	SI Testing	6 th March 2024	
REF-03	MHHS-DEL 300 Test Data Strategy	SI Testing	18 th May 2023	
REF-04	MHHS-DEL813 Overarching Test Data Approach & Plan	SI Testing	24 th May 2023	
REF-05	MHHSP-DES138-Interface Catalogue	MHHS	5 th July 2023	
REF-06	MHHS-DEL618 - Environment Approach & Plan	SI Testing	28 th February 2023	
REF-07	MHHS-DEL852 - Pre-Integration Testing Guidance	SI Testing	18 th August 2023	
REF-08	MHHS-DEL1470-CIT Data Loading High-Level Guidance	SI Testing	19 th July 2023	
REF-09	MHHS-DEL1367 - SIT Functional Test Data Approach & Plan v1.0	SI Testing	16 th August 2023	

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.

[REF-01] 'MHHS-DEL315 - E2E Testing & Integration Strategy' describes the overall, end-to-end (E2E) approach to testing - the manner in which all parties involved in the MHHS programme will conduct testing.

One of the major test phases is the **Systems Integration Testing (SIT)**. The purpose of SIT phase is to prove that the component Services are implemented in a way consistent with the MHHS E2E Design and interact coherently and consistently.

The SIT comprises sub-test stages: (1) **Component Integration Testing (CIT)**, (2) **Functional Test**, (3) **Migration Test**, (4) **Non-Functional Test** and (5) **Operational Test**.

This document, associated with the [REF-02] **MHHS-DEL-2117 SIT Non-Functional Test Approach & Plan**, provides the data preparation guidance for the **SIT Non-Functional Tests**.

This document is a child document of a series of documents progressively detailing the data approach for testing. Therefore it is recommended the following documents be read in conjunction:

- [REF-03] MHHS-DEL 300 Test Data Strategy: covers the data required to be coordinated across the systems for testing purposes.
- [REF-04] MHHS-DEL813 Overarching Test Data Approach & Plan: establishes a common and fully aligned set of test data for use in the industry-wide test phases of MHHS.

3 Introduction

3.1 Document Purpose

This document aims to define a Test Data Approach specifically for the SIT Non-Functional Tests. It provides a detailed view of specific data required per participant role.

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

- Senior Responsible Owner Function (SRO)
- Lead Delivery Partner (LDP)
- Testing and Migration Advisory Group (TMAG)
- Data Working Group (DWG)
- Programme Participant Test Managers
- All Programme party teams and resources involved in SIT execution or support.

3.2 Reviews and Approvals

The SIT Non-Functional Test Data Approach and Plan will go through an initial LDP review by the following team members:

- Lee Cox, SI Test Manager
- Richard Puddephatt, SI Test Data Manager
- Kevin Davis, SI Test Architect
- Iain Smith, SI NFT Test Lead
- Simon Berry, SI Environments and Release Manager
- John Wiggins, LDP Enterprise Architect

Upon completion of the LDP review, any comments and feedback would be incorporated before going to the SRO team for formal review by:

- Adrian Ackroyd, SRO Function Programme Test Manager
- Smitha Pichrikat, SRO Function Client Delivery Manager
- Phil Heiton, SRO SIT NFT/Operational Test Manager
- Balancing and Settlement Code (BSC) and Retail Energy Code (REC)

Upon completion of the SRO and Code Body review it will then be distributed to the DWG for consultation where comments will be incorporated leading to a recommendation of approval by the group.

Approval will then be requested from:

- Systems Integration Testing Advisory Group (SITAG).

The document will be made available for information via the programme portal.

3.3 Change Forecast

The SI team 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.

All updates to this document will follow the review and approval process outlined in section 3.2.

3.4 Summary of Changes

Initial release.

3.5 Assumptions and Caveats

3.5.1 Assumptions

- The Programme Participants taking part in SIT have already identified their systems that will be deployed in the Test Environments and will be used during SIT Tests.
- The Programme Participants, as part of the PIT Testing, are being able to create and load test data to their systems in their PIT test environment.
 - Whenever possible, the tools developed by the participants during the PIT stage can be reused to load test data for SIT.
- As described in the document [REF-06] MHHS-DEL618 - Environment Approach & Plan, the Programme Participants will execute Non-Functional Tests on the SIT-B Environment, segregated from the SIT-A used during the Functional Tests.
 - It is assumed the SIT Non-Functional and SIT Operational can be executed in one environment but not in parallel to avoid conflicts.
 - Programme Participants can decide to have their own environment for each stage or re-purpose their environments for each stage.
- Re-use of Participant's PIT message injection tools and test stubs/harnesses for NFT SIT.

3.5.2 Caveats

N/A.

4 Objectives

4.1 Objectives

The objective of the SIT Non-Functional Testing stage is to:

1. Prove that the systems and solutions being delivered as part of this programme conform to the MHHS Design, meet Non-Functional requirements, and are fit for purpose.

The objective of this document is to establish the approach to obtain the test data required to execute and pass all test scenarios / cases in the scope of the Test Stage without exception.

5 Scope

5.1 In Scope

As described in [REF-02] MHHS-DEL-2117 SIT Non-Functional Test Approach & Plan, the scope of SIT Non-Functional involves the following roles:

1. Data Integration Platform (DIP)

2. BSC Central Service – Industry Standing Data (ISD), Volume Allocation Service (VAS), Settlement Operations, Load Shape Service (LSS), Market-wide Data Service (MDS)
3. Smart Data Service (SDS)
4. Advanced Data Service (ADS)
5. Metering Service Smart (MSS)
6. Metering Service Advanced (MSA)
7. Electricity Suppliers
8. Network Operations
9. Electricity Enquiry Service (EES)
10. Unmetered Supplies Operator (UMSO)
11. Unmetered Supplies Data Service (UMSDS)
12. Data Communications Company (DCC) – Data Service Provider (DSP) and Central Switching Service (CSS)
 - Not within the scope of SIT NFT (SEC Mod MP162), however, MHHS will have a stake in the results from the testing carried out by the DCC and would therefore require the DCC to provide a level of assurance to their systems capacity and performance testing results.
 - DSP and CSS services provided by the DCC are out of scope of SIT B NFR testing.
13. ElectraLink – Data Transfer Network (DTN) – the same production instance with different Test Flags.
14. Registration Service (REGS)

This document provides the Test Data Approach to be used for the different types of Non-Functional Tests.

5.2 Out of Scope

This document does not cover the details of the provisioning of data for:

- All the other SIT Stages – these will be the subject of separate Test Data Approach and Plan documents:
 - Functional
 - Migration Test
 - Operational Test
- UIT Test Stages:
 - Qualification Test
 - E2E Sandbox

6 Test Architecture & Coverage

6.1 NFT SIT – Planned Tests

The Table 1 lists the test types planned to be carried out during NFT SIT. The document [REF-02] MHHS-DEL-2117 SIT Non-Functional Test Approach & Plan contains the details for each phase.

Table 1: NFT SIT Test Types

NFT SIT Phase	Test Type	Comments
Phase 1	DIP -> Helix	Volume testing of IF-021 (Meter Consumption Data Processing)

NFT SIT Phase	Test Type	Comments
Phase 2	Lifecycle Processing	Replication of daily processing across the MHHS eco system. Includes Operational Choreography.
Phase 2	E2E	End-to-end tests of interfaces and requirements not covered as part of the above tests.
Phase 2	Targeted Interface	Solution behaviour under error conditions/unavailability.

This document describes the Test Data Approach to support all four Test Types.

7 Test Data Approach

7.1 Non-Functional Test Data Types - Overview

Four Non-Functional Test Data Types will be provisioned to allow the execution of all NFT Tests. Table 2 contains a summary of the types.

Table 2: Non-Functional Test Data Types

#	Test Data Type	Test Data Approach
#1	E2E Choreography	<ul style="list-style-type: none"> Re-use of SIT Functional Test Data, cohorts pairing and SIT Migration Test Data. Re-load the Test Data into SIT-B Environment systems. <p>Total MPANs available: approximately 10,000.</p>
#2	PP and DIP Bilateral	<ul style="list-style-type: none"> Re-use of CIT Test Data. Re-load the CIT Test Data into SIT-B Environment systems. <p>Total MPANs available: approximately 40,000.</p>
#3	Elexon Central Services and DIP Production Load	<ul style="list-style-type: none"> Manufacture a production load of MPAN data. Seed and load the manufactured MPANs into DIP and Helix on SIT-B Environment. <p>Total MPANs available: production load (33+ million)</p>
#4	PIT Volume Injection Data	<ul style="list-style-type: none"> Programme Participants to pre-load their systems into SIT-B with volume data manufactured during their PIT Non-functional tests. PIT Data and injection tools to be re-used to demonstrate the system can work at the Programme Participant expected production scale on the SIT-B environment. <p>Total MPANs available: the expected production load for the specific programme participant.</p>

The following sections will describe each Test Data Type.

7.2 Test Data Type #1 – E2E Choreography

End-to-end tests in the context of the MHHS Programme are essentially very complex:

- They often involve multiple Programme Participants with different Market Roles interacting to execute business processes.
- Each system involved has different levels of data validation.
- Aligned and consistent data between all involved is required to perform a significant process beyond initial validation, e.g., alignment on the current supplier, assigned data and meter services, market segment, meter type, domestic indicator, etc.

To accomplish the required data alignment to execute E2E tests, the Test Data Type #1 leverages the Test Data produced for SIT Functional and SIT Migration and load them into the SIT-B environment.

Then, to achieve a significant load for the required Non-Functional validations, multiple E2E processes can be triggered simultaneously by Programme Participants in a specific time window. E.g., all cohorts triggering 100 Metering Service MTD Update (IF-005) per minute during a 30-minute window.

Figure 1 illustrates the Test Data Type #1 approach. The data is allocated to align the programme participants within cohorts (Figure 2).

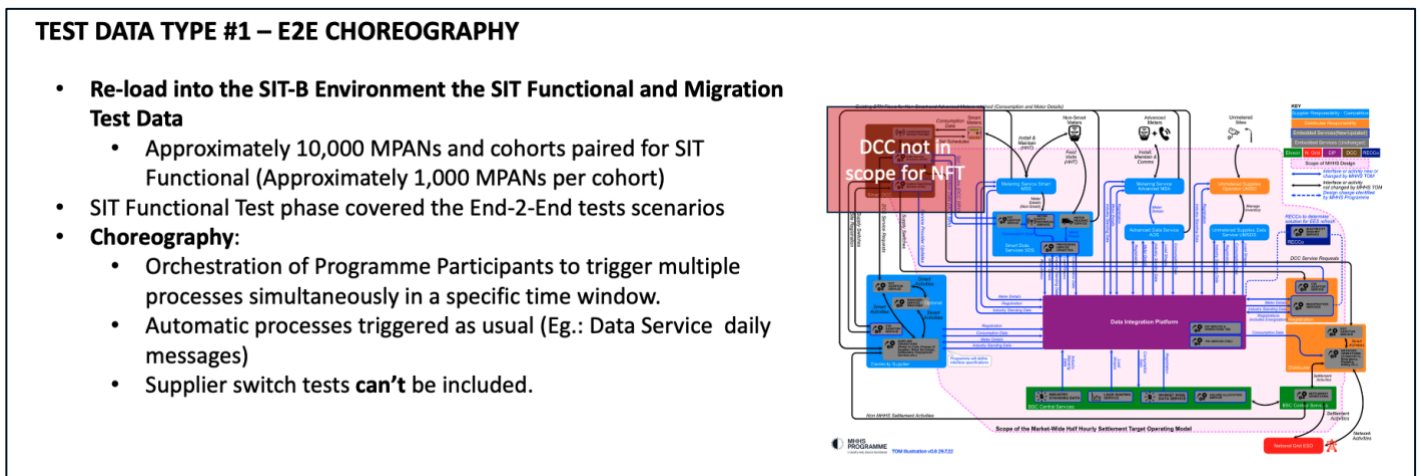


Figure 1: Test Data Type #1 - E2E Choreography

SIT Test Data Buckets – Aligned with Participants Pairing

Test Data Bucket ID	Supplier	Meter Service	Data Service	MDR	LDSO
Test Data – Cohort A 1000 MPANs 50% Market Segment: Smart/Traditional 30% Market Segment: Advanced 10% Market Segment: Unmetered 5% Related MPANs 5% Import/Export MPANs	Supplier A	Smart Meter Service A	Smart Data Service A	Meter Data Retriever A	SSEN & BUUK
		Advanced Meter Service B	Advanced Data Service B		
		UMSO (SSEN & BUUK)	Unmetered Data Service C		
Test Data – Cohort J 1000 MPANs 50% Market Segment: Smart/Traditional 30% Market Segment: Advanced 10% Market Segment: Unmetered 5% Related MPANs 5% Import/Export MPANs	Supplier H	Smart Meter Service F	Smart Data Service F	Meter Data Retriever F	SSEN & BUUK
		Advanced Meter Service G	Advanced Data Service G		
		UMSO (SSEN & BUUK)	Unmetered Data Service H		

Figure 2: SIT Functional Test Data re-loaded into SIT-B Environment with Cohorts grouping

Test Data Type #2 – PP and DIP Bilateral

The Test Data Type #2 – PP and DIP Bilateral is suitable for those Non-Functional tests where the End-to-End process with **multiple participants involved is not required**, but where there is only processing between the DIP platform and one specific Programme Participant.

For example, a test intended to validate the non-functional requirements of the Registration Service processing Supplier Updates to Registration (IF-009). This test can be executed similarly to the approach used for SIT Component Integration Tests (CIT), but with a load big enough to extract and validate the non-functional metrics of the specific Programme Participant system. Following the example, the SI Pseudo-Company, within the Supplier role, could trigger thousands of IF-009 updating the Consent Granularity of MPANs in a specific time window to capture the non-functional metrics.

Test Data Type #2 leverages the Test Data produced for SIT CIT. SIT Programme Participants will load the CIT data into the SIT-B environment. The SI, from the SI End-Point using the Pseudo company MHHS with multiple rules, can trigger multiple calls, in a defined time window, of specific IFs using the SIT CIT MPANs data.

Since the MPANs allocated for CIT are aligned between the MHHS Pseudo company, DIP Platform, and Programme Participant Target System, the DIP can route the IFs to the Test Target System for processing. Non-functional metrics can then be extracted from DIP routing, Programme Participant system processing, and the response sent to the DIP Platform (Figure 3).

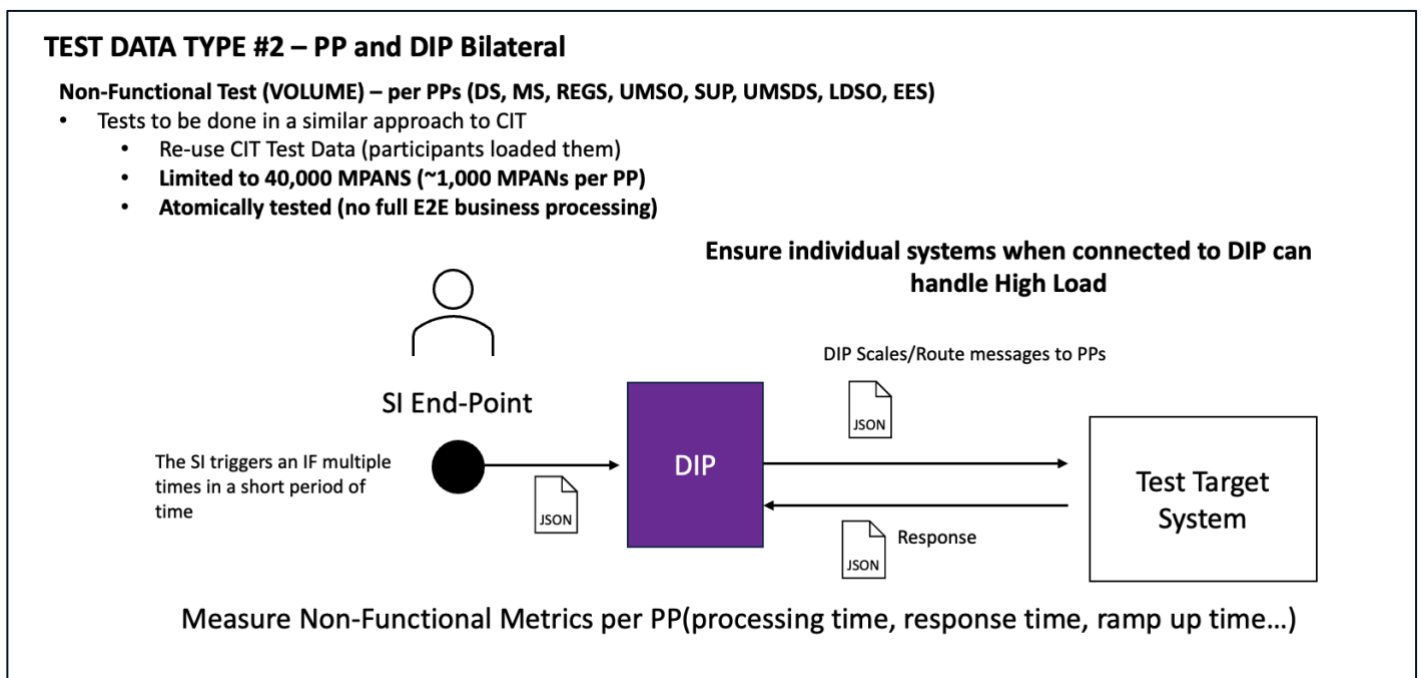


Figure 3: Test Data Type #2 - PP and DIP Bilateral

7.3 Test Data Type #3 – Elexon Central Systems and DIP Production Load

As cited by [REF-02] MHHS-DEL-2117 SIT Non-Functional Test Approach & Plan], the Settlement Period Consumption Data message (IF-021) is expected to account for roughly 90% of the overall traffic expected within the MHHS programme.

The Test Data Type #3 is intended to support tests involving a production load of IF-021 into the DIP and Elexon Central Services. At the time this document was written, more than 30 million MPANs were active in the market.

Manufactured data will be used, all MPAN, Address, Meter data will be manufactured. Large volumes of manufactured MPAN data will be created based on a limited number of defined attributes and characteristics. Except for Helix and DIP all other organisational data will be simulated, e.g. “pseudo” MHHS market participants, MPANs will be begin with “99” etc.

For Test Data Type #3, the SI Test Data team will manufacture the production load of MPANs required by the Non-Functional Tests involving IF-021. The test data will be seeded into the DIP Platform and pre-loaded to Exelon Central Systems. From the SI End-point, using the MHHS Pseudo Company roles created for SIT CIT, millions of IF-021 can be triggered in a specific test time window, and then non-functional metrics extracted (Figure 4)

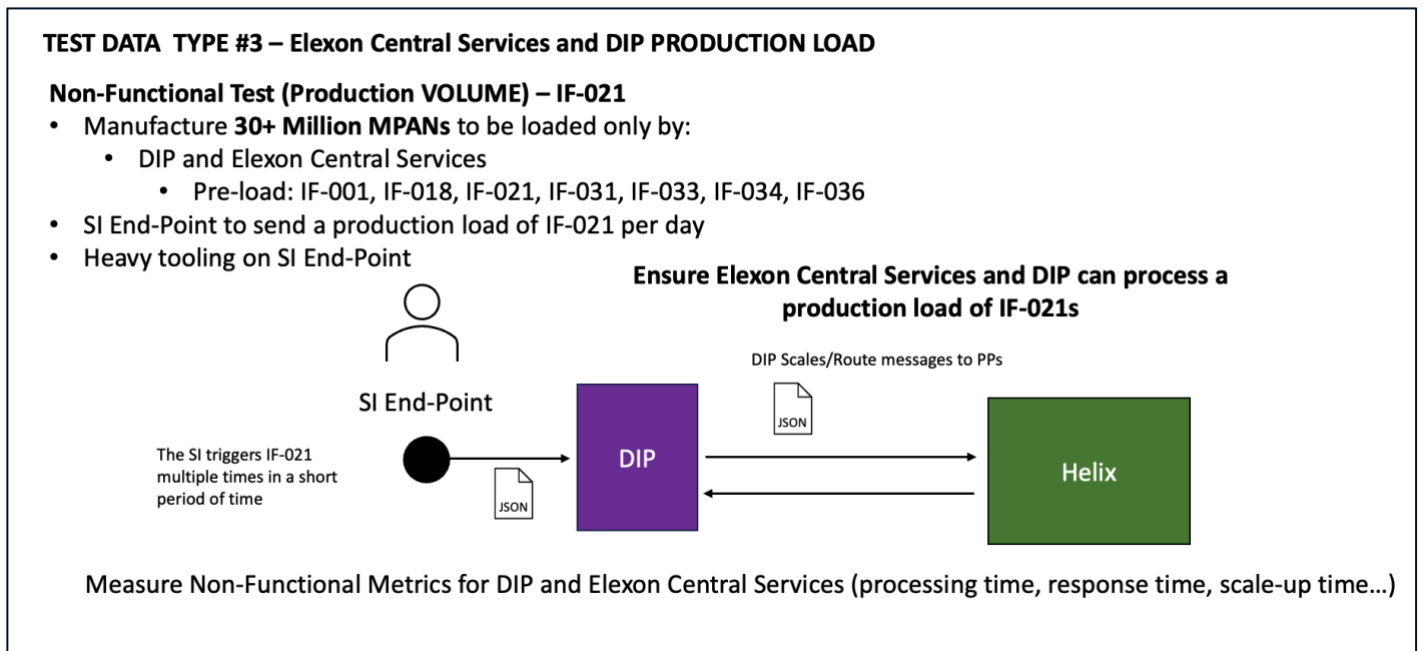


Figure 4: Test Data Type #3: Exelon Central Services and DIP Production Load

Test Data Type #4 – PP PIT Volume Data

Programme Participants will have different levels of processing load after going live in the Production environment. For example, a supplier with a portfolio of five million MPANs is expected to have a much higher system load and processing demand than another supplier with a few thousand MPANs in the portfolio.

As detailed in the [REF-07] MHHS-DEL852 - Pre-Integration Testing Guidance, 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 with the requirements within the MHHS E2E Design.

Before the commencement of SIT Non-Functional tests, the Programme participants must provide testing results demonstrating their compliance with their systems non-functional requirements relevant to their role in the market and specified in the MHHS E2E Design. For PIT Non-Functional tests, participants will need to demonstrate compliance to:

- Performance;
- Load;
- Resilience; and
- Security.

The Test Data Type #4 leverages the automation tools and test data produced by Programme Participants to execute their PIT Non-Functional Tests on their systems now deployed into SIT-B environment (Figure 5). No data for Type #4 will be manufactured by the SI data team.

TEST DATA TYPE #4 – PIT Volume Injection Data

Non-Functional Test (Production VOLUME) – PP system running on SIT B

- Programme Participant manufactured data for PIT Non-Functional:
 - **Amount of MPANs aligned with PP expected production load**
 - The data does **not** need to be aligned with DIP or any other PP.
 - Ensure there is no overlap with Test Data MPANs produced for the other SIT Non-Functional Test Data Types.
 - Ensure the PIT data is good enough to trigger relevant business processing in the test target system
 - The test is able to pass the system's initial validations and trigger relevant business processes downstream.)
- Programme Participant Test Automation tools trigger the anticipated load of PUB messages on the SIT-B Environment

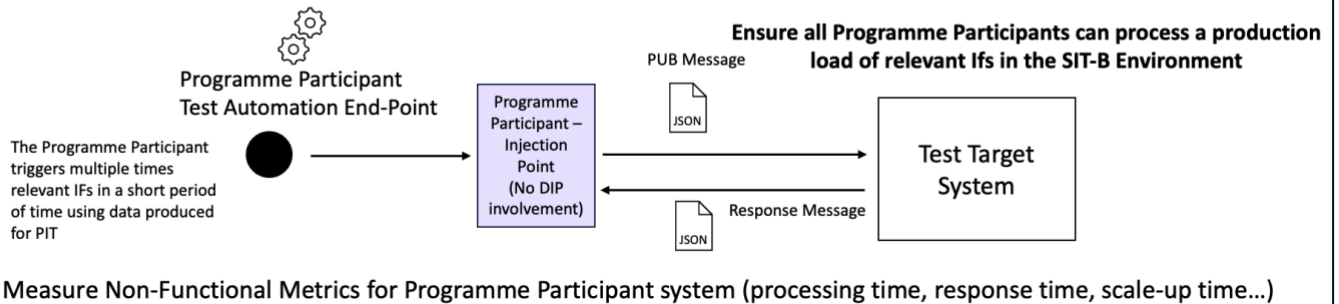


Figure 5: Test Data Type #4 – PIT Volume Injection Data

7.4 Test Data Type Approach vs Non-Functional Test Types

The Table 3 contains a summary of the applicability of each Test Data Type approach to the planned Non-Functional Test Types.

Table 3: Test Data Type Approach vs Non-Functional Test Types

#	Test Data Type	Non-Functional Test Types
#1	E2E Choreography	<ul style="list-style-type: none"> • E2E • Lifecycle Processing • Targeted Interface
#2	PP and DIP Bilateral	<ul style="list-style-type: none"> • Targeted Interface
#3	Elexon Central Services and DIP Production Load	<ul style="list-style-type: none"> • DIP -> Helix (IF-021)
#4	PIT Volume Injection Data	<ul style="list-style-type: none"> • Targeted Interface

7.5 Test Data Loading

The loading of the Test Data for Non-Functional Tests will use the same tools, file types and SFTP environment used for SIT Component Integration Tests, SIT Functional Tests, SIT Migration Tests and Programme Participant PIT. Details available on:

- [REF-08]: MHHS-DEL1470-CIT Data Loading High-Level Guidance
- [REF-09]: MHHS-DEL1367 - SIT Functional Test Data Approach & Plan v1.0

7.6 Test Data Generators

Similar to the approach executed for SIT Component Integration Tests and SIT Functional Tests, **data generators shall be used for electricity consumption data instead of historical consumption data.**

The Data Generator tool, which launched on 24 May 2023, provides realistic test data for the following types of data to use during Pre-Integration Testing (PIT) and Systems Integration Testing (SIT):

- IF-021 – Directly consumable data, consumed by Elexon Central Systems (ECS) among others
- IF-041 – Directly consumable data, consumed by the Data Services

The Data Generator tool fully simulates the above-mentioned types of Meter and Settlement data and produces valid data for testing.

Information on the Data Generator is available on the Simulators & Emulators page of the Collaboration Base. Participants will need their own tool to transform and inject the data into the relevant Service, where appropriate.

Notes:

1. Participants shall **NOT use real domestic customer consumption data** associated with the real MPANs in the Test Environment.
2. If, during the Data Cut, real domestic consumption data is extracted as part of the production data backup and loaded to the participant test environment, the participant shall apply a transformation script to modify and randomise the domestic consumption data.
3. Participants **may use real consumption data for non-domestic** MPANs. It is the responsibility of the participant to analyse the risks and impact of using real consumption data in the test environment. The real consumption data may expose participants' business-sensitive information.

8 Test Data and SIT Non-Functional Environment Reset

Due to the nature of the execution and scale of Non-Functional Tests, the data in the Programme Participant's systems may become inconsistent and unusable over time, making it impossible to continue the Test phase.

The Programme will monitor the data position of all participants and only, as a last resort, will ask, with a two-week notice, the participants to reset their systems to the state before the start of the execution of the non-functional tests.

It is highly recommended that all Programme Participants take a full backup or re-storing point of their system under tests after the initial Non-Functional Test Data Loading and just before the start of the test execution.

9 Test Data Anonymisation

All MPANs records used in testing will be allocated unique reference ID that will be used in all communications, including test results and defect logging in ADO.

Due to the MPAN being considered Personal Identifiable Information (PII), it cannot be shared outside of the System Test Environment. I.e., While the Real MPAN can be used in the IF/PUB or DTS messages transferred and processed in the test environment, it cannot be shared in communication means like email, test reports, bug triage, etc.

The programme will provide a table to all participants with a Unique Ref ID for the allocated MPANs to be used in communication. For example:

- MPAN Core: 20 1234 1234 123
- Ref ID (For communications and reports): ABCD_10001234

Note:

- The same anonymisation/obfuscation approach shall be used for Domestic and Non-Domestic participants.
- **NO real domestic consumption data shall ever be used for tests linked to its original MPAN or Meter.**

- Participants may use real non-domestic consumption/generation to check their processes.
 - It is the responsibility of the participant to analyse the risks and impact of using real non-domestic consumption data in the test environment. The real consumption data may expose participants' business-sensitive information.

9.1 Test Data Anonymisation for Testing Reports and Test Evidence

As the MPAN is considered Personal Identifiable Information (PII) and cannot be shared in Test Reports and any evidence, logs or images attached to Azure DevOps. The participant needs to obfuscate the MPAN while keeping the ability of assurance teams to verify the content.

For Reports and Test evidences:

1. The participant shall remove or obfuscate the unique identifier digits of the MPAN – Digits 11 to 18 of the full MPAN (see Figure 6).
2. For image files, the participants can blur or overlay the unique identifier with any colour graphic shape (e.g.: a white rectangle covering the unique identifier digits).
3. The same obfuscation approach shall be applied for Domestic and Non-Domestic MPANs

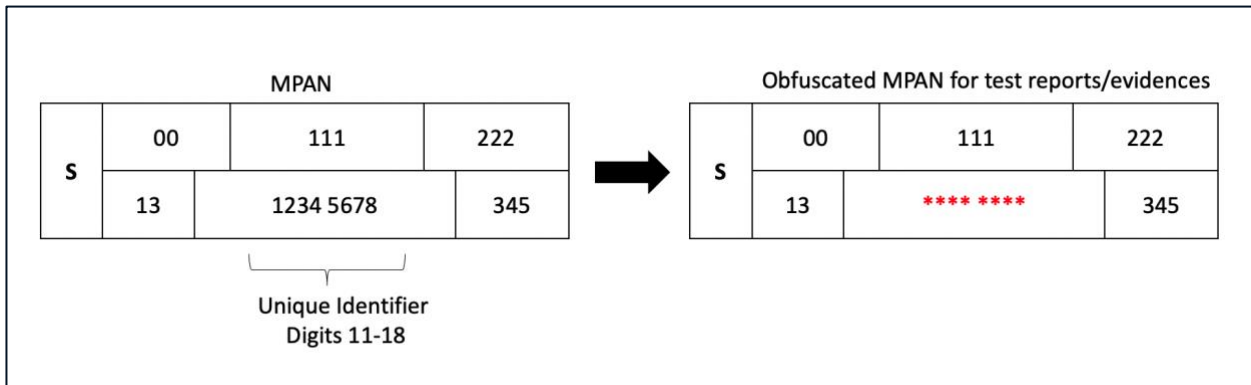


Figure 6 – MPAN obfuscation for Test Reports and evidence

10 Test Data Schedule

Please, refer to [REF-02] MHHS-DEL1259 SIT Functional Testing Approach & Plan v0.1 for the SIT Functional Test Schedule.

The milestones and schedule assume Phase 1 and Phase 2 of NFT SIT run in parallel.

Table 4: Non-Functional Test Data Milestones

Milestone	Milestone Date
Test Data Phase 1 – Shared	08 July 2024
Test Data Phase 1 – Ready	05 August 2024 Four weeks before SIT Non-Functional Start – Phase 1
Test Data Phase 2 – Shared	08 July 2024

Milestone	Milestone Date
Test Data Phase 2 – Ready	05 August 2024 Four weeks before SIT Non-Functional Start – Phase 2

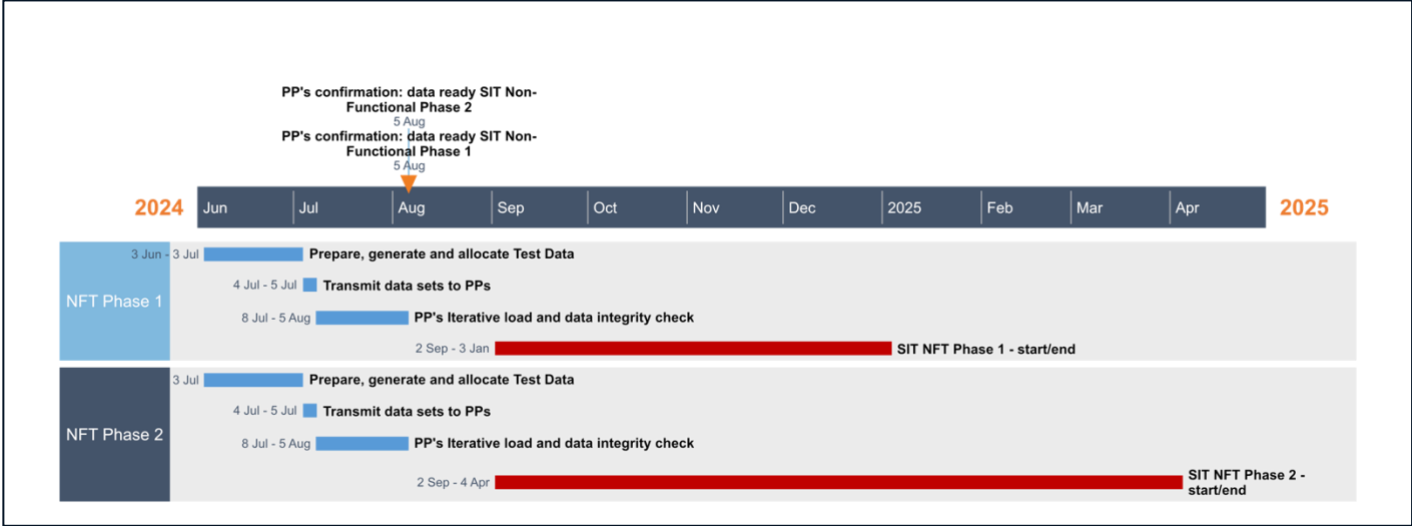


Figure 7: Non-Functional Test Data Schedule

11 Appendix

N/A