



SSE

Nexus Programme Industry Testing Review

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EXECUTIVE SUMMARY

The UK Link Replacement Programme (Project Nexus) represents a significant change for the Gas industry. It will introduce new UK Link systems for the market operator Xoserve and new functionality to facilitate better market operations and support the roll out of Smart Meters in Great Britain.

Given the magnitude of this change, SSE has been monitoring the risks to delivery from both a shipper and overall industry perspective. The approach to testing has been of particular concern; hence SSE commissioned PA Consulting Group (PA) to perform an independent review of the Industry testing arrangements. The objective of the review was to establish the risks associated with the current test plans, activities and dependencies on participants. In practice, the review also considered the context surrounding the testing regime.

Our approach

The review comprised four stages. Firstly, it established the current status of the Nexus programme, good practice for large scale testing programmes and identified lessons and metrics from comparable programmes. Secondly, these inputs were assessed to identify gaps and issues. Thirdly, a risk-based analysis was performed. This examined the risks associated with:

- Risk of early **entry** to market testing - Industry will enter testing too early leading to a highly inefficient and prolonged testing phase
- Risks of an inefficient market testing **process** - Industry will engage in a test process that is not good practice and which will be inefficient and not yield appropriate results
- Risks of early **exit** from market testing - Industry will exit testing too early leading to disruption of the market.

Finally, the review recommends how the industry could address the risks identified. These take account of the need to drive ahead with change, balanced against the need to take account of established good practice in large scale testing and change.

During the course of this review, Xoserve has published new plans for Market Trials. We have undertaken an initial review of these and have incorporated our thoughts into the preliminary analysis and conclusions.

Key Conclusions

The report has highlighted risks in market test entry, execution and exit, as summarised below:

Risk phase	Likelihood	Commentary on likelihood	Impact	Commentary on impact
Risk of early entry to market testing	High	Currently no clear test entry criteria or governance to manage process Programme slippage creates risk shippers will not be ready	Med	Increased industry cost to shippers/Xoserve Prolonged delays to Nexus and benefits Impact on related industry programmes Increases risk of early exit
Risks of an inefficient market testing process	High	High degree of parallel running introduced to compensate for delays Lack of clarity on the market trials process despite recent communications Mandatory end-to-end	Med	Increased cost to shippers/Xoserve Prolonged delays to Nexus and benefits Impact on related programmes Increases risk of early exit

Risk phase	Likelihood	Commentary on likelihood	Impact	Commentary on impact
		market testing may not be within Xoserve remit No clear governance to manage test process and findings		
Risks of early exit from market testing	Med	No defined exit criteria The timescales to implement the new governance regime before start of testing look very challenging. Concerns relate to: <ul style="list-style-type: none"> • Strength of and vires for this regime • Timeliness of this regime, given testing is imminent • Possibility that the underlying industry test process of market trials is insufficiently rigorous. 	Very High	Significant risks for: <ul style="list-style-type: none"> • Customers (through impact on market-supporting processes such as change of supplier). • Confidence in the market and even ultimately the financial stability of some participants • General industry functioning These risks are potentially exacerbated by go-live in the winter period

The most significant concern and the area that will cause the highest impact to the industry is the risk of early exit from market testing. This could have a serious effect on consumers, confidence in the market and even the financial stability of some shippers (for example regarding cashflow considerations). We welcome Ofgem's announcement of new governance and assurance, but this does not entirely mitigate the risk and it is likely that it will be challenging to embed these processes in sufficient time for the start of testing. In addition, and in particular additional risks include:

- **There are no defined exit criteria from testing.** This is essential for an industry change of this magnitude and cannot be left to be determined prior to the 1 October 2015 deadline
- **There is no post go-live contingency planned.** There are no demonstrable plans for rollback should the current planned go-live be put at risk
- **The Market Trials test process will not be sufficiently rigorous.** The current stated process of Market Trials requests participation by companies rather than requiring it. Whilst there are some industry precedents for this, we have not seen a demonstrable risk analysis that confirms this approach is adequate for Nexus and is not a replacement for end-to-end Industry testing
- **Key processes that support the market, such as change of supplier (CoS), fail to operate for all participants.** The decision to exit from testing, without full participation from all industry stakeholders, will be made unilaterally. The impact of a major failure of a key process such as CoS would have a significant impact on customers: up to 25,000 assuming a hypothetical scenario in which a shipper with 10% domestic market share was affected by four weeks of disruption. Shippers and the industry as a whole would also be affected
- **The newly-announced governance regime may not be strong enough and is late in the programme timescale.** It is not clear that the governance regime will have appropriate powers to address concerns. The governance regime and assurance are being introduced very late in the process and need to be effective immediately.

Recommendations

From the above, we conclude that there is a **significant risk** to the October Go Live date and that urgent action must be taken to verify the viability of that date and put appropriate measures in place to

manage risk and – if ultimately appropriate – move the date. These measures should now largely fall to the new governance body to manage and implement.

We believe the key activity that the new governance arrangements should address is to establish a criteria to progress market testing with support from Ofgem, at the latest by **May 2015**. To make this critical decision, the governance body needs to:

- **Critique the current test ‘optional’ approach to market trials.** We recommend that the independent assurance body assesses the industry impact of this approach, in comparison to full end-to-end Industry testing, by rapid consultation with the Shippers and other industry stakeholders
- **Report on the specific state of readiness of each industry participant.** This cannot be left to a questionnaire approach: each Shipper needs to state explicitly whether it would be ready for end-to-end industry testing in June 2015 (to allow 3 months of testing for all industry participants)
- **Provide options for both contingency for the October deadline and the deferral option.** This should examine the whole industry impact and cost, taking into account the key measures of customer impact including loss of potential benefits and increases in costs, security of supply and industry reputation.

The risks that exist in the Nexus Programme are significant and require immediate action. We believe that addressing these risks and following a strict timetable of decisions are in the best interests for customers and all stakeholders.

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1 INTRODUCTION

Xoserve provide transaction services on behalf of all the gas network transportation companies. Effective from October 2015, all UK Link systems, integral to the Xoserve service provision, will be replaced (“Project Nexus”). Simultaneously, this change will bring broader enhancements to the gas business to position it for future strategic changes such as smart metering.

1.1 Objectives of the review

This independent review is focused on the industry testing of the Nexus programme as a critical component to delivering its overall objectives. In the review it is necessary to examine the broader aspects of project and programme delivery, given the significant change associated with Nexus. However, the key objectives for the review are:

- Perform an objective analysis of the risks to the Nexus programme that are present given the current timelines and specifically the testing approach that is being used
- Summarise good practice in testing, in the context of an industry change programme such as Nexus
- Provide examples of when other sectors and organisations have undergone similar changes and how they have approached and/or managed the testing process
- Submit conclusions and recommendations to address the risks identified, recognising both the current constraints on the programme and good practice examples from elsewhere.

1.2 Context of the Nexus Programme

1.2.1 Xoserve is at the centre of the UK competitive energy market

Xoserve is a wholly owned agent of the Gas Transporters (GTs) which are all licenced network businesses. It was established in 2005 following the partial sale of National Grid’s gas distribution business. Xoserve is contracted by the GTs through the Agency Services Agreement to provide a range of services to the market, discharging the GTs’ licence obligations under Standard Special Condition A15.

With the exception of a capacity booking system called Gemini, Xoserve owns the IT platform which delivers these services and which support the competitive gas market. Consequently, Xoserve is of great importance to the energy markets and to the UK’s circa 23 million gas customers.

1.2.2 The origin of the UK Link replacement programme and project Nexus

In 2008 Xoserve conducted a technology refresh for UK Link, entailing a migration to supported versions of hardware, database, operating systems and development software. However, at the time, Xoserve expected to undertake further investment within a timescale of five years. This was because support for elements of the UK Link infrastructure was to end. It was recognised that investing solely in a technology refresh, in and around 2013, could be significantly more expensive than if a re-write had been previously undertaken. Moreover, the prospect of GB-wide smart metering would have resulted in a significant change event anyway.

In the 2008-13 Gas Distribution Price Control Review (GDPCR) submissions, a case was made for a re-write of the UK Link systems. In the final proposals, it was recognised that a re-write of the UK Link systems would be a cost-effective opportunity for the industry to rationalise. It was envisaged that

there would be a consultation with industry to understand the scope of Xoserve's future services. This requirements gathering exercise took four years (from 2009 to 2013) and was known as "Project Nexus". These requirements were captured in a suite of high level Business Requirement Documents (BRDs) which were then expressed as proposals to modify the Uniform Network Code (UNC).

In 2013, Xoserve announced the start of the UK Link replacement programme, based on the UNC Modifications which were anticipated to be approved by Ofgem. The programme had an anticipated completion date of October 2015 which was referred to as 'challenging' by Xoserve. It has become common parlance to refer to this programme as 'Project Nexus' reflecting the provenance of the original requirements.

Figure 1 shows how the UK Link Programme has dependencies on other important industry changes such as Smart Metering and Settlement Reform.

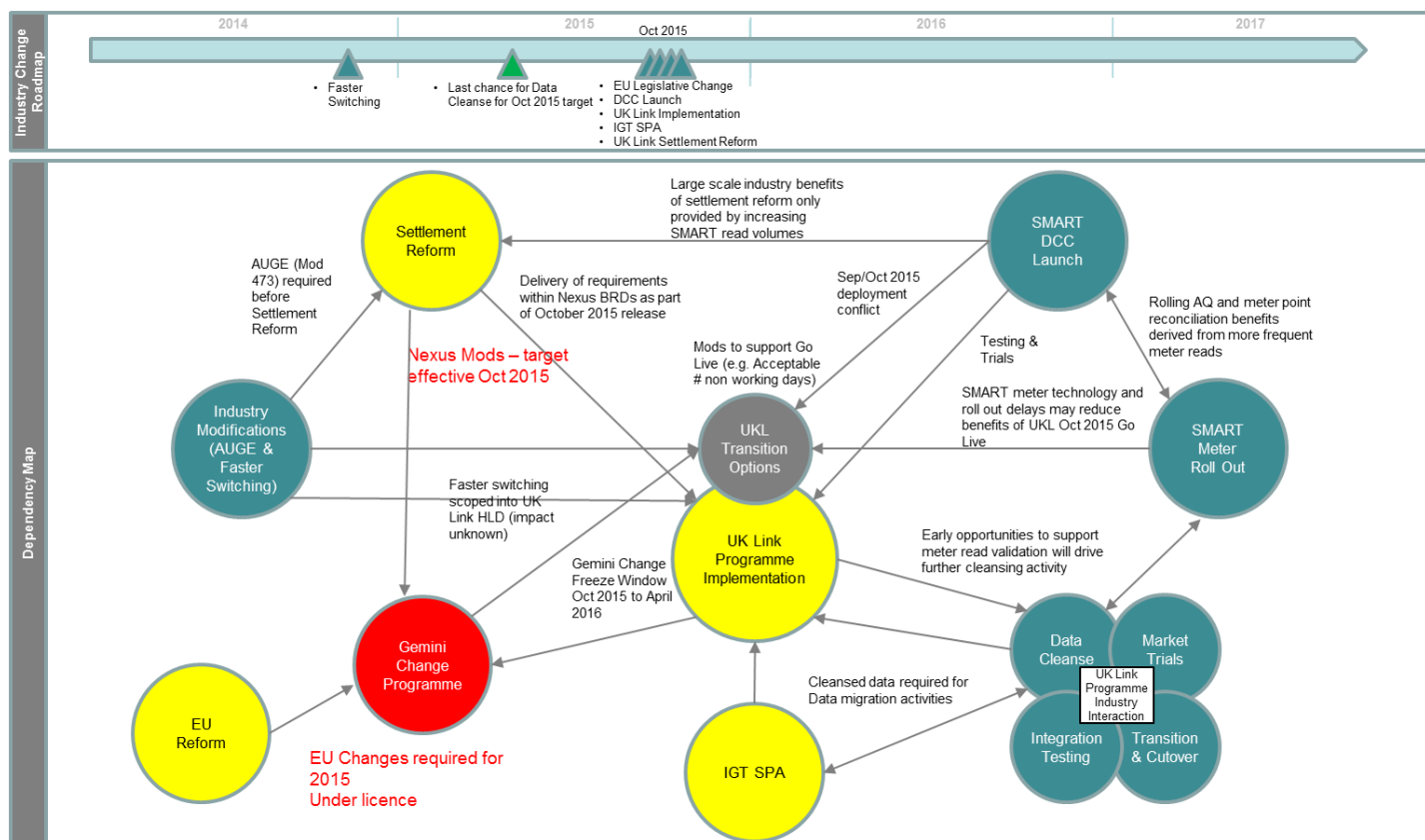


Figure 1: Delivery Dependencies from an Xoserve perspective¹

The UK Link replacement programme is therefore a significant undertaking for both Xoserve and the industry in general. Not only does it involve substantial change to multiple parties' systems, but it is also the key enabler for many other future changes in the industry.

¹ Xoserve Senior Stakeholder Forum. 4 February 2015,

<http://www.gasgovernance.co.uk/sites/default/files/Senior%20Stakeholder%20Forum.pptx><http://www.gasgovernance.co.uk/sites/default/files/Senior%20Stakeholder%20Forum.pptx>

1.3 Our approach

We have adopted a four stage approach. This is shown in Figure 2 below and subsequently described.

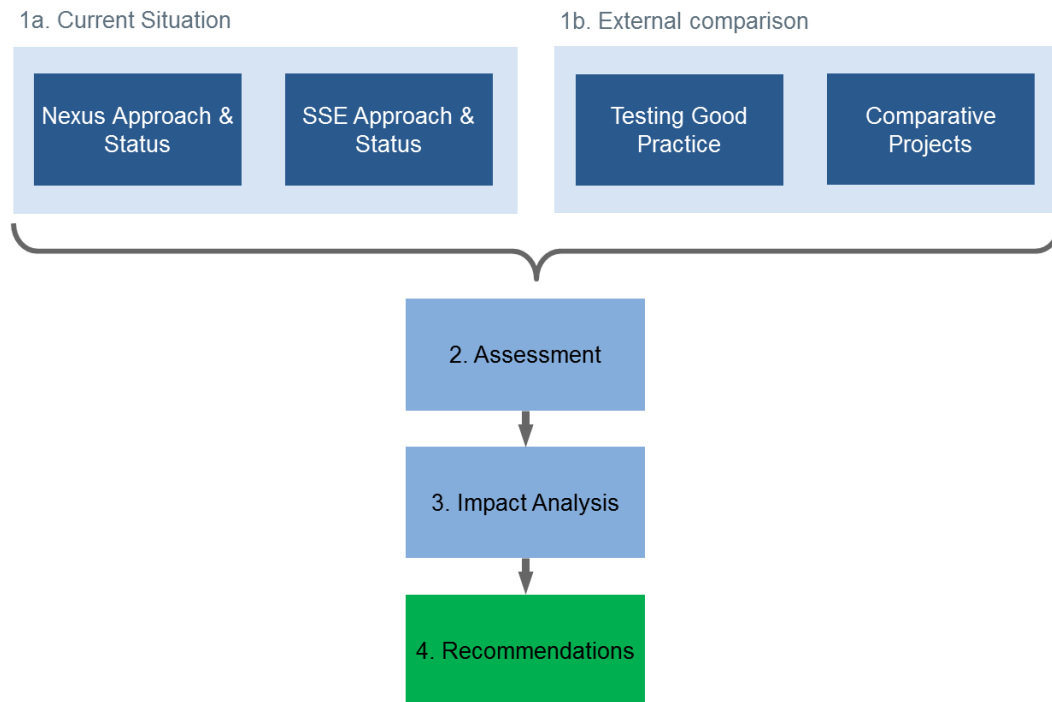


Figure 2: The approach taken for the Nexus Industry Testing Review

1.3.1 Establish Current Situation and External Comparison

We have undertaken a series of documentation reviews, interviews and investigation against the four elements shown:

- **Nexus Approach and Status:** we have reviewed the overall scale of Nexus, its governance, the methodology and plan for its development and testing and the current status against those plans.
- **SSE Approach and Status:** we have reviewed SSE's current approach and plans and SSE's fit to the Nexus status.
- **Testing Good Practice:** we have examined industry good practice for testing based on proven established methods, metrics and supplemented by PA's practical experience. We have identified the approach elements appropriate to a programme of the scale of Nexus.
- **Comparative Projects or Programmes:** we have identified comparable projects and programmes that can be used as comparators to Nexus to assess the approach. We have used three primary examples: UNC 403 which provides a comparator for a 'business as usual' project successfully delivered by Xoserve; Smart Metering, which provides a comparator for a multi-stakeholder national energy transformation programme; Banking seven day switching: which provides a comparator for a multi-stakeholder national financial programme.

1.3.2 Assessment of the Nexus Programme

We have drawn the strands above together to provide a comparative assessment of Nexus against good practice and other projects. We have evaluated Nexus against the critical success factors for major programmes.

1.3.3 Scenario Risk Impact Analysis

The assessment above highlights risks. We have accordingly assessed the potential impact of those risks against the market testing process as shown in the table below:

Risk of early entry to market testing	Industry will enter testing too early leading to a highly inefficient and prolonged testing phase
Risks of an inefficient market testing process	Industry will partake in a test process that is not good practice and will be inefficient and not yield appropriate results
Risks of early exit from market testing	Industry will exit testing too early leading to severe market impact

1.3.4 Recommendations

We propose key recommendations. These are structured as:

- Recommendations on any changes to the testing strategy and approach
- Recommendations that SSE should propose to the new Ofgem established governance body
- Recommendations for SSE's current programme.

1.4 Structure of our document

This document is structured to reflect the methodology above:

- Executive Summary: summarising key findings and recommendations
- Introduction
- Assessment of the Nexus Programme
- Risk and Impact Analysis
- Scenario Impact Analysis
- Recommendations

2 ASSESSMENT OF THE NEXUS PROGRAMME

There have been several reviews of the Nexus Programme² over the past 12 months, including an assessment of the design phase through shipper questionnaires and an independent assessment of shipper readiness. In addition, Ofgem has reported that several shippers have highlighted the challenges facing the Programme in its final stages of delivery.

This assessment has been performed taking into consideration the recent updates in February 2015 by Ofgem and Xoserve, including the publishing of Market Trials information and recommendations for further governance of the Nexus Programme.

2.1 Introduction

PA Consulting Group has been commissioned by SSE to assess the solution delivery lifecycle associated with the Nexus Programme. By definition for this document, the Nexus Programme is made up of three key technical elements that form part of the programme delivery lifecycle³ as illustrated in Figure 3.

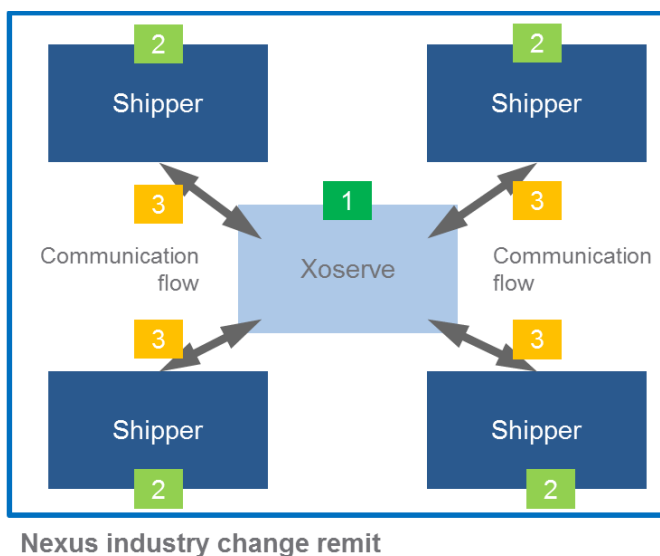


Figure 3: Components of the Nexus Programme of Industry change

The three components shown in Figure 3 are:

² In this section of the document the Nexus Programme refers to the UK Link Replacement Project delivered by Xoserve and the corresponding internal changes required in SSE and other shippers, as a result of these changes

³ We have not considered other elements of an industry change programme such as business change and communications. The focus on this analysis has been on the technical elements of the change and its associated testing and acceptance

1. The internal delivery of the UK Link Replacement Project by Xoserve. This includes all internal build and test of business processes as well as all interfaces that integrate with other stakeholders in the gas industry
2. The changes to market participants' systems as a result of interface changes applied by Xoserve (which includes SSE as a shipper)
3. The combined integration of the two elements above into an industry programme-wide quality assurance phase.

Each element above on its own only forms part of the overall solution. If one element is not operating correctly then the entire industry solution is at risk of failure. This is certainly the case for Xoserve, which manages all the internal and external data flows between market participants and ultimately, subsequent channels - such as financial institutions and customers. Xoserve is at the heart of the programme delivery.

This section looks at both the current situation in the Nexus Programme and provides an external comparison as set out in the Methodology.

2.2 Review of Good Practice

In establishing that the Nexus Programme represents a large industry change programme, it is necessary to review how this change is typically delivered. For this we have looked at good practice examples across the disciplines required for Nexus, for example those pertaining to governance and interface testing. There is no established recognised “best practice” for this scale of industry change, since each change has its own unique qualities that make it inappropriate to apply a fixed model to programme delivery.

There will be many aspects of change incorporated in delivering Nexus. The scope of this review is only considering those with an industry focus. The change programmes internal to Xoserve, shippers and other participants have only been included where there is an industry implication of that change.

2.2.1 Programme Management Good Practice

A project approach is widely recognised as the principal vehicle for delivering change in an organisation, for example in implementing strategic initiatives, developing new assets, products or services, or introducing new technologies. Furthermore, as business becomes more complex, few projects deliver benefits in isolation; increasingly organisations have to find ways to manage a portfolio or programme of projects to achieve their goals.

With industry-change programmes, there are multiple parties involved which will typically have a central body handling communications. The nature of structures such as these is that each party is affected by changes to communication standards, protocols or structures. The overall industry change remit therefore is shown in Figure 4.

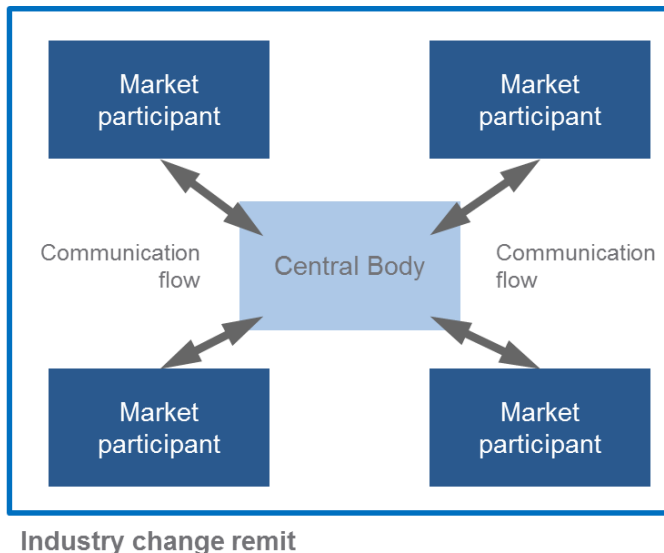


Figure 4: Industry change remit for a change programme affecting the central body and communication flows

There are different vehicles available to define the change on the industry:

- For well understood interfaces and protocols (i.e. HTTP, email, mobile telephony) each party can develop their systems in isolation and test against an agreed specification
- Standards defined by a central body (i.e. an operating system vendor)
- Standards defined by all participants through communities of interest (i.e. W3C)

Recognised good practice methods for programme management

In terms of good practice for project and programme management, within the UK the Government has produced guides and methods on how to plan, establish, deliver and close a project. PRINCE2®⁴ is such a project management methodology which is widely used in public and private sector organisations alike. There are many professional training bodies that provide accreditation and this allows a common language and process to be followed and made transferable to different sectors.

PRINCE2 provides guidance on the high level components of project management and does not dictate the tools or frameworks within each task. It does, however, refer to key management products such as a project brief, business case, risks and issues register, Its principles include continually justifying the business aim of the project, managing by exception and having clarity on roles, responsibilities, stages and products.

Managing Successful Programmes (MSP) takes a programme-level view and has a greater emphasis on the transformation elements of project and programme delivery. As such it pays particular attention to aligning the programme to the business outcomes, the involvement of stakeholders and being responsive to change.

In terms of overall governance, MSP define nine themes which are used to guide the construction of the appropriate governance for the transformation programme. These themes are:

- Organisation
- Vision
- Leadership and Stakeholder Engagement

⁴ PRINCE2®, ITIL® and MSP® are Registered Trade Marks of AXELOS Limited.

- Benefits Realisation Management
- Blueprint Design and Delivery
- Planning and Control
- Business Case
- Risk Management and Issue Resolution
- Quality Management

Applying programme management good practice to industry change

An industry change can be viewed as another form of programme change, where each participant and the central body are projects which need to be managed in terms of dependencies, sequencing and to achieve the overall benefits of the programme.

This means that the industry change should have the same mechanisms of governance and controls that would be expected of any large scale programme. Particular focus would need to be made to getting all the participants aligned in terms of communications and have clarity and focus on what constitutes overall success for the programme. This will prevent parochial views forming in which participants are only concerned about their own systems and not the interoperation with the whole.

2.2.2 Testing Good Practice

The objective of this section of the report is to provide test good practices that will ensure a better quality solution is delivered across all dependent parties. This will include detail on:

- A revised v-model specific to the design, configuration, testing and cross party integration of multiple entities specific to the UK Link Replacement Programme.
- Test good practices adopting a staggered approach from partial to full end-to-end industry integration assurance.
- High level overview of how testing is governed throughout the phases of delivery
- High level overview of Test phases before and after end-to-end integration testing.
- Release Management and Defect Management
- Risk Based Testing

Definition of System Integration Testing and Industry Test good practice V-Model

An important part of the Solution Delivery lifecycle is the process of testing, verifying and validating the delivered software. Simply put, the process of testing applications ensures improved quality in software development and is seen as an important phase in the delivery lifecycle before the launch of a new or updated solution. Generally test phases consist of unit, system, system integration, non-functional, user acceptance and operational acceptance testing. According to the ISTQB, the International Software Testing Qualifications Board, System Integration Testing is defined with the following principles:

- SIT tests the interactions between different systems and may⁵ be done after system testing.
- SIT verifies the proper execution of software components and proper interfacing between components within the solution.
- The objective of SIT Testing is to validate that all software module dependencies are functionally correct and that data integrity is maintained between separate modules for the entire solution.

⁵ all testing is optional depending on the level of quality required which is influenced by the amount in time and costs that it is appropriate to spend

- As testing for dependencies between different components is a primary function of SIT Testing, this area is often most subject to Regression Testing.

Some of the key words or phrases mentioned above include: systems, interfaces, dependencies, integrity, entire solution and regression. These are all critical to delivery of a complex integrated solution, in particular Programmes that impact entire sectors such as the 7 Day Account switching service in the Finance sector and Programme Nexus in the Energy Sector.

Looking at Test good practices for a complex industry-wide Programme such as Nexus, it is important to agree on an adapted V-Model to govern all phases of testing. This includes the two key phases of testing:

- Internal testing of systems as stand along entities, and
- Industry-wide testing of systems in an integrated wide network.

However, test good practice requires that one V-Model is adapted to govern both phases of testing. For this to happen, only one agreed set of Industry High Level Requirements (HLR) or Use Case scenarios can be defined. It is from these HLRs that all underlying detailed and low level design is defined specific to both internal and integrated systems. It is therefore recommended that a central body is responsible for defining and signing-off the HLRs. Obviously, the central body should use as much support as possible from key stakeholders that are impacted by the HLRs but ultimately the accountability for sign-off rests with them.

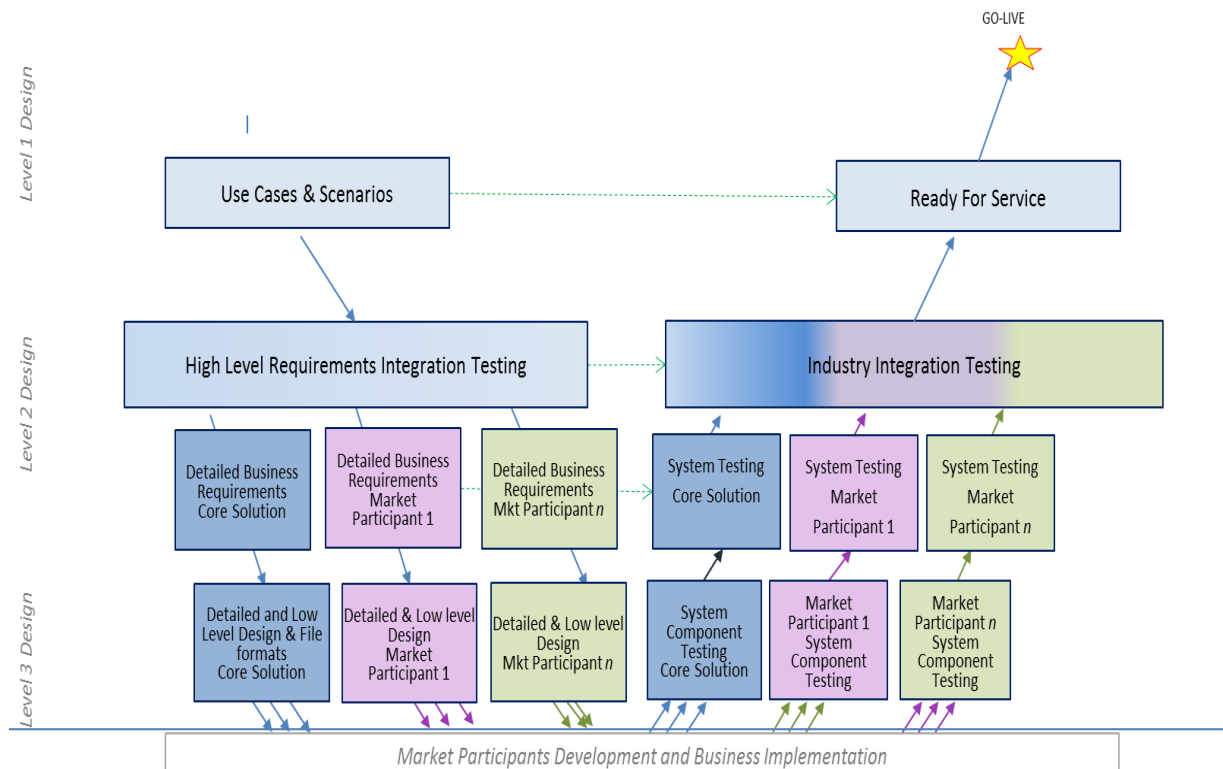


Figure 5: Industry Wide V-Model

Enterprise-wide Test Method

The following terms are used in the context of describing enterprise-wide testing:

- **Industry Testing** is a good practice test phase that incorporates end to end testing of **all** entities in a given industry as a result of changes applied to one or more entities
- **Market Testing** is the testing stage which includes the engagement of industry participants who have elected to take part in the test phase to test a specific market activity.

Industry testing validates data integrity between the different components that make up a specified Industry. Normally where one component is responsible for the integration and data flows between itself and the majority of the remaining components in the Industry, the solution is inclined to have a single point of failure in execution, i.e. the core Solution. If business processes or interface files internal to this component are incorrectly built or technical mapping files are incorrectly defined, then all data flows through the Industry will simply not operate or worse still, will not operate correctly.

Figure 6 illustrates how V-model testing is applied to the central body and participants of an industry change, compared with the overall communication flow being part of industry testing.

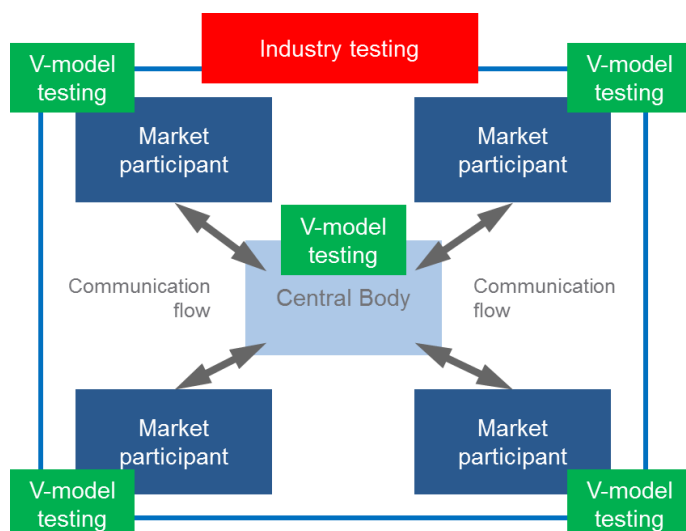


Figure 6: Comparing industry testing scope with V-model system testing

Individual systems incorrectly built and not functioning as required lead to complexities with test validation, false-positives for defects, dirty data or may simply be not identified during the test window meaning the industry launches the solution with incorrect functionality.

Using industry good practices and considering the industry landscape above and the consequences of failure, Industry testing should be planned using a staggered approach to process end-to-end testing. Additional functionality and/or interfaces are progressively introduced in accordance with the agreed priority based test approach and Industry test plan.

The scope of these phases and the priority-based test approach, or rollout of functionality and interfaces, needs to be established and agreed across the Industry. Therefore, it is vital that the test approach and test scope is defined by a centrally governed body with stakeholder support.

Test good practices with Industry governance, normally support 4 to 5 phases of Industry testing and may look similar to the following table.

Phase 0 (or connectivity testing)	Simple connectivity between the Core Solution and a peripheral Market Participant
Phase 1	Each Market Participant runs a series of functional testing directly with the Core Solution covering as many of the Industry Test Scenarios as physically possible due to the restrictions on environment/functionality and the use of stubs
Phase 2	A group of Market Participants, known as 'buddies', execute all required Industry Test Scenarios through the Core Solution
Phase 3	All Market Participants integrate with the Core Solution and each other covering all Industry Test Scenarios

Additional governance is provided around regression testing. Also, the Master Industry Test Strategy should outline the scope, timings and acceptance criteria associated with regression testing.

The swim lane diagram in Figure 7 shows, to a high level, the flow of test good practices required to support quality testing throughout the delivery lifecycle. Aligned with the V-Model above, the High level Use Case scenarios are defined by the central body that govern the integration testing of market participants. Another important element to the diagram below is the governance provided to define and then assess the exit criteria of internal deliveries in the wider Programme. This is particularly important before two solutions, which up to this point were built and tested in isolation, are approved to interoperate in the Industry integration phase of testing.

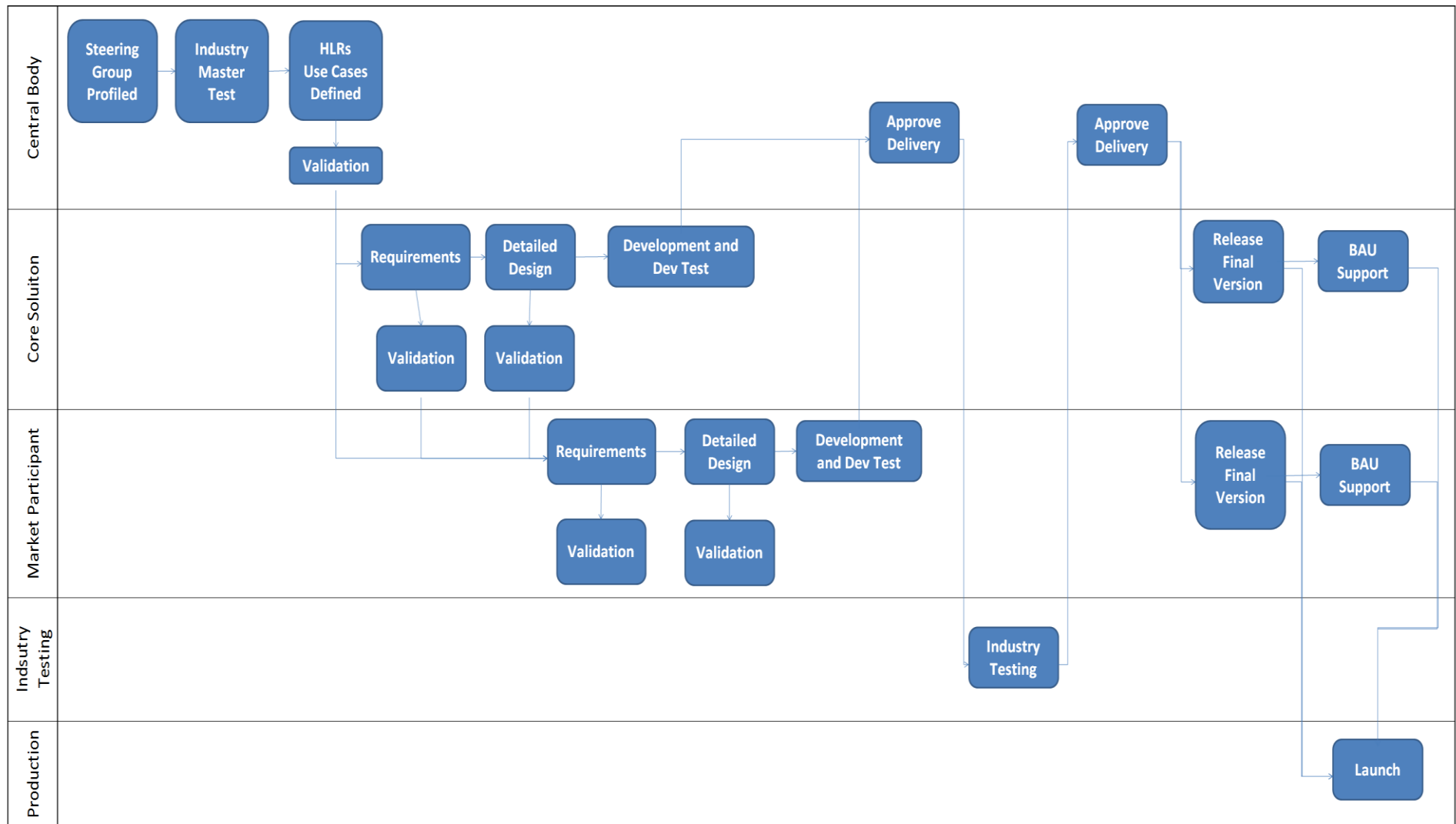


Figure 7: Industry Test Good Practice with Central Governance

Apart from defining the test approach and test scope, the Industry Test Strategy as defined by the central body must also address other key elements to ensure successful integration of the end-to-end solution. Clear governance must be outlined and agreed by all parties on the following elements as shown in Figure 8

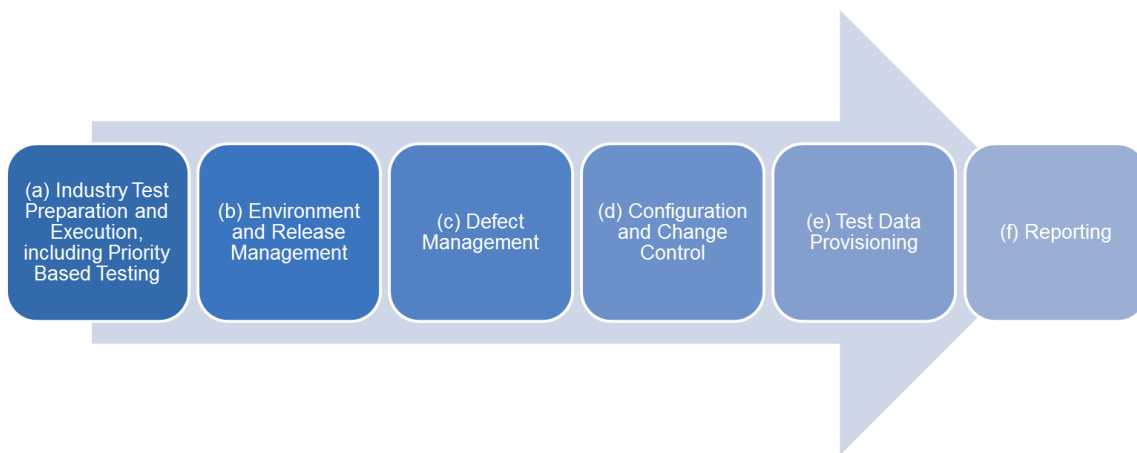


Figure 8: Elements of industry end-to-end testing

Each element is now described in terms of purpose and scope.

Industry Test Preparation and Execution

The Master Industry Test Strategy should outline the key end-to-end test scenarios that require preparation and execution during this phase of testing. Using a phased approach, a number of tests should be defined to support a progressive entry into end-to-end testing.

Test scenarios should be defined based on each phase of testing and ownership should be agreed before execution begins.

Environment and Release Management

A Test environment is required for industry-wide testing to ensure that the functionalities associated with all parties can be appropriately tested. At least one autonomous environment should be provisioned for Industry testing.

Changes made to the integrated environment during a specific test phase should be controlled using a clearly defined release management approach, which should govern a controlled release approach into the end-to-end environment. After each release, the industry environment needs to be regression tested to ensure the stability before formal testing can commence again.

Defect Management

The Master Industry Test Strategy should outline an end-to-end defect management approach which supports all stakeholders. This should include instructions on managing the creation, communication, triage, resolution and closure of a defect. Daily defect management calls should be encouraged during Industry testing and all defects should be resolved and carefully managed through the agreed release management approach.

Configuration and Change Control

It is imperative that changes to internal configuration are communicated regularly to all dependent parties in the industry-wide solution. A separate Change Control process should be defined to govern critical but required changes to the solution and all changes should be correctly impact assessed by all stakeholders.

Test Data Provisioning

A profile of test data is required to support the test objectives of Industry testing and be compliant with the sensitivity and volume constraints imposed by all parties. The test data profile should be:

- Suitable to test boundary conditions
- Suitable to test permutations and combinations needed to support test objectives
- Relevant and realistic (to avoid false defects due to unrealistic data, unless this is the test objective)
- Insensitive so no content could harm the reputation of its stakeholders if seen in the public domain (e.g. no names or content that would be considered defamatory or litigious)
- Compliant with the needs of the Data Protection Act and the data protection guidelines
- Stored and managed such that the test data is easily and reliably restored to its original state.

Industry Test Reporting Procedure

Test progress will be reported in accordance with the Industry Master Test Strategy. Ideally reporting from the Core Solution and dependent Market Participants should include the following:

- Progress reports issued to the Central Governing Body using a standard template they will supply on a fortnightly during Test Preparation
- Progress reports issued to the Central Governing Body using a standard template they will supply on a daily basis during execution
- Weekly Test Progress Reports during the execution phase to the Central Governing Body including:
 - Defect Status
 - Planned tests executed vs. Actual test executed.
 - Requirement coverage status
- Weekly Test Progress Reports during the execution produced by the Central Governing Body
- Test completion reports to be sent to the Central Programme upon completion of each test phase during Industry testing
- Overall Test completion report produced by the Central Governing Body.

2.3 Review of UK Link Replacement Project - Xoserve

The UK Link replacement project is defining changes to the industry flows and is illustrated in Figure 9. This has two immediate consequences:

- **It drives change in Xoserve's systems** – namely UK Link. This need to be managed as a change programme within Xoserve
- **It drives change in Shippers' systems.** They are the recipients of the change through new definitions and interface understanding. This in turns drives change to their own systems which they manage individually.

There is a further dimension of the change – namely that industry integrated change as a consequence of all the parties communicating using the new interface definitions. This in totality defines the scope of the Nexus industry change programme.

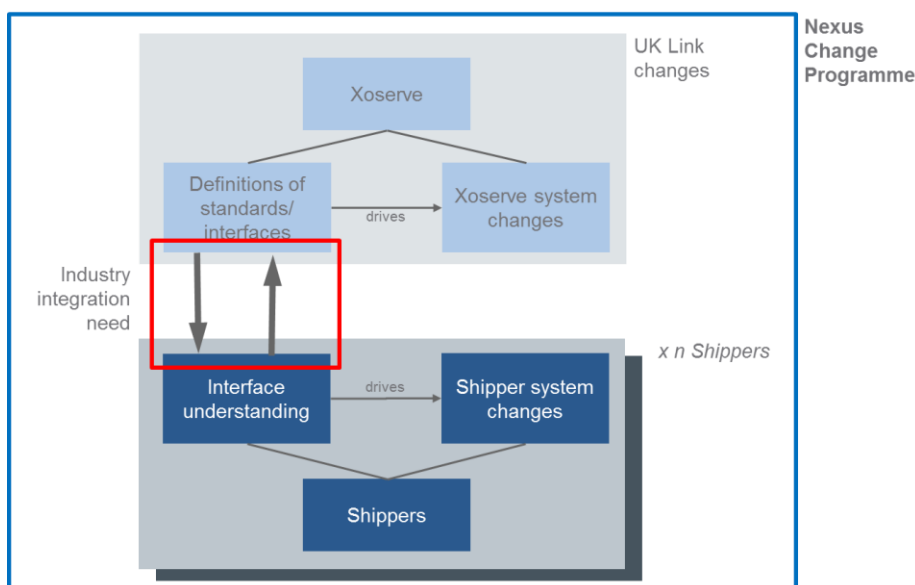


Figure 9: Illustration of the Nexus Change Programme and drivers for system change

2.3.1 Nexus Overview

Project Nexus is governed by an Industry implementation date of 1 October 2015 with an initial industry wide consultation and discussion process starting back in 2009. At this stage of the Programme, Xoserve have completed their internal detailed design as well as successfully approving all interface file formats that integrate with external parties such as Shippers. This key milestone subsequently allows Shippers to initiate their own internal detailed design to support their internal build and testing.

2.3.2 Nexus Test Overview

Project Nexus shared the UK Link Test document with SSE on 12/05/2014. This high level Test Strategy provided brief information on the Xoserve internal test approach and Market Test Overview.

Internal Xoserve testing will prove the fully integrated UK Link service, before it is tested with market participant service users as illustrated in Figure 10. This includes full functional and non-functional testing of the new internal platform defined, any internal data migrations to the new platform and all interfaces to shippers

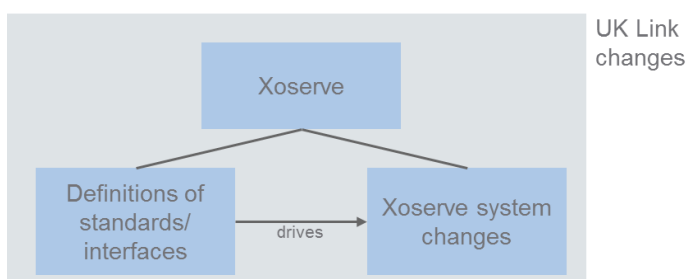


Figure 10: Xoserve driver for changes to UK Link systems

A breakdown of the Internal Nexus Test Phases is listed below:

Test Phase	Objectives
Build & Unit Test	Verification that individual units (segments of code) within the customised systems are functional as per the expectations set out in the agreed unit test cases and in line with requirements.
System Test (ST)	Testing to ensure that separate systems that comprise the new UK Link solution (set

Test Phase	Objectives
	of systems) work as per expected functionality in isolation, producing correct business outputs or exceptions.
System Integration Test (SIT)	Testing of interfaces and overall functionality between separate systems within the new UK Link suite. The tests shall confirm that the systems communicate and work together as per design and as per to-be business processes.
Performance Test	Testing of the new UK Link systems to ensure that they meet non-functional and performance requirements set. To verify that the new and modified existing system applications, databases, underlying technical components and operations tools meet criteria stipulated in the solution's non-functional requirements (NFRs)
Penetration Test	Third party testing to ensure that the new UK Link system stands up to the latest security threats. This is carried out to identify and then mitigate vulnerabilities to an acceptable level.
Operational Acceptance Test (OAT)	The Xoserve IS function's verification of system readiness from an internal operational perspective under the new to-be process expectations. It will validate and verify scalability, reliability and resource usage from an end operational user's perspective.
Xoserve User Acceptance Test (UAT)	Verification that all UK Link functionality is in line with new business requirements and operating in accordance with the to-be business processes.

Of the above test streams, User Acceptance testing plays the most important part as it is the final phase of internal testing by Xoserve. The results from this phase of testing should be assessed against the Market Trials entry criteria before the start of end-to-end testing.

Upon completion of internal testing, Xoserve will initiate Market Testing with Shippers. Market Testing is split into 2 phases: Connectivity Testing and Market Trials described in the table below:

Component	Connectivity Testing	Market Trials
High Level Objective	Testing to ensure that market participants' systems are able to connect correctly to the new UK Link systems as per requirements	Testing to ensure that the outputs of key business scenarios run in the new UK Link system are in line with Nexus requirements and that file flows function as expected
Approach	Interface testing with the UK Link production environments, via the IX portal, DE and CMS solutions.	Scenario based testing to ensure that system functions as per business expectations and outputs contain the correct content in the correct format. Scenarios to be staged throughout this test phase. The test approach document outlines 4 levels of testing. Level 1 – Connectivity Testing Level 2 - File Structure Testing Level 3 – Functional Testing Level 4 – Multi party Testing
Participants	100% market participation invitation with aim of all participants successfully passing connectivity test	Open to all participants to register interest, but not every participant expected to complete all test scenarios
Pre-Requisites	Participants have completed internal testing of their systems against new file formats, meet technical interface requirements and register for testing	Participants have completed internal testing of their systems, connectivity tested with new UK Link and registered to participate in market acceptance testing
Quality Assurance	Xoserve and Shippers	Xoserve and Shippers
Controlling Document	Market Testing Strategy by Xoserve – completed 13/02/2015 ahead of	Market Testing Strategy by Xoserve – completed 13/02/2015 ahead of February

Component	Connectivity Testing	Market Trials
	February review on 20/02/2015	review on 20/02/2015
Environment	Not clear how the end-to-end industry environment will look like for this phase of testing	Not clear how the end-to-end industry environment will look like for this phase of testing
Test Data	No Test data is required for this phase of testing.	Test data is required for this phase of testing.
Start	May 2015	June 2015
Finish	August 2015	August 2015

The delivery approach is illustrated below in Figure 11.

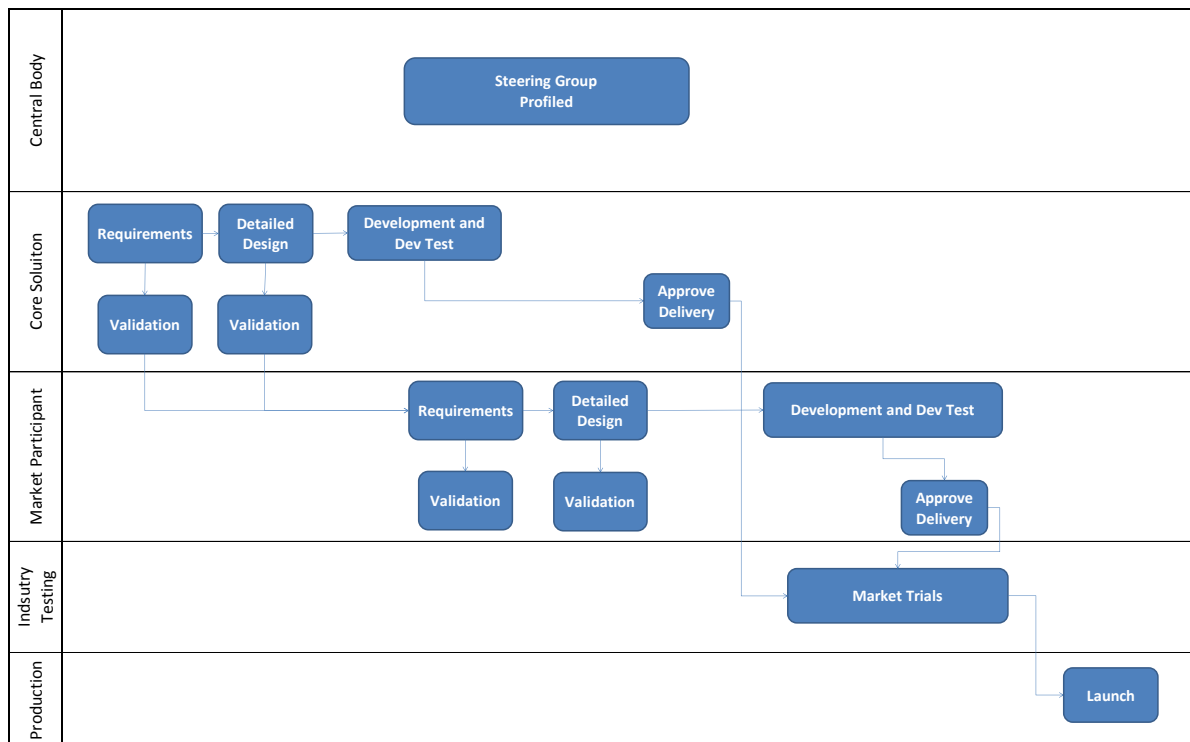


Figure 11: Nexus current delivery approach including Market Trials

2.3.3 Assessment of Nexus High Delivery Work Plan

Xoserve has provided status updates to stakeholders through monthly dashboards since spring 2014. The format of the dashboard does not provide any detailed breakdown on the status against design deliverables as well as the start and end dates of build and test phases. It only provides a milestone completion date for detailed design and then the completion date for Internal UAT.

Since October 2014, Xoserve has started to provide an improved breakdown of development and test phase tasks in the “Plan for the Industry” Project Plan.

Figure 12 shows the high level work plan showing the status against key Xoserve deliverables as part of Project Nexus. It shows the original start and end dates and shows the slippages against each task since revisions could be applied in November 2014.

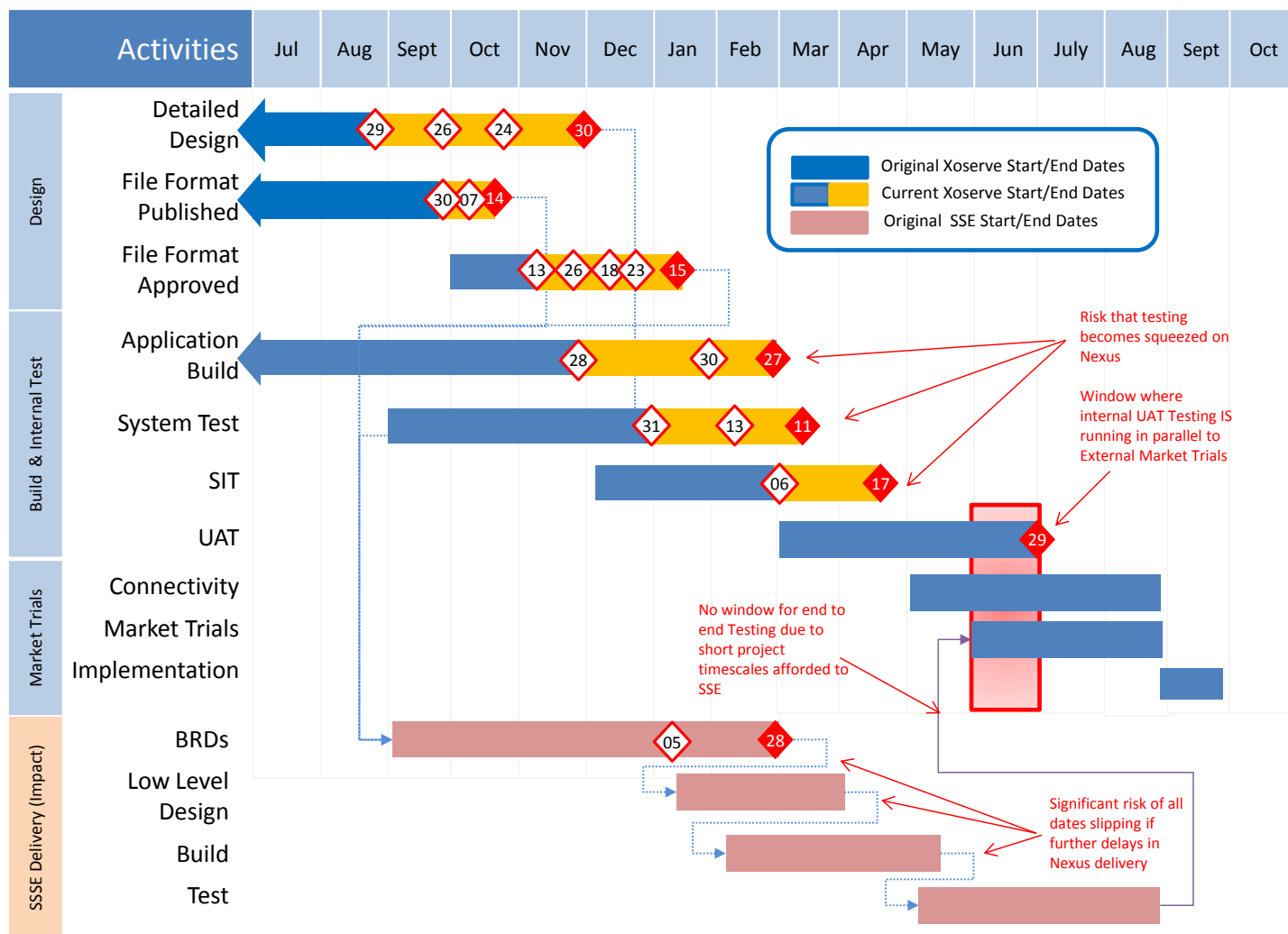


Figure 12: Nexus Delivery Plan and Changes

The table below provides more detail on the key deliverables noted above and the delayed impact on SSE.

Deliverable	Key items in deliverable	Start Date	Original End Date	Revised End Date	Impact on SSE
Detailed Design	Detailed Integration architecture, including file format changes Detailed Test Strategy & Plan to define the over test approach and test phase timelines, including Market Trials Detailed release plan High Level Transition Plan / Arrangements	14/04/14	29/08/14	30/11/14	Impacted the start of High Level Design, which has subsequently pushed SSE design completion dates out from Jan 2015 to Feb 2015 (4/6 week slippage) Impact on definition of SSE Nexus Test Strategy, specific to Market Trials. This in turn has impacted the SSE build start dates. However SSE are confident of absorbing internal build and test into the current timelines with all internal business processes build and internally tested for September release (This does not include Market Trial testing)
File Formats Published	Interface file formats to support dependency changes for Shippers	14/04/14	30/09/14	14/10/14	
File Formats Approved	Interface file formats to support dependency changes for Shippers	14/04/14	13/11/14	15/01/15	
Application Build	Xoserve Solution Build	09/06/14	31/01/15	27/02/15	4 week slip – Build completing only 1.5 weeks before System Test ends. Following a Waterfall approach, ST must be executed after build is complete.
System Test	Xoserve system testing	01/09/14	31/12/14	11/03/15	8 week slip - Impact on the subsequent test Xoserve test phases, including SIT and UAT. Build continues in parallel for most of ST.
SIT	Xoserve integration testing including interface validation	08/12/14	28/02/15	17/04/15	7 week slip - Impact on the subsequent test Xoserve test phases, including UAT
UAT	User acceptance testing	09/03/14	28/05/15	29/06/15	Delayed execution of UAT means Xoserve UAT is planned for execution in parallel with connectivity testing and Market Trials.

*Note that at the time of writing the report. The Xoserve Project Nexus dates have shifted as reported in the February dashboard. The following dates have shifted

- Application Build completion has slipped further from 31/01/2015 to 27/02/2015
- System Test completion has slipped from 13/02/2015 to 11/03/2015
- System Integration Test completion has slipped from 27/03/2015 to 17/04/2015

This shift in dates has not been impact assessed against the current SSE status documented in this report.

2.4 SSE Nexus Project Review – R1a

SSE has established an equivalent project to respond to the changes as a result of Project Nexus as shown in Figure 13. The project was initiated in 2014 but was considerably dependent on key design

deliverables being provided by Project Nexus. Because of this, SSE has completed an internal exercise to prioritise functionality required for Project Nexus.

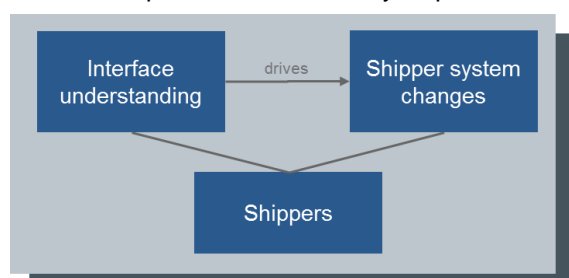


Figure 13: Shipper view of interface changes and corresponding system changes

SSE currently has planned two releases pertinent to mandatory functionality; R1a and R1b deliver regulatory change with R1a delivering critical technical changes to support revised business process.

Recently, SSE has received all approved file formats from Project Nexus. This has allowed SSE to define High and Low level Design with a target completion date of 20/02/2015. This completion date is based on all file formats approved by Xoserve on 15/01/2015. Any subsequent changes to file formats will have a significant impact on SSE plans and shift design, build and test out past September.

2.4.1 SSE Test Overview

The SSE Master Test Strategy is due for completion on 11/03/2015. However, meeting this milestone is dependent on receiving the Market Trials Master Test Strategy in February 2015. A high level internal test approach has been defined, similar to that conducted by Xoserve. A breakdown of the Internal SSE Test Phases is listed below:

Test Phase	Description	Scope
Build & Unit Test	Verification that individual units (segments of code) within the customised systems are functional as per the expectations set out in the agreed unit test cases and in line with requirements.	customer system, MASUS, ESGas, Bsmart, eSystems, HUB/DFMS, Cognition, BI/customer system MIS
ST	Focus on new or changed application Focus on proving the system meets its functional and non-functional requirements Focus on proving the system changes have not impacted any existing processes that were not meant to be changed	customer system, MASUS, ESGas, Bsmart, eSystems, HUB/DFMS, Cognition, BI/customer system MIS
System Integration Test (SIT)	Focus on ensuring that the new and changed interfaces supporting the implementation are working as designed Focus on changed and unchanged systems, their nearest neighbour and end-to-end Focus on regression testing of as-is functionality	Hub/DFMS, customer system, ESGas, BSmart
Performance	Focus on validating the system will perform to the agreed levels at the volumes of data needed to manage the forecasted business peaks. This phase will determine whether at a performance level the solution is fit for production use Target interactive response times; batch processing durations; query/reporting production times; bulk data migration durations; also associated infrastructure performance metrics	TBC
User Acceptance Test (OAT)	Focus on changed or new systems, unchanged systems and business processes in normal and abnormal conditions. This will be a final clean run for business to accept Focus on testing the new and changed business processes and operational reports to ensure the Nexus solution will support	customer system, MASUS, ESGas, Bsmart, eSystems, HUB/DFMS, Cognition BI/customer system MIS

Test Phase	Description	Scope
	normal business functions. Testing of the processes will ensure that the business requirements in terms of data flow and operation processes work after the changes for the Programme are done	
OAT	TBC	TBC

Below is a summary of key milestones in the SSE R1a project plan. Critically, it reveals an internal test completion date of 24/08/2015, leaving a shortened window to conduct Market Trials for all functionality up to 28/08/2015. We note that SSE plan to prioritise testing with parallel phases of testing to enable participation in Market Trials during July.

Upon completion of internal testing, SSE plan to perform a phase of Integration testing with Xoserve and other Shippers. SSE will conform with Market Testing and take part in Connectivity Testing and where possible, Market Trials or Industry Testing.

Test Phase	Description	Scope
Connectivity Test	Testing to ensure that SSE can connect with Xoserve correctly and bi-laterally	SSE and Xoserve
Industry Test	Focus on connectivity between SSE and Xoserve is well established Focus on the file structure changes ensuring they are aligned between Xoserve and SSE Focus on data flows between SSE and Xoserve work as expected Focus on data flows between SSE and other shippers work as expected	customer system, MASUS, ESGas, Bsmart, eSystems, HUB/DFMS, Cognition

2.4.2 Other Stakeholder readiness

An independent report provided by Baringa in December 2014⁶ provided an assessment on participating shippers' preparation and implementation readiness for the launch of Project Nexus using a detailed questionnaire. Out of 27 shippers who agree to participate, 18 (67%) provided feedback and 5 (18%) provided documentation to support their responses. Furthermore, 72% of respondents had not yet developed a project plan to manage the delivery lifecycle.

The Baringa report stated there was not clear evidence to suggest shippers would not be ready for UK Link Implementation. However, it stressed that progress was slow and challenging and suggested adopting a formal and structured management approach to Project Nexus Delivery with a central project plan and more robust progress reporting.

2.4.3 SSE High Level Delivery Work Plan

Figure 14 shows a high level work plan showing the status against key SSE deliverables as part of Project Nexus on 04/02/2015.

⁶

http://www.gasgovernance.co.uk/sites/default/files/Ofgem%20Shipper%20Delivery%20Plan%20Assessment%20Report%20v1_0_0.pdf

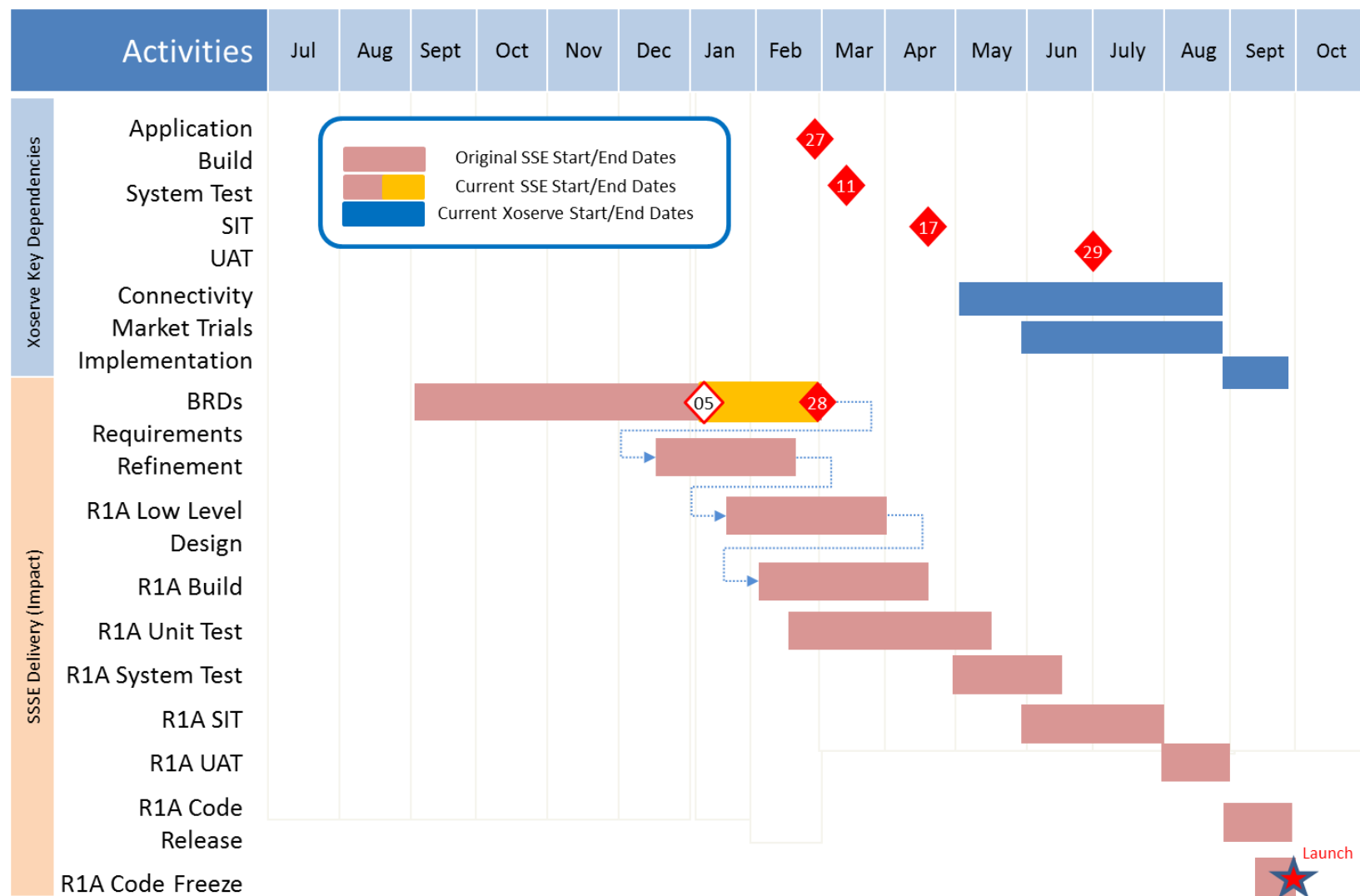


Figure 14: SSE High Level Delivery Work Plan

The table below provides more detail on the key deliverables noted above and the delayed impact on SSE.

Deliverable	Key items in deliverable	Original Date	Revised Date	Impact
Detailed Business Requirements	Analysis Report (internal Business process change) Requirements Traceability Matrix (Inc detailed list of integrated data flow changes)	Jan 2015	Feb 2015	Impacts on SSE build start date. However SSE is confident of absorbing internal build and test into the current timelines.
R1A LLD	SSE customer system build and data flow	31/03/2015	31/03/2015	No impact
R1A SIT and ST	SSE internal testing	24/07/2015	24/07/2015	No impact
R1A UAT	User acceptance testing	24/08/2015	24/08/2015	UAT executed during August month in parallel to final 4 weeks of Market Trials. Current plan does not allow for any industry testing with Xoserve and other shippers. Significant risk

In summary, there has been no critical shift in SSE project timelines to which carries the risk of introducing defects later in the testing process. However, if there was further slippage this is likely to impact the current test completion date of 24/08/ 2015.

2.5 Review of comparable projects

2.5.1 An example of a BAU industry change: UNC Modification 403: 21 day switching (EU Third package)

Project Nexus and the UK smart programme are clear examples of transformational change. However, it is instructive to assess the role that testing plays in a UNC modification which is largely 'business as usual' (BAU). We regard BAU to reflect the activities associated with the updating of systems to reflect incremental changes in the Uniform Network Code.

Member states of the EU are required under the European Union Energy Package to ensure that a customer can change energy supplier within three weeks. The Government wrote into statute the obligation, which then changed the energy suppliers' licences. To remain compliant, UNC 403 was proposed to modify the UNC to permit this shortened timescale in order that suppliers could remain compliant with their respective licences. A modification was also brought into effect within the Independent Gas Transporters' UNC.

UNC 403 is a good example of a modification to both code and to file formats that is essentially BAU change that is managed by Xoserve. We have been unable to locate a formal set of business requirements (at an industry level) for Modification 403, however it is possible to infer that there are fewer than 10 from the public information published by Xoserve.

Changes were made to the objection window to make it flexible from between 2 to 7 business days in order that the three week switching requirement could be fulfilled. There were minimal changes to file formats with only two small changes to the S10 record required. SSE completed its own system tests; however our current understanding is that there was no formal industry testing for the users of the UK Link system.

In such circumstances, the lack of industry end-to-end testing does not convey a departure from good practice. However, it would be good practice to have established criteria applied to all modifications which would then trigger the need for further market testing if required.

2.5.2 Case Study: Smart Metering good practice

Introduction

The deployment, by 2020, of smart meters to every home and small business in GB will transform retail energy supply. The central service provider in the case of smart metering is the Data Communications Company (DCC). Like Xoserve, the DCC has a wide reach into every supply point. Its communication services will link suppliers and other market participants to customers. The DCC has a central role in the operation of the competitive energy market and supports critical market processes such as energy settlement and change of supplier.

Smart is poised to reset the relationship that consumers have with their energy consumption and with their energy supplier. This transformational project is also set to make an important contribution to meeting the UK's climate change targets.

We have examined smart metering implementation from the perspective of governance, testing, and the DCC's approach to managing significant change to its baseline design.

Approach overview – governance

The DCC plays an essential role in the market by conveying meter readings and control messages both ways from participants' (e.g. suppliers') systems through to the meters which they are authorised to access. The DCC, unlike Xoserve is a licensed entity under primary legislation and has obligations to maintain an economic, efficient and co-ordinated communications system. Under its licence therefore, the DCC cannot take a narrow and parochial view of its obligations.

There are a number of competing interests amongst the diverse stakeholder group that comprises 'smart'. These include the energy suppliers with different commercial strategies, their agents, consumer groups and distribution network businesses. However, the smart programme has been driven forward by both Ofgem and the Department for Energy and Climate Change (DECC).

Obligations have been entered into the suppliers' licences and to the newly established smart energy code (SEC). The SEC sits under the DCC's licence and is a contractual framework that binds together the DCC and its users. It is self-governing and allows its signatories to evolve arrangements without day to day regulatory intervention.

The DCC established the Technical Design and Execution Group, which comprises one representative from each SEC party. Changes to the end to the end technical design are discussed and the SEC parties are formally consulted.

The SEC Panel has a number of duties defined within the SEC or signalled in forthcoming SEC drafting regarding System and Equipment Testing leading up to Initial Live Operations. These include approving that the DCC's Test Approach documents for each testing phase are appropriate and approving that defined exit criteria have been met for certain phases. The Testing Advisory Group (TAG) was established by the SEC Panel on 14th May 2014 to assist it in fulfilling these and other duties by providing it with specialist advice. Members of both the SEC panel and TAG are required to act independently and not as a delegate from their respective organisations.

The formal requirement for DCC users (through the SEC Panel) to approve its testing approach facilitates a DCC testing strategy and supporting documentation that is relatively comprehensive and substantive. The DCC is also responsive to the needs of its Users whilst also being cognisant of its own licence obligations.

Approach overview: Testing

The DCC has a transparent approach. Its testing objectives, strategies and associated consultations appear on its website. Testing is divided into the internal testing of DCC and its service providers and end-to-end testing with its prospective users. There are also formal market entry criteria for Users and the DCC itself cannot commence live operations without a defined number of its users having completed a set of formal testing criteria.

Testing Objectives and approach

The DCC's testing objectives are summarised in a joint testing strategy⁷

- **Define** the testing activities that will ensure a robust solution which meets stated requirements
- **Identify** the responsibilities, obligations, governance activities required across the testing life cycle
- **Inform** stakeholders of the activities, deliverables and process and act as the primary point of reference
- **Mitigate** the risks of poor quality components being introduced into the network.

The DCC's proposed test strategy is separated into two streams; one appropriate to DCC and its service providers and one for the Users and the end-to-end DCC.

Internal testing with the central body

The testing phase that is appropriate to the DCC and its service providers comprises two sections

- **Pre Integration Testing** – This is the stage in which the DCC and its service providers test their systems in isolation and which comprises unit tests, link tests, system tests and factory acceptance tests
- **Systems Integration Testing** – this stage entails testing the DCC as a fully integrated system with all service provider systems. It comprises two stages; the solution test and the User Acceptance Test (UAT).

Testing of the central body with participants

This is separated into two phases; formal testing and informal testing. These end-to-end testing phases are more fully described in a document published by the DCC⁸.

- **Formal testing** – comprising UEPT, SMKI and Repository Entry Tests (SREPT). Upon successful completion of the SREPT stage, Users are eligible to access the SMKI repository and become an authorised subscriber. Participants are required to pass this testing phase before they can become Users.
- **Informal testing** – this is optional for participants and comprises the facility to access the Data Services Provider (DSP) and test the interaction between their systems and that of the DSP. It is envisaged that this will help participants de-risk UEPT. The DCC will also provide a test tool to help users test their interpretation of protocols.

Other key Features of DCC testing

- **Entry and exit criteria** - In respect of formal testing, DCC live operations cannot start until two large suppliers, per fuel type, have completed User Entry Process Testing. Not all suppliers are likely to exit UEPT at the same point and are likely to be staggered during a period of restricted DCC live operations. We note the parallel running of UAT and Interface testing for a period of two months, although this is preceded by a period of informal testing.
- **Soft start** - The number of live smart meters at the start of live operations is likely to be a fairly small portion of the UK market. Moreover, DCC may restrict services or volumes during initial operations. Consequently, in this respect, the start of DCC live operations will be 'softer' than the big-bang approach that is a feature of the UK Link replacement programme.
- **Release strategy incorporating defect management** - Fixes and changes to the design will be subject to PIT and SIT with DCC's service providers. Moreover, the DCC will assess the risk of whether a new release could stop previously tested features from working and conduct suitable regression testing as appropriate.

⁷ http://www.smartdcc.co.uk/media/5936/dt_0006_joint_test_strategy_v2_3.pdf

⁸ http://www.smartdcc.co.uk/media/14108/141117_dcc_plan_and_im_consultation.pdf

DCC testing phases

Test Phase	Description	Participants
Pre Integration Testing	Conducted by the DCC and its service providers (DSP/CSP) This comprises unit, link, system and factory acceptance test phases.	DCC and service providers
System Integration Testing – (Solution test)	This is conducted with DCC, its service providers and registration providers to test the fully integrated solution	DCC and service providers
System Integration Testing (UAT)	DCC witness testing and assurance against an agreed subset of service provider testing, already conducted during solution test	DCC and service providers
Informal testing	Optional activity to enable prospective users to test the interaction between their systems and the DSP using a subset of service requests	DCC, service providers and Users.
Interface Testing	This testing phase in which the DCC tests its interface with its users, such as suppliers. The DCC is not permitted to exit interface testing until two large suppliers per fuel type have completed user entry process testing in each of the DCC's communication regions.	DCC, service providers and Users.
End-to-end testing	This facility exists for users and other test participants to test the interoperability of smart meters and other devices. Users can also test their back office systems (and business processes) against the DCC	DCC, service providers and Users.
DCC Live	This is the point at which the DCC commences live operations following completion of SIT and two large suppliers having completed UEPT	DCC, service providers and Users.
DCC Live operations	A constrained launch of DCC services. However, not all suppliers are likely to enter this phase at the same time	DCC, service providers and Users.

	Testing Phase	2015				2016				2017
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
ACTIVITIES WITHIN THE DCC	Pre Integration Testing Conducted by the DCC and its service providers (DSP/CSP) This comprises unit, link, system and factory acceptance test phases.									
	System Integration Testing – (Solution test) This is conducted with DCC, its service providers and registration providers to test the fully integrated solution									
	System Integration Testing (UAT) DCC witness testing and assurance against an agreed subset of service provider testing, already conducted during solution test.		▲		▲					
ACTIVITIES WITH PARTIES	Contingency Review Points Review level of required contingency at these points.									
	Informal testing Optional activity to enable prospective users to test the interaction between their systems and the DSP using a subset of service requests									
	Interface Testing This testing phase in which the DCC tests its interface with its users, such as suppliers. The DCC is not permitted to exit interface testing until two large suppliers per fuel type have completed user entry process testing in each of the DCC's communication regions.									
	End to end testing This facility exists for users and other test participants to test the interoperability of smart meters and other devices. Users can also test their back office systems (and business processes) against the DCC									
	DCC Live This is the point at which the DCC commences live operations following completion of SIT and two large suppliers having completed UEPT						▲			
	DCC Live operations									

Figure 15: Testing Phases for Smart Metering (including contingency and based on Plan Variant 1)

Approach overview: managing change

Once DCC was appointed, its focus was to finalise the requirements for the end-to-end design. However, the DCC experienced a number of changes to the SEC and the underlying technical specifications. After a period of re-assessment, the DCC consulted the industry on slipping the DCC go-live date by around twelve months to accommodate these significant changes to design. The DCC also published a revised testing approach. Due to the increased complexity of the solution, the DCC extended the duration of its system integration testing by at least two months. DCC also recognised the importance of end-to-end testing within the industry by bringing forward the availability of the end-to-end test environment to meet the needs of suppliers with more advanced meter deployment strategies.

Conclusions

The smart metering implementation is extremely complex and touches all suppliers and their customers. However, once the DCC has responded to its consultation on the new plan, it will be in a good position to move forward.

Several points stand out from our review, which are:

- **Implementation milestones have been shifted in time rather than wholly squeezed.** - The complexity of the end-to-end smart metering system resulted in changes to the design baseline. Consequently, the smart meter programme slipped by up to twelve months, including the implementation date. Internal testing (SIT) has increased in duration and informal testing for participants has been extended. As the design baseline has changed, the DCC has acknowledged the risk of further issues emerging and is consulting in a revised plan with contingency.
- **Exit criteria: market entry not possible without passing testing** – User Entry Process Testing, Smart Meter Key Infrastructure Testing (and Repository Entry Process Testing) are compulsory for

users. Under the SEC, no participant can become a User of DCC services until it has passed the formal tests.

- **End-to-end testing continues beyond ‘live operations’** – The test environment continues beyond the start of live operations, in recognition that not all suppliers will have exited from compulsory testing at the same time. Live operations can only commence when two large suppliers, per fuel type, have completed User Entry process testing
- **Implementation is intrinsically soft start and not big bang** – There is effectively parallel running of traditional metering and smart metering processes from the start of live operations. The cut-over period between traditional and smart industry systems exists whilst smart meters are deployed across GB. The DCC acknowledges the possibility of restrictions on the services it provides at the start of the live operations.
- **Central services provider manages testing but in a strong governance framework** – The DCC manages many of the technical standards and the testing consultation process and is overseen by the SEC panel. All DCC users are party to the SEC and, in addition, many Users are licenced.
- **Release management strategy incorporates regression testing** – Fixes and configuration changes that occur during the end-to-end testing phase will undergo PIT and SIT with the DCC’s service providers. This will also include an appropriate period of regression testing to manage the risk of affecting features that had previously worked correctly in the end-to-end environment.

2.5.3 Case Study: banking faster switch

Summary

In 2001, the Payments council imposed new regulatory requirements in the financial service sector to reduce the account switching period from 18 to 7 working days. Cutting the switching window had implications on all banks and a significant amount of their internal systems required change to support the new law. The Payments council outlined a directive where all financial institutions were required to internally test their updated solution before taking part in mandatory end-to-end Industry Testing. The objective of end-to-end Industry testing was to test that:

- Each bank could successfully integrate with the account central switching service
- Each bank could successfully integrate with other banks and play out the role of being both the Old and New bank in the switching process.

Overview

Following the banking crisis, the Independent Commission on Banking (ICB) identified a key issue as lack of competition in the Personal Current Account (PCA) market. It saw improvements to competition in the PCA market as being critical given the central role PCA’s play. On 19 December 2011, the Government accepted the ICB’s recommendation to shorten the switching service period to 7 working days and also to introduce a redirection layer.

The central redirection layer will ensure that all payments are correctly moved from the old account to the new account even if Direct Debit companies fail to set them up correctly. The intention was to reduce the total account switching elapsed time from an industry average of 18 working days to 7 working days.

As part of the delivery lifecycle, the Payments Council outlined governing timelines to conduct a series of industry-wide testing commencing with Phase 0 and 1 in Q1 2013 and Phase 2 and 3 in Q2 2013.

The total cost of implementing the new service was £750 million. The majority of this cost falls into the participants’ own space, covering the changes required to their own processes and IT Infrastructure. The central costs of developing and running the new service amounted to almost £100 million; £21 million of this relates to the design and implementation of the new central switch service by the Payments Council. This was paid by Payments Council members and allocated in proportion to their current account market share.

An overview of Test Good Practices adopted by the Financial Service Sector and dependent banks

Test Phase	Description	Participants
Unit Testing	Testing of individual units of source code	Dev Team Bank
Component Integration Testing	Testing of multiple units of source code and their integration	Dev Team Bank
Link Testing	Testing of connectivity between components and web services	Dev Team Bank
System Testing	Independent testing of all functionality within one system	Test Team Bank
SIT	Testing of the interfaces or integration points between systems, including external systems.	Test Team Bank
UAT	Stakeholder engagement to validate requirements have been met	Business Team Bank
Performance Testing	Testing of performance related non-functional requirements	Test Team Bank
Industry Testing	End-to-end Industry Testing in 4 phases ranging from connectivity tests through to tests with other member banks	Bank + Payments Council Switch Service

Industry Testing – Objectives

Industry Testing, governed by the Payment Council was carried out on the new Account Switching Central Service and assured the following:

- The validation and routing of messages and population of the Redirection Database
- As a New Bank, the sending and receiving of messages, setting up of payment arrangements and the receiving of forwarded and redirected payments and cheques
- As the Old Bank, the sending and receiving of messages, provision of payment arrangement details to the New Bank, closure of the old account and the forwarding of payments and returns cheques
- Acting as a collecting Bank for Direct Debits (Mortgage Payments) as well as cheques
- CHAPS/SWIFT/SEPA routes tcredits to Old Bank and credits forwarded to New Bank

Industry Testing – Overview and High Level Timelines

Industry testing of the new Account Switch Central Service⁹ was split up into 4 distinct phases as specified by the Payments Council as shown in Figure 16

- **Phase 0** – This was for each member bank to establish connectivity with the AS Central Service over a 4 week which started on 7th January 2013.

⁹ How was the decision to deliver a new account switching service reached
http://www.paymentscouncil.org.uk/how_was_the_decision_to_deliver_a_new_account_switching_service_reached/

- **Phase 1** – This was for each bank to conduct account switch functional testing as both the Old and New bank, by acting in either role with appropriate stubs set up against the central switching service. This phase started on the 4th February 2013 and ran for 8 weeks.
- **Phase 2** – This was for each Bank to carry out testing of account switch functionality with other banks in a 'buddy' testing group of 3 or 4 other banks. The objective of which was to confirm each bank could successfully complete account switches both in and out. This phase of testing was run over an 8 week period starting on the 2nd April 2013.
- **Phase 3** – This phase was a 6 week period involving all parties and banks run as closely as possible to reflect normal service with multiple parallel switches executing a formal set of agreed test scenarios specified by the Central Programme Test Team. This phase of testing started on the 28th May 2013.

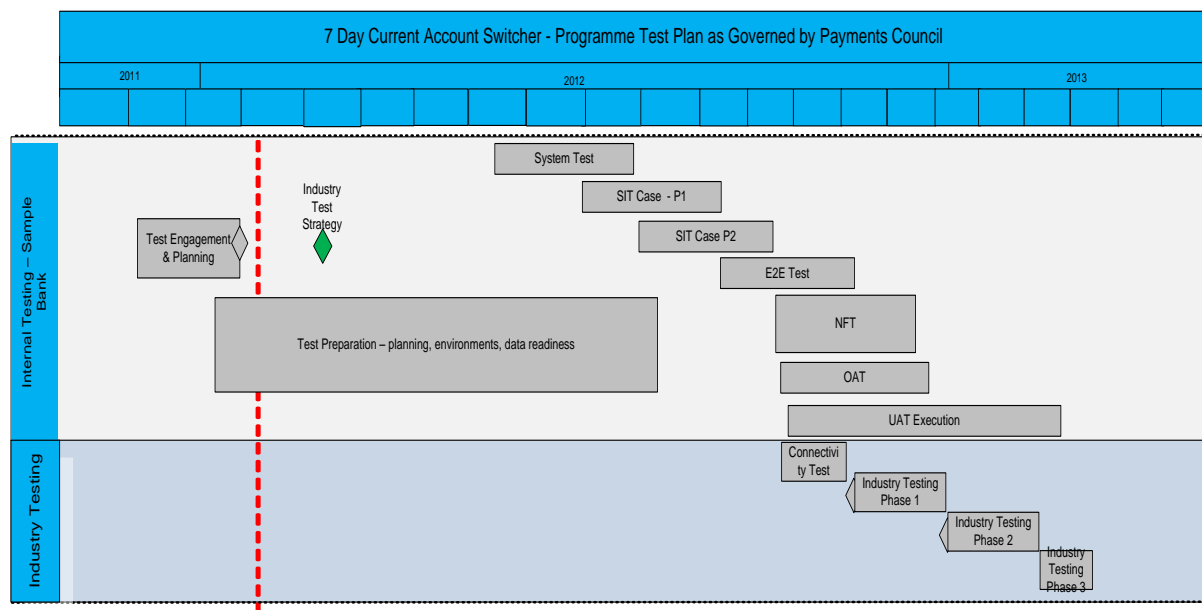


Figure 16: Programme Test Plan for 7 day Bank Switching

After Industry testing, the actual switch service did not launch for another 3 to 4 months in Sept 2013

2.5.4 Outcome

On 16th September 2013, the Payments Council successfully launched the new account switching service. The service is free-to-use for consumers, small charities, small businesses and small trusts and is backed by a customer guarantee and aims to: increase competition in the high street; support the entry of new banks in the current account marketplace; and give customers greater choice if they want to switch.

The success of the service is currently being measured against three criteria agreed with HM Treasury:

1. Customer awareness of the service – against a survey of 2,200 people aged 18 and over, 72% answered 'yes' in May 2014 (target was 50%)
2. Customer confidence in the service - out of 2200 respondents, confidence levels averaged at 65% in Dec 2014 (target was 65%)
3. Performance of the service - .As of December 2014:
 - a. The central switching service has successfully processed 1.48 million switches
 - b. The service has successfully redirected more than 5.6 million payments from a switching customer's old account to their new account

- c. More than 99% of switches that successfully start are completing in the seven working day timescale.

2.5.5 Conclusion

To ensure customer confidence in the new switching service, it was imperative that the Payments Council worked with all participating banks to design and cost the new current account switch service. The Payments Council and banks agreed on the high level design and timelines in early 2012, nearly 2 years before the actual service was launched. By following a structured and phased test approach (both internal and external testing), the banking Industry as a whole with governance from the Payments council ensured a successful, growing and sustainable account switch service was achieved.

3 RISK AND IMPACT ANALYSIS

3.1 Introduction

The Nexus Programme is complex and covers many industry parties, systems and changes. Our impact analysis has therefore focused on three key themes to structure the analysis of the programme based on the testing that is being used from an industry perspective. These themes are shown in the table below:

Risk of early entry to testing	Industry will enter testing too early leading to a highly inefficient and prolonged testing phase
Risks of an inefficient testing process	Industry will partake in a test process that is not good practice and will be inefficient and not yield appropriate results
Risks of early exit from testing	Industry will exit testing too early leading to severe market impact

For each theme we examine the areas that contribute to the risk rating and provide an assessment of the risk that is present by comparison with good practice and other industry examples.

3.2 Risk of early entry to market testing

This risk theme is concerned with the industry entering market testing too early, leading to a highly inefficient and prolonged testing phase. There are three main areas of this risk described in the sections below:

3.2.1 Specification delays

This risk has been introduced due to the multiple delays that have been experienced by the programme in terms of the release (or subsequent change) of key specifications. Figure 12 and the subsequent table illustrates how the original milestones for specification release have slipped over the past six months of the programme.

This has reduced the time available to all Shippers to design, build and test their systems to implement the changes for Nexus. Previous reviews of the programme have highlighted consistently the concerns raised by the industry regarding the pressure on timescales. We have noted that at the time of this report no party has stated publically that it cannot meet the deadline. However, the current situation means that there are significant pressures across the industry to compress system delivery into a significantly shorter time period.

3.2.2 Lack of clear baseline

This risk has been introduced by the lack of detailed reporting on key milestones on the Xoserve dashboard. The plans have focused on the start and end dates of the programme as a whole without any baseline dates against the industry build and test phases.

This situation has meant it has been difficult for the industry as a whole to assess the impact of change since there were no definitive milestones to hit in the first place.

3.2.3 Lack of governance

This risk is introduced due to the lack of overall governance for the programme. Whilst the recent independent review of the programme did examine some issues, it did so with each Shipper in isolation and not the industry as a whole. There is no governance on reporting for the industry as a whole, looking at key areas such as integration and individual Shipper implementation status.

In addition, there are no quality gate or entry criteria for the UK Link systems – the recent Market Trials Test Approach assumes that Xoserve will be ready. There is no governance approach for Xoserve to produce test status reports and test completion reports.

This situation means that there is unnecessary opaqueness to the entry criteria for testing for an industry which relies on sharing of information and transparency of operations.

3.2.4 Conclusion

Given the expectation to meet the 1 October 2015 date, the overall risk is that testing is entered too early when central or participant systems are not sufficiently tested and robust. The primary risks here relate to cost, time and risk of early exit.

If testing is entered too early, then there is a significantly increased risk that tests will not work and there will be substantial re-runs and delays while participants/Xoserve fix bugs that should have been trapped in an earlier test phase. Further, it may be much more difficult to track the source of a bug across systems, generating an increase in cost and delay in timescales. This is a highly inefficient process that will cost central bodies and participants alike considerable money.

It could be argued that these costs will only impact participants and not the consumer. However, they will also cause significant delays to the implementation of Nexus itself, with concomitant delays to the benefits. The process of re-running significant numbers of test scripts is highly inefficient, with a need to undertake extensive regression testing. This would add significantly to the timescale for Nexus.

3.3 Risk of a poor market testing process

This risk theme is concerned with the Industry partaking in test processes that are not good practice, will be inefficient and not yield appropriate results. There are two main areas of this risk described in the sections below.

3.3.1 Parallel running of testing phases

This risk has been introduced with the high degree of parallel testing that is now planned over a four month period. With any significant parallel running process there is typically a risk-based testing approach used which structures the scenarios. In this situation key scenarios are executed and passed first so they can be migrated to the next test phase. Lower priority scenarios are testing in the original test phase and hence will not hold up the process if defects are found.

In addition, the risk is further increased since there has been no definition of how releases to the testing environment will be managed or how regression testing will be managed. Without a clear definition in these areas, the testing process carries the significant risk of building uncertainty of system versions and quality across the whole industry's systems.

3.3.2 Lack of clear governance during testing process

This risk has been introduced due to the lack of a centrally governed defect management portal that has clear visibility across the industry. This is exacerbated by no plans on actually running regression testing or prioritisation across the test scenarios.

In addition, it is not clear what will happen to any industry participant who fails part of the testing process. In some instances it may be appropriate that they remain in the market trials process but in others it may be more beneficial to focus on fixing internal defects. Without this definition made up

front there is a risk that decisions will be made on an ad hoc basis and not consistent across industry participants.

3.3.3 Conclusion

The key concern is that the market testing process appears to have been defined assuming all the test scenarios work. The lack of criteria for testing success, regression testing approaches and visibility of progress across the industry all increase the risk that the test process will fail. Add to this that there is no contingency for the testing timescales itself and it leads to a high likelihood that the testing process will develop significant issues.

3.4 Risk of early exit to market testing

This risk theme is concerned with exiting the market testing process too early, leading to severe market impact. There are four areas of this risk described in the sections below.

3.4.1 There is no defined exit criteria from testing

This risk has been introduced because the Market Trials approach document v1.0 does not define any criteria that will mark the successful completion of industry tests and hence demonstrate that a pre-defined acceptance level has been reached.

Defining exit criteria up front is essential for an industry change of this magnitude and cannot be left to determine prior to the deadline.

3.4.2 There is no post go-live contingency planned

This risk has been introduced by the implicit assumption that Nexus will be entirely successful for the whole industry, since there are no demonstrable plans to implement any alternative arrangements should this not be the case. We note that parallel running of UK Link systems has been previously discounted as not possible in Xoserve Programme Update 3. However, a contingency plan does not necessarily require previous systems to be used should a new regime not be successful.

This risk is also represented by an outstanding question on the Xoserve portal (X647) which at the time of this report had not yet been answered. We could expect for a programme of this size and impact that there would be a contingency plan in place and to not have one represents a significant risk to the industry as a whole.

3.4.3 The newly-announced governance regime is not strong enough

Although welcomed, we feel that the collaborative approach to governance is unsuitable for a large programme that has been lacking the necessary governance to date and does not carry the mandate for go/no-go decisions. The nature of the compressed timescales requires a governance structure that can make rapid, binding decisions for the industry as a whole. Fortnightly meetings, as proposed, do not appear to reflect the urgent nature of many of the decisions and actions needed across the industry.

By taking a collaborative approach this introduces the risk of extended debate and discussion, rather than agreeing and driving through the key decisions that are needed to reduce the overall programme risk.

3.4.4 The test process is ultimately flawed

The current stated process requests industry participation rather than requiring it. There is a tangible risk that an industry process could pass a test process with only two industry participants. For a “big bang” approach such as Nexus not mandating that all industry participants engage in end-to-end testing carries a significant risk.

Although we have recognised that some large industry changes, such as Smart Metering, have stated that go-live can occur with a sub-set of participants, this has been a “soft” go-live with the parallel

running of old and new systems. Moreover, whilst comparison with Elexon shows that a go-live of changes can be achieved with a sub-set of participants, the changes to date do not approach the magnitude of the changes in scope of the Nexus Programme.

3.4.5 Conclusion

The risk of early exit to Nexus market testing represents the highest concern. The combination of no stated exit criteria, no go-live contingency planned and the late implementation of industry governance for testing all contribute significantly to the risk rating in this category. Our concern is that the market testing process itself is ultimately flawed by not requiring mandatory full industry participation for end-to-end testing.

The risk of one or more industry participants going live on 1 October 2015 without a fully tested solution is very high. The resulting impact of system(s) failure will be very high to customers, participants and the sector reputation as a whole.

3.5 Summary of risk and impact to the industry

The table below is a summary of the risk and impact to the industry against the phases of market test entry, market test process and exit from market testing.

Risk phase	Likelihood	Commentary on likelihood	Impact	Commentary on impact
Risk of early entry to market testing	High	Currently no clear test entry criteria or governance to manage process Programme slippage creates risk shippers will not be ready	Med	Increased industry cost to shippers/Xoserve Prolonged delays to Nexus and benefits Impact on related industry programmes Increases risk of early exit
Risks of an inefficient market testing process	High	High degree of parallel running introduced to compensate for delays Lack of clarity on the market trials process despite recent communications Mandatory end-to-end market testing may not be within Xoserve remit No clear governance to manage test process and findings	Med	Increased cost to shippers/Xoserve Prolonged delays to Nexus and benefits Impact on related programmes Increases risk of early exit
Risks of early exit from market testing	Med	No defined exit criteria The timescales to implement the new governance regime before start of testing look very challenging. Concerns relate to: <ul style="list-style-type: none"> Strength of and vires for this regime Timeliness of this regime, given testing is imminent Possibility that the underlying industry test process of market trials is insufficiently rigorous. 	Very High	Significant risks for: <ul style="list-style-type: none"> Customers (through impact on market-supporting processes such as change of supplier). Confidence in the market and even ultimately the financial stability of some participants General industry functioning These risks are potentially exacerbated by go-live in the winter period

The most significant concern and the area that will cause the highest impact to the industry is the risk of early exit from market testing. This could have a serious effect on consumers, confidence in the market and even the financial stability of some shippers (for example regarding cashflow considerations). We welcome Ofgem's announcement of new governance and assurance, but this does not entirely mitigate the risk and it is likely that it will be challenging to embed these processes in sufficient time for the start of testing. In addition, and in particular additional risks include:

- **There are no defined exit criteria from testing.** This is essential for an industry change of this magnitude and cannot be left to be determined prior to the 1 October 2015 deadline
- **There is no post go-live contingency planned.** There are no demonstrable plans for rollback should the current planned go-live be put at risk
- **The Market Trials test process will not be sufficiently rigorous.** The current stated process of Market Trials requests participation by companies rather than requiring it. Whilst there are some industry precedents for this, we have not seen a demonstrable risk analysis that confirms this approach is adequate for Nexus and is not a replacement for end-to-end Industry testing
- **Key processes that support the market, such as change of supplier (CoS), fail to operate for all participants.** The decision to exit from testing, without full participation from all industry stakeholders, will be made unilaterally. The impact of a major failure of a key process such as CoS would have a significant impact on customers: up to 25,000 assuming a hypothetical scenario in which a shipper with 10% domestic market share was affected by four weeks of disruption. Shippers and the industry as a whole would also be impacted.
- **The newly-announced governance regime may not be strong enough and is late in the programme timescale.** It is not clear that the governance regime will have appropriate powers to address concerns. The governance regime and assurance are being introduced very late in the process and need to be effective immediately.

4 SCENARIO IMPACT ANALYSIS

We recognise the importance of maintaining firm and challenging dates for industry implementation of change. This encourages activity and helps drive the industry forward. However, it is important to balance the risks this introduces against the potential impacts of those risks.

4.1 Introduction

This section considers the potential risk impacts of progressing with testing against the current plan. These are considered in terms of three hypothetical scenarios which cover:

- Risk impact if market testing is entered too early
- Risk impact if market testing is exited too early
- Cumulative risks arising from the above.

4.2 Scenario risk impact of entering market testing too early

Given the pressure to meet the October 2015 date, there is a risk that testing is entered too early when central or participant systems are not sufficiently tested and robust. The primary risks here relate to cost, time and risk of early exit.

If testing is entered too early, then there is a significantly increased risk that tests will not work and there will be substantial re-runs and delays while participants/Xoserve fix bugs that should have been trapped in an earlier test phase. Further, it may be much more difficult to track the source of a bug across systems, generating an increase in cost and delay in timescales. This is a highly inefficient process that will cost central bodies and participants alike considerable money.

It could be argued that these costs will only impact participants and not the consumer. However, they will also cause significant delays to the implementation of Nexus itself, with concomitant delays to the benefits. The process of re-running significant numbers of test scripts is highly inefficient, with a need to undertake extensive regression testing. This would add significantly to the timescale for Nexus.

4.3 Scenario risk impact of exiting market testing too early

Given the pressure to meet the October 2015 date, there is a risk that testing is exited too early. The risk impact of this is greater than the above, since it could directly affect consumers and the financial management of companies, particularly the smaller participants. These are considered below.

4.3.1 Change of supplier: Scenario impact on customers

The change of supply (CoS) process caused can be disrupted by failure in the information flows within the network of market participants and Xoserve. This is likely if testing is exited too early. The Market Trials Scenarios that cover this situation are:

- SC4 – Objection cancellation of incumbent Shipper
- SC5 – Confirmation cancellation by proposing Shipper
- SC6 – Transfer of ownership/Contract creation process
- SC18 – Reconciliation Process

Market trials are proposing to “pass” the above scenarios if the test can be executed between two shippers only. However, Market Trials needs to be compulsory for all shippers in order to fully assure the above scenarios and guarantee each shipper can correctly process these requests so there is no impact to other shippers’ business processes. Additionally all shippers need to be engaged in Market Trials from the beginning to ensure participation in testing when directed by Xoserve.

Cause

Only a partial number of shippers are committed to partake in Market Trials. This means some shippers will not have validated the data flows and internal business processes associated to these critical scenarios. If one shipper fails this process, it will have an immediate impact on another shipper. Figure 17, Figure 18 and Figure 19 illustrate the scenarios that could occur should one or more shippers not be ready for industry go-live.

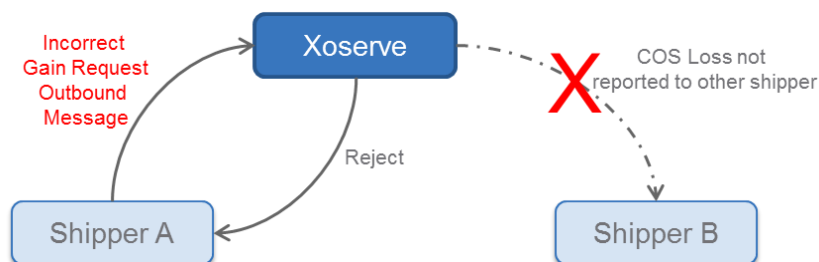


Figure 17: Shipper A has not partaken in Market Trials and CoS functionality

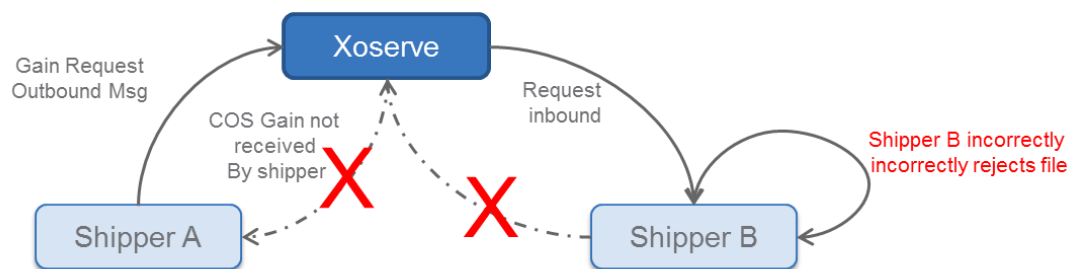


Figure 18: Shipper B has not partaken in Market Trials and CoS functionality

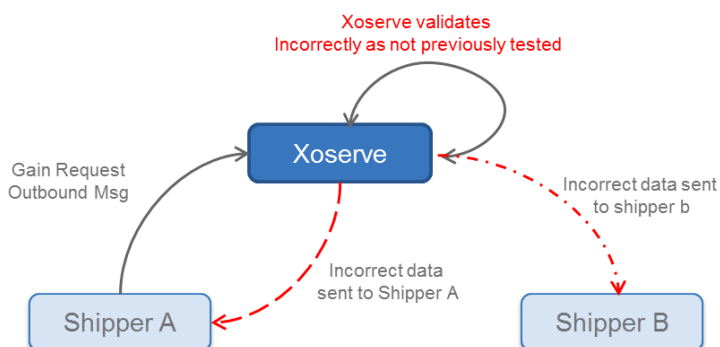


Figure 19: Late participation in Market Trials meaning some data flow incorrectly validated by Xoserve

Consequence

CoS gains and CoS losses, one of the highest priority requirements, will not be assured across the Industry. It is very difficult to attribute costs to this, but we have made some high level assumptions below, within a hypothetical scenario in order to assist consideration.

Based on independent evidence, we have assumed an annual switching rate of 14%¹⁰. There are circa 23 million domestic gas meters in GB and we have approximated this to the number of domestic gas customers. By calculation, about 250k customers switch supplier every month.

We have assumed that a gas customer could save an average of £11 per month by switching supplier. We have also assumed, in our hypothetical scenario, that disruption to the information flows that support this process could occur for around one month. If a significant portion of these switching customers were precluded from changing supplier then a measure of value at risk (from a customer perspective) is around £1m pa. If the failure was experienced by one industry participant (such as a large supplier) then the effect would approximately be reduced to its market share. By way of illustration, assuming a large shipper/supplier held 10% of the gas market, then up to 25,000 customers would be impacted in some way. Other suppliers, who were on the 'other end' of the change of supply process would also experience an impact.

In this hypothetical scenario, thousands of customers that are undergoing the change of supply process could be inconvenienced. The number could be 10 to 100 times the current level of erroneous transfers that were reported to run at 1% of switching rates (say 2500 per month). Customers are likely to find the disruption confusing and annoying and this may deter them from switching supplier in the future.

4.3.2 Financial and markets: scenario impact on shippers

Another aspect is the impact to the market. We have restricted our attention to suppliers / shippers. These companies can be wholly owned subsidiaries of a common parent company.

Shippers and suppliers could experience a disruption to their cash flows within a hypothetical scenario. However, the severity of the impact may differ dependent upon their relative size, which can be shown for illustrative purposes in the following way. A hypothetical small shipper / supplier may serve a customer base of about 100,000 customers and be worth, in net asset terms, about £150m. A hypothetical large supplier / shipper might typically be part of an international group and serve around sixty times more gas customers (6 million) and be part of a group with a market capitalisation one hundred times the value of small shipper / supplier (£15bn). In respect of the domestic customer base, we are further assuming that domestic settlement-related cash flows scale with customer numbers.

In the hypothetical case above, the large shipper / supplier's domestic cash flows would also be about sixty times that of the small supplier. It is conceivable that in the scenario, the cash flows of both companies may change by the same amount caused by some effect of a market disruption. If so, it follows that the percentage impact on the small shipper / supplier would be sixty times that of the large shipper / supplier. In practice, the relative impact on the large shipper / supplier would be even less given the likely disproportionate contribution of industrial and commercial load to its cash flows compared with the small shipper supplier. Moreover, in this scenario the large shipper/supplier also enjoys superior financial strength measured by a group balance sheet that could have about 100 times the value of the smaller shipper / supplier.

Whilst a one-off disruption may not substantially undermine market confidence over the long term, it will do nothing to lower the market barriers to entry for small suppliers and shippers, which will in turn lead to less choice for customers.

4.4 Cumulative risks

There is some risk that the risks above could have a cumulative impact. Customer and investor confidence is critical in the energy markets. Ofgem's broader policy objectives pertaining to smarter markets may be affected. This includes the centralisation of registration and the introduction of electricity settlement reform which forms another plank of the longer term smart business case.

¹⁰ <https://www.ofgem.gov.uk/ofgem-publications/39463/customer-engagement-energy-market-tracking-survey-2012.pdf>

In the scenario in which there was a significant disruption to fundamental market processes such as change of supply, then enforcement action by the regulator may also be appropriate.

4.5 Conclusion to the scenario impact analysis

We recognise the impact of reducing scope or increasing market testing (and potentially delaying the programme). However, from a strategic perspective, market testing could be the first time that all industry parties share a common view of the truth. It is also the point in time in which certain underlying issues are exposed and can then be resolved – thus mitigating the risk of the hypothetical scenarios which we have described here.

All industry participants are averse to the risk of market disruption and therefore it is prudent to explore different implementation plans and to put due focus on market testing. This is covered in our recommendations in section 5.

5 RECOMMENDATIONS

5.1 Overall finding for Nexus market testing

It is welcome that Ofgem's recent announcement on 6 February 2015 has proposed to strengthen the governance, management and assurance for Project Nexus. In addition, the publication of the Market Trials approach on 13 February 2015 shows further consideration of the issues. However, in our view this is not sufficient given the complexity and size of the Nexus Programme.

From the risk analysis presented in the previous sections, we conclude that there is a **significant risk** to the October Go Live date and that urgent action must be taken to verify the viability of that date and put appropriate measures in place to manage risk and – if ultimately appropriate – move the date. These measures should now largely fall to the new governance body to manage and implement.

We believe the key activity that the new governance arrangements should address is to establish a criteria to progress market testing with support from Ofgem, at the latest by **May 2015**. To make this critical decision, the governance body needs to:

- **Critique the current test 'optional' approach to market trials.** We recommend that the independent assurance body assesses the industry impact of this approach, in comparison to full end-to-end Industry testing, by rapid consultation with the Shippers and other industry stakeholders
- **Report on the specific state of readiness of each industry participant.** This cannot be left to a questionnaire approach: each Shipper needs to state explicitly whether it would be ready for end-to-end industry testing in June 2015 (to allow 3 months of testing for all industry participants)
- **Provide options for both contingency for the October deadline and the deferral option.** This should examine the whole industry impact and cost, taking into account the key measures of customer impact including loss of potential benefits and increases in costs, security of supply and industry reputation.

The risks that exist in the Nexus Programme are significant and require immediate action. We believe that addressing these risks and following a strict timetable of decisions are in the best interests for customers and all stakeholders.

5.2 SSE Specific Recommendations

During the course of this review, we have been working closely with SSE and gained some insight into its approach to Nexus delivery from a Shipper perspective. Although we have been clear that it is not the objective of this report to review the Shipper's testing arrangements, there are however some activities that SSE should perform that will benefit both SSE and the industry as a whole. In addition, these recommendations could potentially be equally applied to other Gas Shippers.

5.2.1 Ensure robustness in internal plans to cope with potential further delays or changes

SSE is changing a number of internal systems to implement the interface changes to UK Link. Given that the project timescales have been compressed, it would be prudent for SSE to perform critical path analysis to understand where there is contingency in its system changes, testing and acceptance processes.

This will allow a rapid response to Xoserve (and the industry) to highlight the impact of any further changes in scope or timescales. SSE and other Shippers could then work, under the new governance

arrangements proposed by Ofgem, in a pro-active manner to consider the options available across the industry to manage the risk of these changes.

5.2.2 Support Xoserve and Ofgem in the execution of industry governance

Ofgem has called out the need for stronger project management and governance in Nexus. By the nature of commissioning this report, plus its role in the competitive gas market, SSE is an ideal partner to help shape suitable terms of reference and actively participate in its execution.

A INDUSTRY COMPARISONS

This section compares the current Nexus programme against good practice and comparable projects. We use the broad aspects identified in the table below.

Scale and complexity	an assessment of scale, to consider which elements of good practice and comparator projects this should be considered against
Governance	the governance arrangements for the overall programme
Baseline	whether a baseline exists and if so for how long prior to testing it has been established
Testing process	the testing process that has been established
Testing timescales	the planned timescales for testing
Assurance	an independent assurance regime to verify readiness

A.1 Scale and Complexity

The table below compares the Nexus project to other projects to form a view of scale and hence appropriate arrangements:

	Nexus	Mod 0403 21 day switching	7 day banking switch	Smart Metering
Central cost	£25.4m – £32.7m~	£0.7m- £0.9m	£21m	£30m*
Strategy, analysis time	4 years (2009-13)	16 months	2 years	4 years
Number of participants	37 – 160**	37 – 160** (TBC)	36	85-220***
High Level requirements	TBC	C <10 TBC	c.250	c. 200
Technical complexity	Very high	Low	Very High	Very high
Functional complexity	Very high	Medium	High	High
'Big Bang' go-live	Essential	Essential****	Essential****	Phased

~ Costs are calculated on the basis of the five mods that have been proposed to support implementation of project Nexus (0432, 0434, 0440, 0467 and 0473).

*Costs are derived from the overall contract value of £75million

**The range is based on uncertainties surrounding the number of active shippers (from the 224 licensees) operating in the market (Ofgem data provided to the European Commission in 2014 indicates that there are 15 shippers with a significant share of the market and UK Link data suggests they have engaged with 150 users during the Nexus project; the figure of 160 accounts for the DNOs).

*** The range is based on uncertainty surrounding the number of active shippers / suppliers. The same assumptions for shippers have been used as above and Ofgem data provided to the European Commission in 2014 indicates that there are 62 active suppliers).

*** To ensure that all customers are switched on the same basis and that there is no preconception that customers can be switched more quickly by some suppliers than others.

A.1.1 Assessment

Based on the table above, it is clear that Nexus is a very substantive change programme, considerably larger and more complex than the standard Xoserve changes. There is a high degree of functional complexity with the move to processing of daily readings data and consequent changes to financial settlement which will require very rigorous testing. This is being undertaken in tandem with a substantial technology refresh. The cost, time and requirements metrics similarly emphasise the scale and complexity.

Overall the programme is of a lesser scale and complexity than smart metering, but of a greater scale than the banking seven day switch. However, we would expect the governance arrangements, baseline, testing process and testing timescales to be comparable to those programmes rather than standard (business as usual) Xoserve changes.

The scale and complexity of the programme, associated with the functional breadth, means that from a risk perspective there is the capacity to create:

- **significant consumer risks** – such as impact on market supporting processes such as change of supplier
- **financial risks** – such as fluctuations in settlement cashflow impacting on small shippers, if not managed correctly (covered in section 4)

A.1.2 Key Findings

Overall the programme is of a lesser scale and complexity than smart metering, but of a greater scale than the banking seven day switch. However, we would expect the governance arrangements, baseline, testing process and testing timescales to be comparable to those programmes rather than standard (business as usual) Xoserve changes..

A.2 Governance and Management

The table below compares the governance and management arrangements for the Nexus programme to other comparable projects

	Nexus	7 day banking switch	Smart Metering
Clear governance body with overall accountability and representation of appropriate stakeholder groups.	This is being managed via Xoserve mod processes supplemented by the UK Link Programme Industry Engagement Forum (UKLPIF) which meets monthly to discuss issues	The Account Switching Programme Board provided a voice to all market participants and decisions were taken by the Payments Council Board	Groups overseeing the transition are the Smart Metering Steering Group, the Smart Meter Delivery Group, the Technical and Business Design Group (TBDG) and the Implementation Managers Forum. The Testing Advisory Group (TAG) advises the SEC panel on matters

	Nexus	7 day banking switch	Smart Metering
			appropriate to testing.
Single party responsible for the end-to-end test regime	Xoserve is responsible for central testing and participant connection testing, but there is limited clarity on end-to-end market trials	CGI was the systems integrator who supported the project from its inception (an IT and business process services company)	The DCC is responsible for testing that its systems work in their own right and can interoperate with users' systems.
Clear shared test plan with stages, roles, responsibilities, entry and exit criteria	High level documents were developed to shape the solution and a high level plan was issued in November 2014	The Account Switching Programme Plan included a clear plan for the Industry Test Strategy	A published plan has been consulted upon allowing all parties to input to the approach.
Regular meetings allowing assessment of progress	The process is being managed through existing Xoserve meetings and the monthly UKLPIF	The Account Switching Programme Board met regularly to discuss developments	The DCC is holding regular forums to support the design and testing elements of the programme and has published a schedule of these meetings

A.2.1 Assessment

Nexus is broadly being governed and managed as per the usual Xoserve modification process. While this is a well-proven process for small scale modifications, there is concern that this is insufficient for a programme of the scale and complexity of the Nexus project; especially when compared to good practice and comparator projects.

The potential insufficiency of appropriate governance and management arrangements raises risks of delays when end-to-end testing is undertaken. Such delays could arise as a result of a lack of participant readiness, differing interpretations of plans and requirements and limited clarity about the regime to be used to address issues and bring all parties together to determine a common solution.

We note Ofgem's open letter of 6 February 2015 stating an intention to establish a Project Nexus implementation steering group with the authority to make decisions and/or recommendations on the most effective way to implement Project Nexus. The steering group will represent a cross-section of industry, including both larger and independent shippers, gas transporters and independent gas transporters. Ofgem and Xoserve will also sit on the steering group.

A.2.2 Key Findings

The Nexus governance and management arrangements are not sufficient for a national programme of this scale and complexity. This creates significant programme risk.

We welcome Ofgem's announcement of a new governance regime to address the current industry concerns which should help in part address this gap. However, we are concerned about the lack of power of this body, the collaborative approach which does not appear to fit well with the tight timescales and the lack of urgency in the proposed schedule of governance meetings.

A.3 Baseline

In programmes of this scale, it is vital to establish a clear baseline such that all parties know what they are working towards. This baseline should then be placed under rigorous and transparent change control. For Nexus, the primary specifications are the interface specifications produced by Xoserve. These are critical to participants' ability to build their systems. The table below compares the Nexus baseline position to that for smart metering.

	Nexus	Smart Metering
Specification Baseline	Baseline established on 15/01/15	GB Companion specification provides

	Nexus	Smart Metering
exists	with agreement of final file formats	baseline- Nov 14
Specification Baseline locked down at appropriate time before testing	Connectivity testing planned for May, 3 months after lockdown	Interface testing planned for July 16 – 18 months after lockdown
Development Baseline exists	Development completion targeted for end February 15	Not separately declared
Development Baseline locked down at appropriate time before testing	Development completion 2 months before connectivity testing	Not separately declared
Clear transparent change control process applied to baseline.	Assumed to be managed through standard Xoserve modification process. No separate established change control forum.	Yes – managed through the SEC panel

A.3.1 Assessment

Nexus is not directly comparable to the Smart Meter Programme. However the figures above highlight the considerable tightness of the time for participants to adapt systems, undertake unit, internal system, factory and user acceptance and achieve readiness for connectivity testing. Specifically, 3 months has been allowed for Nexus participants compared to 18 months for smart meter participants. Participants are responding to this by adapting plans, prioritising flows and de-prioritising any internal system change by introducing manual processes.

Notwithstanding these changes, the timescales are extremely short and create a high risk. This risk is exacerbated by the fact that the dates have moved more than once since the plan was issued in November 2014. The latest dashboard report highlighted development completion moving one month to end of February.

The impact of any change will be exacerbated by lack of a clear change control process.

A.3.2 Key Findings

The timescale between specification and development baselines and testing is short, not stable and raises a high risk that end-to-end testing will fail or be elongated by significant changes.

A.4 UK Link Testing Process

The table below compares the Nexus testing approach to other comparable projects

Good Practice	Nexus	7 day banking switch	Smart Metering
Unit Test	✓	✓	✓
Link/system test	✓	✓	✓
System Interface Test	✓	✓	✓
Operational and User Acceptance test	✓	✓	✓
Non-Functional test	✓	✓	✓
Participant Connectivity/ Interface test	✓ (parallel to UAT)	✓	✓ (parallel to UAT)
End-to-end market test	✓ (but only not full industry and parallel to UAT)	✓	✓ (parallel to UAT)

A.4.1 Assessment

The Nexus testing strategy is broadly following good practice. There are three primary issues: visibility, parallel test activities and non-mandatory participation in market trials.

The process and approach for both connectivity and end-to-end market test are not currently visible and under discussion and design with industry participants. This hampers participants' ability to plan for these activities.

Both connectivity and end-to-end market test are in parallel with UAT. This can be achievable and is, for example, an approach currently being proposed for smart metering. However it should be noted that the smart metering interface test is preceded by 13 months of informal testing where a central 'sandpit' will be made available to participants. The parallel running is also a concern given the already compressed timescales between baseline and testing as noted above.

PA has also reviewed these project plans from October to February and we have the following concerns that add significant risk to both Xoserve and all dependent shippers:

- In the 4 months since October, there has been significant slippage reported against Build and Unit testing. This 3 month delay, due to additional functionality or change in scope has not resulted in a re-assessment of the test window provided during delivery.
- In the 4 months since October, there has been significant slippage reported each month against all test phases, apart from UAT. Although the test phases have increased in size the actual end-to-end test window remains the same.
- The Plan has squeezed considerably, in particular around test with parallel testing occurring across all test phases, including market trials.
- The current dates highlight that development and unit testing is currently planned to complete only 2 weeks before acceptance testing commences.
- The current dates highlight that development and unit testing is currently planned to complete only 2 months before Market Trials begin
- Due to the level of parallel testing noted above, the regression test approach needs to be clearly documented along with the release management approach needed to support code fixing.
- The current dates highlight that User Acceptance Testing is currently planned for execution in parallel to 50% of Market Trials testing. This will cause Xoserve and Shipper conflicts across all of the key Test good practices documented above, including test execution, defect triaging, change control, release management, regression testing and data integrity.
- Because UAT testing is planned to run in parallel to Market Trials, the importance of having a clear exit/entry criteria at this phase of the project becomes blurred. As noted in section 2.2.2, it is extremely important to have proper governance linked to the entry into Market Trial testing and having a clear and easily quantifiable set of exit measures for each internal project before entry is granted.
- The period of time provided by Market Trials is short. The latest plan has only an 8 week window where only Market Trial testing is occurring and giving the scale and complexity of change to the industry-wide Solution, this is very tight. Please review included Case Studies and section 3 for more information.

A.4.2 Key Findings

Currently there are no internal exit criteria published by Xoserve. Also, the Market Trials test approach document does not include entry criteria into market trials. From a test good practice perspective, PA has identified this as a critical shortfall in the completion of Xoserve internal testing and has judged this to arise due to the absence of an overarching governance to support the entry into end-to-end testing.

Xoserve have defined an "Industry Go/No-Go Criteria in the UKLP Industry_COB_Go No Go Discussion Framework_V0 1. However, this gate governs the completion of Market Trials only. The

document proposes 3 factors for Market Trials entry: IT Delivery, Data and Governance. However, the acceptance factors provided are not explicit or quantitative enough to easily measure success at this stage of delivery either. Xoserve is broadly following good practice testing by identifying the separate phases that are required. However, due to the extent of parallel running there needs to be far greater visibility of the approach, including defect management, test data management and entry/exit criteria.

Finally, there is a significant concern that by making market trials optional that this will carry with it significant risk that not all participants will either be ready or have a system that will operate correctly on 1 October 2015.

A.5 Testing Timescale

The table below compares the Nexus testing timescales to other comparable projects

Good Practice	Nexus	7 day banking switch	Smart Metering
Build, Unit Test and system test	8 months		24 months
System Interface Test	1.5 months		8 months
Operational and User Acceptance test	3 months		2 months
Participant Connectivity/ Interface test	4 months parallel 2 months post UAT	3 months not parallel	13 months parallel 2 months parallel to UAT
End-to-end market test	3 months parallel to connectivity	3.5 months not parallel	2 months parallel to UAT 1 months post UAT

A.5.1 Assessment

The timescales are broadly comparable to smart metering. There are three issues for consideration: SIT, the extent of parallel running and the lack of a discrete end-to-end market test phase.

A.5.2 Key Findings

The SIT phase is short compared to other comparable projects. However this is an internal Xoserve test and may be representative of a limited number of major systems.

There is considerable parallel running, which raises risks as noted above. It is also important to note that the banking 7 day switch programme – a programme with significant financial implications – did not embrace parallel running.

There is no discrete end-to-end market test phase. This raises a significant risk as there should be a clear hand-off between connectivity testing and end-to-end market testing.

A.6 Assurance regime

The table below compares the assurance regime for Nexus to other comparable projects

	Nexus	7 day banking switch	Smart Metering
Party responsible for assurance	No defined regime in the form of milestones or checklists for compliance prior to go-live	The Technical Assurance team had a number of responsibilities and its primary responsibility was to lead activities to ensure that the business and technical solutions would address all necessary requirements consistently	The DCC will provide an assurance service that includes the testing of systems provided by Service Providers, changes to the systems provided by the Registration Data Providers and interfaces with Service Users.
Process for assurance	As above	The assurance role was carried out via a series of requirements and technical design review	Testing will be undertaken in defined phases and will use devices obtained in accordance

Nexus	7 day banking switch	Smart Metering
	workshops lead by the Technical Assurance team.	with the requirements of the Smart Energy Code (SEC).

A.6.1 Assessment

Good practice indicates that assurance services are a critical part of any significant data project. As illustrated in the cases of the 7-day banking switch and smart metering, the establishment of clear processes early in the project will ensure consistency of systems and ultimately secure interoperability between market players. This will help to avoid the need for significant post-go-live amendments to systems.

The provision of clear responsibility and accountability for this role in turn provides confidence to all market participants that the required steps have been taken to secure successful go-live. It also adds credibility to the project for interested stakeholders observing the process.

A.6.2 Key Findings

To date, assurance has not been an area of focus for the nexus project. We welcome the recent Ofgem decision to elevate the role of assurance within the remainder of the process but note that it would have been beneficial for these considerations to have been taken into account from the outset.

A.7 Conclusions

The table below summarises the above assessment

Criteria	Status	Comment
Scale and Complexity	N/A	Large scale, functionally complex, multi-participant programme requires appropriate supporting infrastructure
Governance and management	Amber	Proven modification processes in place, but probably insufficiently sophisticated or frequent for a programme of this scale. The newly-announced governance regime may not be strong enough and is late in the programme timescale
Baseline	Amber/Red	Baseline established for specification. No baseline for development yet. Timescale between baseline and testing is very short.
Testing Process	Amber/Red	Some good practice process, but with limited visibility, considerable parallel running and potentially a flawed testing approach by not mandating full industry participation
Testing Timescale	Amber/Red	Timescales are short and usage of parallel running raises risks.
Change process	Amber	Assumed standard modification processes will be used, but probably insufficiently sophisticated or frequent for a programme of this scale
Assurance regime	Amber	No existing regime, but Ofgem proposals should contribute to addressing this issue.. Timeliness is important.

As an illustration of the importance of testing, we have included a previous debrief from the NETA programme.

In 2001, the New Electricity Trading Arrangements (NETA) were introduced into the market, replacing the Pool arrangements and introducing more competition in the electricity markets.. The reforms were enabled by a £100m computer system built by Logica and owned by Elexon.

Following recognition that the original date for NETA to Go-Live was 31 October 2000 (and a subsequent date of 21 November 2000) would not be achieved; Ofgem revised the NETA programme go-live date to 27 March 2001 which was subsequently met. The delays were high-profile and reported in the mainstream and trade press. In

November, 2000, Computing Magazine reported an Ofgem spokesperson as saying;

"It's the testing of the links between the electricity companies and the central NETA system which is responsible for the delay. It's taking longer than expected. We aren't pinning the blame on anyone. What we always said was we didn't want to get started over the Christmas period because the electricity demand pattern just made it impractical."

In 2003, commenting on the slippage, in a comprehensive report on the outcomes of the new trading arrangements, the National Audit Office wrote

"The extensive trialling and testing of the NETA systems ensured that there was a seamless transfer to the new arrangements on 27 March 2001, from the outset, security of supply has been maintained"



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