Digitalisation Strategy

March 2023 Update

SP ENERGY NETWORKS

Contents

1. Introduction

1.1 Foreword

Digitalisation and data are at the heart of our plans to modernise the energy system and transition to Net Zero. Our role in meeting the UK's ambitious climate change targets is critical for a sustainable, Net Zero future and we must lead by example.

We must both decarbonise and increase energy production to meet the growing demand resulting from the electrification of heat and transport. To meet this demand, we must increase efficiencies through innovation and make informed decisions based on our Data.

We have already started on this journey and the latest information relating to the associated initiatives are explored in more detail in our latest Action Plan update (www.spenergynetworks.co.uk/digitalisation).

Progress since our Digitalisation Action Plan publication

Since our December 2022 publication, we have continued to make great progress on our RIIO-T2 and RIIO-ED2 plans. A deliverability assessment has been carried out to look at our extensive RIIO-2 programme to understand the 'what', the who' and the 'how' to deliver such an ambitious programme. This exercise has been concluded and we have agreed our deliverability strategy for 2023/24 which covers our resourcing model, our priorities, and our delivery methodologies.

We have also accelerated progress in specific areas, flexing to meet the demands of our customers and stakeholders. 3 key strategic areas of accelerated focus are

- Customer Connections
- Big Data and Analytics
- CRM

Our ambitions continue to grow as we progress through 2023, as we gain a greater understanding of the opportunities, we have to bring efficiencies to our customers, and the role that digitalisation and data can play in transforming our business, ready to meet our Net Zero targets. We have already mobilised our programme of work, but we recognise that we have a long journey ahead, and we need to be flexible in our approach to respond to changes as they happen.

Keeping our customers and stakeholders at the heart of everything we do is core to our RIIO-2 vision, and we would really value your feedback on our Digitalisation Strategy and Action Plan to allow us to shape our future plans in line with your expectations.

Our Digitalisation Strategy fits into the wider RIIO-2 context as shown in the diagram below:

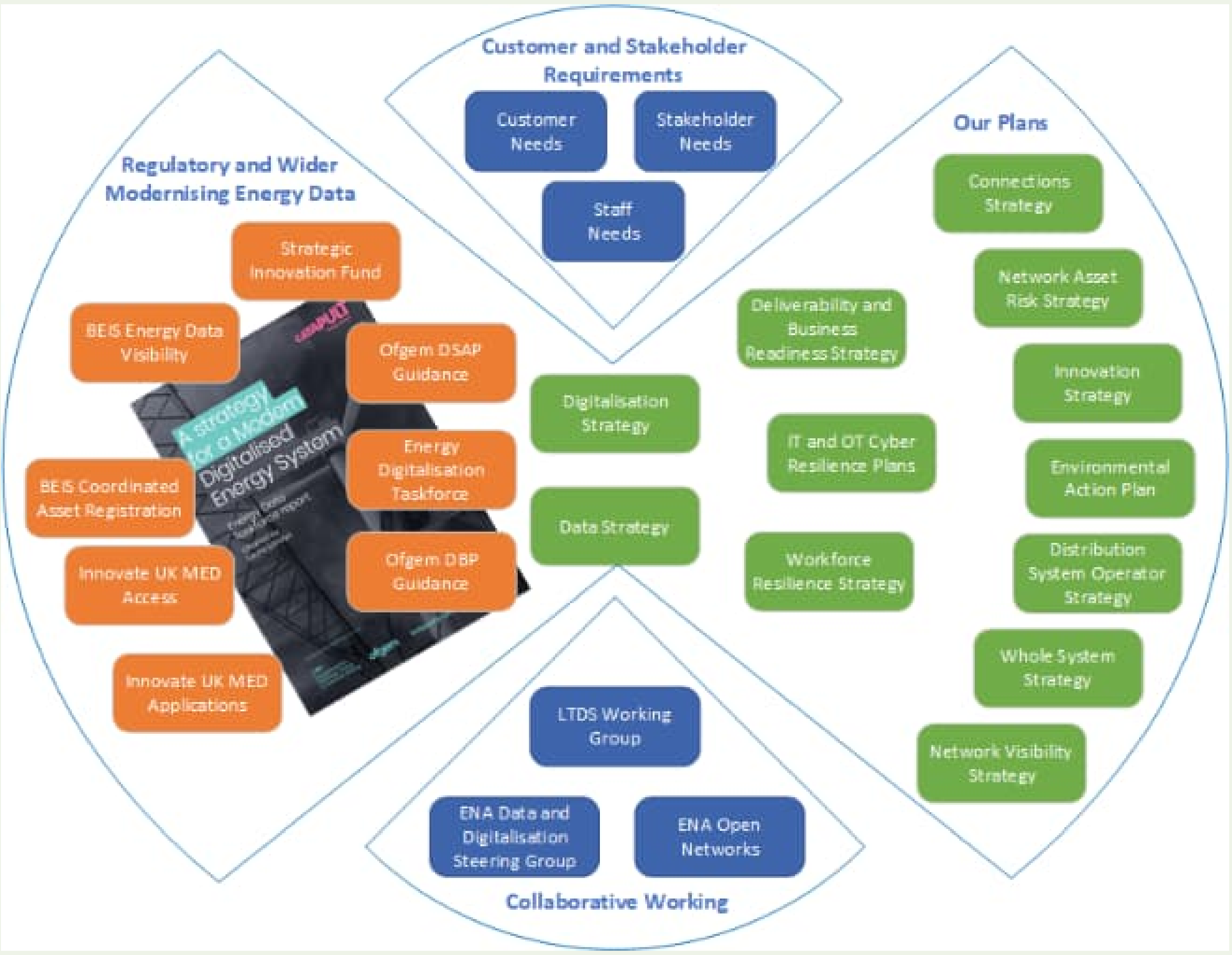


Figure 1 Visual Representation

By putting digitalisation and data at the heart of our plans, we aim to deliver a modern digitalised energy system capable of improving the services we provide to our customers and stakeholders whilst supporting a Just Transition. We will invest in solutions that enable us to achieve efficiencies and represent value for money for our customers.

Our digitalisation plans will enable us to:

- optimise our asset and network management
- support the development of new business models and markets
- prepare our network to deliver a 'Just Transition' for our customers
- increase the opportunities for our people
- turn data into insight
- use digital technology to deliver enhanced customer services

These objectives drive our vision for digitalisation and data and underpin our pillars that show how we will deliver our vision. Sections 3 to 9 provide a breakdown of the projects and initiatives that we are proposing to deliver our vision.

Unlocking the full potential of digitalisation and maximising the use of data for the public good has been a strong influence throughout our digitalisation strategy. To portray this, we have created personas, which are described in section 1.4, and introduced each of our 6 pillars together with a table highlighting the commitments that will be met from delivery of our plan.

Combined, our Digitalisation and Data Strategies set out our investments, outputs, and costs over the RIIO-2 period. They define our digital roadmap, describing how we will enhance our digital capabilities, drive innovation, and introduce new ways of working. They capture how we will embed digitalisation to unlock Net Zero benefits for our customers and stakeholders, and ensure our network is ready for the future.

Our plan describes how we will deliver our digital transformation as well as what we will deliver. We describe how we will build on our successes from RIIO-1 to deliver benefits early and incrementally. We describe how we will adopt agile approaches where appropriate, adapting our governance mechanisms to reflect the need for us to be more responsive to the challenges RIIO-2 presents.

We will review and update our Digitalisation Strategy and publish it on our website at least every 2 years. We will maintain our Digitalisation Action Plan and publish it 6-monthly. In doing so, we will encourage stakeholder engagement with our plans, responding to the feedback we receive to evolve our approach in line with customer and stakeholder expectations. We describe how we will:

- identify and engage stakeholders to understand their digitalisation and data needs
- how we will govern our activities to focus on delivering the vision set out in our Digitalisation Strategy

After setting our future vision and identifying the most relevant technology trends we have developed our Digitalisation Strategy, taking into consideration our extensive engagement with customers and stakeholders including detailed reviews by our Customer Engagement Group.

Our Digitalisation Strategy is summarised below:

Figure 2 SPEN Digitalisation Strategy

Structure

This strategy is split into sections, one for each of the six strategic pillars displayed in green in Figure 2 above plus an “Enablers” section which covers the ongoing maintenance and evolution of our current solutions. Each pillar sets out the high-level initiatives followed by the lower-level projects.

Each of these high-level initiatives contain both the ‘Business as Usual’ and ‘Digitalisation’ aspects of the transformation required to meet our customers’ and stakeholders’ needs.

Definitions of these aspects are as follows:

Business as Usual ("BaU")	Minimum investment required to meet the currents needs of our customers and stakeholders without implementing significant efficiency gains and/or meeting the needs of net zero. This includes minimum legal and regulatory requirements.
Digitalisation	Additional investment required to transform our business to meet the future needs of our customers and stakeholders. This includes the use of digital technologies to improve products and services, to produce new value-producing opportunities and to modernise the energy system to meet the needs of net zero.

Table 1 Definition of BaU and Digitalisation

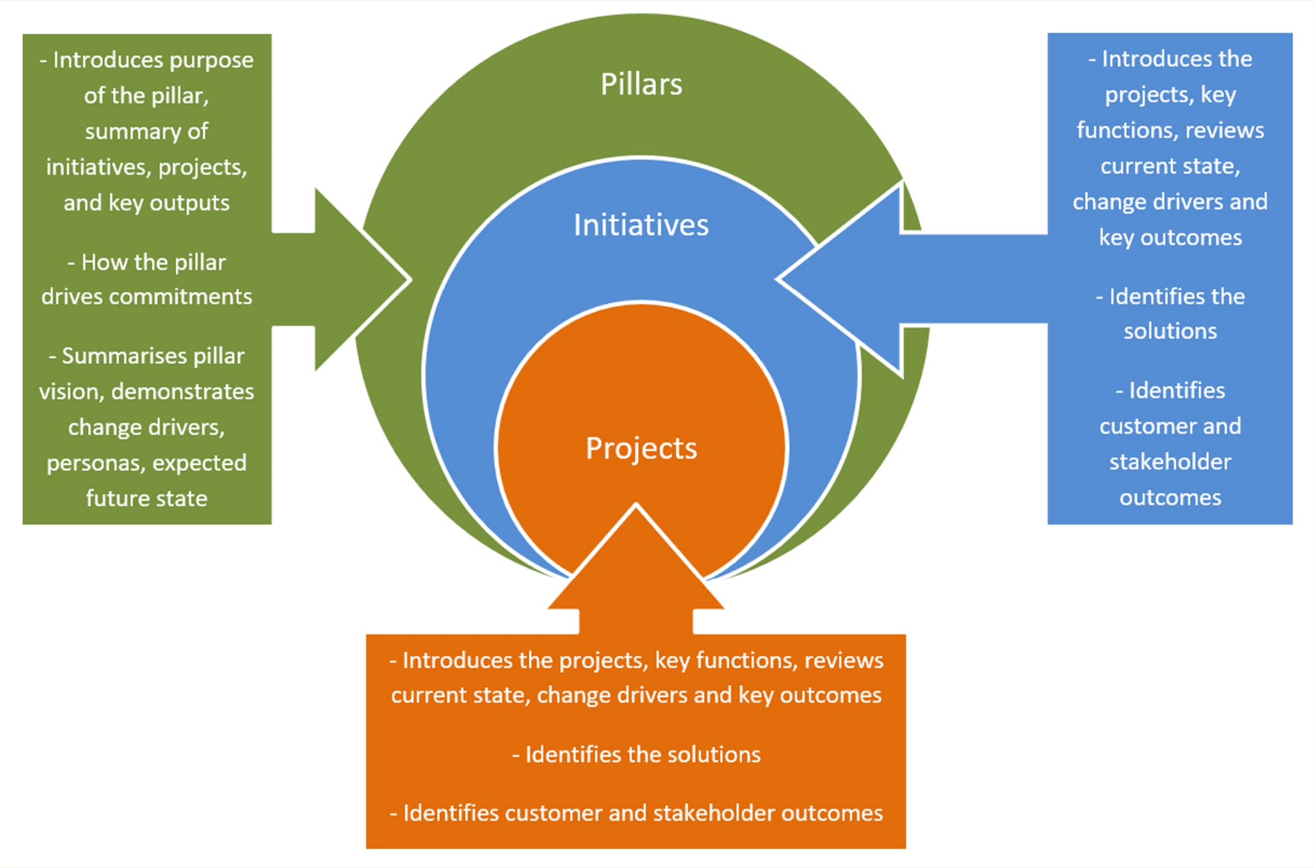


Figure 3 Strategy Structure

Each of the pillars follows a consistent format which is described in the diagram above.

The following table summarises how each initiative aligns with their associated pillar.

Pillar No.	Pillar Name	Initiative
1	USING DIGITAL TECHNOLOGIES TO DELIVER ENHANCED CUSTOMER SERVICE	CRM Platform
		Self-Service Functions
		NAVI
		L&P Digitisation
2	OPTIMISED ASSETS & NETWORK MANAGEMENT	Asset Management Solutions
		Connected Assets
		Connected Worker
		Supply Chain, Procurement & Logistics
		SMART - IOT Solutions
3	DEVELOPING OPTIONS TO MANAGE PEAKS IN LOAD	ENZ Platform
		SMART - Data & Analytics
4	SUPPORTING NEW BUSINESS MODELS & MARKETS	Sustainable Operations
		DSO Market Operation
		Open Data
5	INVESTING IN THE DIGITAL SKILLS OF OUR PEOPLE	
6	IMPROVING MASTERY OF OUR DATA	Improving Mastery of Our Data
	ENABLERS	Enablers

Table 2 Initiatives Mapping Summary

The following diagram has been developed to assist our customers and stakeholders better understand and engage with our digital strategy. This shows how our key initiatives are inter-dependant with each other, how they have been designed, with our stakeholders' input, to deliver the outcomes expected from our customers and wider stakeholders and captures the essence of our digitalisation strategy. We have future plans to create an interactive version on our web site for customers and stakeholders to explore.

Figure 4 Digitalisation and Data Strategy summary

The following diagram summarises the high-level interdependencies between this Digitalisation Strategy and the enabling elements from elsewhere in our RIIO-2 submission:

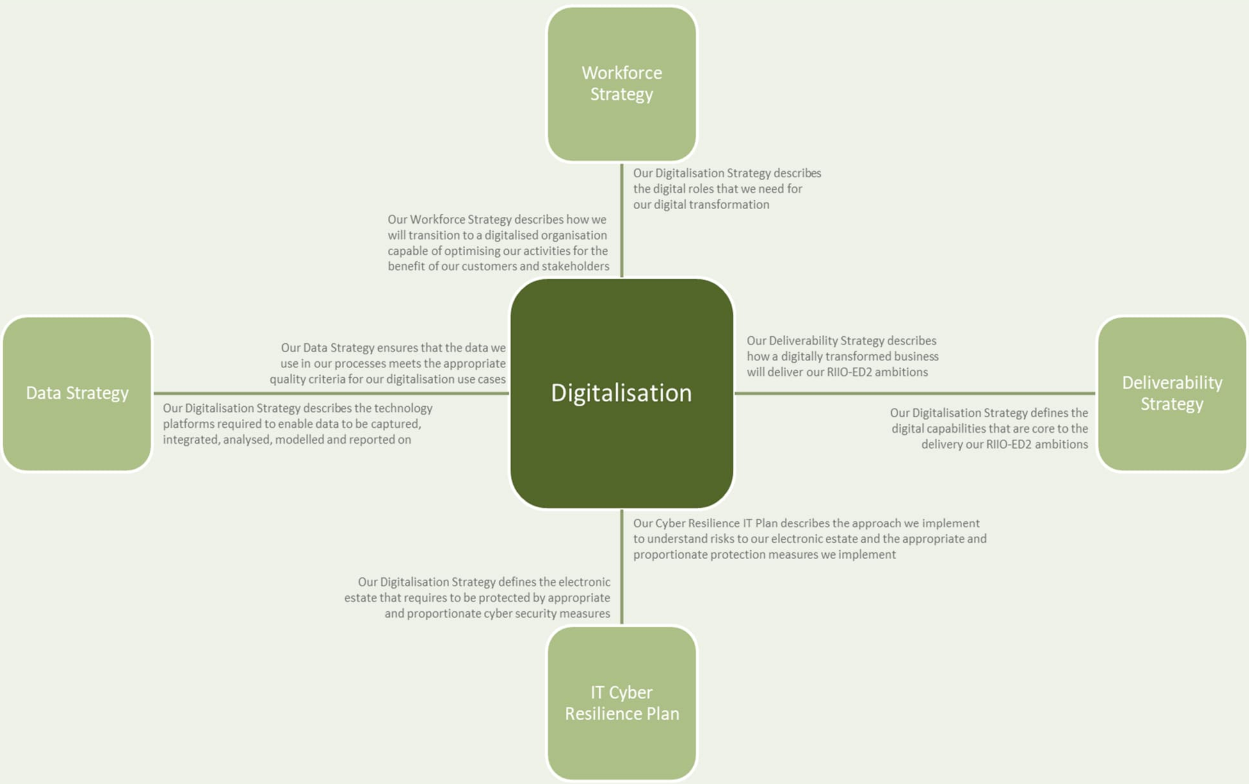


Figure 5 Enabling elements

The following diagram summarises the high-level interdependencies between this Digitalisation Strategy and the wider business priorities as part of our overall RIIO-2 submission:

Figure 6 Wider business priorities

In order to ensure we have alignment in the delivery of our plans with the different parties within our organisation we establish forums for discussion and collaboration, where we will discuss, plan and co-ordinate cross functional activities.

1.2 Key highlights

Our approach builds on our successes and proven track record from our RIIO-ED1 digitalisation programme, including the implementation of our Network Asset Management System (NAMS) which now provides the backbone for our asset management and field operations. We have developed an ambitious future vision to illustrate the role that digitalisation and data will play in improving services to our customers and stakeholders and improving our business operations by 2028. Note, the numbers in figure 4 are for illustrative purposes and do not represent commitments:

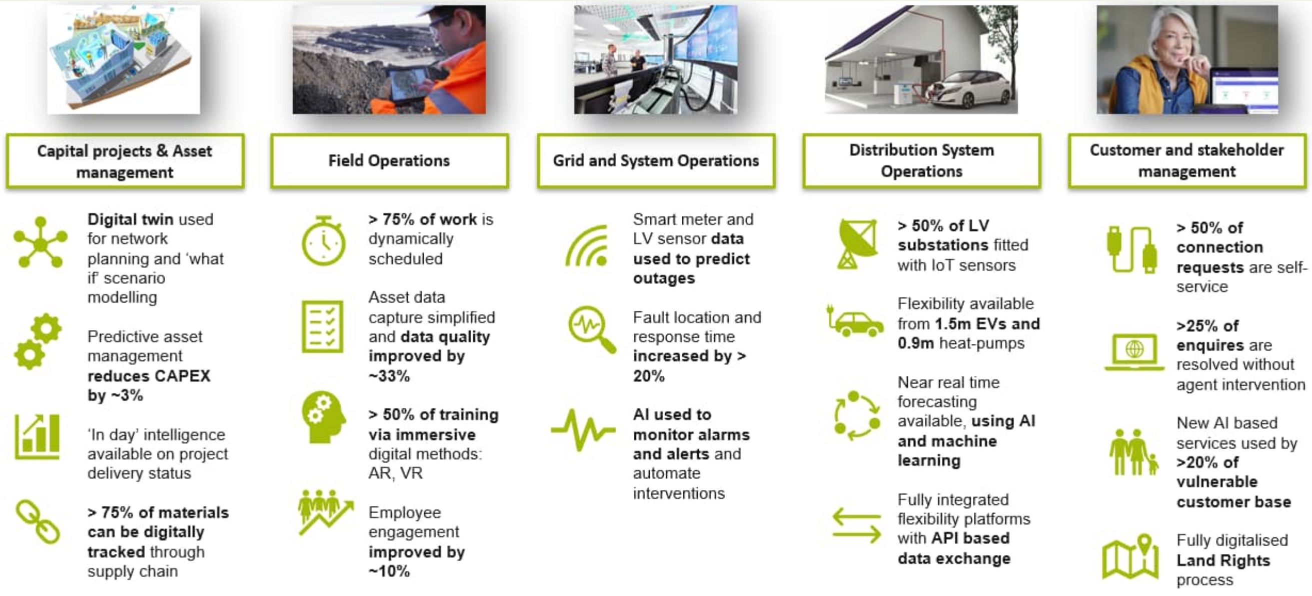


Figure 7 Digitalisation Use Cases that are Supported Through Data Mastery

We recognise that delivering a significant digital transformation will impact our workforce, business and supply chain and we have developed plans to support the transition. We have established our business "Centre of Excellence" and "IT Digital Hub" which will work alongside our existing IT, Business Change, and innovation teams to implement our Digitalisation Strategy (see Part 5 of our Digitalisation Strategy: Implementing our Plan). We have recently appointed a Business Transformation Director to oversee our transition to a "digital first", data driven organisation.

In developing our plans, we have considered our internal capabilities and resourcing capacity, and our partners and suppliers who will be part of our transformation, and we have undertaken rigorous assessments to ensure the deliverability of our programme. We have identified efficiencies through the internalising of key skills and resources and incorporated these into our investment proposals.

We have also carefully reviewed a range of new and existing technologies and trends and identified the ones that we believe will deliver the most value for our customers, stakeholders, and our people and that are needed to support the future vision above. Please see review output below.

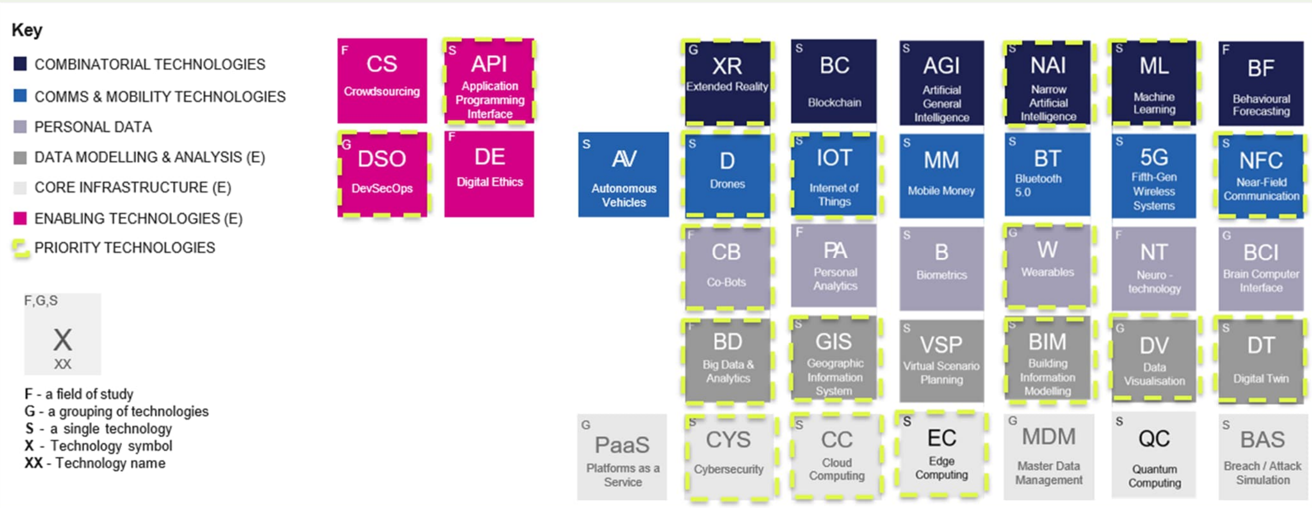


Figure 8 New and existing technologies and trends

After setting our future vision and identifying the most relevant technology trends we have developed our Digitalisation Strategy, taking into consideration our extensive engagement with customers and stakeholders including detailed reviews by our Customer Engagement Group.

We have considered the impact our Digitalisation Strategy and Data Strategy will have on our existing IT estate. The following diagram provides a high-level overview of some of our key systems that support our business operation:

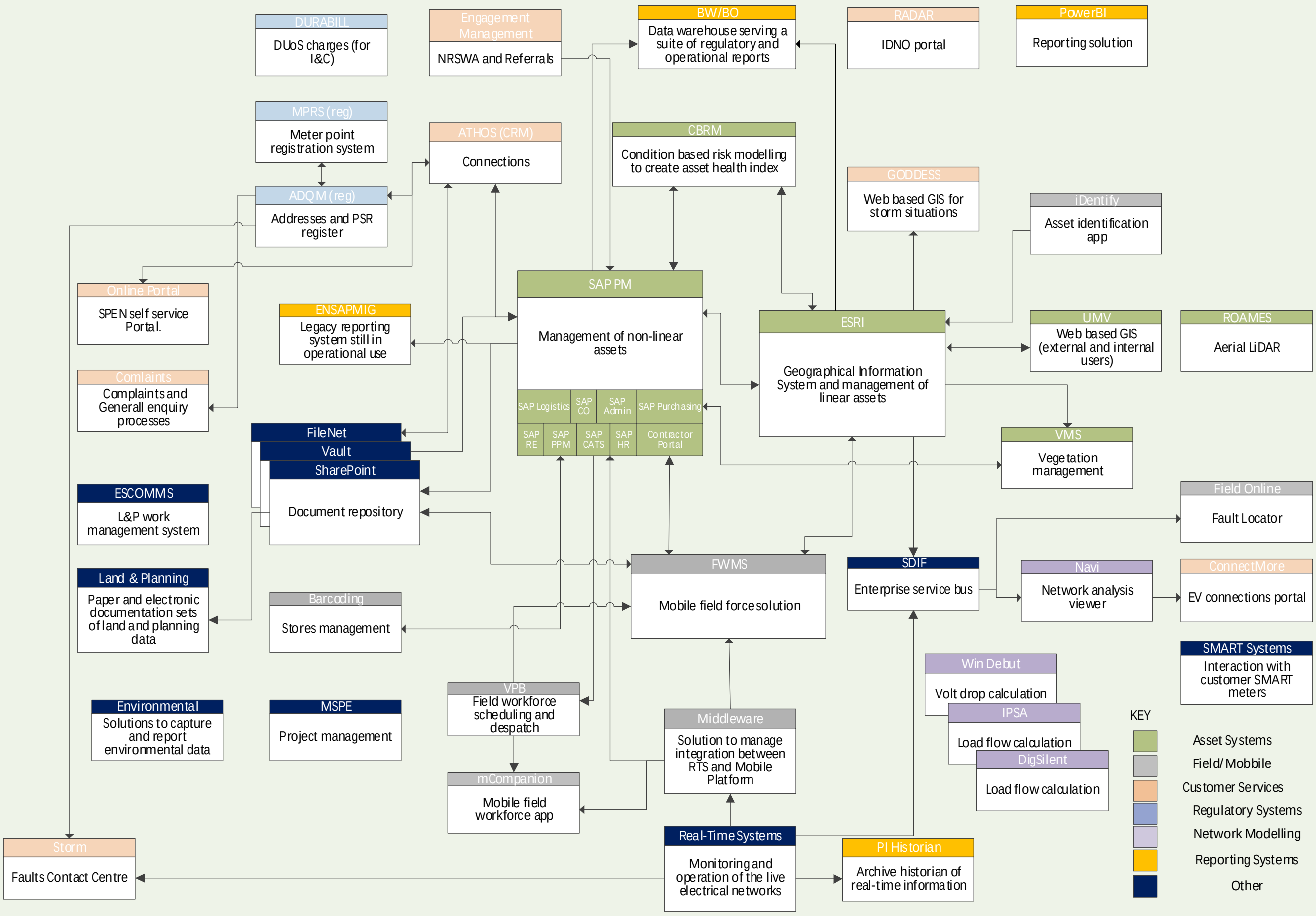


Figure 9 Our "As Is" System Architecture

At a high level, our Digitalisation Strategy is built on top of many of our existing solutions, which we will retain, to ensure better value for money for customers. We have thought carefully about the role that digital will play in complementing our existing platforms and have prioritised where intervention is needed and will deliver the best value, benefits, and outcomes.

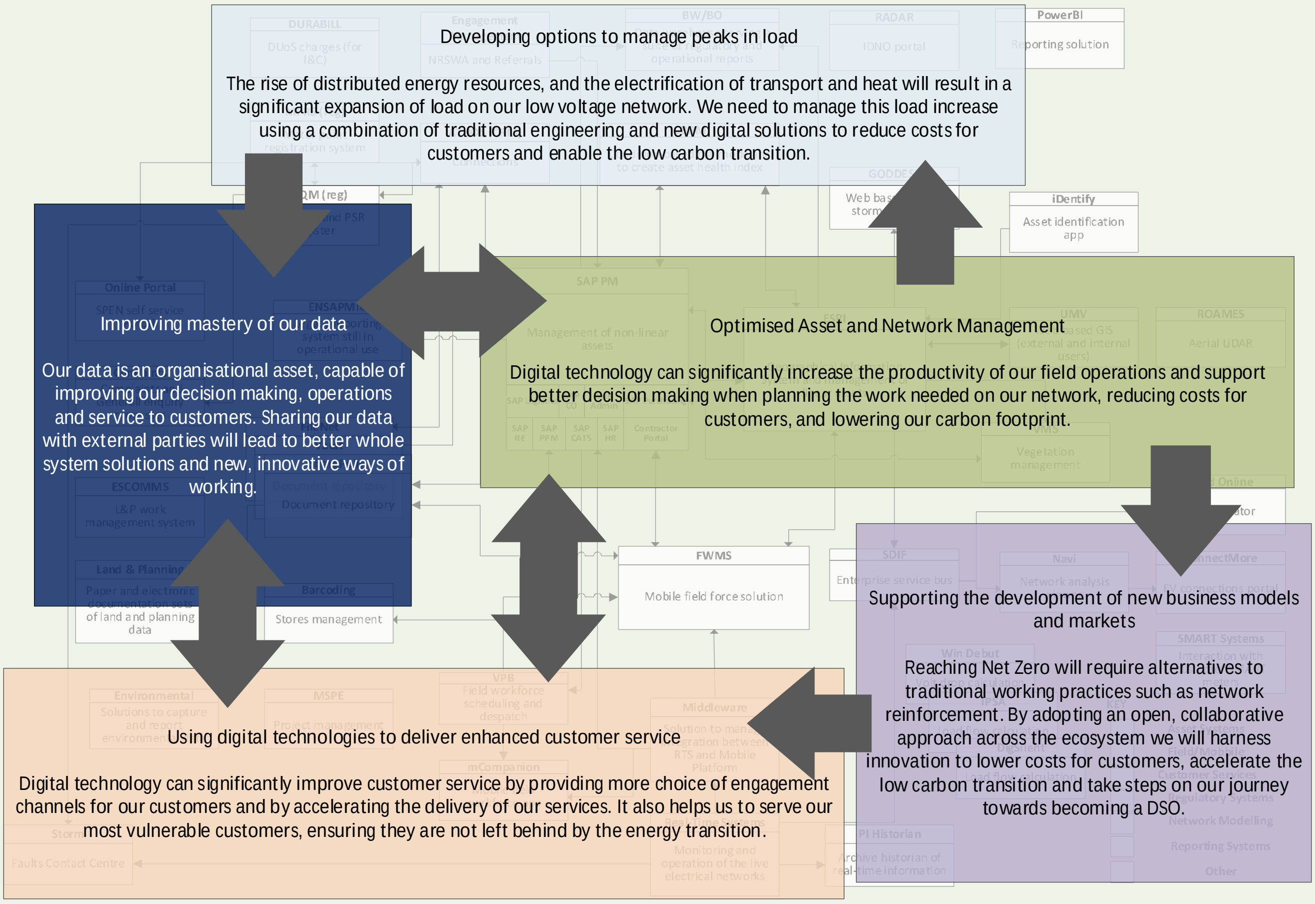


Figure 10 Our Digitalisation Pillars

The pillar "Investing in the Digital Skills of our People" is not shown on the diagram above. Our people are a fundamental part of our Digitalisation Strategy, enabling us to deliver and operate our new solutions efficiently, and use them to extract maximum value from our digital estate. As such, this pillar is embedded in every part of our plan.

The following diagram provides an overview of our roadmap for delivery of our Digitalisation Strategy:

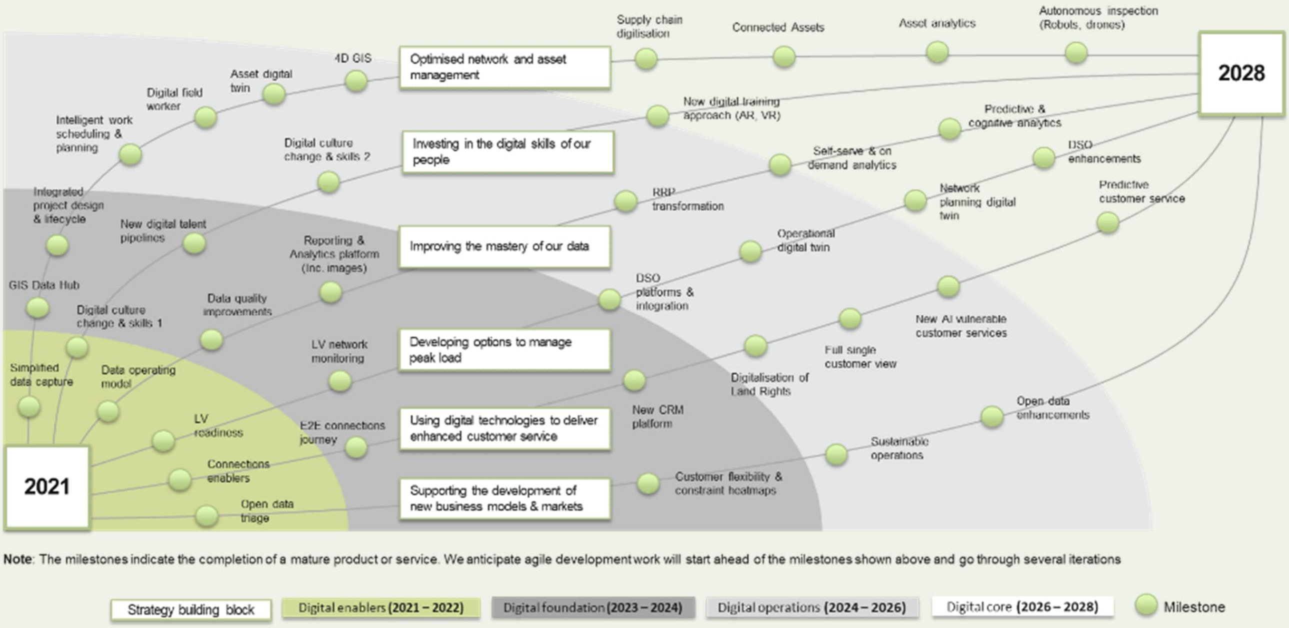


Figure 11 Our Roadmap for Delivery

We have also developed a dependency map which illustrates how each of our key initiatives build on one another to deliver an integrated vision and a set of complementary products and services, and the key dependencies between products and services. This will ensure that we deliver an integrated, holistic set of services / outcomes for our customers and that we understand the links between different elements which will help us manage and de-risk delivery

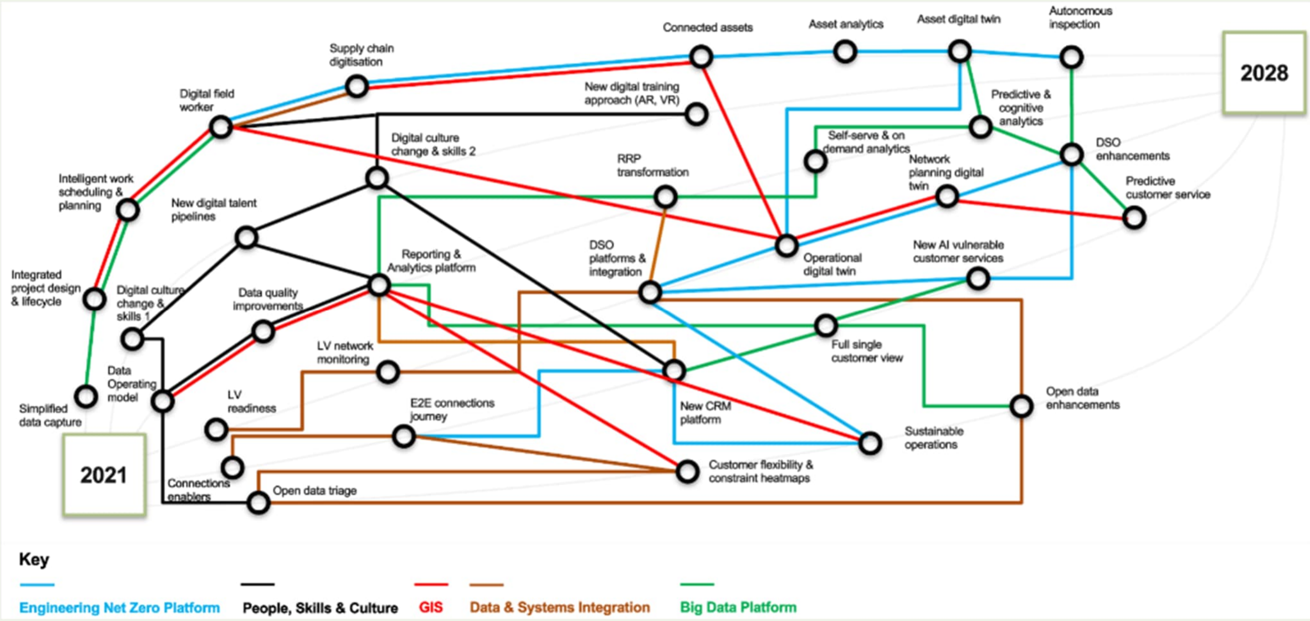


Figure 12 Initiatives Dependency Map

We recognise the journey our customers and stakeholders are going on as they transition towards low carbon energy systems. Our plans ensure that no-one is left behind, including recognising a wider range of vulnerabilities than those identified in standard industry codes, and those who are digitally excluded.

1.3 Benefits

Our investment in digitalisation includes a radical restructuring of our business to maximise the value of data and develop the skills and capabilities necessary to support the delivery of our wider RIIO-2 programme (and beyond). Our investment will deliver optimised solutions that maximise efficiency in the face of the central role our network will play in the UK's energy transition. We recognise that now is the time to invest to secure the capabilities necessary and have proposed an ambitious plan to prepare for the challenges ahead. Our investment ahead of need will ensure we are prepared to adapt our organisation, systems, and processes as part of the drive towards decarbonisation. Our CBA is presented in Appendix 10.5 below.

In addition to our customer and stakeholder engagement, we have developed a value tree which demonstrates the key outcomes that digitalisation can deliver and connects our Digitalisation and Data Strategies. We have qualitatively assessed the impact of our RIIO-2 initiatives on each of the value levers, and have assigned a 'high, low and zero' rating based on existing information. Further detail on benefits is included in each section of the initiatives within this document.

Key - Value Lever Benefits Assessment	
	High level of benefits
	Low level of benefits
	No benefits

Pillars	Initiatives	Optimise TOTEX	Improve customer service	Stakeholder engagement	Reduce carbon footprint	Facilitate net zero transition
Using digital technologies to deliver enhanced customer service	Self Service Functions	Low	High	No	No	Low
	Customer Relationship Management Platform (CRM)	Low	High	High	No	No
	NAVI	High	No	Low	No	High
	Digitalisation of Land and Planning	Low	No	High	Low	No
Optimised Network and Asset Management	Asset Management Solutions	High	High	No	Low	Low
	Connected Assets	High	High	No	No	Low
	Connected Worker	High	High	No	Low	Low
	Supply Chain, Procurement & Logistics	High	High	No	Low	No
	IoT Smart Initiatives	No	Low	No	Low	High
Developing options to manage peaks in load	Engineering Net Zero Platform	High	High	Low	High	High
	Smart Data and Analytics	No	Low	No	No	Low
Supporting the development of new business models & markets	Sustainable Operations	High	No	No	High	High
	DSO Market Operation	Low	High	No	No	High
	Open Data	Low	High	High	Low	High
Investing in the digital skills of our people	Digital skills	Low	High	No	No	No
Improving mastery of our data	Big Data Platform	High	High	No	Low	Low
	Data and Systems Integration	Low	High	Low	No	No
	Data Governance and Mastery	High	Low	Low	High	High
	Operational & Regulatory Reporting	Low	High	Low	Low	Low

1.4 Customer and stakeholder input

Our customers and stakeholders are at the heart of our digitalisation plans. We have tested our approach and proposals listed within this document and shaped them through engagement with our customers and stakeholders. Continuous engagement is critical to our plans so we will launch a new digital engagement and collaboration platform to provide better ways for customers and stakeholders to interact with us in the future.

We define customer and stakeholder success as gaining an understand of their needs, understanding the ways in which they can help drive success, understanding their responses to our proposed plans, adjusting our plans in response to their feedback, ensuring we are all inclusive and encompass all groups and that we achieve a just transition.

Within each initiative we have sought to identify performance metrics to show how we will track the success of our delivery. The measurement criteria have been identified, and as the projects progress and we engage further with our customers and stakeholders, we will build on these and add the actual measurement value and assess the true benefits. We expect this to be a dynamic process as priorities change during RIIO-2 and as we revise and publish our Digitalisation Action Plan 6-monthly and our Digitalisation Strategy every 2 years. This enables us to identify stakeholder priorities and deliver benefits early whilst maintaining our overall vision for a modern digitalised energy network.

Both Digitalisation & Data Stakeholder engagement and Customer Service engagement with customers were carried out via workshops, smaller sessions, and also through our online survey in order to develop a unified understanding of the views of our stakeholders, to enable us to make informed decisions to develop RIIO-2 proposals and then to test these proposals.

The ‘feedback and triangulation’ loop consists of three elements:

1. Feedback database - all answers to engagement questions and other feedback gathered via stakeholder events, market research or bilateral meetings were stored and categorised in a curated database.

2. Synthesis Reports - synthesis reports were developed to keep workstream leads informed of all feedback relating to topics that influence their proposals. This included any feedback gathered across all events.

3. Triangulation Record – information was recorded on how workstream leads used stakeholder feedback in conjunction to other forms of evidence (e.g., CBAs, engineering justification papers) to establish a golden thread between RIIO-2 proposals and stakeholder engagement.

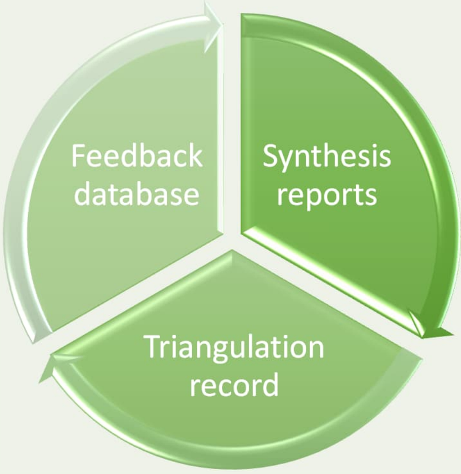


Figure 13 Feedback and Triangulation Loop

Identification

To create a representation of our key stakeholders, understand who they are, their needs, and the potential benefits we can bring through our RIIO-2 programme, we have chosen to develop Personas which we have reviewed with our Customer Engagement Group (CEG).

The diagram below demonstrates our approach:

Figure 14 Stakeholder Identification Approach

The diagram below demonstrates stakeholder and customer mapping output:

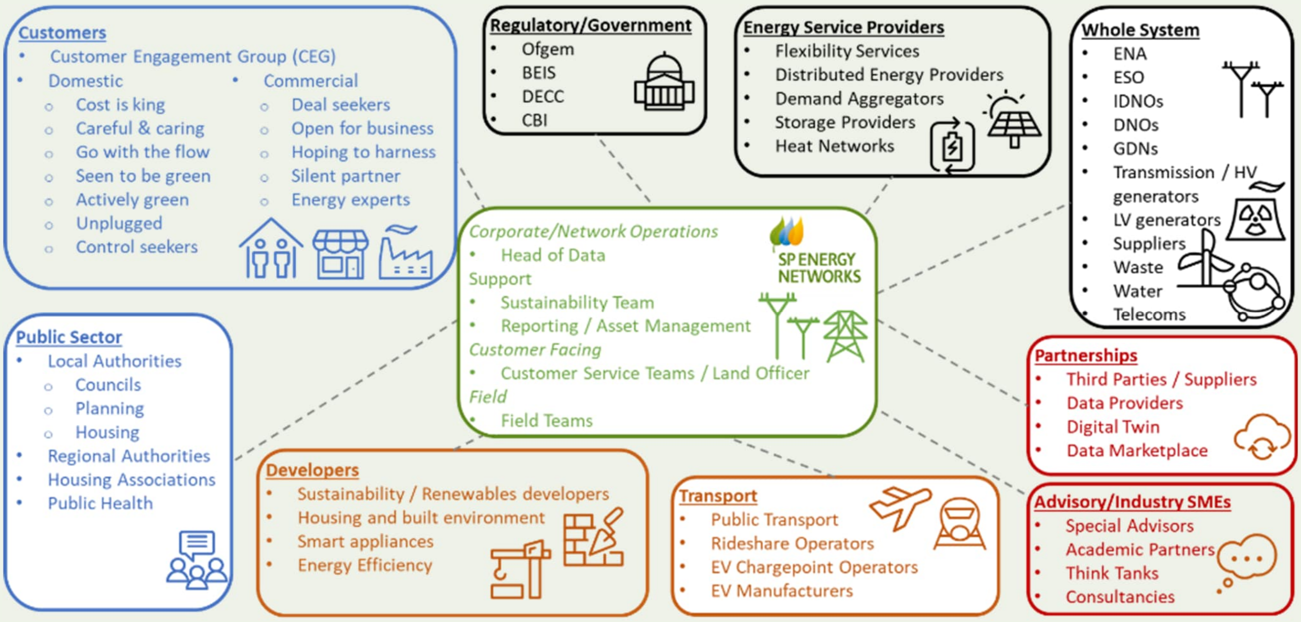


Figure 15 Stakeholder Map

Below are 2 examples of our personas illustrating who they are and the benefits and impact of digitalisation:

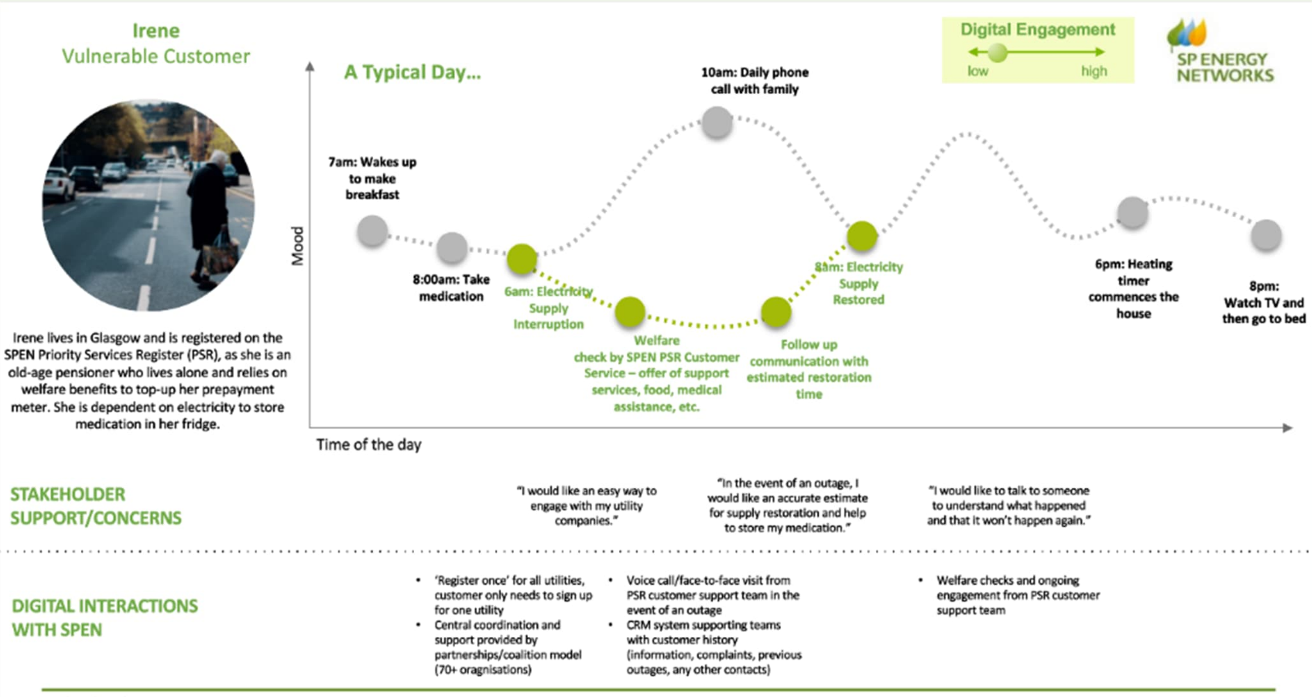


Figure 16 Vulnerable Customer Persona

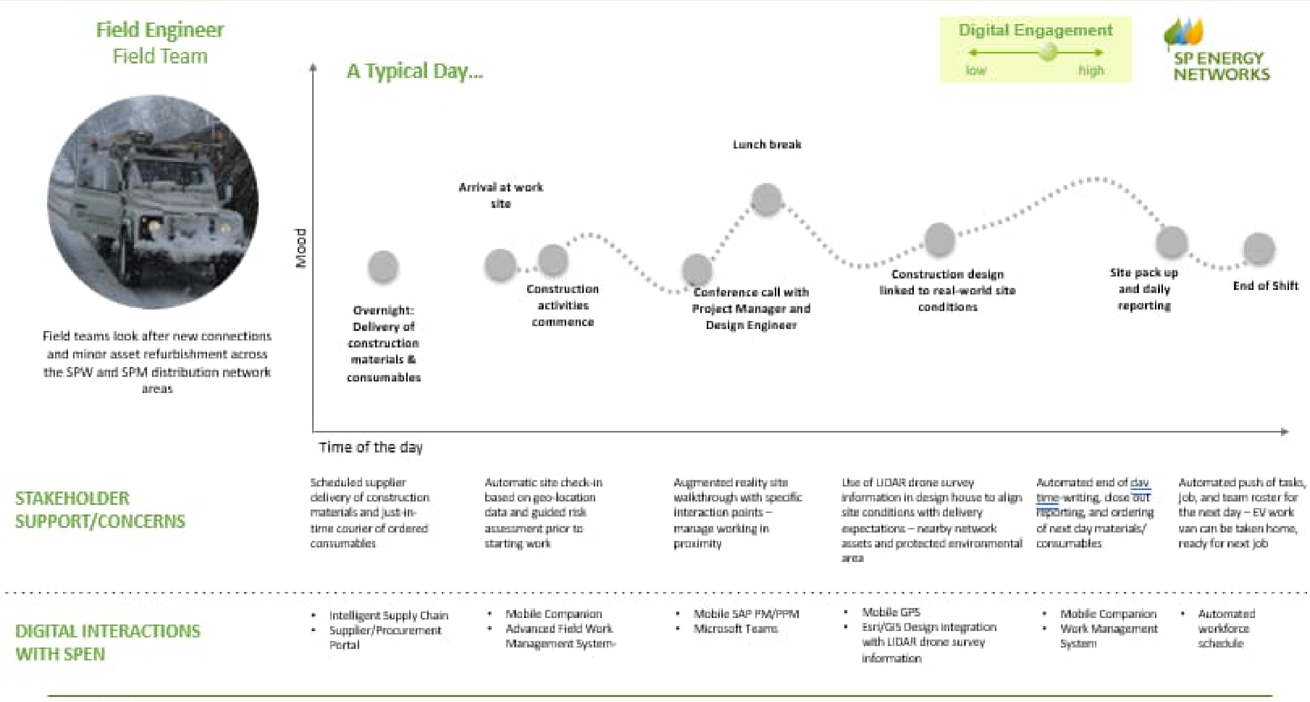


Figure 17 Field Teams Persona

External customers and Stakeholders – feedback

The Stakeholder engagement activities resulted in 3 key outputs which we have used to shape our plan: commitments, customer priorities and general customer and stakeholder feedback.

The table below summarises the RIIO-2 programme commitments, illustrating the key categories and subcategories, the total number of commitments for each subcategory, and the number which our Data and Digitalisation initiatives will contribute to. Each pillar will identity the commitments which have informed our plan.

Develop a Network that's ready for Net Zero Commitments	Total	D&D Involvement
Develop the network of the future	14	5
Ensuring a safe and reliable electricity supply	10	5
Provide timely and efficient connections	6	6

Be the Trusted Partner for Customers, Communities and Stakeholders	Total	D&D Involvement
We will deliver excellent satisfaction and enhanced services for all customers	18	14
We will support vulnerable customers and communities to ensure no-one is left behind	13	6
We will work with communities to facilitate the energy system transition	9	1

Ready our Business for a Digital and Sustainable Future	Total	D&D Involvement
We will support an environmentally sustainable network	24	6
We will promote an inclusive, skilled, and community-based workforce	5	3
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	3

The Digitalisation and Data workstream put forward 4 commitments and tested these throughout our stakeholder engagement process.

We will create a new Digital environment to meet our customers', stakeholders' and business' future and strategies.

We will build a Digital representation of our energy system and operation which will enable the following:

- Forecast and model the uptake of low carbon technologies, enabling us to understand future demands on our network
- Develop solutions to operate a flexible low voltage network, providing an alternative to network reinforcement
- Create a collaborative environment to facilitate whole system considerations
- Deliver customer focused solutions that meet the needs of our entire customer base
- Undertake our operations as efficiently and effectively as possible

Metrics will be published in line with our Digitalisation Strategy & Action Plan (DSAP)

We will track, measure, and publish our progress via the Digitalisation Strategy & Action Plan (DSAP). The Digitalisation Strategy will be refreshed and published at least every 2 years, and the Action Plan at least every 6-months.

This will enable us to:

- Communicate our plans and encourage stakeholder engagement
- Respond to the feedback we receive to ensure our plans remain focused on the needs of our customers and stakeholders
- Identify opportunities for collaborative with external parties in the efficient delivery of our plans

Through our data strategy, we will make data more accessible for more people (internally and externally) so that we can deliver more value for our stakeholders**,** and we will take a ‘presumed open’ approach to data.

We will ensure we treat data as an asset and ensure we maximise the value of this data. Through data we will consider a Whole System approach, ensuring co-ordination is prioritised in the decision making and planning process.

To do this we will apply the principles from Ofgem's Data Best Practice Guidance and implement strong data management and governance to underpin our digital journey.

This will be a perpetual evolution throughout RIIO-2 and beyond.

We will operate a risk-based approach to the management of vulnerabilities and threats to the -security and resilience of our IT and OT estate and data. We will continually assess our current position, review the threat landscape, and create action plans to apply proportionate technical and organisational mitigation steps. We will coordinate our IT and OT related cyber-security activities to ensure robust protection of our electrical networks. This will be a stepped increase from RIIO-1 as cyber threats evolve.

The feedback received demonstrated:

- 89.8% of household customers believe that the Digitalisation commitments proposed by SPEN are acceptable.
- 84.4% of commercial customers believe that the Digitalisation commitments proposed by SPEN are acceptable.
- 82.6% of customers are willing to pay for the Digitalisation commitments proposed by SPEN.

During the Phase 1 engagement customers were asked to Rank the 24 key topics in order of importance. The results are captured below

Priorities	Domestic Rankings	Commercial Rankings
Speed of restoring power after a power cut	1	1
Network resilience, not having a power cut	2	2
How SPEN communicate with customers should a power cut occur	3	3
Providing additional support for vulnerable customers	4	13
How SPEN manages health and safety regulation	5	4
Investing in a network to meet future needs	6	5
SPEN being environmentally friendly	7	9
How SPEN meets environmental regulations	8	8
Ways you can contact SPEN	9	6
SPEN setting target customer satisfaction levels across all areas	10	7
How SPEN manage waste reduction	11	14
If/how SPEN shares personal usage data	12	12
Environmental sustainability in SPEN supply chain	13	10
How SPEN meets Government objectives	14	15
Adding low carbon technology to the network	15	17
Encourage non-peak electricity usage with cheaper tariffs to reduce peak demand	16	19
Speed at which SPEN can make additional connections to the network	17	11
How SPEN Invests in staff	18	16
Timelines for when SPEN achieve being carbon neutral	19	20
If/how SP Energy Networks shares network usage data	20	23
How SPEN deal with community requests to connect low carbon tech	21	22
Biodiversity at SPEN sites	22	24
Central innovation funding directed by OFGEM	23	21
Getting a quote for a new electricity connection from SPEN	24	18

Figure 18 Phase 1 Stakeholder Ranking

We took cognisance of these priorities and used them to shape our initiatives and projects. Each pillar will identify the priorities used to inform the plan.

During the customer and stakeholder sessions we captured feedback, which again have helped to share our Digitalisation and Data plan. The list below captures the key elements:

- Providing new and enhanced services to create opportunities for our customers and stakeholders to maximise net zero benefits received an average importance of 3.88/5.
- There is clear support that SPEN should prioritise digitalisation to manage the network flexibly as opposed to building new network capacity.
- There is clear agreement that sophisticated monitoring and control of the electricity network will be essential as we move towards a low carbon energy system.
- There is stakeholder support that SPEN's Digital Vision permits them to deliver the '3D's. However, stakeholders challenged how these principles will be actioned and encouraged to move to the next level of detail; identify which initiatives will support the vision and how will they be implemented
- 100% of stakeholders agreed with our approach to consider our digitalisation strategy as 'digital throughout' and cited strengths of the approach included – digital is an enabler and that data from all departments and levels is key.
- Stakeholders suggested we include how the vision will be implemented at the workforce level
- There is clear support among stakeholders for the collecting and sharing of data with other organisations

- There is a clear stakeholder preference for data to be shared and distributed via APIs, with spatial file format, web portal and CSV downloads also being quite prominent.

Internal Stakeholders

Twenty workshops were held, with attendees from across the operational business areas from SPT, SPD, SPM, Customer Services, Smart Grid Operations and Real Time systems, Network Planning and Regulation, Process and Technology, UK IT and the other RIIO-2 workstreams.

The workshops covered all aspects of our business, focusing on areas of improvement to benefit our customers and stakeholders, with ~300 ideas captured which were consolidated into 10 major themes split into ~26 initiatives.

The sessions were supported by use of digital techniques:

- Sessions facilitated via the Teams collaboration tool
- Digitally recorded the TEAMS sessions
- Comprehensive notes captured during sessions
- Utilised AI to analyse both the recordings and the notes, to ensure consistency
- Created word clouds to demonstrate ideas captured and highlight those themes which were prolific throughout, providing confidence that sessions had been correctly captured

Examples of the word cloud outputs are shown below:

Figure 19 New Connections

Figure 20 Environmental & Sustainability

The outputs from both the internal and external sessions were reviewed to gauge and drive the level of ambition for our Digitalisation Strategy.

Keeping Stakeholders at the heart of our Digitalisation Strategy decision making

We have built our Digitalisation Strategy around the evolving priorities of our customers and stakeholders; however, our engagement does not stop there.

When it comes to planning for the future, we know that collaboration is key. We will therefore continue to engage and collaborate with our customer and stakeholder groups, engaging with new groups as our plans mature. This will ensure we recognise the needs of existing and future customers.

Our strong performance in stakeholder engagement throughout RIIO-1 has allowed us to take our customers and stakeholders into the future, in the most fair and efficient way. Over this period, we have significantly transformed the way we conduct stakeholder engagement – shifting from tactical, project specific engagement to broad, tailored, and relevant engagement to deliver real business change based on stakeholder need.

Building on this strong track record we identified best practice methods for stakeholder engagement through lessons learned to continue to facilitate meaningful engagement to deliver positive outcomes for our customers and stakeholders.

Our ongoing stakeholder strategy clearly lists who we engaged with and who we will continue to engage with throughout RIIO-2 in order to perpetually shape our plans and what we deliver for our customers and stakeholders. This section also details how we will continue to engage, and the methods for more pro-active activity which we will adopt.

Although a wealth of benefits has been realised through the use of digital engagement methods during Covid-19, we recognise there is no substitute for in-person active dialogue in terms of the quality of feedback that can be elicited, therefore a hybrid approach of face to face and digital engagement will be adopted to ensure maximum breadth and inclusivity within our engagement.

Throughout RIIO-2, we will test our digitalisation and data priorities with customers and stakeholders on an enduring basis to make sure our strategic direction is informed by their needs and preferences. We will do this through on-going stakeholder engagement such as qualitative and quantitative surveys, activity on our stakeholder online community and our stakeholder programme of events, ensuring our business priorities remain aligned to our stakeholders needs. Insight gathered will be used to encourage proactive integration of feedback into our decisions.

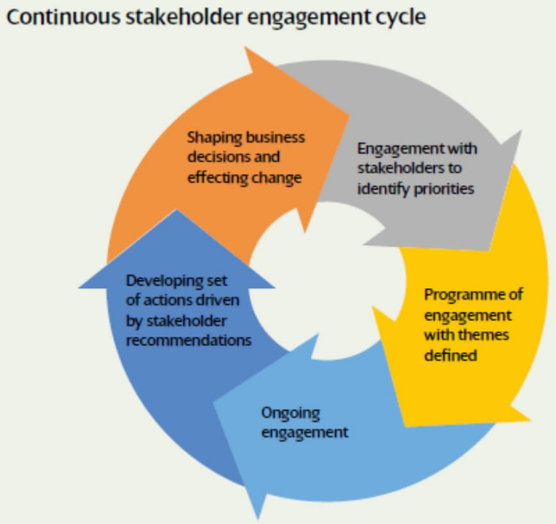


Figure 21 Continuous stakeholder engagement cycle

How we will track and publish progress

The following diagram illustrates that data and digitalisation heavily influence both our RIIO-T2 and RIIO-ED2 business plans.

In order to clearly track progress and present this in a clear, accessible, and concise manner for our customers and stakeholders, our Digitalisation Strategy and Action Plan (DSAP) will be accessible via our website. This will provide updates to the plan together with progress at project level and will be influenced by stakeholder engagement throughout the period. Our DSAP can be accessed at www.spenergynetworks.co.uk/digitalisation.

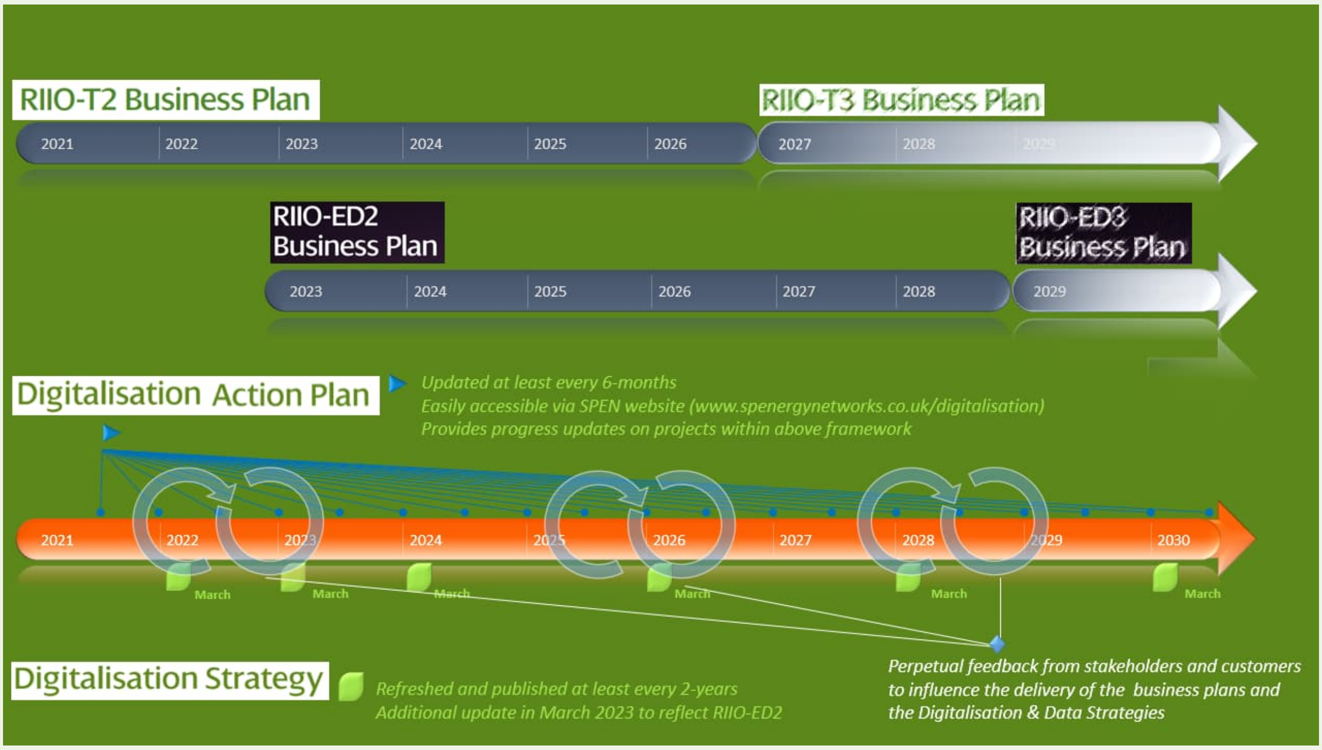


Figure 22 Progress updates from our DSAP

Making engagement easy

The website version of our DSAP, detailed above, has been structured to provide a quick, easily accessible format for customers and stakeholders to understand the Products and Services and the status of their delivery. The following extract shows a summary of our projects and when the expected delivery dates will be. There also pop-up boxes, written in simple language, to explain at a summary view what the outputs will be.

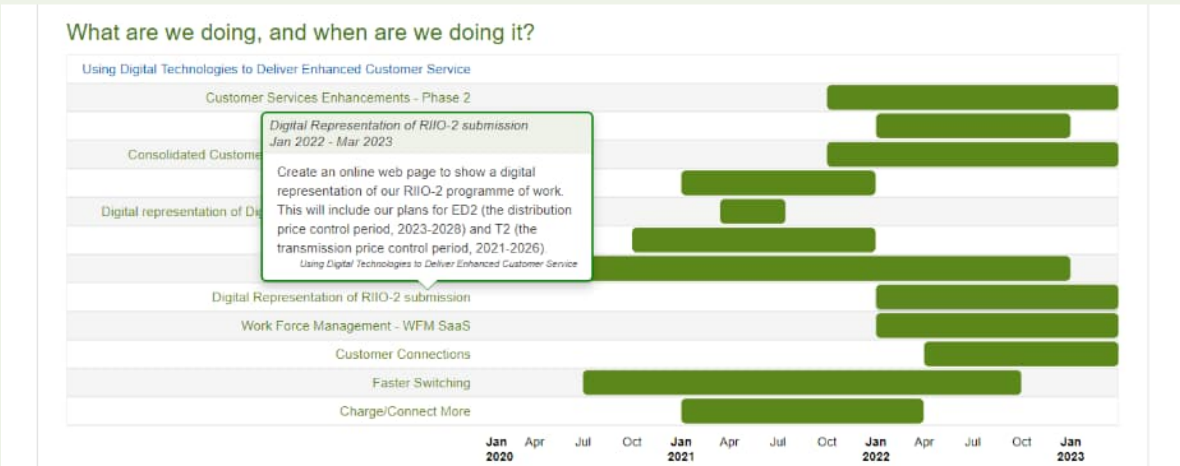


Figure 23 Project update screen snapshot

We have also created a simple way for customers and stakeholders to contact us to discuss, and be involved in, our future plans. And we have offered a simple method for customers to discuss our DSAP in more detail. The snapshot below is from our live DSAP website.

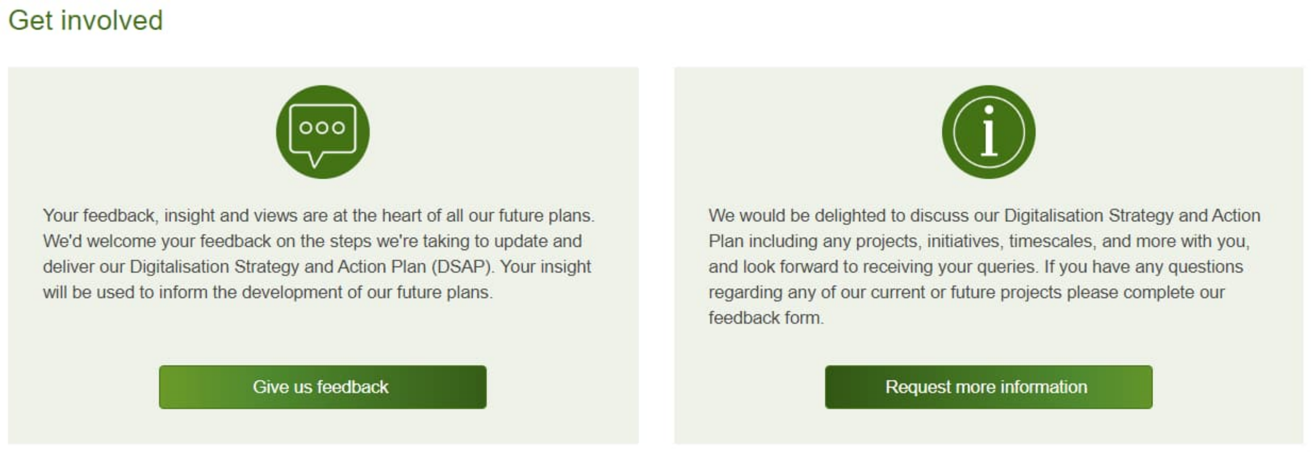


Figure 24 Easy methods of contacting us

This website is new, and we have plans in place to continue to evolve the format, content and information displayed within the pages. Interaction and suggestions from our stakeholders and customers will be key to the evolution of this page.

1.5 How we'll fulfil our promises

Introduction

Our ability to deliver our ambitious targets has been a key consideration throughout the development of our Digitalisation Strategy. The delivery of our digitalisation and data initiatives will require us to make significant changes to our business to support the transition to Net Zero.

We are confident that we will meet this challenge. Much of our digitalisation strategy places a reliance on digitalisation and data enabled approaches to planning and intervention, and to increase the productivity and efficiency of our workforce. To ready ourselves for this transformation we are already mobilising the necessary recruitment and upskilling programmes for our future workforce. We are also working closely with our supply chain to plan how we deliver together through RIIO-2.

In doing this now, we are preparing our workforce with the skills they will need to meet the demands of the future and working closely with our supply chain partners to ensure they are ready and able to deliver what our customers and stakeholders need.

We demonstrated during RIIO-1 that we can set out and deliver a comprehensive business plan which meets the needs of our customers and stakeholders, and we will go further in RIIO-2 on this journey.

Our plans for digitalisation and data have been market tested and validated through collaboration with specialist consultants (including Accenture), industry user groups and customer engagement groups. This market testing has ensured an external influence and input to our plans.

We have already started

We have created an easily accessible online web site which details our current and future deliverables. (https://www.spenergynetworks.co.uk/digitalisation). The site will be updated at least every 6 months and offers our customers the opportunity to provide feedback to inform our future plans, by either completing an online survey, or by completing a web form on a specific topic.

In recognition of the works required in advance of RIIO-2, we have recently assembled a number of agile squads working under the Scrum framework, focusing on the following key areas of improvement:

- Connections
- Customer Relationship Management (CRM)
- Big Data & Analytics
- Mobility & Scheduling

These squads are in the discovery phase and are key enablers for delivering our Digitalisation Strategy.

Each agile squad consists of a Product Owner, Scrum Master, Subject Matter Experts, Change Leads, Design Leads and supported by several expert roles from across the relevant business areas. Overseeing each squad is a Product Owner, from directorate level within the organisation. The figure below demonstrates how our squads are assembled.

This is a critical step in ensuring the business is ready to deliver on our commitments to our customers and stakeholders according to their needs. The squads will be used as training and upskilling of our own staff around the agile methodology and lessons-learned sessions will be used to improve the next scrums and squads as they are assembled. Our intention is to increase the use of squads through RIIO-2 and continue this methodology throughout. This is a new way of working for SPEN and has been chosen as it is cross-functional and intended to break down any departmental siloes, which in turn will help to deliver value to customers quicker.

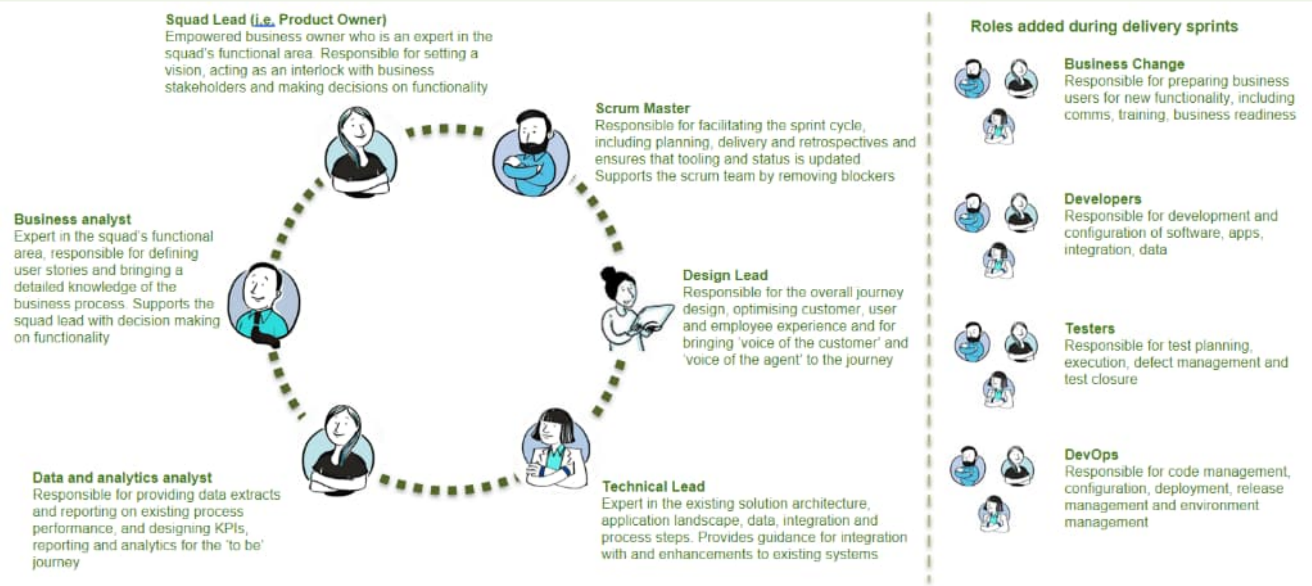


Figure 25 Agile Squad

Delivery Methodologies

Throughout RIIO-2, two key methodologies will be used as part of our delivery model:

- Agile
- Waterfall

We recognise the need for both delivery methodologies and in some cases a blended approach using both. Our initiatives detail where Agile, Waterfall or a blended approach is best suited to the individual projects being delivered.

Agile will be used predominantly for projects where there is a level of uncertainty and complexity, and where Subject Mater Experts require to be extensively involved. We recognise the opportunity of moving to agile ways of working and we believe that this will be our default delivery method.

A **waterfall** approach will be used to ready systems for integration to new platforms where integration between legacy platforms is required

We also recognise the need for a **blend** of delivery methods whilst we transform our approach to digital ways of working.

Agile

The Agile Manifesto embodies the following core values:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

There are different types of agile delivery methods, SPEN's adopted method is Scrum.

Scrum is a lightweight, iterative, and incremental framework (note – not a process) for managing complex work. It is based on Empiricism, which asserts that knowledge comes from experience and making decisions based on what is known.

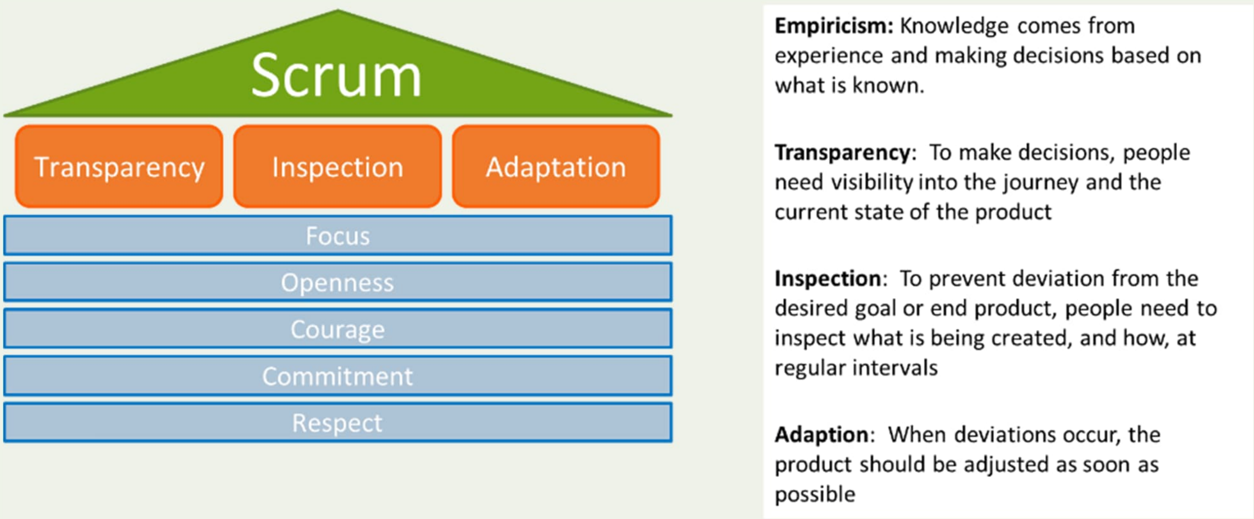


Figure 26 Scrum Framework Principles

Figure 27 Scrum Framework Values

Scrum includes the same types of activities as traditional waterfall projects, but rather than implementing them sequentially, they are encapsulated into multiple iterations (sprints) to create a working piece of software (increment). In this way, Scrum builds the application incrementally, with each increment adding and improving features and functionality on top of the output of previous increments.

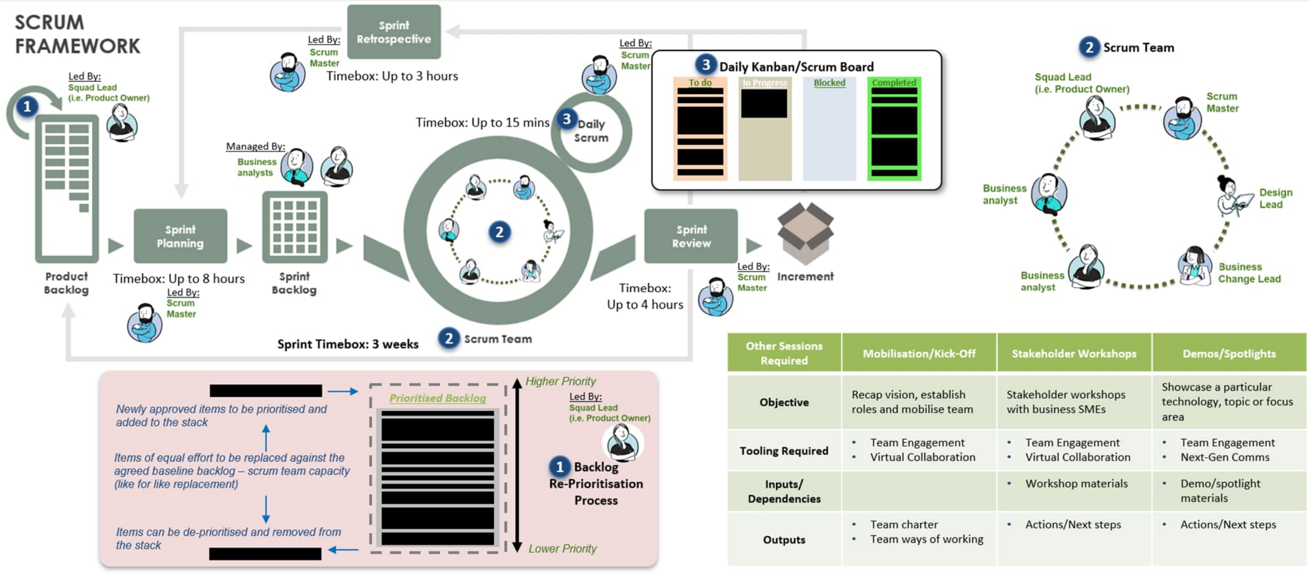


Figure 28 **Scrum Process Visualisation**

The Scrum squads will carry out fortnightly sprints with a set of defined user cases. The deliverables will be pulled from the product backlog by collective team with agreement based on business benefits. The output of the sprints may be implemented into production dependent on business value.

The table below outlines the standard resources in the scrum squads referred to throughout the document.

Resource Type	Purpose
Scrum Master	Drive agile delivery of projects, coordinating with development team and product owner
Development Team (Not in Discovery phase squads)	Build solutions in an iterative manner from MVP to full scale deployment.
Product Owner	Overarching responsibility for initiative in agile approach
Subject Matter Experts	Provide expert guidance on stakeholder requirements

Table 3 **Standard Resource Types and Purposes in the Scrum Squads**

Waterfall

Waterfall is a more traditional method of project delivery where tasks are completed in sequential order. The diagram below illustrates this:

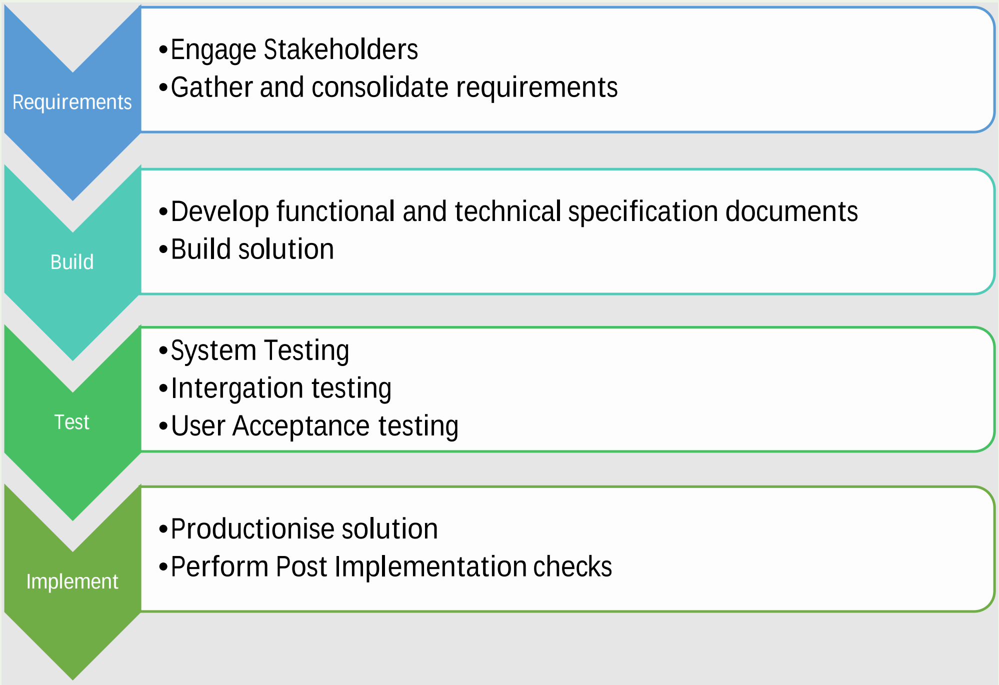


Figure 29 Waterfall Methodology Stages

Change Management, Prosci and ADKAR

With any new functionality and technology comes change and transformation for our internal stakeholders. To enable that people-change, we will be using Prosci change management methodology. This methodology has been selected as the global change management process and will be applied in all Iberdrola Networks Businesses (Neoenergia, SP Energy Networks, Avangrid Networks, and i-DE).

Change management is the approach to driving adoption and usage, ensuring initiatives deliver expected results and outcomes:

- Applying change management enables organisations to deliver results on each change more effectively and build competencies that grow the organisation's capacity to tackle more changes at the same time.
- Change management focuses on helping people change how they do their jobs, allowing us to capture the adoption contribution and the people-dependent portion of project ROI.

SPEN are currently increasing the number of Prosci change practitioners within the organisation to embed the change culture and provide our change practitioners with the processes and tools to build customised, targeted and research-based change management strategies and plans to drive project results and outcomes. We have noted below a tool and method from the Prosci toolkit:

The **Project Change Triangle (PCT)** has three strategic elements that reflect the overall health of a project that must be in place and strong to achieve project success:

- **Leadership/Sponsorship**: Governance, strategy, and direction
- **Project Management**: The technical side of change
- **Change Management:** The people side of change

The **ADKAR Model** is a simple but effective model for managing individual change made up of five building blocks of change: Awareness, Desire, Knowledge, Ability and Reinforcement.

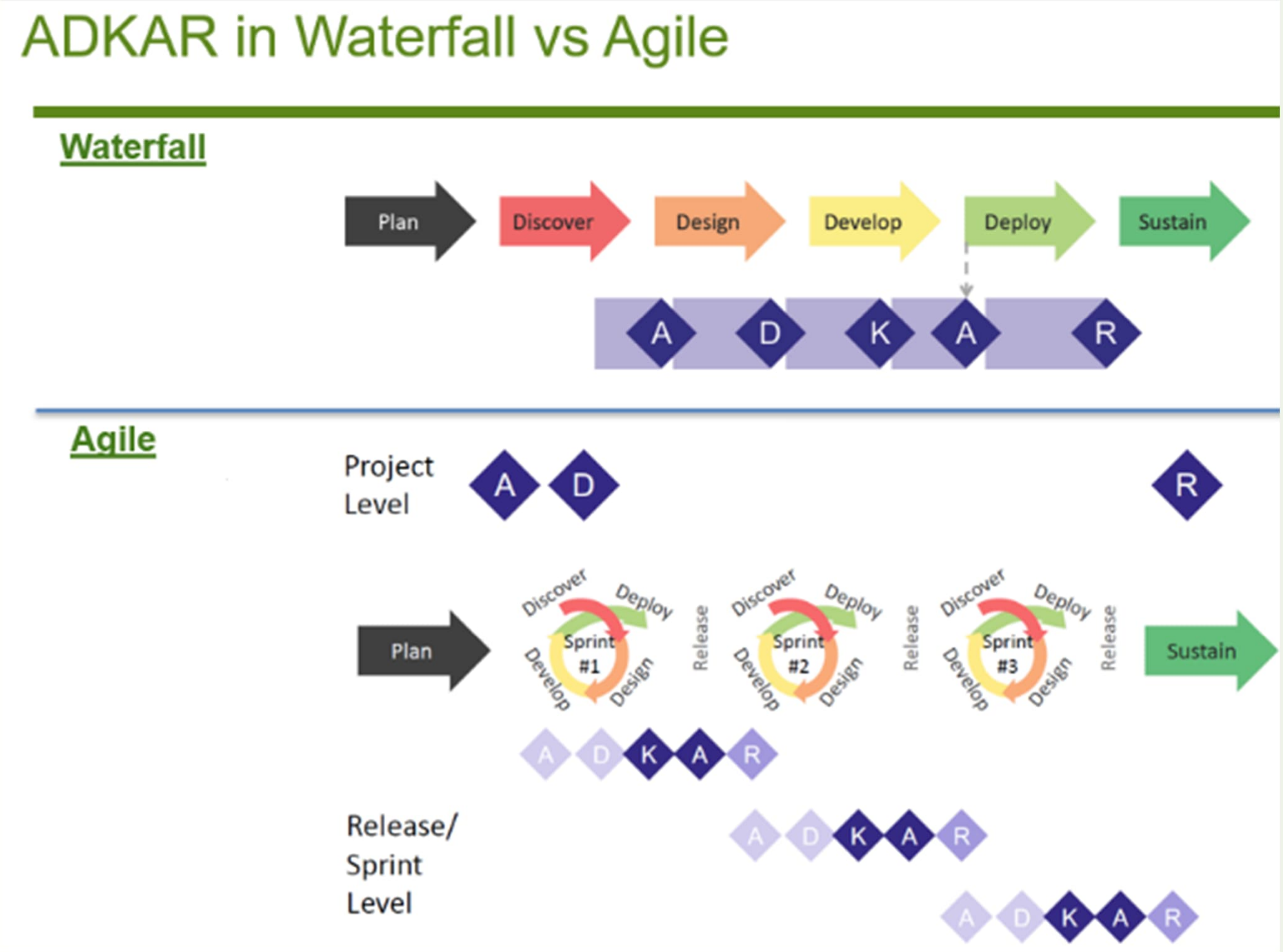


Figure 30 ADKAR Model

2. Governance

2.1 Methodology

Production of the Digitalisation Strategy commenced in Q3 2019 with the appointment of Gartner to assist with the creation of SPEN's first Digitalisation Strategy. A condensed period of activity with a focused SPEN / Gartner team and input from across the business resulted in SPEN's first Digitalisation Strategy being published on our website on 9th December 2019. This identified the 6 key pillars of digitalisation for SPEN: optimised network and asset management; developing options to manage peaks in load; supporting the development of new business models and markets; improving mastery of our data; using digital technologies to deliver enhanced customer services and investing in the digital skills of our people.

Following on from the 2019 publication, a "digital team" was established under the leadership of the Centre of Excellence with support from the UK IT Business System Director team with a specific focus on the Digitalisation and Data Strategies for SPEN, and co-opted support from UK IT IOC (Infrastructure, Operations and Communications), SERCO (Security, Risk, Compliance) and Digital Hub teams, together with a number of graduate and summer placements. This team took responsibility for:

- Creating the Digitalisation Strategy and Data Strategy
- Liaising with appropriate external stakeholders (e.g., ENA forums, Ofgem, BEIS (now DESNZ), Innovate UK, CEG, etc.)
- Responding to regulatory publications and consultations
- Creation of the digital plan for RIIO-T2, building on the T2 final determination
- Updating of the Digitalisation Strategy and Action Plan for RIIO-2
- Creation of the Cyber Resilience IT Plan in liaison with the team creating the Cyber Resilience OT Plan

Feedback on the December 2019 Digitalisation Strategy was received via a bilateral and an open letter to all network companies in June 2020. Ofgem requested all network companies to publish an update on their DSAP by 31 Dec 2020. SPEN published an addendum to our Digitalisation Strategy providing more details on the Digitalisation Action Plan: the activities we were undertaking or planning to deliver our Digitalisation Strategy.

To produce the SPEN Digitalisation Strategy, during Q4 2020 and into Q1 2021, twenty internal workshops were held covering all aspects of SPEN's operations. Workshop attendees were provided with pre-reading and a survey to capture initial thoughts. The format of the workshops was an introduction provided by the digital team followed by a facilitated session which was tailored based on material gathered from the surveys and using the NAMS "golden thread" business process models to focus the discussion. Output was captured via OneNote and the workshops were also recorded with the audio then being analysed via a Python script to create word clouds, text summaries and N grams.

Analysis of the workshop outputs resulted in roughly 200 projects being identified: a mixture of strategic and improvement objectives. These were consolidated and rationalised to 51 projects, aggregated to 17 initiatives, and mapped back to 6 pillars. Each initiative was then allocated to digital team members to create a more detailed breakdown using a template established considering several inputs:

- Feedback from Ofgem on SPT's RIIO-T2 Non-operational IT&T Capex Plan
- Feedback from customer and stakeholder engagement sessions and surveys
- RIIO-ED2 Sector Specific Methodology Decision
- RIIO-2 Business Plan Guidance
- Ofgem Open Letter on RIIO-2 Digitalisation Strategies
- Ofgem draft Data Best Practice Guidance and Digitalisation Strategy and Action Plan Guidance
- Engagement with other DNOs through the ENA Data and Digitalisation Steering Group

During Q1/Q2 2021, the digital team undertook a series of two-week sprints for the 17 initiatives to create the different sections of the SPEN Digitalisation Strategy. Initial drafting was undertaken with subject matter experts and the involvement of appropriate third-party resources to provide cost data. This was then reviewed by senior members of the team and cross checked between the digitalisation and data strategies and revised accordingly.

The digital team undertook several external stakeholder engagement activities during the development of our Digitalisation Strategy and Action Plan. These allowed the SPEN team to present our proposals to external stakeholders and experts and gain feedback on them. It should be noted that stakeholder engagement will continue during the delivery of our RIIO-2 digitalisation and data programme and updates to our Digitalisation Strategy and Action Plan will be published on our website together with the mechanisms stakeholders can use to engage with and influence our activities on an ongoing basis.

In March 2021, Accenture was appointed to work alongside the digital team and co-create the Digitalisation and Data Strategies and action plans. Accenture provided support to:

- Validate the projects and initiatives that the digital team had created
- Cross check our proposals with other comparable organisations and sectors
- Validate and enhance the business case justifications for the investment being requested
- Assist with the costing of initiatives to ensure robust cost breakdowns
- Advise on the deliverability and organisational implications of the proposed programme
- Create visualisations to enhance the presentation of the RIIO-2 data and digitalisation plans

In parallel with the sprints, which focused on the digital transformation SPEN is proposing, a separate exercise was undertaken to capture the requirements to maintain SPEN's existing IT estate: the "business as usual" costs. Between Q4 2020 and Q2 2021, analysis was undertaken of our existing digital / IT estate to create a programme of activity required to maintain our existing systems and infrastructure. Business applications and infrastructure (including client devices, servers, and networking infrastructure) were identified through analysis of information from Clarity APM, IT Now CMDB and EA, with the results being captured back into EA. The lifecycle stage of each item was analysed along with the strategy to replace, upgrade, or supersede each item based on an expected average life of 4 years.

A Cost Benefit Analysis exercise was undertaken to justify the digitalisation and data expenditure being proposed. This followed the Ofgem CBA guidance. A separate CBA was carried out for the DSO costs and therefore the digitalisation / data costs for this were excluded from the digitalisation / data CBA. The baseline scenario for the CBA was taken from the run the business plus the IT cyber security costs.

In June 2021, a separate part of Accenture undertook an independent assurance check of our Digitalisation Strategy, Data Strategy and Cyber Resilience IT Plan. The results from this were reflected back into the documents. This assurance tested our digitalisation strategy for accuracy, level of ambition and efficiency.

The final stage of the strategy creation was the DAG process. This consists of a thorough second person review, senior manager review and finally the executive review. Results from these reviews were captured and fed back into the final version of the document.

During the process outlined above, SPEN executive and the wider RIIO-2 team including the RIIO-2 Programme Management Office and the Deliverability workstream have been engaged and briefed on the steps, issues, risks, and outcomes from the work being undertaken. They have provided oversight and validation of the approach and the content.

2.2 Overview

We currently have a well-established, robust, and rigorous governance and control model in place. This is managed by our Centre of Excellence, a team which was formed in 2019 to drive technology roadmaps in line with the needs of our customers and stakeholders, to create and manage programmes of work and to ensure benefit realisation from these projects.

Our directorate own, and are actively engaged throughout, the governance and control model and attend our monthly Process and Systems Design Authority (PaSDA) sessions.

In terms of the governance and control model, the following principles are in place:

- Adopting an agile approach to allow squads to respond quickly to changes and the needs of our customers and stakeholders, delivering iterative products as services

- Creating 'Proof of Concept' where we deem appropriate
- Ensuring the plan is realistic and achievable in terms of budget, resource, return / efficiency and in line with strategic roadmaps
- Ownership at a SPEN director level
- Undertaking monthly reviews and responding in an agile manner to carry forward successful projects and importantly to close out non-performing and delivered initiatives

As we progress through RIIO-2 we recognise that our governance and assurance model needs to evolve in line with the transformational change that digitalisation and data bring.

To that effect, we have appointed a Business Transformation Director. This is a significant commitment in recognising that our business needs to transform the way it operates to meet the challenges of Net Zero. As our RIIO-2 plan illustrates, the investments we need to make will rise significantly in future years and the way in which we do business will need to change to meet the requirements of our customers and stakeholders. This appointment will ensure that we are well prepared to meet that challenge.

The Transformation Director will be responsible for leading and coordinating this transformation with the executive team and ensuring our staff have the support they require to deliver our commitments. We have already started on a transformation master plan which is aligned to delivery of the digitalisation strategy commitments.

SPEN has an annual review process based on performance targets set out at the beginning of each year. To reinforce the importance of our digitalisation plan, new performance targets will be created which will relate directly to its delivery.

There is a strong reliance on digital and data solutions throughout our full digitalisation strategy, from Customer Services, Connections, Engineering, DSO and Sustainability to list a few. We recognise this reliance and have already started to change our working practices and supporting governance and controls.

Assurance

In order to ensure our ambitious plan meets the needs of our customer and stakeholders needs, we carried out a full assurance process to test accuracy, level of ambition and efficiency. This has been assessed by a number of internal and external specialists for each of our pillars and our Executive Committee have reviewed and signed off on this basis.

Externally we engaged with Accenture to carry out a full assurance on the written narrative and costs associated with each initiative. Their comprehensive involvement and feedback have been incorporated in our final document. This gives confidence that our plan is realistic, achievable and in line with our strategic goals. We are also confident that the plan aligns with the outputs from our stakeholder engagement programme and that our stakeholder and customer needs will be met through delivery of the plan.

2.3 Approval process

Although we have rigorous governance in place, we recognise the need to align this with our newly formed Transformation function and better align to an Agile project delivery model.

Our governance model maintains the integrity of our top-level Board governance and control, down through to our Energy Networks Executive Team (ENET) governance, and then through our newly formed Transformation Board (see figure 27).

In the next layer of governance, we are adapting one of our existing technical and IT change governance meetings into a Technical Design Authority. This forum will be responsible for the development and management of the technology roadmap while ensuring this roadmap is aligned with the business transformation plan.

To augment our existing governance structure, we have also introduced a Solution Architect Group (SAG). This is in recognition of the anticipated level of organisational change required to deliver our commitments. This forum will be responsible for driving coherence and integration across all the streams of change affecting the organisation (people, process, technology, and supply chain).

Prior to commencing work, individual project dossiers will be created containing:

- Details of alignment to the SPEN Digitalisation Strategy
- The identification and approval of key stakeholders
- The scope, project timescales, deliverables, and benefits for the projects
- The costs at an individual work package level and budgetary provision

All dossiers are reviewed and approved by business stakeholders, SPEN Business Systems Director, Head of SPEN CoE and SPEN Finance Director prior to submission to the formal approval process through the SPEN and IT Executive Teams. The following diagram describes our robust project approval process:

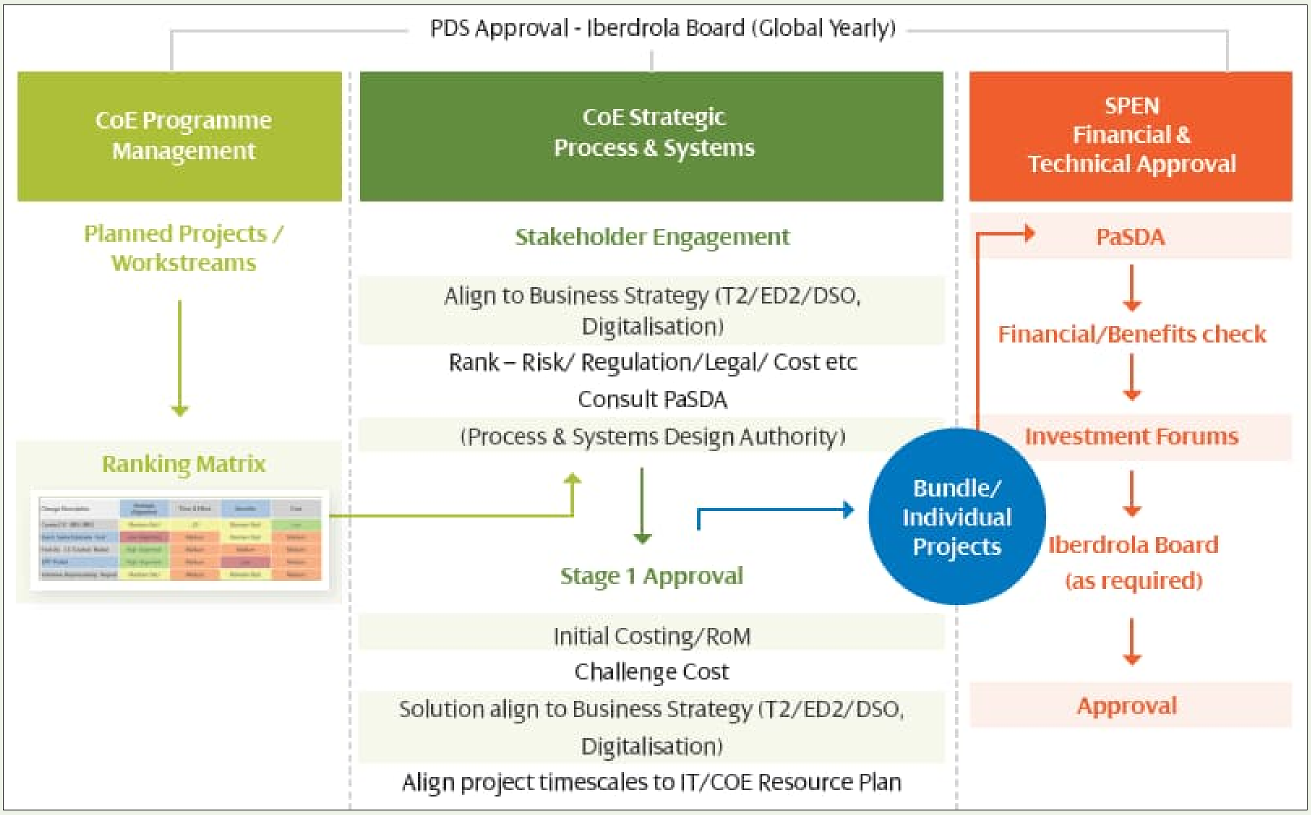


Figure 31 SPEN Internal Approvals Process

The combination of project approval, documentation approval and the defined project meeting and reporting cycle will provide a set of gates that ensure governance and control is enforced throughout the lifecycle of the project and mitigates risk to the overall project delivery. The diagram below details the key project gates:

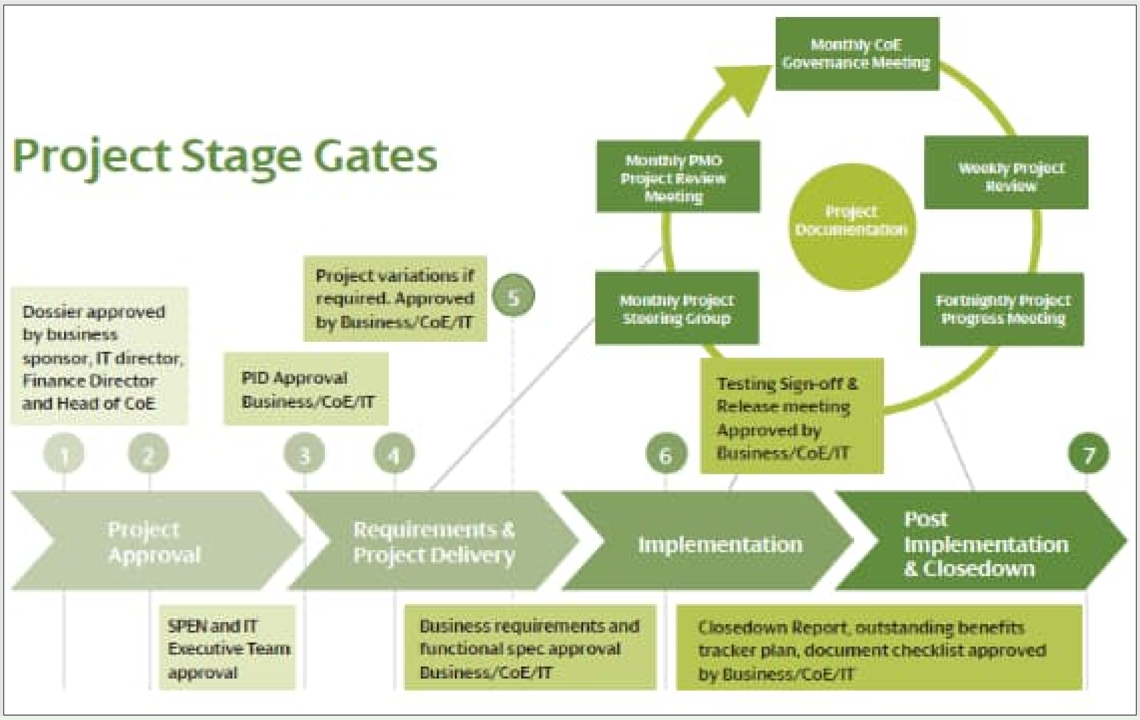


Figure 32 Key Project Governance Stage Gates

3. Pillar 1: Using Digital Technologies to Deliver Enhanced Customer Service

We play a critical role in meeting the UK's ambitious climate change targets for a sustainable future. While we do this, we must reduce our own environmental impacts, adapt our world-class resilient network to the effects of climate change, and continue to deliver sustainable value for all our customers. We are digitalising our network, upskilling our people, and strengthening our supply chain as we look to a cleaner, greener, and more sustainable future.

Customers' expectations have changed through using digital services in all aspects of daily life and work therefore our customers will expect digitally enabled channels and self-service options when interacting with us.

We are committed to a tailored and locally focused approach that helps to prioritise the needs of our customers and stakeholders, while continuing to deliver a safe, reliable, and sustainable network.

Digitalisation presents us with an opportunity to be ambitious around improving customer experience and overall efficiency in many areas which allows us to deliver more value for our stakeholders. All our contact strategies will be customer led, using new technologies to automate communication and keep customers informed in ways that work for them. We will segment our customer-base so we can tailor communications and effectively encourage the uptake of low carbon technologies.

We recognise that we must go much further to make sure the service we deliver continues to give customers what they need and leaves no one behind in a fair and just energy transition.

We have designed an ambitious portfolio of solutions to offer services that efficiently satisfy our customers' diverse needs and meet our commitments.

As referenced in section 1.4, extensive engagement was carried out in collaboration with our Stakeholder team to understand our customer and stakeholder needs.

The diagram below shows the commitments to which these initiatives will drive and contribute, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.

We will deliver a proactive, tailored customer contact process through enhanced methods to ensure fast response times. We will always contact them in a language and channel of their choosing providing greater levels of information, and reliably delivering services.

We will help customers capitalise on the benefits of the energy transition by delivering advice services to 40,000 customers who register with us to help reduce costs, drive efficiency and access the benefits of low carbon technologies.

We will re-define vulnerable and high-risk customers, and how we reach them, to better target and tailor the services we provide to these groups

Develop a Network that's ready for Net Zero Commitments	Total	Pillar 1
Provide timely and efficient connections	6	2

Be the Trusted Partner for Customers, Communities and Stakeholders	Total	Pillar 1
We will deliver excellent satisfaction and enhanced services for all customers	18	14
We will support vulnerable customers and communities to ensure no-one is left behind	13	3
We will work with communities to facilitate the energy system transition	9	1

Ready our Business for a Digital and Sustainable Future	Total	Pillar 1
Embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	1

We will ensure a stronger voice for our customers, stakeholders and communities throughout ED2 by continually listening and acting upon the views and needs through an increased range of methods and tools that are internationally recognised as best practice to drive impactful and inclusive engagement

We recognise power outages as one of the highest customer priorities and will provide customers with improved support and response before, during and after either planned or unplanned occurrences with an enhanced approach for our most vulnerable and at-risk customers.

We will support our communities develop their community energy ambitions through strategic planning and partnership working and the provision of technical advice, optioneering and signposting.

Figure 33 Key commitments driving the initiatives

The key customer priorities, taken from the customer and stakeholder feedback, which we have used to inform this pillar are:

- SPEN setting target customer satisfaction levels across all areas
- Providing additional support for vulnerable customers
- How SPEN communicate with customers should a power cut occur (both domestic and commercial customers)
- Ways you can contact SPEN

The diagram below provides a vision of our customer and stakeholder services enhancements that we will deliver and the enabling works that have already started in 2021 and 2022.

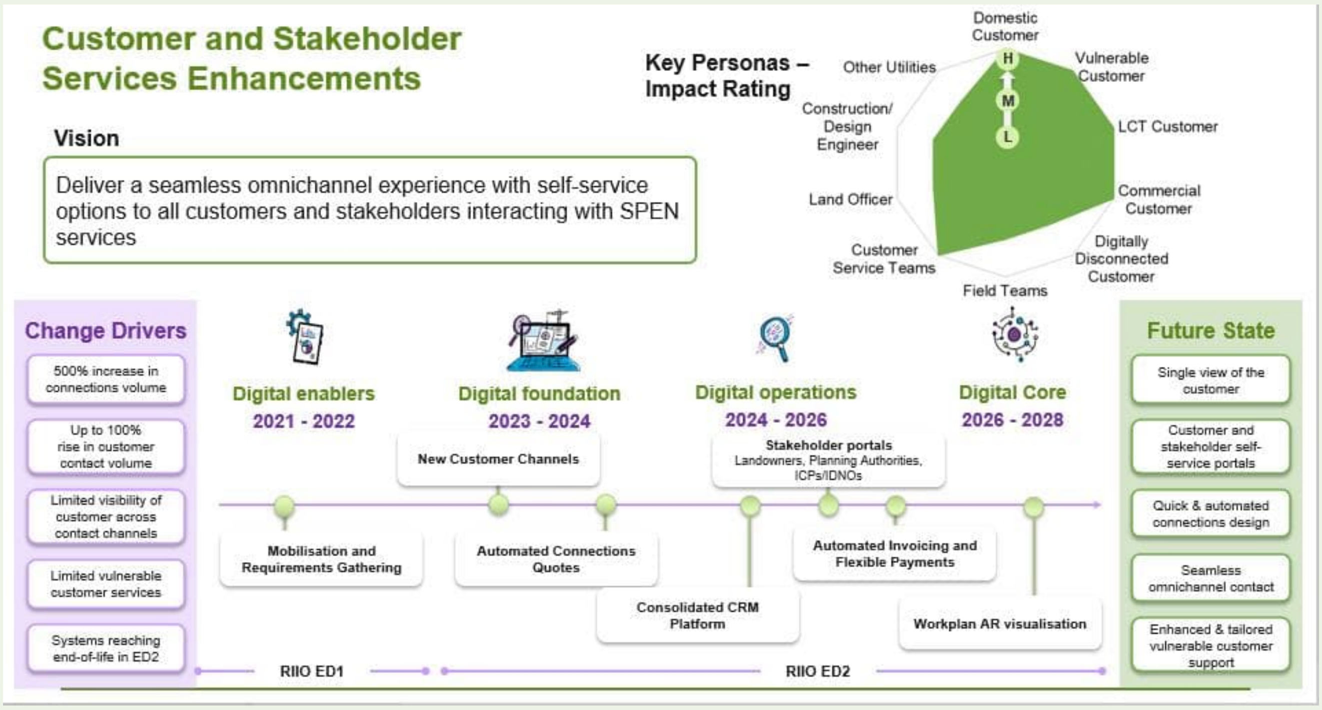


Figure 34 Summary View of Pillar 1

There are 4 initiatives documented within this pillar, with the CRM Platform and Self-Service initiatives being heavily intertwined with significant interdependencies.

The Customer Relationship Management (CRM) and Self-Service initiatives encompass a number of projects that will enhance the experience of SPEN customers and stakeholders. This includes new integrated services and channels, as well as encompassing our existing processes. The new CRM system, enhanced Self Service Portal and Channel of Choice will provide the backbone to our new seamless omnichannel digital platform

It is also essential that we continue to allow our digitally disengaged customers to contact us by traditional means and we offer the same high level of service and contact methods as now.

The diagram below shows our customer journeys which we will cater for within our initiatives:

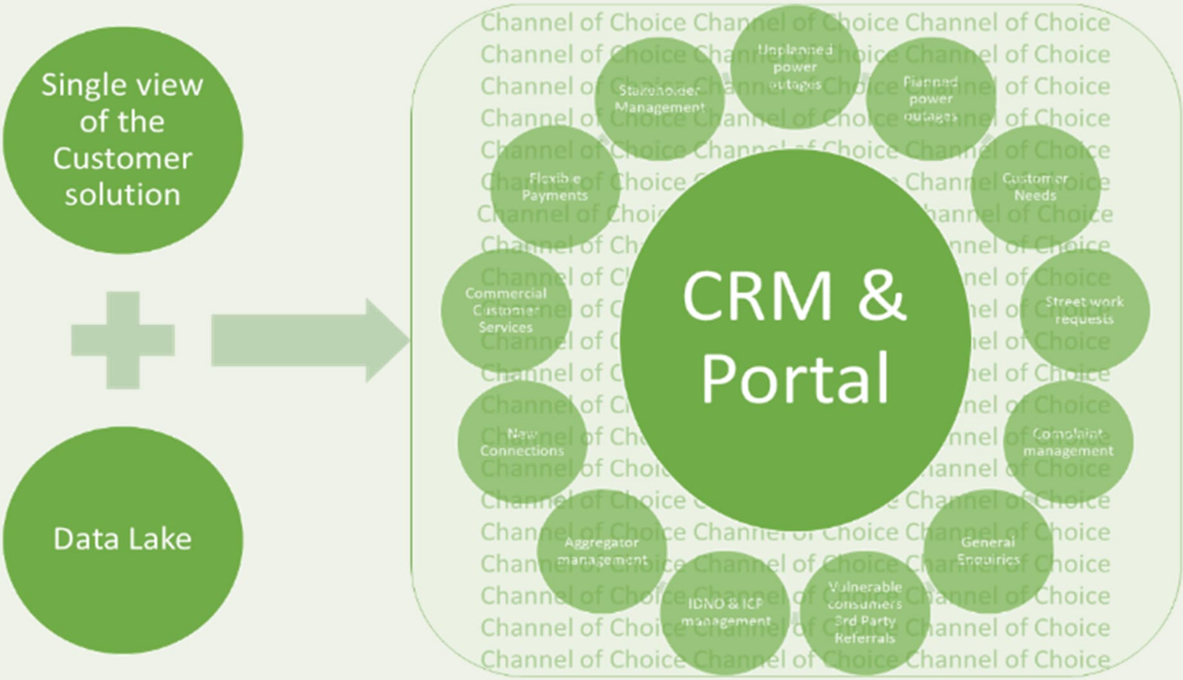


Figure 35 CRM & Self-Service Customer Journeys diagram

The following two diagrams illustrate our As-Is and To-Be customer services system architecture. Integration to our corporate SAP system, Meter Point Registration System (MPRS), Address Data Quality Management (ADQM) system and PowerOn is shown in both diagrams. In addition, our Storms Contact Centre will be replaced in advance of 2023 and integration to its replacement is shown in the 'To-Be' diagram below:

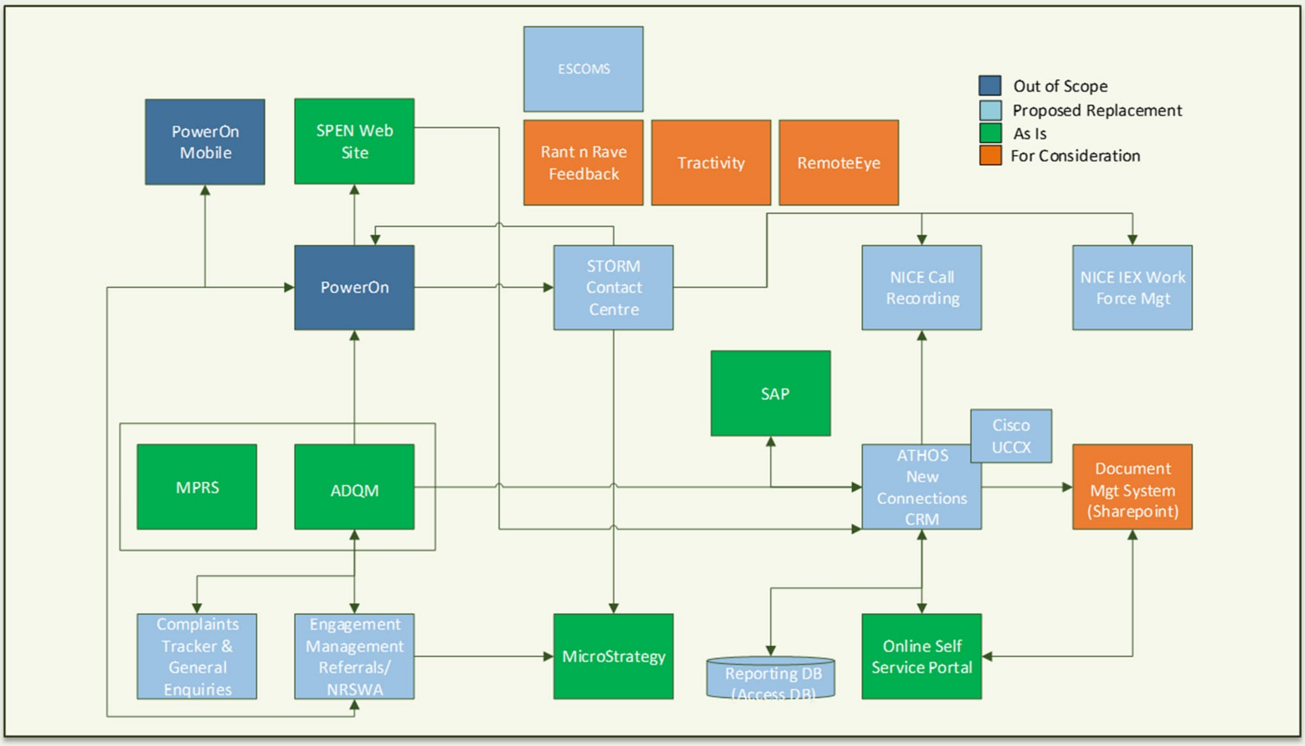


Figure 36 As-Is Customer Service context and dependencies diagram

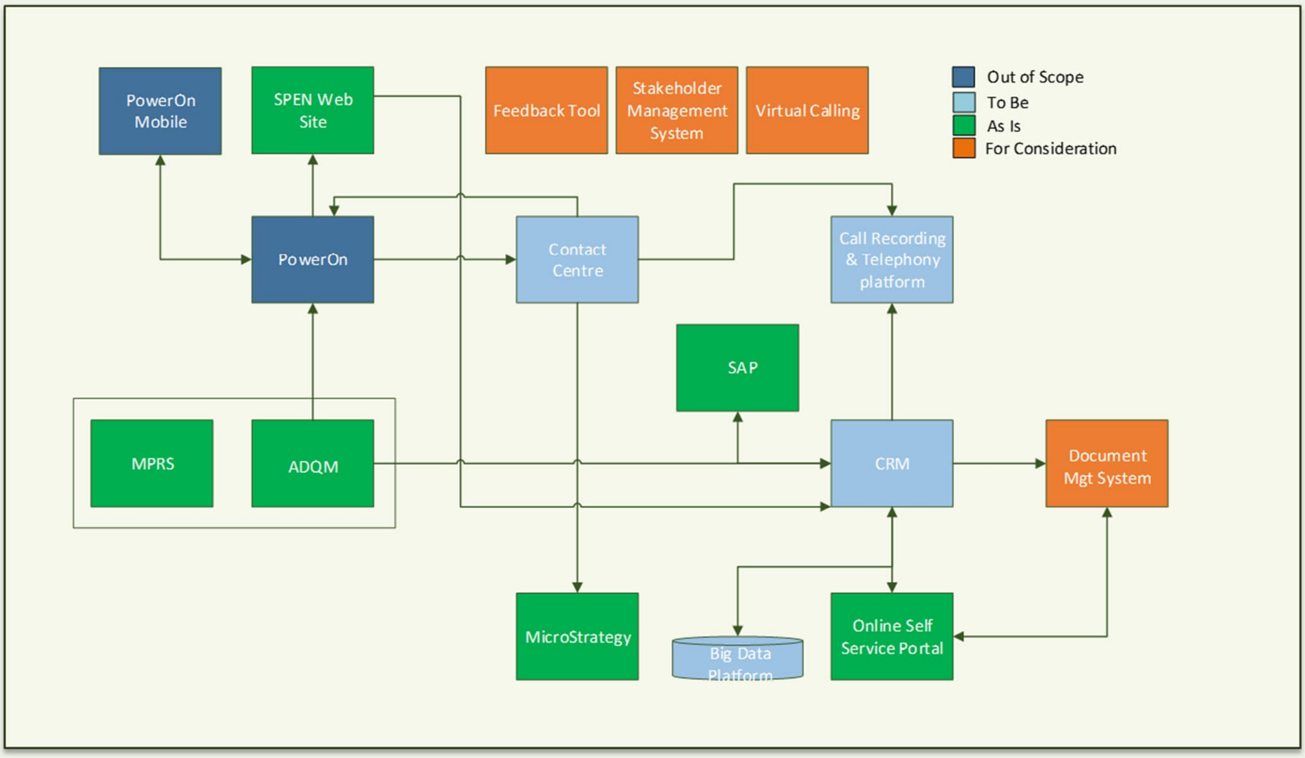


Figure 37 To-Be Customer Service context and dependencies diagram

Deliverables

Deliverables	Timeline
Replace our current CRM system with a digital platform to incorporate existing processes, new processes, integration with our self-serve functions and integration to our asset, regulatory and control systems.	Incremental deliveries from 2023 – 2025, with the discovery phase starting in 2022
Extend and develop our self-serve capabilities to offer more services, multiple channels and cater for new customer types.	Incremental deliveries from 2023 – 2028
Evolve our Network Analyse & View (NAVI) model to become scalable and be supported as part of our core systems.	Incremental deliveries from 2023 - 2026
Enhance our new ESRI GIS Land and Planning layer by fully digitising our remaining paper records.	Incremental deliveries from 2023 – 2025

Table 4 Using Digital Technologies to Deliver Enhanced Customer Service Deliverables

3.1 Customer Relationship Management Platform (CRM)

3.1.1 Overview

The Customer Relationship Management (CRM) initiative encompasses a range of functions that will enhance the experience of SPEN staff, customers, and stakeholders.

The key objectives to be met by the new digital platform are as follows:

- Provide a consistently high service to our customers and stakeholders, facilitating an omnichannel experience with a communication method of their choice at a time most convenient to them.
- Create one single view of the customer
- Incorporate and streamline existing processes

- Remove or replace obsolete systems which are not cost effective and not adding value for our customers
- Create processes for new customer types, in order to facilitate new markets and models
- Provide full integration with our self-service functions
- Continued integration with our asset, regulatory and control systems
- Use of the single view of the customer data for reporting and analytics to inform improved customer service, and ensure all information is available to serve customers, consumers, and staff.
- Store and manage information relating to external stakeholders too, such as interactions with journalists, think-tanks, academia, community groups, business and enterprise groups, government, and environmental groups.

3.1.2 Projects

3.1.2.1. CRM Platform

The new CRM solution will encompass three main areas

- Incorporation of existing processes
- Build of new processes to cater for new customer types, markets, and models
- Integration with our self-service capabilities, which are covered in the subsequent section

Interactive Voice Response (IVR) functionality will also be included, which enables customers to access information via a voice response system of pre-recorded messages.

Current Position	Change Drivers
Our current CRM system, Athos, is primarily for new connection customers and does not include any other customer journeys. This system is reaching end of life. Other customer service solutions are made up of a suite of disparate systems, so we do not have an integrated CRM solution.	Our stakeholders expect us to continue to meet our customer service targets, improve our online capabilities, and introduce new services. The drive to become a digitalised organisation includes the need to share data more openly, within appropriate security measures, therefore it is essential that our CRM system is robust enough to support our online services. Our main platform, Athos, has now reached end of life therefore a replacement is required in 2023. Customer data is currently spread across multiple systems resulting in a disjointed service when customers contact us.
We have no single view of our customers' data.	RIIO-2 sees the emergence of new customer types from new markets and models giving us the opportunity to include additional services to meet the changing needs of our customers at the same time

Table 5 CRM Current Position and Change Drivers

Solution

The new CRM platform aims to deliver a solution to manage the full customer journey and all stakeholder interactions. The output of this will be a single omni-channel platform for our customers and stakeholders. It will introduce self-service capabilities to cater for the anticipated increase in enquiries through RIIO-2 and into RIIO-3 for the uptake in low carbon technologies to meet the UK governments' Net Zero targets.

The table below lists the existing processes and associated systems that will be replaced and/or incorporated into the new platform.

*****_Indicates an associated self-service function_

Process	Description
***New Connections**	Athos CRM covers Application, design, quotation, and part of the delivery process. The application is reaching end of life and due for both application and infrastructure upgrades. The new CRM platform will include all current functionality, streamline processes to promote efficiencies, introduce further integration with existing and new systems, and create new functionality to better support the end-to-end New Connections journey.
***Customer Needs**	Engagement Management Customer Needs Tracker (CNT) tracks the needs of customers during an outage. Tracks who's impacted, who has been contacted, what needs they have and have these needs been met. There is also a reporting element required. This is a standalone system, with no integration to our current CRM or Contact Centre systems, or systems used by field staff who support the needs of the customer during a fault. Manual processing required. This system requires both an infrastructure and application upgrade. The new CRM platform will provide a fully integrated end to end customer needs process, providing efficiencies both to our call centre staff and field staff, and will provide a better customer experience.
***Knowledge Management**	Knowledge Management is part of the Engagement Management system. This module is used to providing support and knowledge to staff. The application is reaching end of life and due for both application and infrastructure upgrades. The new Knowledge Management will introduce new staff utilising tools such as Guided Workflows/Wizards, Next Best Action (NBA) recommendations.
Complaints	Customer Complaints tracker facilitates the logging, tracking and resolution of complaints Requires replacement due to obsolescence The new CRM platform will facilitate a single view of the customer, and a more efficient process providing a better experience for both SPEN staff and our customer
General Enquiries	Customer Complaints tracker (also used for this process) facilitates the logging, tracking and resolution of general enquiries. Requires replacement due to obsolescence

	The new CRM platform will facilitate a single view of the customer, and a more efficient process providing a better experience for both SPEN staff and our customer
Refunds	SAP-SD Refunds must be raised directly in SAP-SD, creating a very manual tracking process, which can result in customer complaints. The current solution does not provide an efficient and full end to end process. The new CRM platform will enable all customer interactions to be tracked and managed, highlighting any deviations from expected process and facilitating rapid resolution of issues. Appropriate approval workflow triggers, escalation points and exception handling will be included in the process.
***NRSWA**	Engagement Management (EM) facilitates road openings/closure requests for New Roads and Streets Works (NRSWA) used by internal and external parties. In addition, links to the Corporate Web site facilitating self service capabilities. There is no other integration to other systems. EM is a standalone system, with no integration to other systems. Manual processing required. This system requires both an infrastructure and application upgrade. The new CRM platform will provide a more efficient process, linking into the other processes such New Connections, general enquiries, and complaints to ensure all interactions and activities are visible and traceable.
***3rd Party Referrals**	The SPEN web site allows customers to sign up to the Priority Services Register and enter their requirements. Engagement Management facilitates the workflow. There is no other integration to other systems. EM is a standalone system, with no integration to other systems. Manual processing required. This system requires both an infrastructure and application upgrade. Process/technology needs upgraded to cater for increased functionality in RIIO-2. The new CRM platform will provide a more efficient process, and also introduce new enhancements to the current process in line with the Customer Services priority services improvement strategy.
***Management of Land Ownership**	ESCOMS records and manages projects for the negotiation and management of wayleaves, with landowners and their tenants. Requires replacement due to obsolescence The new CRM platform will facilitate a more digital and joined up approach and will facilitate the integration to further self-service capabilities for Landowners and associated customers and stakeholders.
***Independent Connection Providers/Independent Network Operators**	RaDAR External and Internal facing workflow application to facilitate the progression of ICP and IDNO requests. Our Independent Connection Providers (ICP) and Independent Distribution Network Operators (IDNO) customers currently use an online standalone system, which does not interface with our current CRM platform or our SAP system. The ICE committee has highlighted inefficiencies in the system and requested a new system or updated system.

	The new CRM platform will incorporate these processes into our CRM solution and also our self-service solutions to facilitate external access and will also interface to our SAP system to provide an efficient end to end process.
***Stakeholder Management**	Tractivity Holds contact data on our Stakeholders. Facilitates set-up of Stakeholder events, tracks invite, responses and all stakeholder interactions. Cloud based managed service, meets current requirements but further functionality needed to meet RIIO-2 The new CRM platform will provide extended functionality to cater for revised stakeholder processes and new stakeholder types. RIIO-2 will see ongoing engagement with our customers and stakeholders as described in section 1.4.
Interactive Voice Response (IVR)	IVR facilitates both Faults and New Connections enquiries, contains bespoke messaging. Process/technology needs upgraded to cater for increased functionality such as conversational AI. A new IVR solution will be procured in line with our CRM solution.
Staff scheduling and call recording	NICE CRM Facilitates the scheduling of staff and manages call recording Process/technology needs upgraded to cater for increased functionality A new scheduling and call recording solution will be procured in line with our CRM solution.

Table 6 Existing Systems that will be replaced and/or incorporated into the new platform

In addition to system replacements, the CRM system will also integrate to use data from, and pass data to a number of existing systems:

- SAP: Asset management and financial system
- ADQM: Address Data Quality Management system
- Sharepoint: Document Management System
- PowerOn: Scada system
- Rant and Rave: Customer Feedback tool
- Contact Centre solution to be replaced or upgraded
- Remote Eye: a video calling application which provides SPEN staff with real time video footage of a customer’s property
- Big Data Platform to facilitate reporting and analytics

Please see section 8.3 Data and System Integration which illustrates our integration strategy promoting re-use to ensure the best value for our customers.

The CRM platform will contain robust reporting and workflow capabilities, underpinned by improved data collection, storage, and analytics (covered under separate initiatives). A Canonical Data Model (CDM) will be used to support the customer data. The CDM model chosen will be compliant with Common Information Model (CIM).

Documentation such as customer quotations issued by SPEN, and customer correspondence received from the customer and scanned using Optic Charter Recognition (OCR) will be stored in our Document Management System (DMS) and made available to the new CRM platform. In addition, customer photographs and videos which refer to our assets, such as cut out and meter point data, will also be stored.

As part of the delivery of this solution, there will be a migration exercise to move data from our existing CRM to ensure full customer history is retained. Further analysis is required to understand where best all relevant data will be stored.

New processes will be introduced to cater for new customer types. The list below shows a number of these processes which we are currently aware of, however we understand RIIO-2 will introduce further new business processes and opportunities which we will build in response to the needs of our customers and stakeholders:

- Processes introduced as part of the switch to a DSO and the development of the flexibility market. See DSO Market Operation initiatives in Section 6.2 for more information.
- Processes introduced to assist our customer with a reduction in their carbon footprint
- Enhancements to assist with the further advancement of our Priority Register services
- The introduction of Low Carbon Technologies (LCT), such as Electric vehicles will require new processes to assist our domestic customers.
- The introduction of LCT will also require significant process enhancements for commercial customers

Key Outcomes

- The CRM will improve customer journeys across our key services as listed within figure 35
- Provide the customer service team with more efficient information gathering and smoother customer interactions, such as but not limited to:
    - Enable front line field staff to assist customers
    - Improve repair times
    - Provide direct customer service updates
    - Provide support to vulnerable consumers
    - Provide energy efficiency advice
    - Provide advice on Low Carbon Technologies
- A single view of the customer provides enhanced agent support that provides insight and quicker resolution paths for live chats or telephony interactions
- Issuing automated fixed price quotations for small works
- Consolidate platforms
- Improved data management
- Ofgem market segments aligned rather than recorded in separate systems with no integration
- Provide customers with a high-quality update during the initial interaction. The CRM platform aims to provide receipt of an acknowledgement of the customer's request, provision of a unique reference number, provision of timescales associated with the resolution of their query, within 5 minutes of contacting us.
- The replacement/upgrade to our ICP/IDNO processes will allow our external customers and stakeholders to interface with a single platform, a significant improvement from the current system RaDAR
- The new build will facilitate a full end to end journey for the ICP/IDNOs by having full integration with all required systems.
- Removal of obsolete systems which are at end-of-life reduces the number of application upgrades required
- An improve customer refund process provides a better service to customers and return monies due to them within a stated time with proactive communication and interaction throughout the process
- Integration between CRM and corporate SAP systems will ensure customers have only one point of contact

3.1.3 Persona Spotlights

CONSTRUCTION/DESIGN ENGINEER

Digital Engagement

low — high

What is the benefit for me?

Able to provide better service to Commercial and LCT customers

How will I feel the impact of digitalisation?

- Access to detailed and timely connection designs
- Share augmented reality/virtual reality walkthrough of complex construction tasks/integration

CUSTOMER SERVICE TEAM

Digital Engagement

low — high

What is the benefit for me?

Improved means of communicating with my customers and providing excellent service

How will I feel the impact of digitalisation?

- Access to a better platform for communicating with customer through their preferred channel of choice
- Ability to access available customer data from a single source

FIELD TEAMS

Digital Engagement

low — high

What is the benefit for me?

Making site work safer and more productive for me

How will I feel the impact of digitalisation?

- Guided risk and safety assessment to ensure that line outages have occurred
- Intelligent supply chain that proactively manages the delivery of materials and consumables for my team
- Augmented reality/virtual reality walkthrough of complex construction tasks/integration
- Automated job status reporting and timewriting

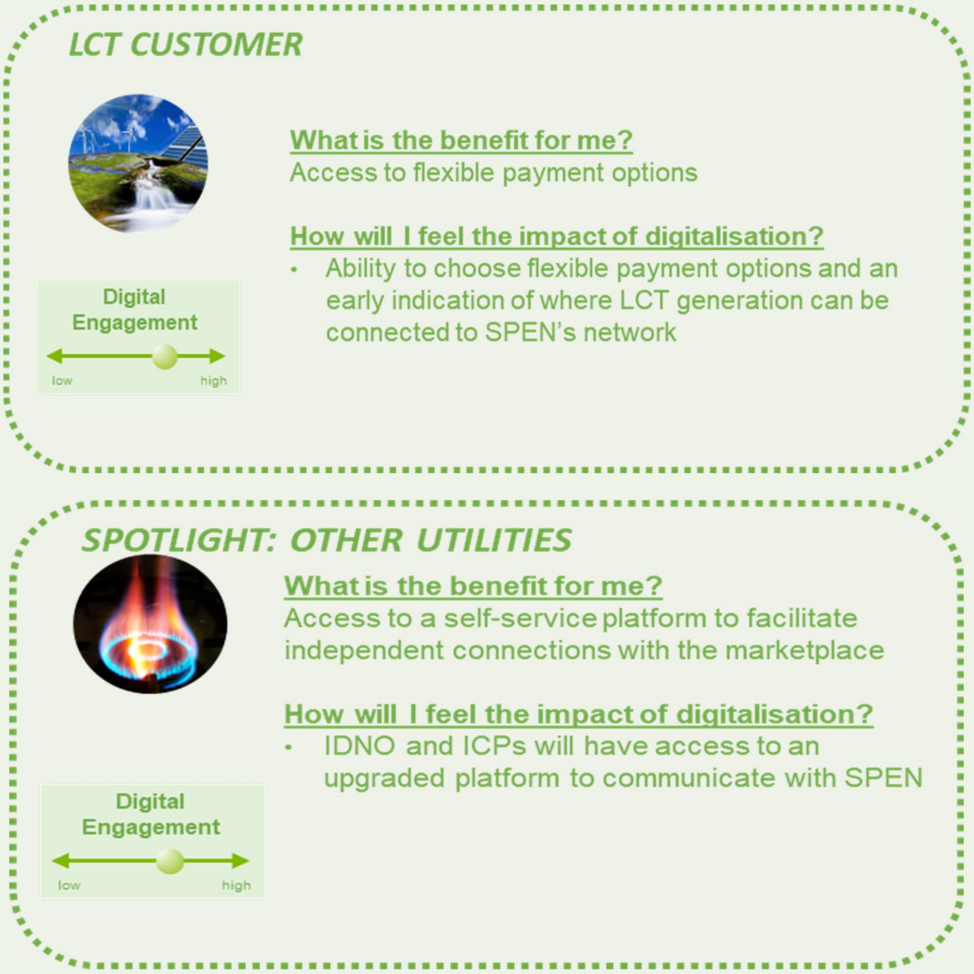


Figure 38 CRM Persona Spotlights

3.1.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	CRM Platform – Customer journeys, CRM Platform – ICPs/IDNOs,
Waterfall	Improve Refund Process
Agile + Waterfall	Where integration is required to our Asset or Regulatory systems agile will be required

Table 7 Approach and Initiatives

The diagram below shows the breakdown of the CRM delivery plan.

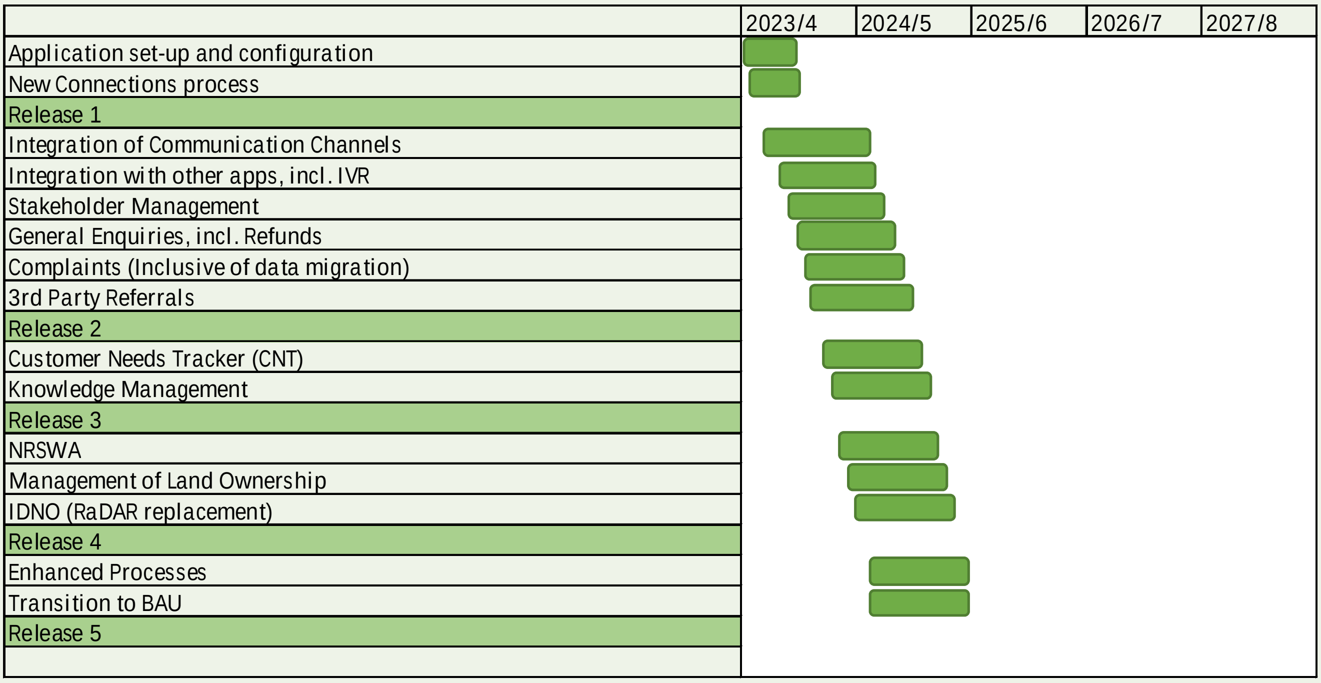


Figure 39 CRM Delivery Breakdown

3.1.5 Resources

Resource Type	Purpose
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies
Programme Manager	Manages the overall programme of work
Change Manager	Prosci accredited change practitioner to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to stakeholders
Communications Manager	Internal and external communication of change
Telcom / Social media Consultant	Advisory role for new omni-channel
Search Engine Optimisation consultant	Ensure that SPEN stakeholders will find our portal and channels quickly and easily through any social media method search using keywords

Table 8 CRM Resource Types and Purpose

3.1.6 Functional Model

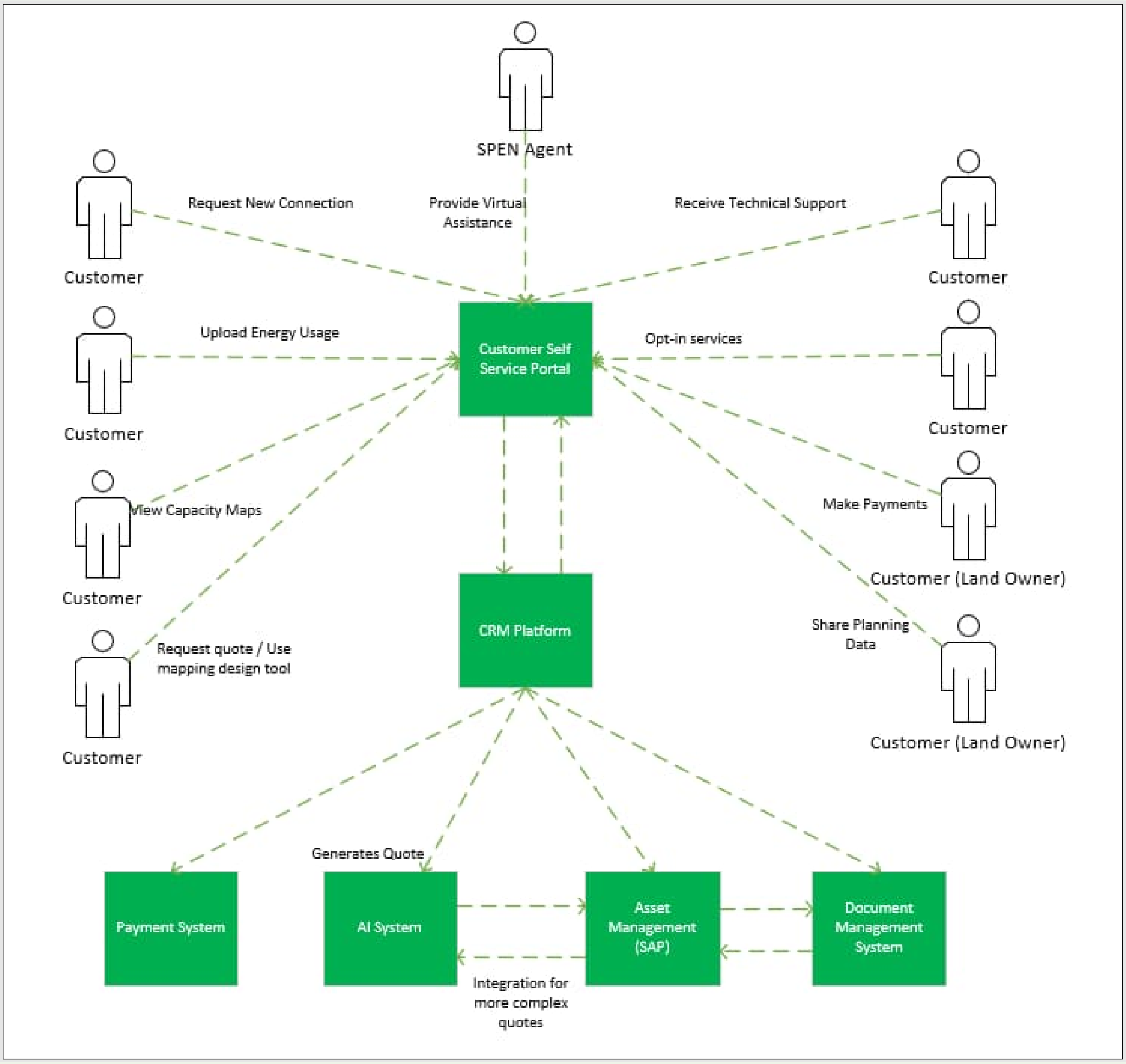
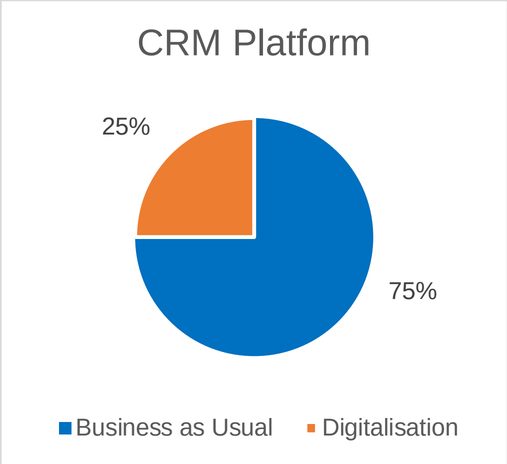


Figure 40 Customer Self-Service Portal and CRM Platform

3.1.7 Costs



BAU Rationale:

A robust Customer Relationship Management platform is at the centre of our plans to deliver excellent customer service during RIIO-2. We will invest to create a fully integrated solution capable of supporting multiple communication channels and providing a holistic view of customer interactions.

Digitalisation Rationale:

We believe we can go beyond excellence to create a customer experience that will support our customers' energy transition, enabling them to understand relevant information and make informed decisions around their changing energy needs quickly and easily.

Table 9 Cost Split

The costs for this initiative have been based on consideration of license fees, an estimate cost for the SaaS tool from the supplier and an upgrade of the existing New Connections process which will continue to be the prominent process in CRM. We have also checked this against external quotes for the deployment of a Software as a Service (SaaS) CRM solution that is of a similar scope and scale, with limited integration through the APIs.

It is anticipated that the number of users will increase from under 100 to over 300 as all customer staff use the system, as well as staff across our District offices.

The first phase which is focused on the New Connection process will involve migration of the existing case management information. Following phases will include migration of critical customer information, for example complaint history, which is currently held in a separate complaints system.

3.1.8 Performance Metrics

Project	Measures of Success
CRM Platform -Customer Journeys	• % of customer enquires resolved first time • % of customer enquires resolved by one person • % reduction in average handling time • % reduction in repeat calls per case
CRM Platform - ICP/IDNOs	• % of ICPS/IDNOS can access SPEN via interface • % reduction in queries to SPEN staff • % reduction in manual tasks for SPEN staff
Improving Refund process	• % of customers refunded within SLA time-period • % of customers following up cheques more than n times

Table 10 Project Success Measurements

3.1.9 Assumptions and Dependencies

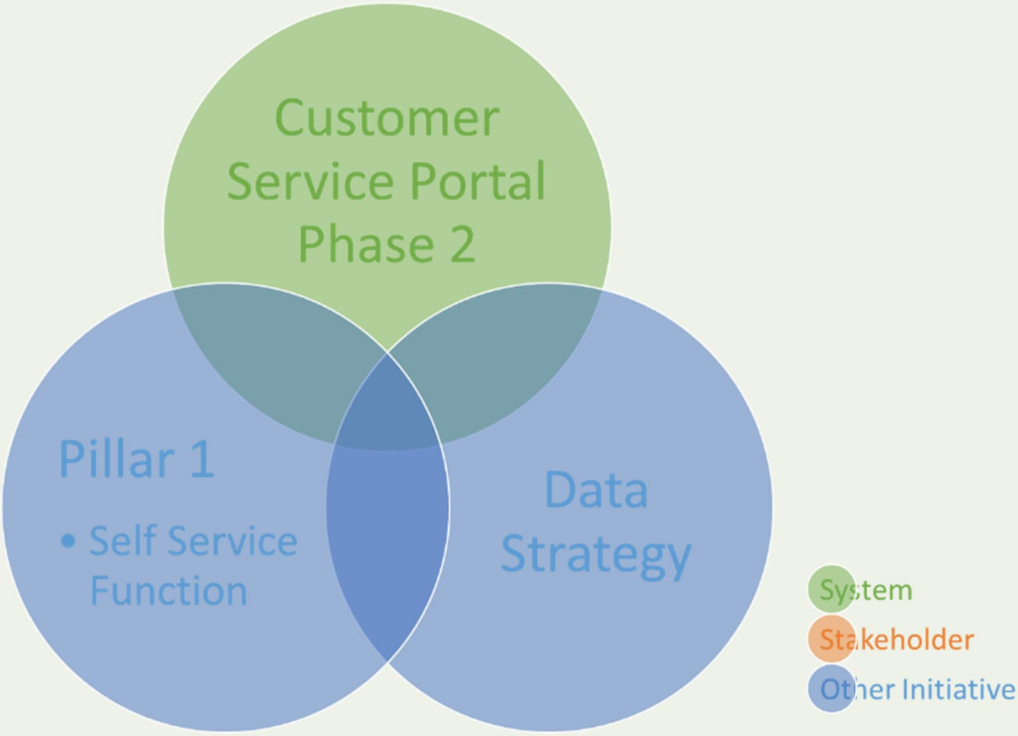


Figure 41 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Self-Service Functions Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Wider Customer Services initiatives and targets reliant on this solution

Table 11 Customer Relationship Management Platform Assumption

3.1.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	CS Portal Phase 2 not achieved in ED1	Ensure project tracked to completion with ED1	Low	High
2	Wider Customer Services initiatives and capabilities that support CRM not delivered	Governance in place to track target of Customer Service initiatives	Medium	Medium

Table 12 Risks, Mitigations and Their Impact

3.2 Self Service Functions

3.2.1 Overview

This initiative will extend our current self-serve capabilities to provide a wider range of self-service options for our customers and stakeholders across our different customer journeys and integrate fully with our CRM system providing one single seamless solution.

As we transition towards Net Zero connection activity levels will increase significantly with the predicted uptake of new low carbon technologies (LCT). This has the potential to bring a level of disruption to customers as the network is upgraded to ensure it is fit for purpose, so we will ensure to deliver digital solution to make this transition easier.

Customer expectations will also increase during this period, especially relating to how interactions with organisations are changing in the digital era.

We will focus on providing a high level of service to our customers by introducing greater service offerings, a wider range of channels and capture customers' preferred contact methods and language. This will assist those customers with sight and hearing loss or impairment, and those whose first language isn't English. We will then look to use these preferences during every interaction we have with our customers. The portal will recognise the customer's preferred language and channel of their choosing, service performance history and any outstanding service issues.

Whilst customers have told us they want a wide range of channel offerings and expect a consistent service no matter the channel, they also have a strong desire for proactive communication, especially during an unplanned loss of supply. These initiatives seek to drive this.

3.2.2 Projects

3.2.2.1. Customer & Stakeholder Information Service

We will offer several new self service functions which have been requested by our customers through the ongoing engagement process previously mentioned:

- Self-service function to enable customers to upload their usage and receive advice on processes and times when they are consuming most energy. Information on areas to focus on to drive down costs across single or multiple sites.
- Customer Capacity and Flexibility Heat Map. Our enhanced heat maps will provide customers with a near real time view of capacity and flexibility options for demand and/or generation on the network.
- Customers will be able to register with us to receive a range of services aimed at helping reduce household or business costs, drive efficiency and access the benefits of the low carbon transition
- Expand our opportunities to allow customers to be registered for vulnerable support, increasing the coverage of our PSR (Priority Service Register) and identify wider forms of vulnerability. The creation of the vulnerability register will improve data sharing amongst utilities and broader organisations in our coalition of partnership model.
- Improve the information and services we provide to our commercial customers.
- We aim to provide a wider range of channels that will improve the quality of information we provide to customers. We will improve the speed of the service and offer a range of new services.

Current Position	Change Drivers
We currently have a Self-Service Portal specifically focussed on customers looking for a new connection, enabling customers to request connections and see the status of their job. Not all contact channels are available for all services and customers	Customer expectations are increasing, especially relating to how interactions with organisations are changing in the digital era. The customer contact strategy is to offer customers preferred contact methods and language The self-service functions we provide need to evolve during RIIO-2 in response to the feedback and requests from our customers and Stakeholders.

Table 13 Self-Service Portal Current Position and Change Drivers

Solution

We will build on the success of our existing self-service platform by extending to new functions in response to the wants and needs of our customers and stakeholders, based on a continuous engagement programme throughout RIIO-2 and beyond. Access will be available via a wide range of channels with a consistently high level of service, and as above we will recognise their channel and language of choice.

This platform will also be used for pro-active contact. Our customers have told us they have a strong desire for proactive communication, especially during an unplanned loss of supply. The portal will recognise the customer's service performance history, any outstanding service issues and push relevant communications using AI technology.

Any customer will be able to register with us at first point of contact to receive proactive updates, capture their preferred method of communication and language when a power outage occurs. This will include updates throughout the power outage and notification when power is restored. We will contact at least 99% of those who have requested this using their preferred method. By broadening this service, we can use these preferences to provide a consistent service no matter the channel.

Key Outcomes

- Improved efficiency and quality of service to customers
- Systems will capture and process significantly more information than before.
- We will be able to provide customers with timely and accurate information in simple formats.
- Fully integrated with CRM platform to provide customer service team with single view of customer, enabling more efficient information gathering and smoother customer interactions
- Assist SPEN staff utilising tools such as Guided Workflows/Wizards, Next Best Action (NBA) recommendations, and Knowledge Management
- A wider range of channels available for customers with a consistently high level of service
- Reduce the cost of customer contact by increasing the use of bots and other automated mechanisms
- Increase our coverage of PSR and widen forms of vulnerability to assist customers who need additional / tailored support and improve our Vulnerability Mapping tool in identifying gaps in our PSR
- Net zero contribution through the introduction of self-service options facilitating energy usage uploads, and the provision of energy efficiency advice to help reduce our customer carbon footprint.

3.2.2.2. Channel of Choice

Our customers' expectations have grown, and they expect SPEN to provide a variety of communication channels across the range of services we provide, including fault restoration, planned power outages, connections, and general enquiries.

Current Position	Change Drivers
Not all contact channels are available for all services and customer groups. The existing channels include phone, e-mail, SMS for specific scenarios, post, Facebook, Twitter, and online community channels	Our customers have expressed their expectation for SPEN to contact them, and them to contact us, via their preferred selection of channels at a time convenient to them. With the expected increase in vulnerable consumers as well as new connections (and thus more need to contact customers), it is important that we can effectively and proactively contact our customers.

Table 14 Channel of Choice Current Position and Change Drivers

Solution

Introduce new self-service channels such as but not limited:

- Asynchronous messaging at a time convenient to the customer, such as WhatsApp
- Live chat, whereby the customer can speak directly to an agent online while carrying on with their daily activities, provide the required information and resolve their query, as well as integration with Home Assistants for example Alexa. This can also help with accessibility and language barriers
- Chat bots/virtual agents. We will create virtual agents through the use of AI, and we will train them to help and resolve customer queries. Where the virtual agent is unable to reach a resolution, we will build in hand-offs, to automatically transfer the customer seamlessly to an agent.
- Secure messaging when a customer wishes to send through sensitive data
- Co-Browsing, where an agent assists customers with the navigation of our online offerings

The communication channels will be routed via the new CRM platform.

Enhanced identification and verification will be required to validate customers across the different channels.

To ensure a just transition we also must ensure the more traditional methods of communication are also available to cater for the less digitally inclined.

Key Outcomes

- Improved customer service by offering preferred choice of contact and storing preferred contact method and language of choice. This will cover those customers with sight and hearing loss or impairment, and those whose first language isn't English. We will ensure to use these preferences during every interaction we have with our customers.
- Enables us to adapt our offerings in line with evolving customer preferences
- Provide support for messaging platforms that allow customers to interact at their pace, while allowing SPEN customer service agent to interact and maintain context with multiple customers at a time
- Where a bot is used, information can be triaged prior to filtering out to an agent
- Proactively contact vulnerable consumers with personalised telephone call whenever they experience a power cut, and speak face-to-face ahead of any planned disruption to their power supply to understand their specific needs and look to put contingency plans in place where possible

3.2.2.3. Customer Photograph/Video Submission

Create a new self-service function to facilitate photo and video capture by customers. The images will link to the new CRM application and be held as part of the customer's information pack which will be available to the SPEN teams during design and delivery. It will also support the fault identification process leading to quicker resolution times.

Current Position	Change Drivers
We are progressing a trial of virtual site visits using a technology called ResponseEye. The SPEN agent sends a weblink to the customer's mobile device. On selection, the ResponseEye technology can access the camera on the customer's device and relay the photo or video back to the agent via a web portal. The system does not integrate with core SPEN systems.	In our drive to improve our efficiencies, reduce emissions and enhance our customers' experience we wish to introduce a data submission mechanism to the portal which will allow collection of data without the need for resources to attend site. Site visits to our customers will always be needed at certain times but for works such as assisting with remote fault resolution; the quick identification of potential health and safety issues and reviewing the needs of New Connection customers this tool will assist both customers and SPEN Staff.

Table 15 Customer Photograph / Video Submission Current Position and Change Drivers

Solution

Section 3.2.2.1 describes new self service functions and services that will be available to our customers. Customer photograph and video submission extend this functionality enabling a rich source of information. A video-integrated real time solution will provide a means to collect the data which will be tied to the customer correspondence history within the CRM platform. The associated documents will be held in a document management system. More information has been provided in Pillar 6: Improving Mastery of our Data.

Key Outcomes

- Provides an alternative option for customers who prefer not to have home visits. Enabled through AI and the video walk through capabilities
- All customer information is captured in one place, which makes it more convenient for customers and improves the efficiency of SPEN internal teams
- Automated integration with CRM platform means the data becomes part of the correspondence history and is available when required
- Ability to host virtual meetings for connections. Enables SPEN team to provide customer advise on their connection prior and post works by remotely walking the customer through work which creates a reduction in site visits saving time and costs and associated energy usage
- Increases capacity for handling quotations and contributes to the ability to cope with the anticipated increase in connection requests
- Mitigates headcount increase
- Net zero contribution through reduction in transport to perform site visits

3.2.2.4. Self-Service Quotation Process

The feedback from our customers is they expect to receive quotations for work within 5 days and approximately 50% of our customers indicated that they would be willing to progress their connection quote online. This project will provide a self-serve facility for customers seeking a new or upgraded connection. Customer assistance from SPEN staff will be available to the customer when required.

We will utilise AI technology to create the quotations using existing data from previous quotations and works delivered. In addition, a feedback loop will be included to ensure our quotations reflect accurate and actual delivery times and costs.

Current Position	Change Drivers
A few basic job types are progressed via fixed price quotes. Most quotations are bespoke, which is time consuming and labour intensive. Not all quotes proceed to delivery resulting in non-value-added effort. Depending on the business market segment, acceptance can range between 20% to 50%. The current portal does not provide the connection design tools to allow the customer to create their own design, with no interface to create the quote in SAP which handles the financial and works management transactions. Our "ConnectMore" solution is developing a platform for commercial EV charge point operators to obtain self-service budget quotes – this doesn't currently extend to domestic customers.	The transition to LCTs is anticipated to bring a significant increase in new connections enquiries from around 30k to 100k per annum. To progress these using the current processes and systems will require a significant increase in headcount of ~97 additional resources. Implementing the systems required to facilitate fixed price quotes for our domestic and business customers will mean an automated approach for most customer connections requests. This will be the most efficient approach and maximise our resources to focus on the more complex connection requests. We will build on the experience gained to develop our fixed price quotes solution.

Table 16 Self-Service Quotation Current Position and Change Drivers

Solution

The project will extend the Self-Service capabilities to provide a new interactive design tool and updated quotation process which customers will use to design their connection. Preconfigured thresholds will determine if the information the customer has provided allows the system to produce a fixed price quotation immediately. Depending on complexity, we recognise that some connections enquiries will need to be reviewed by a designer to finalise the quotation.

The automated power-flow analysis in the ENZ Platform (Section 5.1.2.1) will be used to underpin an automation/wizard process to enable customers to self-generate quotations from our website.

The diagram below illustrates the different stages of the New Connections quotation process, and the new elements which we will add to the existing process.

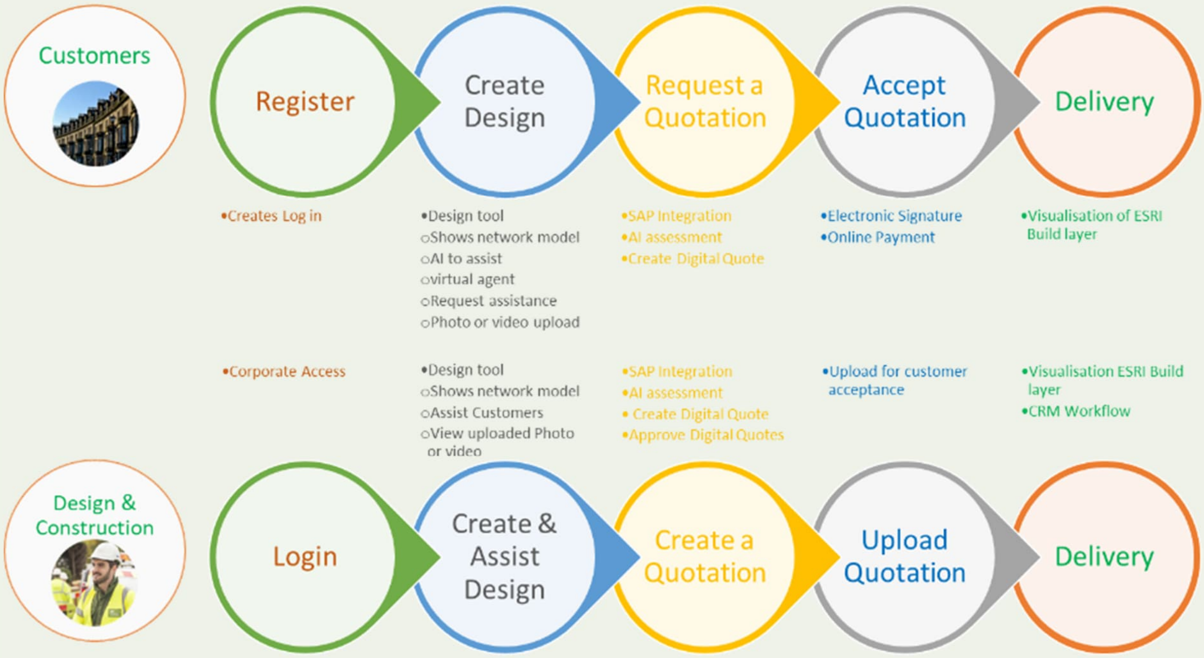


Figure 42 New Connections Quotation process

There will be a virtual assistant to help with the design as well as online channels available to chat with a designer who can co-develop the design with the customer in real-time.

To improve efficiency around quotations, AI for fixed price quotes will be introduced with instant price quotations based on a trained model of previous enquiries. This will be a supervised model to ensure the AI develops effectively. More complex quotes will be designed and priced using the more traditional designer led process in SAP.

Using data and machine learning (supervised) we can calculate prices of quotes; this will be based on current and historical data, which will be stored on a cloud-based big data platform. This process will evolve, starting with simpler designs.

Key Outcomes

- Saves headcount increase due to increase in enquiry and quotation volumes
- Existing staff can be focused on more complex quotations
- Aligns with Business Improvement charter on fixed price
- Improvement in the time to quote despite the significant increase in quotation volume
- Ability to cater for increased demand in enquiries
- Quotations can be automated and issued with minimal human intervention
- Ability for customers to self-quote
- Net zero contribution by enabling an easier transition for our LCT customers

3.2.2.5. *Design & Work Visualisation for Stakeholders (using AR and VR)*

The previous section highlights the New Connections process and introduces the idea of quote automation, and a one and done approach to creating the design, getting a quote, paying, signing, and then moving to the next stage of delivery. Some jobs are too complex to follow this process, and a more in-depth design is required.

The use of augmented reality and virtual reality (AR & VR) will allow our customers, stakeholders and SPEN designers to visualise certain scenarios, such as a connection design, a land agreement route and how works will look once construction commences on site. This will facilitate a more efficient process and an accurate design.

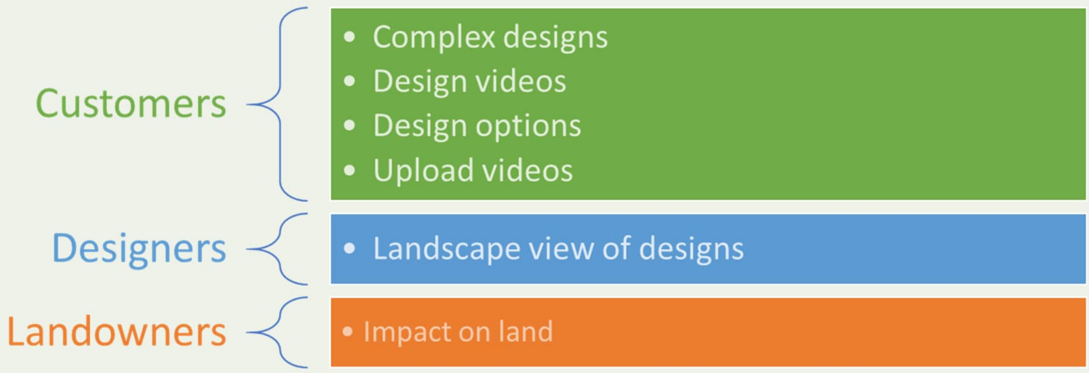


Figure 43 Design & Work Visualisation for Stakeholders (using AR and VR) scenarios

Current Position	Change Drivers
At present there are no BAU processes which incorporate augmented reality. Training takes place on-site, landowners undergo lengthy processes to understand how equipment will look on their site, and engineers spend wasted time digging for underground assets which are often incorrectly logged.	With an expected increase in connections there is a need to introduce innovative ways to share information with and support our customers and stakeholders, both internal and external. There is an opportunity to improve efficiency and reduce health and safety risks.

Table 17 Design & Work Visualisation for Stakeholders Current Position and Change Drivers

Solution

This solution requires the purchase of augmented reality / virtual reality equipment, upskilling the teams in use of this equipment, integration of the equipment with our GIS system and adding new GIS design layer to hold the output of these designs.

Further to this, once the design is finalised, there will be new functionality built to facilitate the upload of the design to the self-service portal with a notification to inform the customer it's there. Once the customer is happy with the design, they can then proceed through to completion within the self-service portal.

Key Outcomes

- Increase a customer's understanding of onsite impact in advance of work starting
- Ability for field teams to demonstrate designs on site leading to improved direct stakeholder engagement
- Provide clear understanding to landowners and stakeholders of potential impact from apparatus enabling constructive dialogue on site
- Facilitate a more efficient creation of a fully electronic record of land rights directly related to the GIS mapping system
- Speed up the creation of new land rights on site and allow quicker delivery of key projects
- Provide immediate access to land ownership information on site, using wearables

- Promote a more agile way of working by facilitating access to data in the field
- Removal of the need for the creation of inefficient paper records to be taken to site
- Net zero contribution through reduction in the need for site visits

3.2.2.6. Commercial Customer Management - Data

Commercial customers have indicated that they would like SPEN to support with planning and determining their energy needs, provide support to help them understand their current consumption and charges, provide education on grants available and on the future energy landscape. In addition, the sharing of data between businesses and other external bodies becomes ever more important.

Current Position	Change Drivers
Current CRM system is primarily for domestic and new connection customers	Our customers are looking to us for support in their own decarbonisation journeys. They want to understand their carbon footprint and the steps they can take to reduce this. Customers are focussed on their energy usage and seeking opportunities to participate in the wider energy transition. Additionally, prospective customers such as LCT providers who are considering where to site and connect their equipment want more information on where this is most effective. To support these customers and stakeholders we need to share data openly with the application of appropriate security measures. Therefore, it is essential that our CRM system is robust enough to support our online services.

Table 18 Commercial Customer Management – Data Current Position and Change Drivers

Solution

Self-Service capabilities will be extended to meet the needs of our commercial customers.

- Area network performance
- Quality of supply information
- Short term forecasting data on likely constraints and opportunities
- Capacity & Flexibility heat maps

Power outage history specific to their business

- Network capacity data
- Automated alerts on network constraints
- Substation loading

Data sharing

- Integration between DNOs, energy suppliers and 3rd parties such as vehicle charging organisations or home appliance device manufacturer clouds may be increasingly important in the future. New capabilities will be provided to facilitate the sharing of data. Please also see section 6.3 on Open Data.

Key Outcomes

- Commercial customers are provided with the data to support with planning and determining energy needs

- Commercial customers understand their current charges and understand grants and the future energy landscape
- Additionally, they will have the ability to offer flexibility to the DSO (See DSO initiatives in Section 6.2 for further details)

3.2.2.7. *Planning Consultation Portal*

Extend our self-service offerings to allow our internal staff, landowners, land agents, planning authorities and other stakeholders to share data relevant to the planning application and consenting processes related with our activities.

Current Position	Change Drivers
Planning applications are managed via manual processes and communicated via post. This can result in inefficiencies in the handling of communication and potential discrepancies in the information being shared.	• Data transparency • Ensuring no information is lost • Removing inefficiencies from the planning and consenting processes

Table 19 Planning Consultation Portal Current Position and Change Drivers

Solution

The Self-Service Portal will be extended to meet the requirements for planning applications and environmental consenting.

While we use the terms “Landowner Portal” and “Consultation Portal”, they are not new systems to be developed but rather new processes / functions to be developed in the existing Customer Self-Service Portal.

Key Outcomes

- Removes paper records that need to be digitised and ultimately replaced by digitalised processes
- Provides a secure solution for all parties
- Effective management of planning authority and environmental consenting applications and associated stakeholder interactions
- Coordination of information provision across a range of internal and external stakeholders
- Early identification of opportunities to intervene to resolve a conflict between development and apparatus which may avoid a claim for loss of development or ultimately result in the cost of diverting / moving the apparatus
- Aligns with the BIM solution for a Common Data Environment that is being developed for our transmission business

3.2.2.8. *Landowner Payments – Land Agreements & Change of Ownership*

Utilise the SPEN Self-Service Portal to allow landowners to carry out an array of services ranging from update of bank details for land agreement payments to updating ownership when some or all properties change hands through sale of land.

Current Position	Change Drivers
Cheques are posted out to landowners without a payment breakdown resulting in landowners phoning in for information which needs to be manually extracted from corporate SAP RE system. When a landowner moves SPEN is often not notified as there is no process in place that allows landowners to communicate the ownership change	More efficient process of tracking and issuing land agreement payments to cope with future demands. There is also some scope to improve the completeness of data and data transparency, which will ultimately improve customer satisfaction

Table 20 Landowner Payments Current Position and Change Drivers

Solution

The Self-Service Portal will be extended to meet the requirements for land agreement payments, land agreements and land ownership.

In addition, we will develop workflow with our new CRM system and financial system to ensure a clear customer journey and visibility.

Key Outcomes

- Improved stakeholder engagement/recognition
- Ensure landowner records/contact details are up to date which facilitates quicker contact during faults and emergencies to obtain permission for access
- Efficiencies in Land Agreements team reducing the need for customer call support and providing a self-serve facility to landowners.
- Effective management of landowners to enable records to be kept up to date and payments made to correct name in a timeous manner
- Notification when landowner leaves property and no longer appropriate to hold personal data
- Ability for simple agreements to be processed on portal without a need to visit site and issue paper correspondence
- Efficiencies from better data resulting in accurate payment information
- Reduce number of claims due to missing consents

3.2.2.9. Virtual Town Hall

Ability for external stakeholders to meet virtually and discuss issues relevant to them with SPEN. This is particularly helpful in communities where new overhead lines or underground cable is being laid over large geographical areas which could impact communities.

Current Position	Change Drivers
Townhall events are held to inform the public about planned work. Due to Covid-19, an alternative to face-to-face events had to be found. SPEN currently uses a third party for virtual town halls but has yet to identify a long-term solution.	To maintain and continually improve our customer and stakeholder engagement, we need to adapt to the 'new normal' and aspire to embrace new digital ways of working. A long-term solution for our townhall events needs to be identified so that we can maintain engagement levels while continuing to host the events in a digital and remote manner.

Table 21 Virtual Town Hall Current Position and Change Drivers

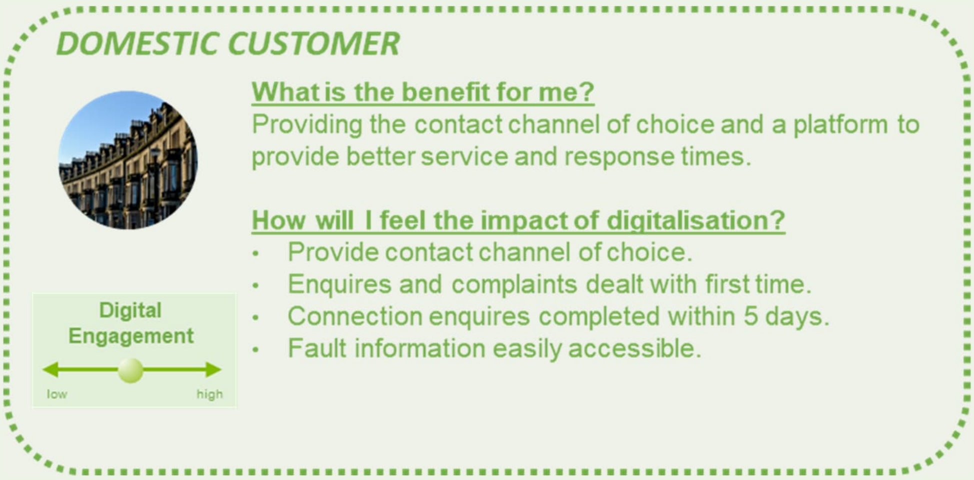
Solution

We will host events and conferences via an AR/VR/XR events and conferences tool, with a central group (plenary) that will have the ability to break out to smaller stalls. Future development may include integration to our corporate systems to provide live connections via break out stalls.

Key Outcomes

- Increased customer / stakeholder service
- One-off consultation events can be viewed repeatedly after the event
- Increases audience participation for the digitally engaged
- Accessible to parties who cannot attend events or who are unable to attend
- Reduced costs in employees across several disciplines attending events, some of which will result in days out of the office
- Single message across events, accurate record of what was presented and comments collection of consultation responses
- Reduction in carbon emissions associated with travelling to locations to engage communities

3.2.3 Persona Spotlights



LCT CUSTOMER

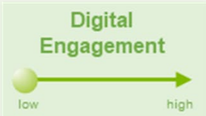
What is the benefit for me?

Access to flexible payment options

How will I feel the impact of digitalisation?

- Ability to choose flexible payment options and an early indication of where LCT generation can be connected to SPEN's network

DIGITALLY DISCONNECTED CUSTOMER



What is the benefit for me?

Continuing to provide telephone options.

How will I feel the impact of digitalisation?

- Traditional communication methods can still be continued and record as preference
- Digital backup communications available
- Data and analytics will enable central coordination of support and customer services, allowing for off-line triage and prioritisation

COMMERCIAL CUSTOMER

What is the benefit for me?

Contacted via channel of choice and able to access to relevant data via the platform

How will I feel the impact of digitalisation?

- Access to a better platform to communicate with SPEN and visualise data
- Contacted via the communication channel of choice
- Enquires and complaints are resolved at first contact
- Connection enquiries addressed within 5 days
- Fault information easily accessible

CONSTRUCTION/DESIGN ENGINEER

What is the benefit for me?

Able to provide better service to Commercial and LCT customers

How will I feel the impact of digitalisation?

- Access to detailed and timely connection designs
- Share augmented reality/virtual reality walkthrough of complex construction tasks/integration

CUSTOMER SERVICE TEAM

What is the benefit for me?

Improved means of communicating with my customers and providing excellent service

How will I feel the impact of digitalisation?

- Access to a better platform for communicating with customer through their preferred channel of choice
- Ability to access available customer data from a single source

FIELD TEAMS

What is the benefit for me?

Making site work safer and more productive for me

How will I feel the impact of digitalisation?

- Guided risk and safety assessment to ensure that line outages have occurred
- Intelligent supply chain that proactively manages the delivery of materials and consumables for my team
- Augmented reality/virtual reality walkthrough of complex construction tasks/integration
- Automated job status reporting and timewriting

Figure 44 CRM Persona Spotlights

3.2.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Customer and Stakeholder information services Customer Channels, Customer Photo Submission, Land Agreements, Virtual Town Hall, Improving Fixed Price Quotations, Design & Work Visualisation for Stakeholders using AR,
Waterfall	Commercial Data, Automating quotes process / Feedback loop for new Connections
Agile + Waterfall	Where integration is required to our Asset or Regulatory systems agile will be required

Table 22 Approach and Initiatives

The diagram below shows the overall proposed plan.

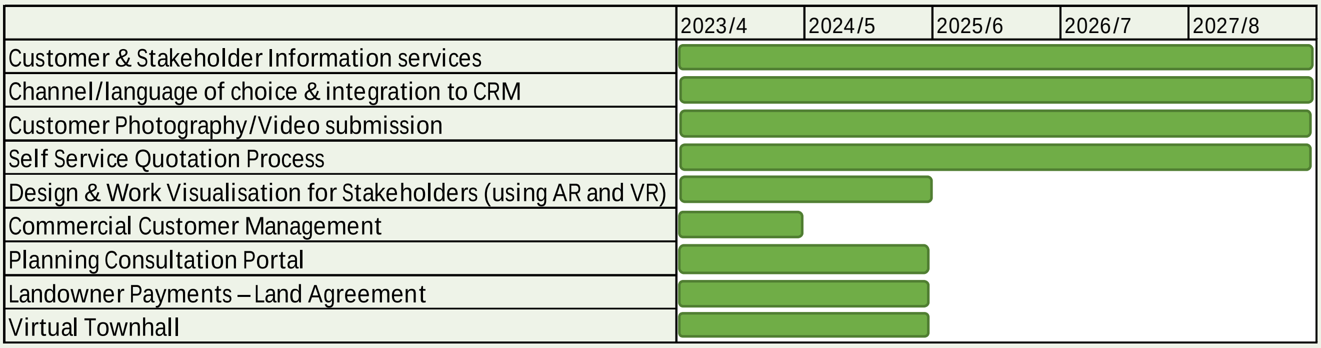


Figure 45 Overall Proposed Plan and Timeline

3.2.5 Resources

Resource Type	Purpose
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies
Programme Manager	Manages the overall programme of work
Change Manager	Prosci accredited change practitioner to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to stakeholders
Communications Manager	Internal and external communication of change
Telcom / Social media Consultant	Advisory role for new omni-channel
Search Engine Optimisation consultant	Ensure that SPEN stakeholders will find our portal and channels quickly and easily through any social media method search using keywords

Table 23 Self Service Resource Types and Purpose

3.2.6 Functional Model

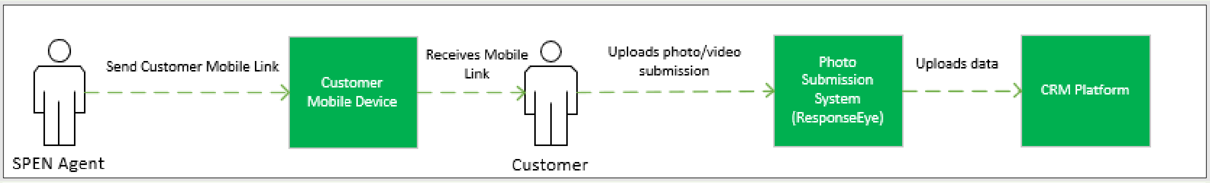


Figure 46 **Customer Mobile Device and Photo Submission System**

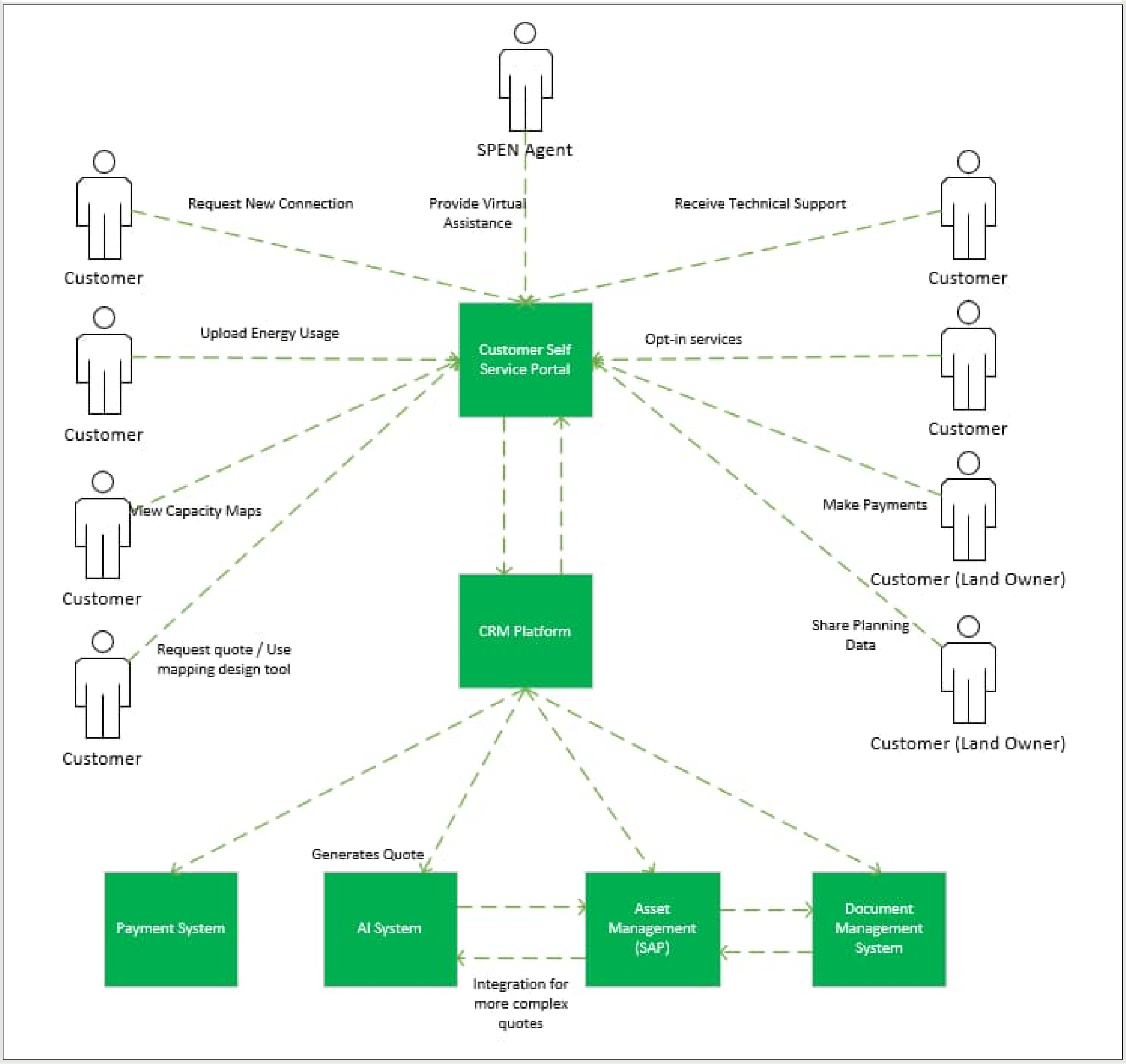


Figure 47 **Customer Self-Service Portal and CRM Platform**

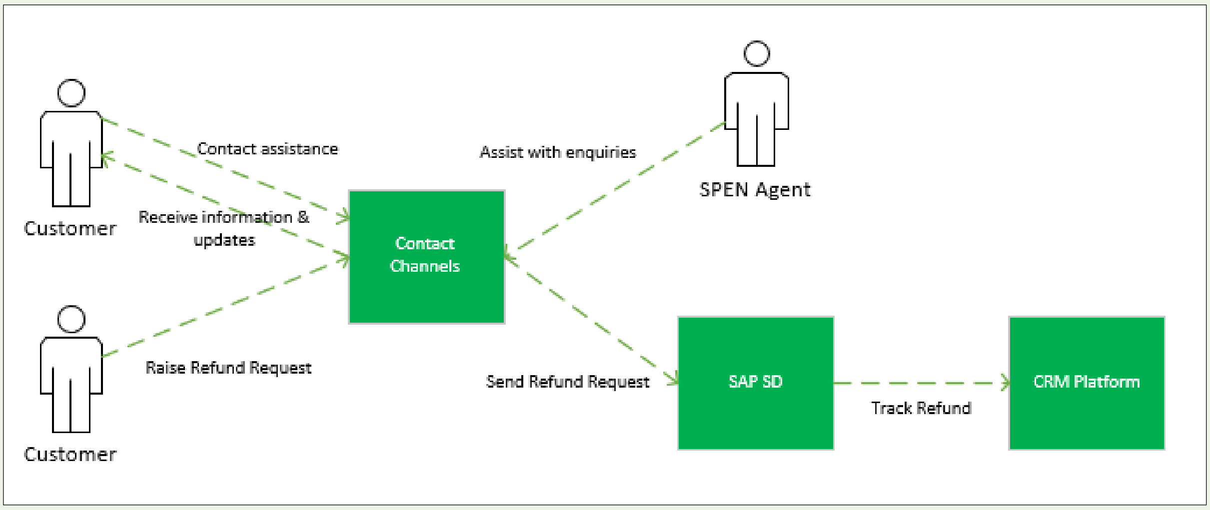


Figure 48 **Channel of Choice and Refund request for Customers**

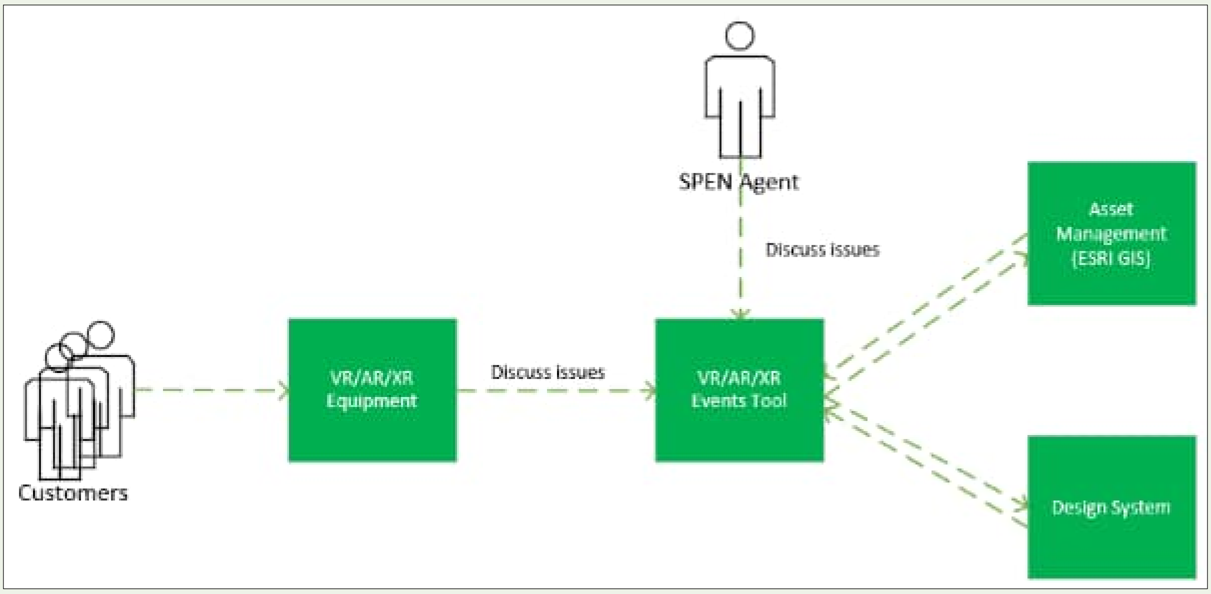


Figure 49 Virtual Town Hall

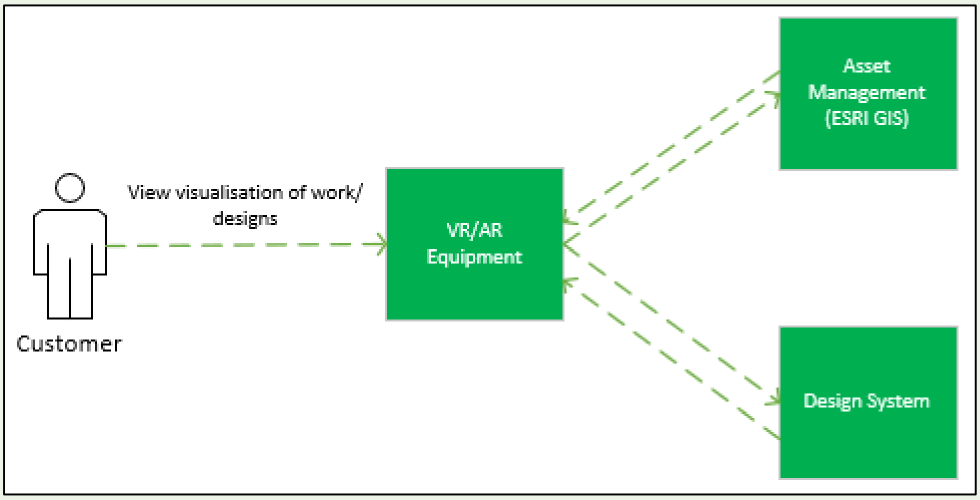
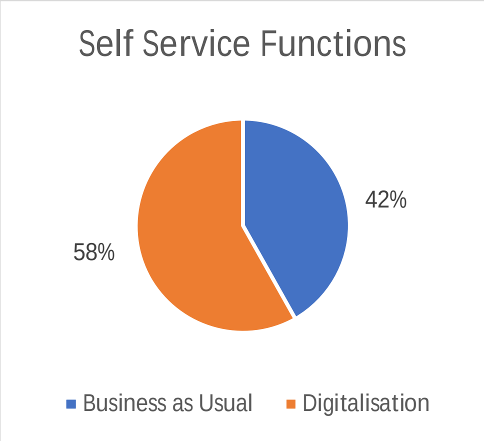


Figure 50 Design & Work Visualisation for Stakeholders

3.2.7 Costs

	**BAU Rationale:** We recognise that our customers and stakeholders will expect us to provide them with a range of self-service options as part of delivering services to a digitally educated population. Our baseline plans include information and service provisions via our website covering our core activities as required by our customers and stakeholders.
	Digitalisation Rationale: We recognise that we can go beyond the provision of basic digital services and will invest to ensure we provide the best digital outcomes our customers and stakeholders' demand. We will develop solutions to facilitate more digital interaction whilst ensure we do not exclude the digitally disengaged.

3.2.8 Performance Metrics

Project	Measures of Success
Customer & Stakeholder Information services	• % self-service connection requests enabled annually • % increase in customers self-serving
New Customer Channels	• % of Customers can use contact channel of choice • Conduct Customer Survey on choice and ease of contact
Customer Photo Submissions	• % of customers able to upload photo submissions and stored/archived correctly
Commercial Customer Management Data	• % of customers able to view commercial data
Landowner Payments – Land Agreements and Change of Ownership	• % of Landowners can access SPEN via Self-Service Portal
Planning Consultation Portal	• % of Landowners can access SPEN via Self-Service Portal
Design & Work Visualisation for Stakeholders using AR	• % of customers can visualise work via AR
Improving Fixed Price Quote Process	• % of customers receive quotes in less than n days
Automating quotes process / Feedback loop for new Connections	• % of customers refunded within SLA time period • Quarterly review of chargeable works rates
Improving quotes process	• % quotes that are progressed to the next stage and are accepted (minimising the number of non-value-added quotes produced) • % quote value equals delivery cost
Continued improvement on Broader Measures scores	• Broader Measure Score

Table 24 Project Success Measurements

3.2.9 Assumptions and Dependencies

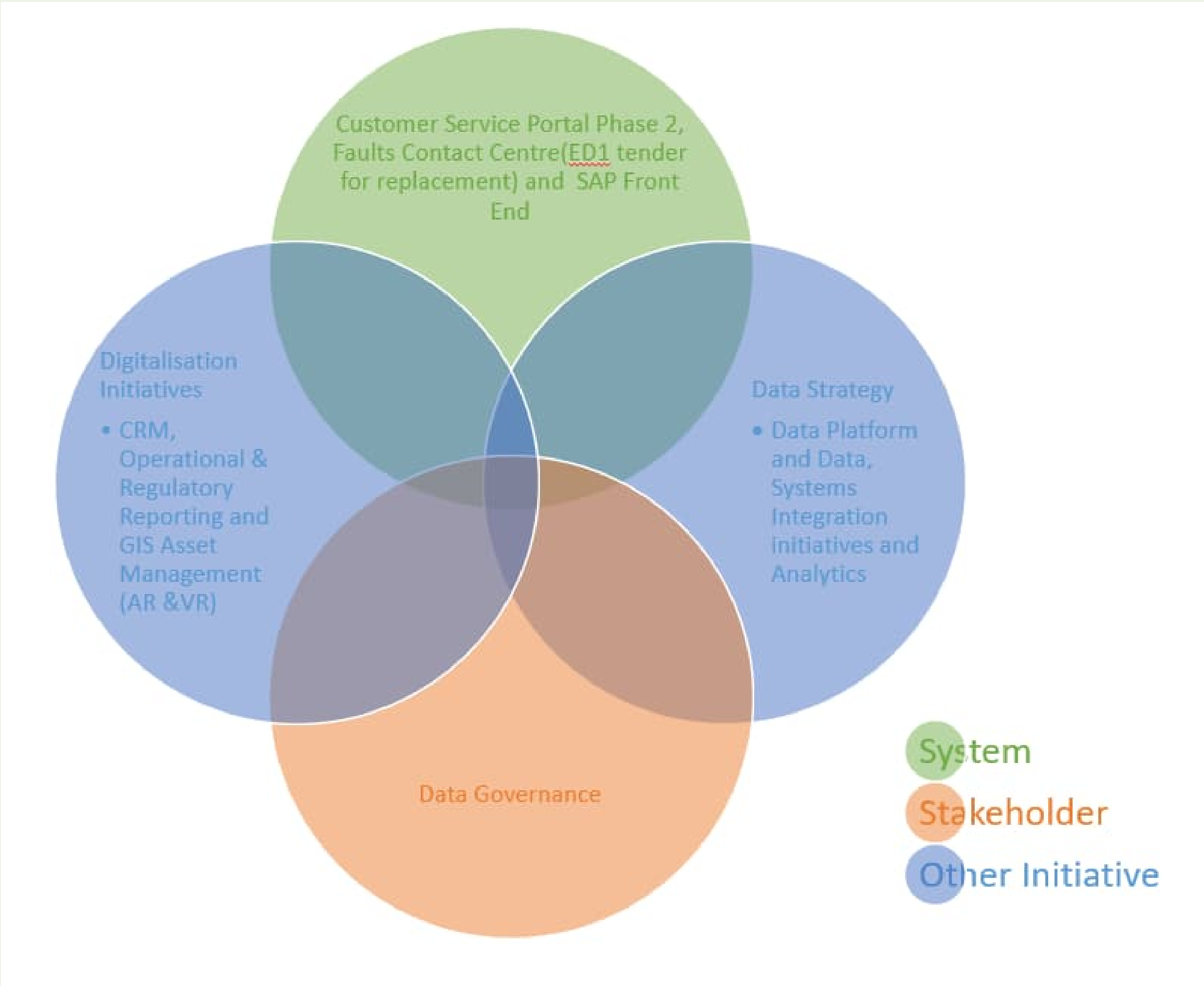


Figure 51 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Self-Service Functions Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Wider Customer Services initiatives and targets reliant on this solution

Table 25 Self Service Function Assumptions

3.2.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	CS Portal Phase 2 not achieved in ED1	Ensure project tracked to completion with ED1	Low	High
2	Wider Customer Services initiatives and capabilities that support CRM not delivered	Governance in place to track target of Customer Service initiatives	Medium	Medium

Table 26 Risks, Mitigations and Their Impact

3.3 NAVI

3.3.1 Overview

An early version of the Network Analyse & View (NAVI) model has been created during the ED1 period, to create a connected network model from our GIS data to allow flexible network analytics to be performed without impacting the daily use or structure of our GIS system.

To facilitate detailed scenario analysis and modelling, our current solution must evolve to become scalable and be supported as part of our core systems.

3.3.2 Projects

3.3.2.1. NAVI

The scope is to improve this model, with the NAVI solution being incorporated into a more comprehensive Integrated Network Model (INM) which is part of the Smart Data Integration Fabric (SDIF) solution. For more information on SDIF please see section 4.5. This project scope covers the transition of NAVI into the INM/SDIF solution.

Current Position	Change Drivers
An early version of NAVI has been developed with Network Innovation Allowance funding during ED1 for specific use cases.	SPEN's DSO & Digitalisation Strategy and Distribution Future Energy Scenarios (DFES) predict significant changes to the network over the coming years which will result in a massive increase in the amount of data and a more complex network to manage. There is a need to introduce more analytics to make network planning, connections, maintenance and control more dynamic To maximise the use of data in both managing and planning for impacts on the distribution network as we progress towards Net Zero, we require that network data can be flexibly analysed to assess future and near-real time network scenarios. To analyse network data, we need a consistent network data reference model.

Table 27 CRM Current Position and Change Drivers

Solution

The present SP Energy Networks (SPEN) network models have been designed with a specific operational task focus i.e., our network connectivity model enables our network control system (PowerOn), our geospatial network model (Esri) enables asset and fault management activities, our asset management solution (SAP) enables asset lifecycle management.

Given their operational focus these systems are not designed to facilitate large scale network analysis incorporating multiple data sets. Given the ambitions set out in our digitalisation strategy and our Smart ED1 Business Plan SPEN has been developing solutions in ED1 to maximise the use of our network data models in large scale analysis to improve the efficiency of our processes.

Our initial step to facilitate this is the Network Analyse & View (NAVI) solution focusing on LV and smart meter network model management. This solution is currently in place. The NAVI solution will be incorporated into a more comprehensive Integrated Network Model (INM) which is part of the Smart Data Integration Fabric (SDIF) solution, managing a complete network data model.

The NAVI & INM solution will continue to build on maximising the use of our network records for detailed analysis functions including but not limited to:

- Data source for modelling platforms e.g., Energy Net Zero (ENZ) platform
- Fault tracing
- Constraints prediction analysis at all voltages, including LV with use of smart meters
- Poor performing circuit identification
- Low Carbon Technology (LCT) impact evaluation
- Missing asset back-fill/network connectivity corrections
- LV Phase Identification
- Provide data for digital twin-like scenario analysis e.g., rolling back of network state to re-evaluate fault scenarios
- Data quality management
- Creation of open data sets, such as the Common Information Model (CIM). The Energy Data Task Force (EDTF) has set out objectives for much wider data sharing by energy utilities and Ofgem has clearly indicated that CIM is the likely data standard. INM creates a central network model that can be output in multiple formats, including CIM
- Integration to our Open Data Hub (https://www.spenergynetworks.co.uk/pages/energy_data_hub.aspx) which can facilitate the sharing of data to external stakeholders and customers.
- Support updated data sets in PowerOn – for example APRS requires PowerOn connectivity and GIS data on cable length/impedances. This can be provided by INM rather than created manually
- Feed into our GIS system to better facilitate 3D positioning, land use, biodiversity, and land rights to inform decisions about our network and assets. Also use this data to feed into the ENZ, and then the resultant plans can be represented back into a 4D GIS view.
- Feed into our ‘Network Visibility Strategy’ covering additional sensors on the network and the associated data, smart meter data and the subsequent analytics, all brought together within the ENZ platform.

Key Outcomes

NAVI forms part of our evolution to a longer-term strategy for a wider Integrated Network Model, which this takes the GIS data, from NAVI, and maps it to the control and asset management system network models to give a single reference model for all network data. This gives multiple benefits as detailed below:

- A single point of truth for network model data
- An overlay system which leaves the 3 master system data models as they are
- A flexible structure that allows measurement, building type, external data sets to be associated with the network
- Retain multiple network versions to allow replay scenarios
- A separate system which can be heavily queried without impacting the 3 core operational systems
- A data quality assessment engine allowing data improvement in our core systems
- A single reference system to share network data to other market participants
- Reduce the risk of network damage and/or longer network outages due to inability to use data to understand the increasing complexity of the network, so less downtime for our consumers.

- Consumers will benefit from reduced network risk immediately as the different components of the project are completed

A specific enhancement will include automation of the extraction of the current network state from the Control System into the SDIF/INM. This is an enabler for current and future SDIF applications to provide more accurate near real time advice e.g., fault location.

3.3.3 Persona Spotlights

SPOTLIGHT: LCT CUSTOMER

What is the benefit for me?

Improved Connections process

How will I feel the impact of digitalisation?

- Quick and efficient identification of Network capacity
- Lower incidence of faults and quicker restoration

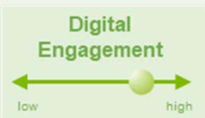
SPOTLIGHT: FIELD TEAMS

What is the benefit for me?

Better Data modelling means better forecasting, so problems can be pre-emptied

How will I feel the impact of digitalisation?

- Fix potential issues before they occur
- Improved visibility of asset data
- Greater visibility and understanding of network capacity



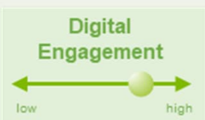
SPOTLIGHT: Reporting Asset Management

What is the benefit for me?

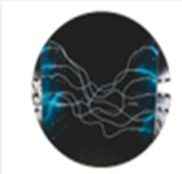
Provides a single reference point for network data

How will I feel the impact of digitalisation?

- Provides centralised and reliable data source for network modelling
- Facilitates an easy way to share data both internally and externally



SPOTLIGHT: FLEXIBILITY SERVICE/EV CP./DEMAND AGGREGATOR



What is the benefit for me?

Provide a key source of data for new energy technology sector

How will I feel the impact of digitalisation?

- Application of new energy scenarios
- Improved forecasting of network capacity
- Asset optimisation

Figure 52 NAVI Persona Spotlights

3.3.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Navi will adopt an agile delivery methodology

Table 28 Approach and Initiatives

The diagram below shows the overall proposed plan.

Figure 53 Overall Proposed Plan and Timeline

3.3.5 Resources

Resource Type	Purpose
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies
Programme Manager	Manages the overall programme of work
Change Manager	Prosci accredited change practitioner to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms
Data Scientist	Identify required scenarios, build algorithms, perform analytics, and present outputs

Table 29 CRM Resource Types and Purpose

3.3.6 Functional Model

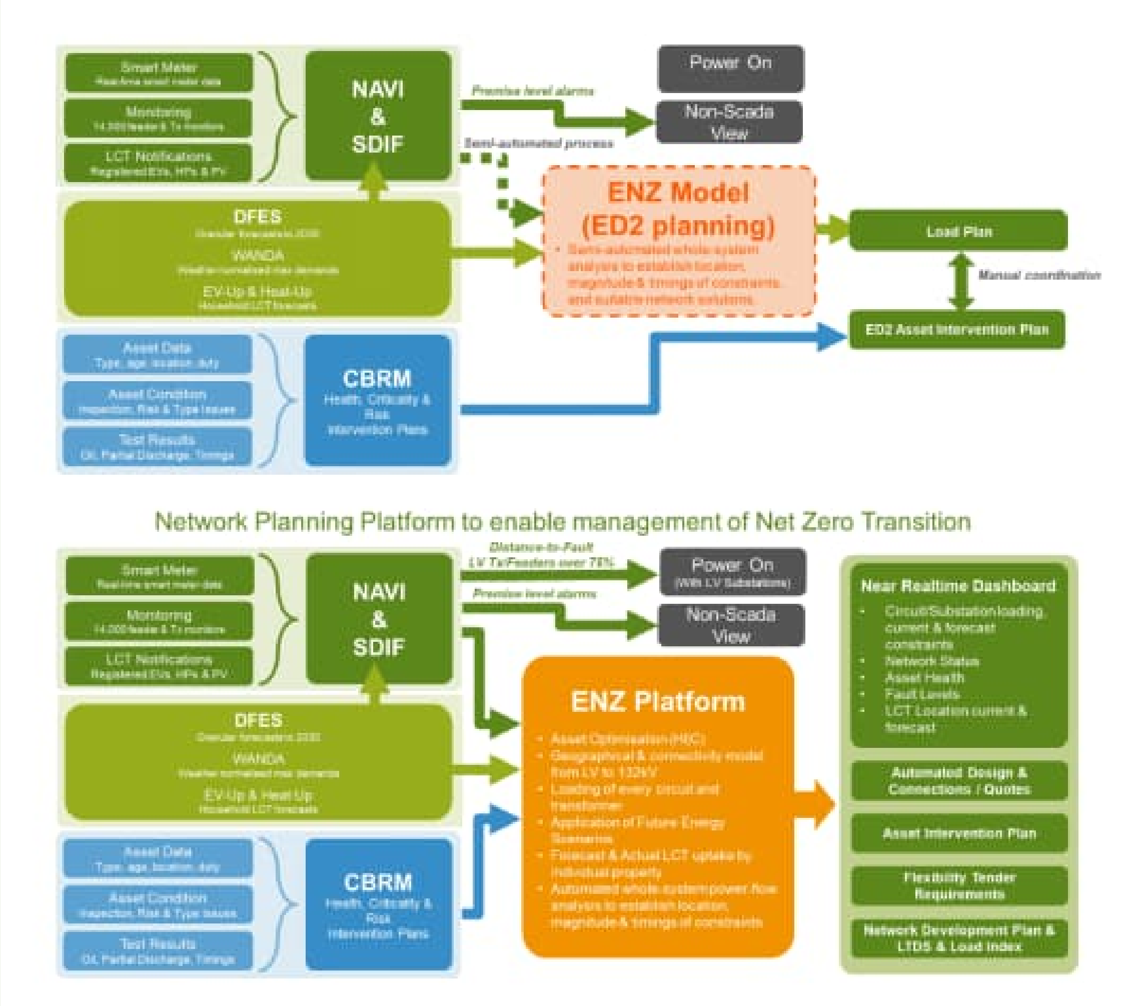
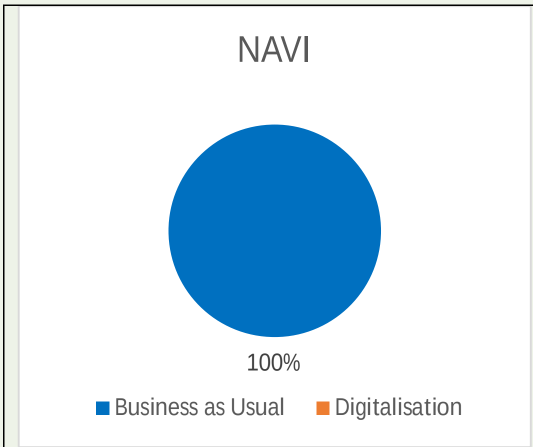


Figure 54 NAVI

3.3.7 Costs

	**BAU Rationale:** Our NAVI platform is a key enabler for many other parts of our plan, in particular to feed data to our Engineering Net Zero platform and to provide the mechanism to support the sharing of our network data externally using appropriate meta data standards. We have therefore allocated all NAVI costs to BAU.
	Digitalisation Rationale: See above.

3.3.8 Performance Metrics

Project	Measures of Success
NAVI	• X hours saved on time to connect • % reduction on manual network analysis

Table 30 Project Success Measurements

3.3.9 Assumptions and Dependencies

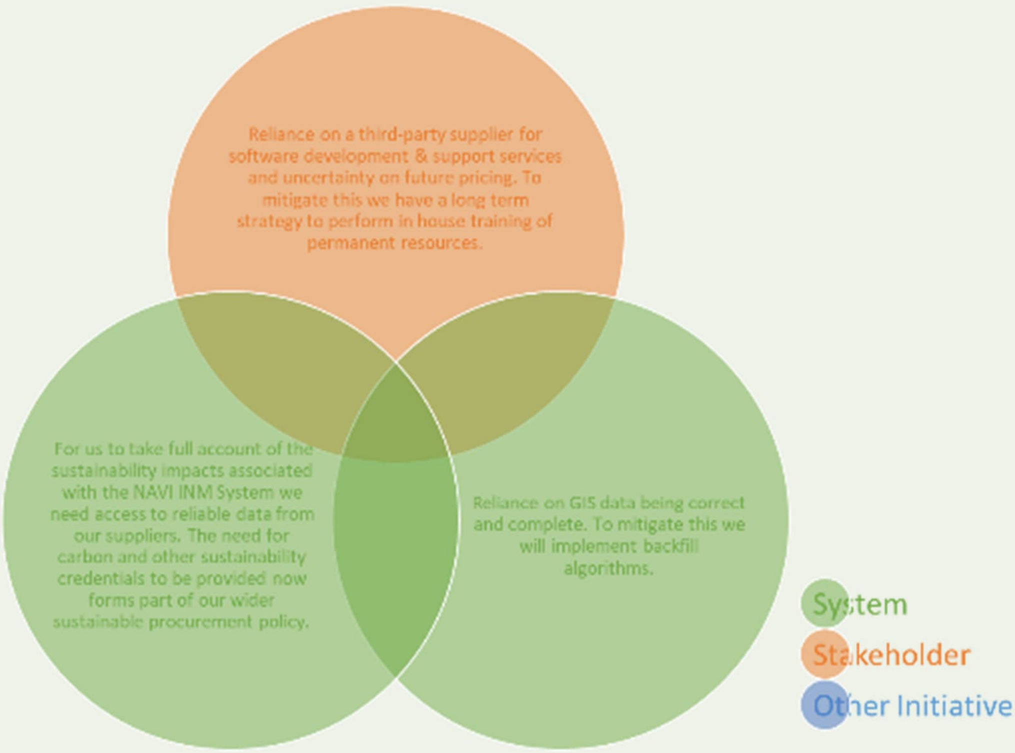


Figure 55 Dependencies by Type

3.3.10 Risks and Mitigations

The deliverability risk of NAVI is extremely low considering it is already a tool being utilised within the business, developed as part of a NIA funded project within ED1.

The main risks associated with NAVI are as follows:

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Demand for solution exceeds current infrastructure capability. The	Migrate to Openshift infrastructure	Medium	Medium
2	Low user uptake results in errors persisting in system	Requested Exec engagement to embed usage of system	Low	Low

Table 31 Risks, Mitigations and Their Impact

3.4 Digitisation of Land and Planning

3.4.1 Overview

During 2020 SPEN completed a project to introduce a new layer to our ESRI GIS system to allow the Land and Planning teams to enter land agreements, titles, and planning consents. This created a link between our corporate Real Estate system SAP RE and ESRI. Since then, all new Land and Planning Records have been digital and removed our reliance on paper records.

3.4.2 Projects

3.4.2.1. Digitisation of Land and Planning

This project aims to fully digitise the remaining archive of paper records by electronically scanning all paper land rights documents held by SP Energy Networks, index them with the appropriate naming convention and SP Energy Networks reference number.

Current Position	Change Drivers
350,000 paper documents located in eight separate SPEN sites (7 in Scotland and 1 in North Wales). There is a mix of paper record types; loose sheets, bound by glue, bound by ring binders and sizes with varying sizes of A4, A3, A2 A1 and A0 These are not easily accessible to staff and will require specialist resources to digitise.	Build on the new GIS layer by having a complete record of our land and planning landscape. Contribute to our long-term digitalisation plan by making the data available for use via our new digitalisation solutions such as the Self Quotation Process and Design Work and Visualisation outlined in Self Service Functions.

Table 32 Digitisation of Land and Planning Current Position and Change Drivers

Solution

Following a tender process (adhering to SPEN and Iberdrola purchasing polices) SPEN will outsource the work to a third-party organisation to carry out the following:

- Scan all paper records
- Reference accordingly
- Provide in an electronic format
- Link directly to the relevant contract within our internal SAP RE payment system.
- Assess each contract map/plan attached to each land contract and plot these using a vector shape within SPENs Land GIS.

Key Outcomes

- Create a relationship between the two sets of data. Without this linkage it is not possible to report on the land rights associated with an asset, or the assets that appear within a land right.
- Create a new set of SPEN data suitable for use within multiple new digital tools
- Easy accessibility for parties, all records will be held in a centralised store, less risk of loss or damage than paper records, efficiency improvement as investigations on finding info should be quicker

3.4.3 Persona Spotlights

Figure 56 Land & Planning Digitisation Persona Spotlights

3.4.4 Delivery Approach and Timeline

Approach	Initiatives
Waterfall	Testing of SAP-RE linking and GIS plotting would be carried out post Digitisation.

Table 33 Approach and Initiatives

The diagram below shows the overall proposed plan.

	2023/4	2024/5	2025/6	2026/7	2027/8
Digitalisation of Land & Planning					

Figure 57 Land & Planning Digitisation Overall Proposed Plan and Timeline

3.4.5 Resources

Resource Type	Purpose
3rd Party Contractors	Scan and create link to SPEN systems
Land & Planning Staff	Locate physical records and co-ordinate with 3rd party for uplift
Testers	Test solutions – this includes System testing (SAP-RE and GIS), integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies. Overview of 3rd party contractors and co-ordinate uplift of physical records.
Business Sponsors	Ensuring success of project and leading awareness

Table 34 Land & Planning Digitisation Resource Types and Purpose

3.4.6 Functional Model

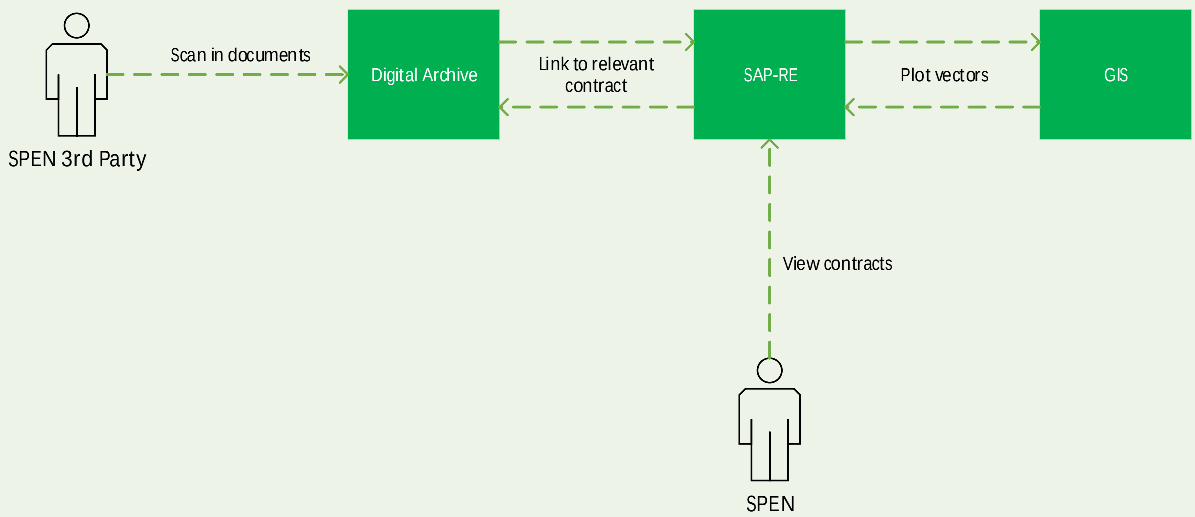
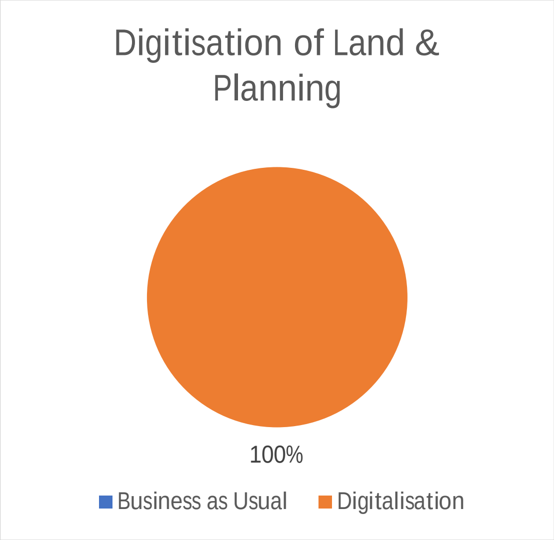


Figure 58 Digitalisation of Land & Planning Digitisation

3.4.7 Costs

	**BAU Rationale:** Our current processes involve the management of hardcopy land and planning documentation. We have implemented a digital solution for any new land rights, but this has not been applied retrospectively. It would be possible for us to continue working with hardcopy documents.
	Digitalisation Rationale: The digitalisation of L&P records and processes will enable this data to be integrated into GIS and fully utilised throughout our processes. All costs for digitalisation of L&P have been allocated to digitalisation.

3.4.8 Performance Metrics

Project	Measures of Success
Digitisation of Land & Planning Records	• 50% complete by Q1 2024 • 100% complete by Q1 2025

Table 35 Land & Planning Digitisation Project Success Measurements

3.4.9 Assumptions and Dependencies

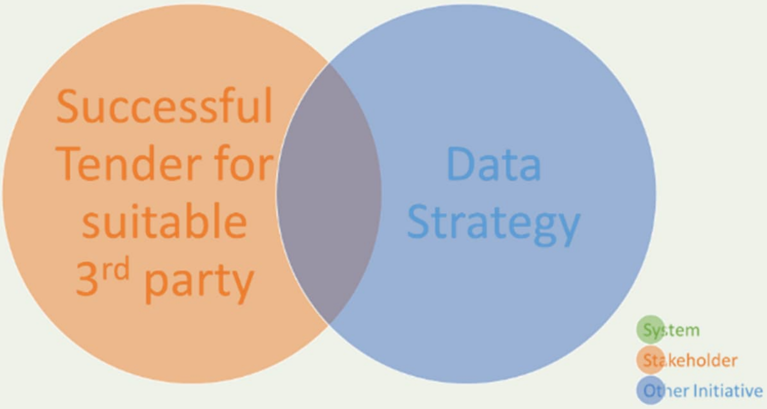


Figure 59 **Dependencies by Type**

The diagram above illustrates the Dependencies required for the implementation of the Digitisation of Land and Planning Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Access to SAP-RE and GIS will be granted to 3rd parties

Table 36 Land & Planning Digitisation Assumptions

3.4.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Damage to Paper Records	Appointment of Specialist resources by SPEN and Iberdrola tender process	Low	Medium

Figure 60 Land & Planning Digitisation Risks, Mitigations and Their Impact

4. Pillar 2: Optimised Asset & Network Management

Our network will see an unprecedented volume of change as our customers shift towards electrification of their transport, heating, and industrial demand. Coupled with the rise in the connection of DER the demand on our assets and processes will see a transformational shift. To facilitate this, it is crucial that we invest in more efficient approaches to manage our assets; planning, scheduling, and delivering field work and managing our supply chain and logistics.

Digital technology will play a key role in enabling us to navigate this transition and deliver on our commitments to enable Net Zero while maintaining a safe and reliable network. Digital technology will also play a key part in significantly increasing the productivity of our field operations and support better decision making when planning the work needed on our network, reducing costs for customers, and lowering our carbon footprint.

We aim to deliver this by:

- Developing a digital twin of our network
- Deployment of autonomous robots for inspection and operation in restricted sites
- Deployment of advanced field technology such as wearables (i.e., smart technology that can be worn like Google glasses)
- Use of connected construction technology to digitalise our delivery of capital projects
- Automation, fault location technology and predictive analytics to increase network resilience and accelerate our response to outages
- Digitalise our inspection regime using aerial LiDAR and drone footage image processing technology.

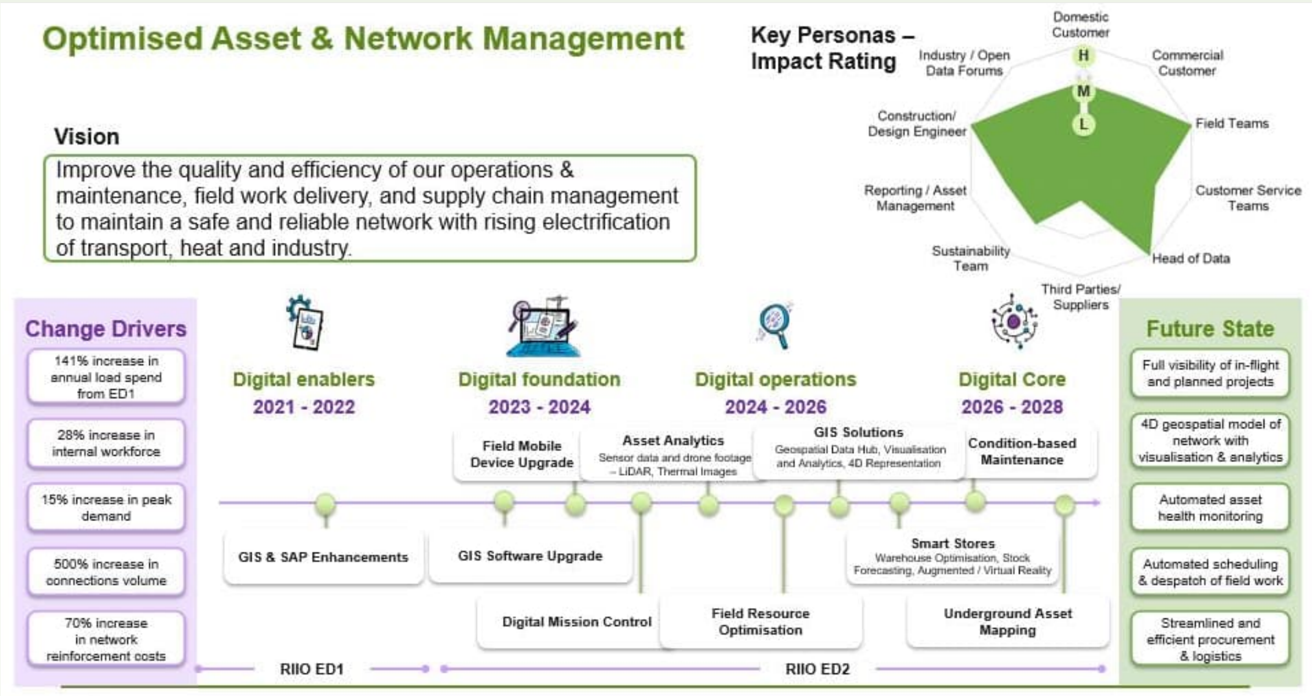


Figure 61 **Summary View of Pillar 2**

The diagram below shows the commitments which these initiatives will drive and contribute to, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.

We will increase visibility of our low voltage networks by delivering over 14,100 LV network monitors at large secondary substations and enhancing our use of smart meter data within ED2. This will enable us to maximise utilisation of the existing network, identify targeted areas for upgrades, and facilitate customer flexibility.

We will continue to provide transparent reporting of our environmental and sustainability performance by publishing an annual report of our progress against all environmental and sustainability commitments – in line with metrics and a format developed in collaboration with the other DNOs.

Develop a Network that's ready for Net Zero Commitments	Total	Pillar 1
Develop the network of the future	14	4
Ensuring a safe and reliable electricity supply	10	6
Provide timely and efficient connections	6	2

Ready our Business for a Digital and Sustainable Future	Total	Pillar 1
We will support an environmentally sustainable network	24	1
We will promote an inclusive, skilled and community-based workforce	5	1
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	1

We will create opportunities for our staff to develop new skills through development, upskilling and training plans aligned to our digital transition and journey to Net Zero to achieve a workforce who are motivated and confident to embrace the challenges we face. We will do this through annual internally recruited trainee programmes and annual upskilling plans for our people.

We will engage with all local authorities in SPD and SPM to support the strategic siting of public EV chargepoint hubs, utilising our extensive network knowledge and working collaboratively with local stakeholders in optioneering, to identify the optimal locations. We will publish a report on our work at the end of the price control, reporting the number of optioneering reports we completed with local authorities and the consumer benefits delivered in relation to reduced connection charges.

Figure 62 Key commitments driving the initiatives

The key customer priorities, taken from the customer and stakeholder feedback, which we have used to inform this pillar are:

- Network resilience, not having a power cut
- How SPEN manages health and safety regulations
- Investing in a network to meet future needs

Deliverables

Deliverables	Timeline
Integrated GIS solution	• Upgraded GIS platform delivery in 2024 • Enhanced 3D GIS capabilities in 2025 • Incremental enhancements to GIS platform
Additional GIS data layers	• Additional layers added to the GIS platform to be delivered incrementally as required by stakeholders
Building Information Modelling	• New integrated BIM platform for 132kV Manweb projects in 2025 • BIM light implementation enhancement for smaller projects in 2027
Asset Risk Based Decisioning	• Core asset risk modelling integrated platform delivery in 2024 • Enhancement for migration to condition based in 2025 • Incremental enhancements to asset risk analytics and decisioning
SAP Efficiency Enhancements	• Enhancements to current SAP platform delivered incrementally

Connected Asset Analytics	• Core asset capture platform in 2025 • Extensions to capture additional datasets delivered incrementally
Connected Assets Location Tagging	• Existing system enhancements for integration with LiDAR data in 2024 • Extensions to enable additional locational data enhancements delivered incrementally
Connected Asset Records	• Delivered incrementally
Connected Worker	• Field resource optimisation new solution to be delivered in 2026 • Contractor field application to be delivered in 2026 (dependency on new field resource optimisation solution) • Field image capture solutions – new platforms to be developed to handle drone / wearable data in 2025 • THOR hammer solution enhancement to existing systems delivered in 2023 • Integrated smart forms to be delivered via extensions to existing solutions • Underground asset Management – new solution to be delivered in 2027
Supply chain, procurement, and logistics	• Warehouse optimisation solution – enhancement to existing warehouse solution to be delivered in 2026 with incremental enhancements • Enhancement to existing vehicle management solution to be delivered in 2024 with incremental enhancements • Stock supply and framework visibility solutions to be delivered in 2024
SDIF	• Enhancements and extension to existing SDIF solution to be delivered incrementally
IOT Gateway	• New system to be delivered in 2024 • Incremental enhancements to be delivered

Table 37 Optimised Asset & Network Management Deliverables

The following sections provide more detail on each of these areas.

4.1 Asset Management Solutions

4.1.1 Overview

The following section contains projects associated with our Asset Management Solutions initiative.

Crucial to the effective and efficient operation of our network is knowledge of our assets:

- Location
- Connectivity
- Capacity
- Utilisation
- Condition
- Inspection and maintenance windows and output

- Predicted loading
- Planned investment
- Services including flexibility

These will provide the basis to support our customers' transition to a Net Zero future. Our core asset systems of SAP and ESRI work in conjunction with several satellite solutions to provide the information we need to optimise our network and meet the challenges we anticipate.

All our network assets are mastered in our core asset systems and the asset records are synchronised through nightly updates. Our "serialised" assets (those individual items of equipment such as transformers or switches which are identified through individual serial numbers) are mastered in our SAP Plant Maintenance system. Non-serialised assets (linear assets such as overhead lines, underground cables, poles, and towers) are mastered in our ESRI Geographical Information System (GIS). The additions or disposals of assets from our network are captured in the appropriate master system and replicated through to the other platform nightly. Thus, our core asset systems provide the single view of our assets and enable us to manage all our assets efficiently.

Progressing through RIIO-2, we see the efficient management of our assets becoming increasingly challenging due to the changing nature of loading and utilisation of these assets, and the need to manage a large increase in the connection requests to enable decarbonisation of transport and heat. Our GIS platform is a core element of our strategy to maintain a secure and resilient network in the face of huge changes whilst continuing to deliver efficiencies and reduce cost implications for our customers.

Our RIIO-T2 programme includes significant investment in our Building Information Modelling processes and systems. This enables us to build a digital twin of our projects from the early-stage designs right through to construction, commissioning, and operation. Whilst most of our distribution projects are not of a scale to warrant full BIM implementation, we envisage some of elements of the BIM solution will be applicable to our distribution projects and we intend to create a "BIM light" implementation that is tailored for a smaller value but higher volume of distribution capital projects.

Using technology and data to understand the condition of our assets is already in place but the output from this is largely focused on our capital investment programmes to replace or refurbish assets. We anticipate being able to capture more data on our assets through the use of additional sensor or IoT devices connected to our network / assets, or through using mobile data collection such as the use of drones and mobile apps. We will implement solutions that enable us to utilise this information to optimise our asset interventions, prolonging the working life of assets and reducing faults.

Our asset management solution investments fall into the following categories:

- Geographical Information System (GIS) strategy:
    - Geospatial Data Hub
    - Geospatial Data
    - 4D Representation
    - Geospatial Solutions
    - Geospatial Visualisation and Analytics
- Condition-Based Maintenance
- BIM
- SAP Enhancements

The following sections provide more detail on each of these areas.

4.1.2 Projects

4.1.2.1. Geospatial Data Hub

Investment in our core platform including connection to other solutions to centralise locational based information in our GIS. This includes:

- Connections with our SAP PM asset management system
- Aerial LiDAR scans
- Photo and video footage
- Asset condition assessments
- Big Data Platform
- NAVI / INM platform to create a fully connected network representation
- Engineering Net Zero Platform (see Section 5.1)

Current Position	Change Drivers
We have geospatial data in several systems not all linked into our core GIS platform. Our aerial LiDAR point cloud data and associated information and video footage is held in our Virtual World Asset Model (VWAM) solution. We are piloting the use of drones in various parts of our business and the data from the flights is not linked through to the GIS. Similarly, for other data collected from the field, this is not all available in our GIS platform. SAP and ESRI are synchronised through nightly batch jobs, but not all data is exchanged. Our NAVI solution extracts data from ESRI and PowerOn to create a connectivity model, but derived data is not fed back into ESRI. Our ESRI platform is built on a geometric network representation. This will soon be unsupported, and we will need to implement the Utility Network model to maintain our LV connectivity master model.	Our Data Strategy vision is to maximise the value of our data. We will not be able to do this if we don't bring our datasets together and make them available at the point of consumption. Our GIS system will be the master for all our geospatial data, creating a geospatial data hub that enables us to undertake geospatial reporting and analytics. We expect an increased volume of data to become available on our assets and our network, and that this will help us make informed decisions about our operation. Locational information will become increasingly important to our workforce, customers, and wider stakeholders. To understand the impact on the network from the connection of new Distributed Energy Resources (DER), our planned reinforcement activities and the introduction of flexibility related products, we need to have a fully connected network representation. The master connectivity model for our LV network is in ESRI and it needs to be updated to utilise the more modern Utility Network implementation. Our GIS system must remain in full support to ensure appropriate availability and cyber security.

Table 38 **Geospatial Data Hub Current Position and Change Drivers**

Solution

We will migrate our geometric network representation to the more modern ESRI Utility Network, capturing the feedback from the NAVI model back into our GIS. This will enable us to build a robust LV network connectivity model capable of supporting our field workforce and providing the basis for a digital twin of our LV network (see Section 5.1).

We will create integration layers in our core GIS solution, enabling all geospatial data to be linked to ESRI. This will allow us to visualise and perform geospatial analyses on all geospatial data.

For our VWAM data, we will link to the Roames dataset to bring the power of LiDAR into our geospatial data. We will develop and implement a mobile device capture strategy to enable integration of mobile collected data (wearable technology, dash cams, drones, field devices, etc). We will bring our SAP and ESRI datasets closer together through investigating solutions such as the hosting of the ESRI database on the SAP HANA environment and the SAP Geographic Enablement Framework. Additionally, we will utilise our Enterprise Service Bus (SDIF) to ensure alignment of datasets between our various geospatial / network connectivity solutions. This work will be enabled by our data and systems integration initiative.

Our GIS will be integrated with our Big Data platform enabling the capture, reporting and analysis of locational information from the use of drones and other field data capture devices as well as "static" sensors.

Key Outcomes

- Single point of reference for all geospatial data
- Improved workforce efficiency through access to rich dataset of geospatial data at the point of decision
- Improved asset management efficiency through using data to maximise asset operation
- Reduced maintenance and vegetation management operational costs through integrated use of data from multiple sources
- Optimised asset maintenance schedules fully informed by relevant geospatial information
- Master connectivity model for the LV network fully implemented in our GIS platform enabling modelling of network flows (e.g., the ability to identify islanded customers from a field device, the ability to determine impact on the network of new DERs etc) (see Section 5.1)
- Increased network reliability and reduced outages through proactive management of defects
- Improved customer service through geospatially informed decision making
- Improved connections quotation process
- Improved fault restoration process and reduction in Customer Minutes Lost
- Fully informed short- and long-term planning decisions using increased network and asset insights

4.1.2.2. Geospatial Data

This project involves investment in the capture and representation of locational based information into our core GIS solution. This enables activities such as creating a 3D representation of the network, repositioning assets to align with our aerial LiDAR information, the extraction of additional data from our raster layers in GIS (e.g., cable size and type, phases, installation dates, pilot cables, etc.) and the representation of DERs. It includes relationships with other location specific factors such as ground clearance, structure and vegetation proximity, land ownership, land rights and environmental considerations (e.g., biodiversity, natural capital, protected species) (see Section 6.1).

Current Position	Change Drivers
We have data held in several datasets that could be brought into our ESRI platform, either as additional layers or as additional attribution to our existing GIS data.	Having a fully enriched geospatial representation of our assets and their relationship with location is required to ensure that all relevant factors are taken into consideration in decisions. Data underpins SPEN's plans to create a network and processes capable supporting a just transition. We expect the volume of customer interactions and the network loading to change considerably. Having access to relevant information at the appropriate point in our processes will enable us to deliver our RIIO-2 plan efficiently at minimum cost and maximum benefit for our customers and stakeholders.

Table 39 **Geospatial Data Current Position and Change Drivers**

Solution

Our GIS platform has the technical capability to hold a wide range of data, but we need the capacity and structures to allow this to be captured and made available for visualisation and analysis. There is a danger that without the appropriate data structures and technical solutions the GIS platform could become unusable.

We will scale the platform to cope with the volume of data that we envisage being captured. We will create the data structures that enable this data to be held in the system and used at the appropriate points in our processes. We will develop the user interfaces to enable easy retrieval of appropriate data without overly burdening users.

Currently our aerial LiDAR information is held separately from our GIS platform. When integrating these two systems we will discover discrepancies and will need to make informed decisions about how to resolve these. The LiDAR information will provide accurate GPS positions for all our assets and therefore we will reposition our GIS records to align with this. We will develop solutions to enable us to identify potential asset matches between the two systems and highlight locational discrepancies. Where we have a high confidence of record matching and the associated locational adjustments, we will develop automated scripts to update these. We will develop reporting and governance solutions to enable a combination of automated and manual adjustments and capture any resultant changes to the regulated asset volumes arising from this process. Where assets that straddle above / below ground require repositioning, there will be appropriate processes and solutions to capture the associated changes to our underground asset information.

The accurate positioning of assets in our GIS platform is an enabler for several initiatives presented in this Digitalisation Strategy. The Thor pole hammer tester uses GPS to associate its test results with an asset. The ability to present locational context sensitive information to our field teams requires not only that their GPS position is accurately tracked, but also that the position of assets is accurately represented. The use of augmented reality will only work if the asset data being presented is in the right position. Integration with other datasets and systems will also not be possible if the data is not accurate, for example, integration with What3Words has assigned every 3m square location in the world a unique three-word address.

Our aerial LiDAR information provides 3D coordinates for our above ground assets. This 3D data will enable us to build an improved record of our assets (e.g., by correctly capturing the sag on our overhead lines and recognising the impact of differences in altitude between the end of spans) and allow us to properly model vertically aligned assets (e.g., rising mains and laterals and vertically oriented conductors).

We have data held in “raster” layers in our GIS. This represents the paper records that predate our fully vectorised GIS implementation. We believe there may be data in the raster layers that could improve our GIS vectorised data. We will investigate image processing solutions to extract information from our raster layers.

We recognise the importance of maintaining and improving our GIS data. Our approach to data governance will allow for proposed data updates to be quarantined pending approval to ensure the continued high quality of our GIS data.

Our network will see a large increase in the connection of DER, leading to a significant change in the electrical flows particularly on our LV network. To manage this, we need to have visibility of DER and we are undertaking an innovation project to pilot potential solutions for this, and we will extend this into a BAU platform.

As we move towards a more active LV network, it will become increasingly important to understand the flows and constraints on the network and the condition of our assets. We will develop an IoT platform that enables us to capture more information and link this back to our core asset management systems for visualisation and analytics.

For our land and planning (L&P) data, we have created the structures that allow L&P data to be represented in our GIS. We will look to make this more accessible, focusing on:

- our field workforce by providing geospatially context sensitive information relating to land ownership and rights appropriate to their tasks
- our design teams by ensuring they have access to L&P data whilst they are creating designs

We have environmental data held in offline systems and reports. We will move to recording the output from environmental studies by third parties in our GIS, creating the layers required to capture biodiversity, species distribution, natural capital, land use and other environmental metrics into our GIS. We will evaluate the potential to derive environmental data from sources such as satellite imagery and drone video footage using image processing technologies (see Section 4.2.2.1.).

Our GIS platform is our master asset record system for our linear (non-serialised) assets. As such, we need to ensure the integrity of the data in our GIS platform. We currently have comprehensive data quality governance processes to manage the addition and disposal of assets from our GIS platform and any data quality updates that we make. We will support these with enhanced processes to enable managed data updates from the field, utilising our field workforce or other (e.g., drone or LiDAR) data capture techniques (see Sections 4.2 and 4.3). All the data changes and underlying functional enhancements required to facilitate them will go through our governance processes to ensure geospatial data integrity.

Key Outcomes

- Positional accuracy will give us the ability to integrate What3words
- 3D asset representation will improve regulator returns (more accurate representation of the network)
- 3D asset representation enables correct modelling of rising mains and laterals, enabling identification of cut-outs and disconnection points. This reduces fire risk, a health and safety benefit
- 3D asset representation will enable us to correctly model all our vertically oriented assets, enabling them to be managed via our core asset management systems and processes
- Accurate, timeous, verified, and accessible geospatial data about our network, our assets and their environment underpin much of our Digitalisation Strategy

4.1.2.3. 4D Representation

Development of the capability to represent the assets and network over differing time periods, enabling the historical and planned state to be visualised and analysed in addition to the current state. A 4D network representation will become necessary to manage the volume of connection requests we anticipate during RIIO-2. It will enable us to have a "single view of the plan" for our network.

Current Position	Change Drivers
Our GIS system contains a 2D representation of our network. As noted in the Geospatial Data section above, we will move towards a 3D representation including the implementation of a full LV connectivity model using ESRI's Utility Network (see Section 5.1.2.1). In addition to this, we need to capture planned changes to our network to ensure forward visibility of how the network will be as well as its current state.	The volume of change to our network is anticipated to be significant. It will no longer be sufficient for designs to consider only the current network state; they will also need to consider future (committed) network changes. At present, our systems and processes do not enable this.

Table 40 **4D Representation Current Position and Change Drivers**

Solution

We will implement the capability to capture designs directly into our GIS platform. This will include the status of the design (e.g., proposed, accepted, planned, underway) as well as the appropriate dates. This will enable us to scroll forward / backward in time and ensure that our decisions take account of not only the current state of the network but also the planned future states. Having our designs captured in our GIS will also enable us to implement redlining from the field.

This work will feed into our plans to enable "Digital Mission Control" discussed in Section 4.3.2.2.

Key Outcomes

- "Single view of the plan" enables design decisions to take account of future network plans and loading
- Coordination of network activities to optimise use of resources. This will enable optimisation of human resources and materials to be at the appropriate locations in time for work to be undertaken.
- Reduction in CML through optimal coordination of work
- Reduction in costs through coordination of common activities such as street works (and associate reduction in disruption)

4.1.2.4. Geospatial Solutions

Development of solutions to capitalise on our GIS investment and enable us to deliver our Digitalisation Strategy. This includes support for customer self-service quotes (see Section 3.2.2.4.), the recording of designs within the GIS, redlining from the field, integration with BIM solutions, the ability to undertake scenario modelling, support for augmented / virtual reality visualisations, visibility of information from the field and tools to support field workers (see Section 4.3).

We will utilise enhanced data on our network loading to enable more sophisticated calculations to optimise the use of our assets and network. Data about our assets and their surrounding environment can be used to improve our vegetation management processes, and ensure environmental considerations are fully accounted for in our decisions.

Current Position	Change Drivers
Our GIS system is at the heart of our regulatory reporting processes, enabling us to have a single system of record for our regulated asset base. Our GIS system can be utilised by our design teams, but they often refer to LiDAR data or schedule site visits in addition due to known limitations in the GIS data. Designs are normally recorded as annotated PDF drawings. Our customer service portal has no capability for self-service quotations. Our delivery teams return an annotated PDF capturing the "as built" network. This is processed manually by our asset digitisation team by redrawing the network in GIS. Scenario modelling is only undertaken as single, large projects (e.g., as part of our Long-Term Development Statements, Distribution Future Energy Scenarios, or regulatory submissions). We have no capabilities to automatically create augmented / virtual reality representations. A key metric used in the modelling of LV network loading is the after diversity maximum demand (ADMD). Our vegetation management solution is largely based around cyclical inspection, consenting, and cutting. Environmental factors are usually only considered for large one-off projects.	Digitalisation of our processes can present huge opportunities for efficiencies and improvements to the services we provide to our customers and stakeholders. Capturing designs in our system will allow us to understand the future state of the network and fully consider this in our decisions. The ability to redline from the field will remove inefficiencies from our processes and result in fewer manual errors. Providing customers with the capability to self-serve quotations will enable us to respond to the expected increase in connection requests and improve speed to quote. Having a digital twin of our network, both as it is now and as it will be in the future will allow us to model scenarios and take informed decisions that efficiently optimise our outputs. Using well established technologies such as augmented and virtual reality will enable us to better communicate with our internal teams and our external stakeholders. Using improved measures of offtake than the current ADMD approach will allow us to more accurately pinpoint constraints on the network and determine where flexibility can help deliver the transition our customers are requesting. Increased information on the vegetation surrounding our assets will enable more efficient vegetation management decisions to be taken. The priority of the environmental impact of our activities is increasing. We need the data to underpin our decisions. As we transition towards the DSO model, we need our GIS to support the creation of a flexibility market.

Table 41 **Geospatial Solutions Current Position and Change Drivers**

Solution

We will develop solutions to capitalise on our geospatial data. We will:

- Develop support tools for our design teams to enable them to model their designs on top of our GIS data. This will allow planned works, environmental, land and planning and other relevant datasets to be considered during the design phase
- Integrate with field resource scheduling and optimisation (see Section 4.3.2.1.) to maximise productivity
- Enable redlining from the field to update GIS designs to match "as built"
- Support the development of a Self-Service Portal for customers to enable them to create their own budget quotes (see Section 3.2.2.4.)
- Develop augmented / virtual reality platforms to enable visualisation of our network and our plans based on the data in our GIS platform
- Integrate with our Engineering Net Zero Platform (see Section 5.1) to enable accurate forecasting of network loading and scenario modelling to support optioneering on actions to support a just transition
- Develop solutions to support the development of a flexibility market based on the outcome of our scenario modelling. The feed from our GIS platform will be required to enable visualisation of constraint management zones and flexibility contracts
- Develop enhanced vegetation management processes supported by the geospatial datasets we collect. We will use aerial image processing and LiDAR data to model vegetation growth and ensure the focus of our vegetation management activities is on the priority areas

Key Outcomes

- Efficiencies in the design process will lead to increased capacity to deliver against the needs of our customers as they seek to transition to low carbon transport, heating, and industrial energy supply
- Ability to "redline" drawings from the field leading to more efficient and faster digitalisation of "as is" network
- Augmented or virtual reality will improve the experience of our internal teams, customers, and external stakeholders with better visualisation of our network and plans
- More representative modelling of our network will enable optimisation of the use of the assets and informed decisions around the use of flexibility vs reinforcement
- Development of a market for flexibility services
- Improved vegetation management efficiency and reduced outages and health and safety risks through targeted vegetation encroachment interventions

4.1.2.5. Geospatial Visualisation and Analytics

Visualisation of various data layers, such as land and planning data, DER, environmental data, operational data, planned network investments, network constraints and the integration with external datasets (for example, flood risk areas, transport heat maps, land use, etc). Integration with our open data platform (see Section 6.3) to enable bidirectional flow of data into and out of the GIS platform for visualisation and analytical purposes.

Current Position	Change Drivers
Our asset data teams use a combination of digitisation platforms to update and perform analyses on our GIS data. We have several web-based GIS solutions, the main one being Utility Network Viewer (UMV) which is used by both internal and external users to view the GIS data.	SPEN is an active participant in the network companies' collective response to the challenges set within the Energy Data Taskforce's recommendations on a "Strategy for a Modern Digitalised Energy System". One of the 5 key recommendations was the establishment of a National Energy System Map, bringing together all the energy assets for the UK into one place.

Our generation connection capacity heat maps are published externally but limited other geospatial data is published. GIS maps are synchronised to our field devices. We have limited geospatial analytical capabilities.	Our GIS has been developed over the years and now needs to be transitioned over to modern data models and platforms. Understanding of location and the impact this has on our network and our assets will be vital for the continued efficient operation of them. The increasing complexity of the energy system required to deliver Net Zero will be enabled by robust and reliable data and the analysis of this. We need to respond to the "presumed open" energy data call from the EDTF.

Table 42 **Geospatial Visualisation and Analytics Current Position and Change Drivers**

Solution

- Develop and publish additional heat maps to show key data such as fault incidences and load connection capacity
- Develop solutions to calculate, visualise and publish carbon intensity maps
- Develop a dashboard to allow interactive visualisation of our Distribution Future Energy Scenarios
- Create visualisations to integrate with our Engineering Net Zero platform and publish our flexibility requirements
- Create the mechanisms to share our GIS data externally and enable external geospatial data to be integrated into our platform

Key Outcomes

- Facilitates open data exchange of geospatial data
- Provides platforms to visualise, interact with and interface to geospatial datasets for internal and external use

4.1.2.6. BIM For 132kV SPM Projects

Building Information Modelling (BIM) can be defined as "the process of designing, constructing and/or operating a building or infrastructure asset using electronic object-orientated information". BIM is not a technology or 3D software package to make drawing production easier. BIM is an integrated process promoting and improving collaboration, information management and quality assurance throughout the whole life cycle of a built asset. BIM will be the single source of truth where all relevant and accurate information for all project stages can be obtained.

BIM is a project execution method which is largely concerned with both the work process and the information flow. It is used by individuals and businesses who plan, design, construct, operate and maintain buildings and physical infrastructure, such as electricity, water, gas and communications utilities, roads, railways, bridges, ports, and tunnels.

BIM is a process supported by various tools, technologies and contracts involving the production and control of digital representations of physical and functional characteristics of places (in this application, these will be substations and circuit routes). Building information models are computer files which create and manage information digitally across a construction project's life cycle.

In SPEN, there are two key types of projects that are part of this BIM project. The first are the large capital projects which require full BIM implementation. This includes the implementation of full BIM (at Level 2) methodology for 132 kV in SP Manweb (SPM). SPM is currently somewhere between BIM Level 0 and Level 1. Civil & Structural and Protection & Control departments have both used BIM enabling tools in several projects at 132 kV substation projects, leading to the realisation of benefits. This initiative aims to fully roll out BIM in SPM. As part of this, BIM will need to be integrated with GIS and SAP so that a holistic view of the network is enabled which also shows planned designs and planned changes. Secondly, considering the benefits of BIM, a scaled down "BIM Light" project will be implemented to roll out BIM for smaller capital projects to support the increased volume connection requests expected and the need for these to be well managed and coordinated. This will include some of the integration and collaboration aspects of BIM.

BIM is also an initiative in SP Transmission (SPT), where BIM at Level 2 is currently being implemented. The work for SPT will be adapted as appropriate for use in our distribution business. There will be mutual benefit to all our licences by creating a single platform based on BIM for our design processes, in addition to a benefit to our customers.

The purpose of the BIM initiative is the implementation of a transformative enabling process for the design and delivery of large projects. This new process will facilitate benefits to the customer through cost and time efficiencies of project delivery with additional benefits in management of health, safety, quality, environment, and sustainability through the project lifecycle, also shown in the following figure:

Figure 63 **Business benefits of BIM**

Current Position	Change Drivers
As part of business case development, the BIM Charter Group identified that SP Manweb (SPM) is currently somewhere between BIM Level 0 and Level 1. Civil & Structural and Protection & Control departments have both used BIM enabling tools in several projects at 132 kV substation projects.	Enabling efficiencies and cost reductions within the Ofgem frameworks. Futureproofing the business to ensure we are able to meet future market challenges Better asset management and whole-life cycle assessment: improve operations and maintenance management by having more reliable and complete data sets from constructed asset and being able to better assess the asset overall costs. BIM implementation will support our transition towards sustainable development by design

Table 43 BIM for 132kv SPM Projects Current Position and Change Drivers

Solution

Rollout of BIM at Level 2 across 132 kV in SPM. BIM will be integrated with GIS, ESRI and SAP to show the current state of the network but also planned designs. It will also integrate with Microsoft Project Enterprise and other business critical systems. This will rely on our data and systems integration initiative.

This initiative is also related to the BIM initiative for our transmission license as outlined in our RIIO-T2 submission. It will build on the experiences we gain implementing BIM for SPT (currently implementing Phase 1 of BIM implementation), applying a BIM methodology to three pilot transmission substation projects. SPT's RIIO-T2 submission proposed the delivery of phase 2, learning lessons from the pilot projects followed by roll out of the BIM methodology to all SPT substation and circuit projects. The scope will include the introduction of new processes and procedures for design and delivery of projects. These processes and procedures will improve collaboration between teams, facilitate earlier decision making and will speed up construction of assets – saving costs and providing new assets and infrastructure onto the SPT transmission system more quickly.

BIM methodology will be central to the design and delivery of SPEN large capital projects. As such, successful delivery of the initiative will be interdependent on all aspects of SPEN business, from BAU systems to technical and financial governance process for the capital programme.

BIM will support component level granularity of cost and environmental data – and will be dependent on departments currently managing this data. The project is dependent on the procurement of hardware and software, training of personnel and support from external designers and equipment suppliers.

Key Outcomes

- The introduction of construction industry benchmark software applications into the business
- Improved project "design and build" team collaboration and workflow efficiency
- Reduced administration and co-ordination of tasks through workflows driving completion of tasks
- Greater clarity on project supply and installation costs which can then be used to improve cost estimating and forecasting
- Build towards our Net Zero carbon ambition
- Reduction in future operation and maintenance costs through accurate capture of as-built information for sites and assets

4.1.2.7. 'BIM Light' for Smaller Distribution Projects

The processes described above for larger projects are not directly applicable to smaller projects (for example, our drawing office function would not be involved in a smaller project). There are however useful principles, particularly related with the coordination of design information between teams. In combination with the use of the GIS system to capture designs, elements of the BIM solution can also drive benefits for smaller projects. This initiative is to define a cut down "BIM Light" implementation applicable to smaller distribution projects and embed this into the business.

Current Position	Change Drivers
There is currently no consideration of any aspects of BIM for smaller distribution projects.	Rising volumes of connection requests and other updates to LV network are expected. BIM can introduce automation and greater efficiency in our delivery on this demand increase With greater delivery efficiency and automation, BIM will enable us to avoid unsustainable cost increases. BIM implementation in SPT and SPM (above 132kV) will provide lessons in areas including design digital twins, approaches for information sharing and collaboration, and cyber-security provisions. Applying these lessons at lower voltage levels to high volume, smaller projects will scale the benefit to us and our customers.

Table 44 **'BIM Light' for Small Distribution Projects Current Position and Change Drivers**

Solution

Elements of the BIM methodology will be adapted and scaled for use on smaller projects. In combination with the use of the GIS to capture design information (see Section 4.1.2.4) this will enable the sharing of design related data between appropriate parties.

The project will create a single shared design repository and make this securely available to the relevant internal and external parties. It will integrate with other relevant datasets (see Section 4.1.2.2) including environmental and land and planning information, enabling these to be considered through the project lifecycle.

Key Outcomes

- Improved design coordination between disciplines and reduction in design costs
- Avoided cost increase to customers with automation and standardisation in design process
- Ability to take fully informed design decisions early on in project lifecycles
- Early identification of conflicts avoiding potential costly remediation or mitigation
- Reduction in project variation

4.1.2.8. Asset Risk Based Decisioning

This project focuses on switching from cyclical maintenance to condition-based maintenance to extend the working life of assets, and to reduce both outage penalties and premature asset replacement costs. This will be delivered through the capture of additional data from sensors and IoT devices on the network and field devices, and the use of digital twins to understand asset condition. It also covers using predictive asset analytics to forecast asset interventions.

Current Position	Change Drivers
SPEN largely follows a time-based approach to asset maintenance, with intervention carried out in response to asset health degradation highlighted during cyclical inspections and monitoring activities. The output of our cyclical inspections is used in our Condition Based Risk Management (CBRM) system. When an asset is installed, asset management policy will dictate set times by which the asset must be inspected and maintained. This approach is inefficient and does not consider the full range of factors that can affect asset condition. SPEN follows the Common Network Asset Indices Methodology (CNAIM) agreed between DNOs as to how to measure the risk of an asset. Risk is calculated as a multiplication of Health Index and Asset Criticality scores. Health Index is measured on a scale of 1-5, based on factors such as location, proximity to sea, condition, and measurement factors. Asset Criticality is measured on a scale of c1 – c4. The criticality of an asset will not change unless its geographical location changes. It is based on factors including asset environment e.g., if it is in a built-up area, number of customers located in the vicinity of the asset and local network performance. Asset criticality is measured in GBP, based on the replacement cost. These two elements are combined on a matrix to provide a quantitative method of maintenance	The key drivers for change are to extend asset lifetimes and proactively monitor and resolve issues on the network before they escalate into faults. Condition-based maintenance by the utilisation of sensor data will save cost by avoiding unnecessary or early asset replacements. The additional benefit is the reduced occurrence of unplanned outages and the provision of a more reliable service to our customers and stakeholders. Our cyclical inspection and maintenance approach is not suited for the expected increase in stress and loading on our assets. We are currently only able to determine the health of the asset based on a point-in-time inspection. Proactively monitoring the network through a range of sensors and other IoT devices will give us a more holistic view of the health of assets on the network, enabling data-driven decision making. The ability to incorporate the impact of equipment failure into decisions about the operation, maintenance and replacement of assets will enable us to reduce outage occurrences.

optimisation based on the result of the combined risk score. Currently, we do not use CBRM to manage maintenance cycles, but rather to understand our risk base, allowing us to build investment plans and track outputs based on our plans and investments. Our SAP system initiates maintenance work orders based on asset management policy which will have been determined at point of installation.	

Table 45 Condition Based Maintenance Current Position and Change Drivers

Solution

Shifting from Condition Based Risk Management (CBRM), and subsequent asset maintenance activities, to Condition Based Monitoring (CBM), with proactive maintenance of assets will allow for optimisation of our asset management activities.

A greater level of data capture and processing will allow us to understand the network assets in detail, and therefore facilitate data-driven decision making. This will be facilitated by:

- processing data from the 14,000 new sensors due to be installed on our network
- capturing the output in our Big Data platform from increased data captured from the field (see Section 4.3 Connected Worker) and from the increased instrumentation in modern equipment
- Implementing prediction intelligence solutions including machine learning to develop models of asset operation, likely failure conditions and network consequences enabling optimised decisions to be taken

The utilisation of drones flying LiDAR and multi-spectral cameras and having field workers on-site with mounted cameras and thermal imaging devices, will provide a more accurate understanding of the SPEN asset risk profile. The data from these devices can be used to instigate maintenance intervention at certain thresholds e.g., the temperature of an overhead line. This solution can link with our field work management solution on a risk-based basis as well as utilising the output from modelling conducted as part of our Asset Analytics projects (see Section 4.2.2.1).

At present, only some assets are monitored through the current CBRM system, however going forwards more assets such as batteries and civil assets will all be inspected and proactively monitored due to the impact these could have on the network.

Additionally, using this information together with understanding the impact of failure will allow us to prioritise equipment replacement to minimise the impact of outages.

Key Outcomes

- Cost savings from extended asset lifecycle, increased upgrades and refurbishments with fewer asset replacements and deferral of network investment spend
- Better service provision to customers with reduction in unplanned outages (Reduce faults on the network due to actively managing any maintenance issues that appear before they have an impact on the customer)
- Reduced penalties for customer interruptions and minutes lost due to fewer unplanned outages
- More holistic view of condition of assets on the network, aiding medium to long term planning of investment and optimised use of resources such as spares and field resources (including staff, vans, backup generators, etc)
- Easier risk-based prioritisation and scheduling of field work
- Greater efficiency of inspection and maintenance with less manual assessment and primary utilisation of sensors and other IoT devices for monitoring assets
- More sustainable use of materials from reduced unnecessary asset replacement

4.1.2.9. *SAP Efficiency Enhancements*

Investment in our core platform SAP to introduce efficiency, reduction in manual re-entry of information and enhancements to user interfaces to simplify processes. The enhancements cover a broad spectrum of processes including income management, contractor management, maintenance planning, operational delivery, and project management.

Current Position	Change Drivers
Our core financial and project management system SAP is aligned with several global models such as purchasing, logistics, administration, and financial control. This can make navigation through the system complex for our staff. There are some areas of the system which are not fully integrated, therefore some duplication of effort in data entry occurs. There are other scenarios where users have identified areas for efficiency in managing costs, dealing with sub-contractors and project closures.	To maximise the efficiency and productivity of our back-office and field staff, our core system SAP requires enhancements across a few key areas. Reducing manual effort and simplifying our internal processes and project management is critical to deal with increasing volumes of work. The current manual workarounds in use are not scalable to significantly greater activity.

Table 46 **SAP Efficiency Enhancements Current Position and Change Drivers**

Solution

Enhancing our core platform SAP will allow efficiencies to be implemented across key processes. By assessing our process bottlenecks using process mining techniques and understanding from staff where process inefficiencies are impacting timely and high-quality delivery of work, we will be able to focus on the most critical areas for improvement. We are already engaging with other organisations, in understanding how we can best demonstrate and analyse the bottlenecks in our critical processes.

There are also opportunities to introduce robotic process automation (“RPA”) across some of these key areas to mitigate duplication of effort and minimise manual processes and data entry.

Required upgrades which have been identified so far include:

- Enabling direct creation of follow-up work orders in SAP when a field worker is carrying out a site inspection or there for other work
- Eliminating repetitive entry of operational delivery dates by allowing multiple dates to be captured for each work order
- Enhanced visibility of project costs and early warning indicators to allow proactive decision making
- Additional functionality within our contractor portal to allow project managers to manage disputes, payments, and variations more efficiently
- Automation in project closure process with the system evaluating costs against set criteria and closing compliant projects – subject to internal financial approvals

Where appropriate, we will investigate options to use our Robotic Process Automation (RPA) platform to reduce manual processes. RPA will primarily be a tactical solution, enabling quick wins whilst longer term strategic solutions are developed. This will ensure that we don’t create a legacy of complex RPA implementations that could be difficult to unpick at a later stage.

Key Outcomes

- Enabling creation of reactive work from site will cut down on multiple visits, improving worker productivity and improving sustainability of field work with reduced travel
- Reduction in re-entry of key data into SAP – this will increase data accuracy and improve productivity

- Introduction of early warning indicators for project finance will allow project managers to be more proactive and data-driven in decision making
- Enhancements in our contractor portal will improve collaboration and transactions with sub-contractors
- Streamlining our income process across all business areas will increase project management efficiency
- Automation in project closure will reduce manual effort by project managers in interrogating costs and income against work completed prior to closure.

4.1.3 Persona Spotlights

CONSTRUCTION/DESIGN ENGINEER

Digital Engagement

low high

What is the benefit for me?

Able to visualise design using the BIM solution

How will I feel the impact of digitalisation?

- Access to all relevant data required for project designs
- Single shared repository of designs enabling collaborative development
- Consistent and auditable processes and procedures
- 4D network allows engineers to take into consideration future network plans and loading
- Increased capacity to deliver customer needs

FIELD TEAMS

Digital Engagement

What is the benefit for me?

Easy interaction with asset data and systems, and more efficient scheduling

How will I feel the impact of digitalisation?

- Ability to access to all relevant information for the task at hand
- Ability to easily capture data in the field and feed this back into core systems – single point of reference for all geospatial data
- Improved efficiency e.g. through the ability to redline in the field to digitise the 'as is' network efficiently

HEAD OF DATA

Digital Engagement

low high

What is the benefit for me?

Ability to access a single view of asset data

How will I feel the impact of digitalisation?

- Ability to access asset data that is consistently captured and represented in the core asset management systems
- Data quality improvements are efficiently and effectively implemented
- Open data enables bidirectional sharing of data

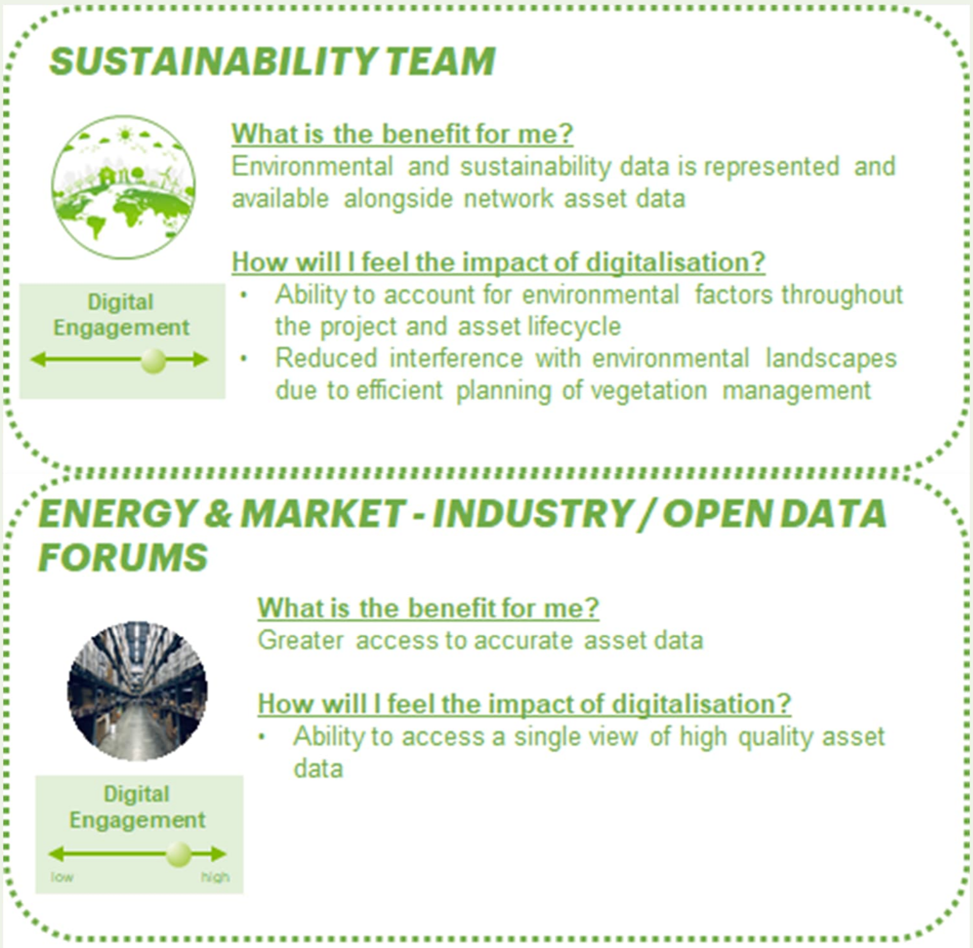


Figure 64 **Asset Management & Network Management Persona Spotlights**

4.1.4 Delivery Approach and Timeline

Approach	Initiatives
Agile + Waterfall	All projects

Table 47 **Asset Management Solutions Approach and Initiatives**

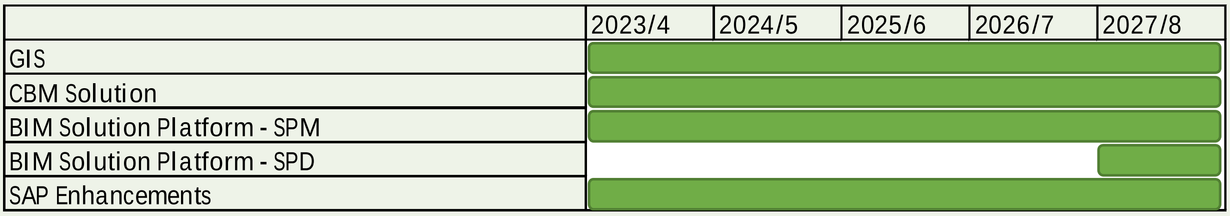


Figure 65 **Asset Management Solutions Delivery Timeline**

4.1.5 Resources

Resource Type	Purpose
Scrum Squad	Responsible for delivering project scope (see scrum squad profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers (non-agile)	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages deliverables, timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Change Manager	Prosci accredited PM to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts	Platform integration
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to end-users
Communications Manager	Internal and external communication of change
Data Experts	Ensure alignment of initiative with Data Strategy
GIS Specialists	Required to drive GIS specific solutions and deliver GIS benefits to the business
Geospatial Data Specialists	Required to ensure geospatial data is appropriately represented in the GIS platform (e.g., 3D modelling, incorporation of environmental, land and planning layers)
Asset Data Stewardship Team	Asset Data team will continue to maintain the master data sets for assets and networks ensuring the collection and quality assurance of data, as well as the underlying connectivity model.
Asset Risk Modelling Experts	Drive the development of asset risk models to be used for asset risk based decisioning
Network Designers	Define requirements for an integrated electronic design platform

Table 48 **Asset Management Solutions Resource Types and Purpose**

4.1.6 Functional Model

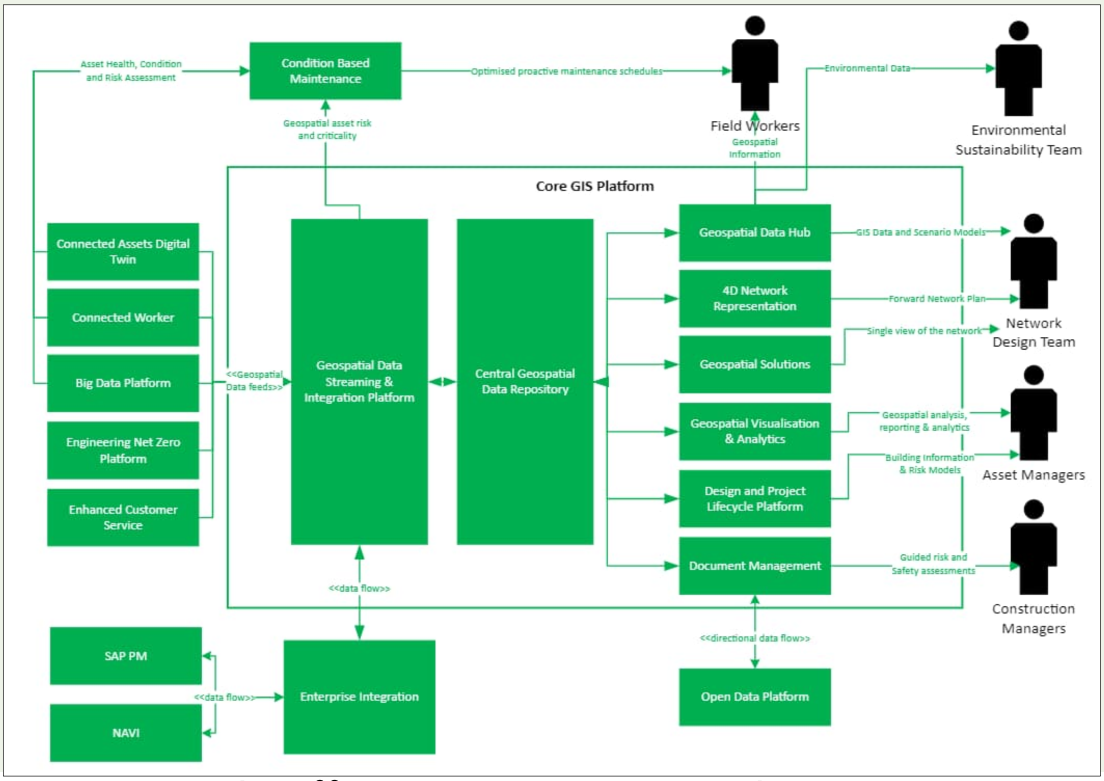
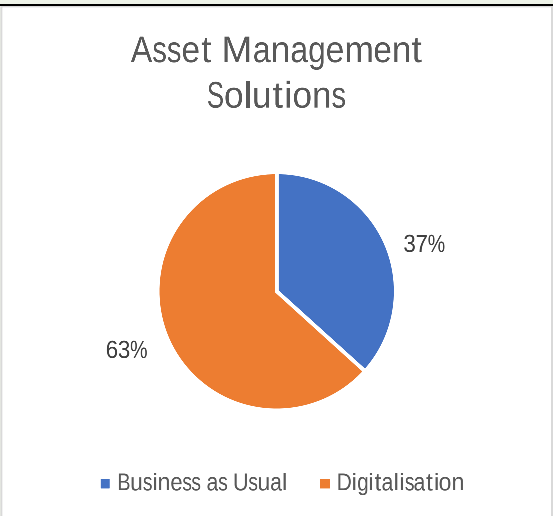


Figure 66 **Future Asset Management Solution Map**

4.1.7 Costs

<table>
<tr>
<td rowspan="2">
</td>
<td>BAU Rationale:

Our GIS platform provides the basis for our linear asset records. We have point-to-point integrations with our SAP PM asset management platform, our BW/BO reporting platform and our CBRM asset risk management platform. Our BAU spend represents the evolution and maintenance of our existing solution.</td>
</tr>
<tr>
<td>Digitalisation Rationale:

In our digitalisation vision, our GIS platform is central to the management and optimisation of our geospatially related activities. We believe that investing heavily in our GIS platform is the only way we can fully digitalise our business and therefore a high proportion of our GIS investment has been allocated to digitalisation.</td>
</tr>
</table>

4.1.8 Performance Metrics

Project	Measures of Success
Geospatial Data Hub	• Single source of reference for all geospatial data • Full network connectivity model
Geospatial Data	• GIS recognised as the authoritative source for all geospatial data • 3D asset representation
4D Representation	• Ability to capture time slices of the network both historically and forecasted
Geospatial Solutions	• GIS design tool available for internal usage • Redlining from the field implemented • Enhanced vegetation management solutions based on growth forecasts and modelling
Geospatial Visualisation and Analytics	• AR/VR platform supported • Platform for open bi-directional exchange of data
Condition-Based Maintenance	• % of network being actively monitored by sensors and IoT • % reduction in cyclical inspection and maintenance activities • % reduction in customer interruptions and customer minutes lost • Reduction in costs associated with asset maintenance and replacement • Reduction in asset faults
BIM	• Full BIM level 2 compliance for SPM 132kV projects
SAP Enhancements	• Efficient processes to interact with SAP

Table 49 **Asset Management Solutions Projects and Measures of Success**

4.1.9 Assumptions and Dependencies

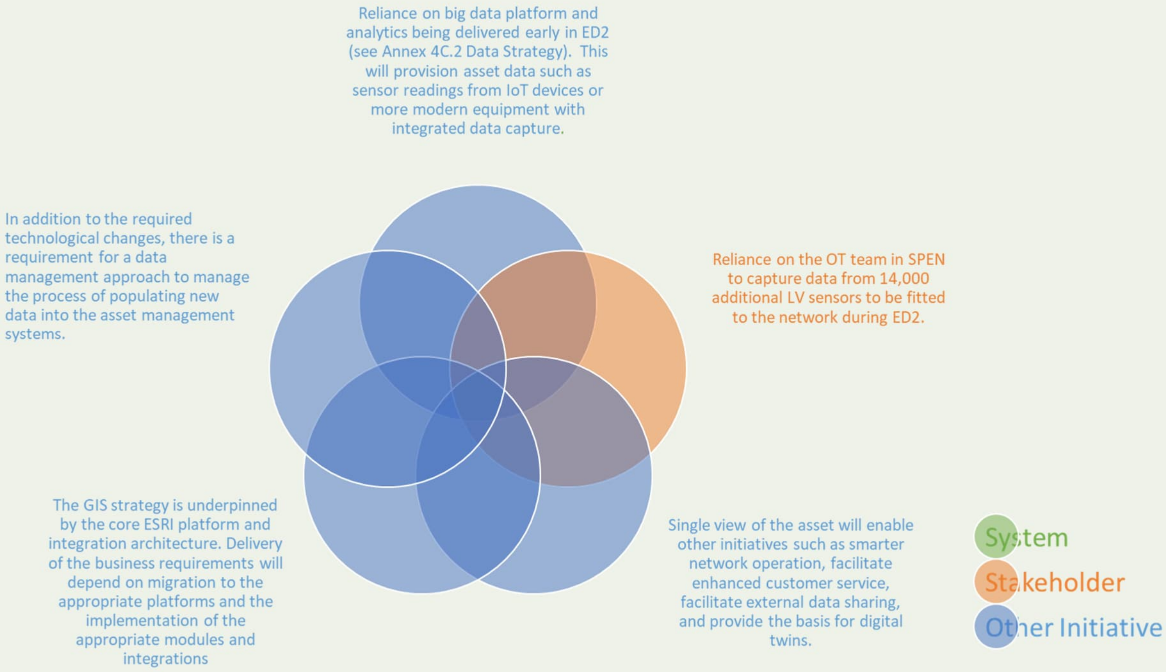


Figure 67 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Asset Management Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Assumptions have been made around the design platform based on our current use of the AutoDesk product set and extending this to facilitate BIM compliant processes. A pilot exercise is currently being undertaken to determine the best approach to the delivery of the BIM requirements noted above. This will be used to inform a procurement activity to ensure the best solution is selected for our requirements.
Existing support provisions will be extended to cover the BIM platform

Table 50 **Asset Management Solutions Assumptions**

4.1.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Risk of higher costs than estimated due to assumptions made around the design platform based on our current use of the AutoDesk product set and extending this to facilitate BIM compliant processes.	A pilot exercise is currently being undertaken to determine the best approach to the delivery of the BIM requirements. This focuses on prioritisation of initiatives to deliver value. This will be used to inform a procurement activity to ensure the best solution is selected for our requirements.	Low	Medium

2	The initiative is complex and has multiple interdependencies. It will require careful planning and management to drive successful delivery.	Ensure dependencies are understood and accommodated into roadmaps and plans	High	High

Table 51 Asset Management Solutions Risks, Mitigations, and their Impact

4.2 Connected Assets

4.2.1 Overview

The projects under the connected assets initiative aim to improve the data records by having enhanced datasets and a 'single view' of our assets; this will enable us to make informed decisions on our assets. Ultimately, we will be able to optimise our work programme to maximise the use of resources and minimise disruption, providing a stable, secure supply that is value for money for our customers.

The single view of the asset will require rich data describing its characteristics, location and environmental factors, operation, electrical connectivity, health, inspection and maintenance routines, operational restrictions, defects, planned interventions and history. Subsequently, this will support field workers to work more efficiently by providing more in-depth knowledge of assets on the network and more effective methods of analysing condition and maintenance requirements. It will enable us to understand the asset's relationship to its physical location and its role in supporting current and predicted loading on the network. We will be able to plan work across our network more efficiently and have clear visibility of the impact of our interventions. We will also understand the relationship our assets have with their physical location including the following: land ownership, environmental considerations, and vegetation.

4.2.2 Projects

4.2.2.1. Asset Analytics

This project covers the adoption of new technologies to capture information on the network. Data captured will contribute to a digital twin containing detailed information on assets and associated risks. This will allow predictive modelling and analysis to be conducted to contribute towards mitigating risks on the network, extending the useful life of network assets.

Current Position	Change Drivers
Currently, LiDAR scanning is undertaken every 3 years to maintain a 4D digital model of the network. This is primarily to ensure assets are mapped correctly, to aid with the identification of defects such as line sag or pole lean, and to allow efficient planning for vegetation management. Currently the process of assessing asset health is predominantly manual, whether done visually in-person or via pilot-flown drone (most commonly post-storm). At present, all drone footage is captured on an ad-hoc basis, predominantly after storms or when faults have occurred on a line. This has replaced the previous method of walking the line and visually checking for faults. This, while being an effective method of capturing the data, is	Utilising LiDAR on a 3-year cycle is sufficient for a triennial audit of asset location, pole lean and line sag, however, does not fully meet the needs for RIIO-2. We are planning to dramatically increase the use of technology to assess asset condition to allow informed decisions to be made with a goal of extending asset life to its fullest safe period through monitoring and upgrading based on data, therefore reducing the frequency at which customers are off supply. Furthermore, a higher percentage of work done to assets will be planned rather than reactive (typically due to an asset failure) and therefore customers will have time to prepare for being off supply. By using drones and satellite[1] as an alternative to walking the line and potentially automating the process, an increased amount of footage can be captured on a regular

[1] We are currently running a satellite vegetation management proof of concept (PoC)

still a manual and time-consuming task and not yet considered a BAU activity.	basis. This will save time and resource, allowing faults to be dealt with more quickly. Having an automated route will also be more accurate in terms of data gathering and will allow for accurate time-series analysis to be conducted (e.g., for asset health or vegetation management).

Table 52 Asset Analytics Current Position and Change Drivers

Solution

Using a combination of LiDAR, Thermal Imaging, Video Recordings and Sensor data attached to drones or assets, we aim to be able to considerably improve the management of our assets. LiDAR will build a 4D digital twin of the network, which is updated on an ongoing cycle taking 3 years to cover the entire network. In addition to this 3-year cycle, drone cameras that use LiDAR can be used to measure precise distances and contribute towards the model. This information can be combined with data from body, van, and helmet-mounted cameras outlined in Section 4.3.2.4 under Connected Worker. The footage can also then be overlaid with thermal imaging and/or video footage and will feed into asset risk based decisioning. This will provide a level of detail that has not previously been possible to achieve, allowing us to conduct detailed analysis and create a predictive model based on a wide number of factors.

Following a successful trial using drones to identify fault causes, implementing this as a BAU solution will save time and money, as well as reducing the amount of time it takes to rectify faults on the network. In addition to this, the footage can be used for training purposes, and to continue to build twins for further analysis.

Autonomous drones will have set circuits that can be pre-programmed; this means that the pilot can set the drone to fly a circuit and rely on the images captured being consistent with previous flights. This removes the risk of manual error and allows the engineer to focus on tasks that require hands-on work.

Findings will include asset defects, general wear, imminent vegetation management requirements, or other external factors which may have an impact on the asset. In addition, the use of these technologies will identify key environmental/biodiversity impacts such as assets being situated near waterways or habitats, or in areas with a high risk of damage due to e.g., flooding or land slide.

A proof of concept is also currently being run to use satellite imagery for vegetation management. This will have the ability to compliment LiDAR and Drone data to view and analyse encroachment areas on a more regular basis. Less chance of outage

Data captured will be formatted in line with CIM to ensure that all the various datasets can be linked with our assets across multiple systems in a structured format.

Key Outcomes

- The business increases value derived from data by analysing the same data (e.g., video footage) in a multitude of ways
- Field workers will have greater visibility of assets
- The environmental team will gain greater understanding of biodiversity risks
- The environmental team will glean more insight into habitats and environmental risks on our network
- Better understanding of asset health therefore allowing data-driven decisions to be made leading to less time off supply for customers, due to proactive maintenance of assets. This will result in cost savings due to reduction in CI/CML penalties.
- Cost savings related to network upgrades – we will use data to drive when we need to replace/upgrade assets rather than using a cyclical method which potentially replaces assets too soon
- Wider base of information to create a predictive model to prevent faults occurring on the network by combining multiple sources and types of data will create a much more accurate and robust model
- Analysts will have more consistent footage to work with, which will be more reliable for time-series analysis
- Saves significant amount of time compared to foot patrol

- Fewer field staff resource required to analyse the lines, which means flights can take place more frequently to increase the data sample for analysis. This allows field staff to be freed up to do more value-add activities.
- May not require a drone pilot in the future (if automated drones are used)

4.2.2.2. Asset Location Tagging

This project covers the location tagging and tracking of SPEN assets both prior to and post installation. This will enable easier identification and management of assets in stores, the ability to track assets stored in vans and will allow engineers to identify large sites/assets.

Current Position	Change Drivers
Our current source of data, although held in our core systems GIS and SAP, is a manual process to access and retrieve the required information. This can be in various locations, for example if the user wants to find out about the inspection, the maintenance, any operational restrictions, and asbestos information.	There is no quick and easy, efficient, process of accessing data related to plant and equipment assets across our network, especially when in the field. This is critical for operational safety of our staff and to ensure we are targeting the correct assets for inspection, maintenance, upgrades, and replacement.

Table 53 Asset Location Tagging Current Position and Change Drivers

Solution

Geotagging is the process of adding geographical identification metadata to various media such as a geotagged photograph or video, websites, SMS messages, QR Codes or RSS feeds and is a form of geospatial metadata. It can also be used for physical equipment, and it is this that we will use for our assets such as substations, poles, LV pillars, link boxes and the like. The data usually consists of latitude and longitude coordinates, though they can also include altitude, bearing, distance, accuracy data, and place names, and even time stamp.

Use of GPS location on mobile devices on site will automatically detect nearby assets (similar to RingGo parking app) and provide the relevant information on the assets for field staff. This will also act as secondary check that staff are at the correct asset and automatically provide relevant information on their mobile device when they arrive e.g., date/details of last inspection, maintenance carried out, equipment, any operational restrictions etc.

An alternative to Geotagging is physically tagging assets using RFID code, QR code etc. The asset data is then provided to the field staff by scanning a code with the field device. Tagging all of our existing assets is a monumental task and therefore our current preferred option is Geotagging for existing assets, and RFID/QR code for new assets. This will apply for the likes of assets that are in stores/vans prior to being installed. This will allow the current storage location of the asset to be visible via an asset management application, and nearby engineers will know exactly where their required asset is and can therefore optimise their trips to stores to pick up stock.

Key Outcomes

- Increased efficiency in data access and use
- Increased efficiency for data capture
- Real-time access to asset information
- Real-time data updates to optimise processes
- Allows for proactive asset management
- Improve accuracy of data

4.2.2.3. Comprehensive Asset Records

This project focusses on the need to ensure that we have up-to-date asset records which reflect the true state of the network, both in terms of assets as well as how power is being used. Incorporating detail such as land topography, weather data, power flows and any environmental factors will be extremely beneficial in building an informative model.

Current Position	Change Drivers
Currently we do not have visibility of all assets that sit on our network. This creates a barrier to analysing where and how energy is being consumed or produced. For example, EV chargers, PV on homes. In addition, we also currently have a limited view of power flows on the low voltage network. There are projects ongoing using disruptive technologies such as 'iDentify', a proof of concept to test how crowd sourcing 'unknown' information will be beneficial in identifying asset types. Additionally, it is very difficult to find a 'single view of the asset' as we capture asset data in several forms and hold this across a range of platforms depending on the type of data. These include: - CBA/Statutory inspections - Aerial LiDAR - Site photos via FWMS - Field Capture Solutions - Information on EV Charge points - Information on PV installations	As a DNO/DSO, we need to have a clear understanding of what assets are connected to, and how power flows through our network. Traditionally, we have had very low visibility of this, particularly for the low voltage network, and this has limited the ability to understand where constraints are likely to appear. It is crucial that we understand the network flows to be able to actively monitor the demand on the network to remain balanced. To transition to a DSO, this will be vital. Secondly, we require a single view of information on an asset to be able to streamline processes and make data-driven decisions easier to make.

Table 54 Comprehensive Asset Records Current Position and Change Drivers

Solution

This solution involves two key elements. Firstly, implementing a solution that allows data about the assets connected to our network to be captured. By monitoring or modelling energy consumption we can gain an understanding of the power flows on our network. As the connection of DER (e.g., Electric Vehicles and Solar Panels) increases, it is important that we capture the details of these assets and monitor their impact on power flows so that we can maintain a secure network through appropriate targeted interventions or the creation of additional support services.

Secondly, with asset data points, we aim to capture holistic asset data to form an accurate picture of the asset condition; this will encompass incorporating asset location data, data from manufacturers and environmental information (refer to Sustainable Operations initiative in Section 6.1) with the following data points from drones:

- LiDAR scans (refer to Section 4.2.2.1)
- Thermal Imaging
- Video Footage (Section 4.3.2.4)
- AI Recognition

Holistic asset data must be easily accessible to all and structured in a way that enables data-driven decisions to be made. As previously mentioned, this data will be formatted in line with CIM to ensure that the datasets can be indexed and combined for analysis.

In addition to our internally stored data, to create a full holistic model we must also consider datasets such as:

- Land use – Topography and coastal
- Satellite images
- Weather data

These will allow us to conduct analysis and make informed decisions which consider a number of internal and external factors.

Key Outcomes

- DSO Manager has greater visibility of assets connected to the network and is able to analyse and mitigate risk of potential constraints on the network
- DSO Manager able to engage in flexible market and able to analyse load flows via sensor data to understand peaks and troughs in consumption/production to ensure that the network is robust enough to support this
- Customers have more robust connections and ability to be 'prosumers' on the network
- Flexible service providers can engage with SPEN
- EV ChargePoint operators can ensure that there is the capacity on the network to meet their needs
- Cost saving from utilising assets for their full lifecycle rather than premature replacement; cost savings from focusing on maintenance to avoid faults occurring rather than having to replace equipment because of faults causing further damage
- Greater engagement with the data due to the multiple combined sources available, therefore making it more likely that anomalies/discrepancies will be identified in advance of customers being impacted
- Opens opportunities for extensive predictive analytics. This may identify some previously unattainable correlations
- Greater understanding of environmental impact due to the ability to combine datasets
- Clearer understanding of asset loading vs. rating and how this contributes to asset health status

4.2.3 Persona Spotlights

DOMESTIC CUSTOMER

What is the benefit for me?

Reduction in customer interruptions and customer minutes lost

How will I feel the impact of digitalisation?

- Real-time sensors allow less unscheduled time off supply due to maintenance schedule's increased relevance to asset health and assets not being replaced prematurely

COMMERCIAL CUSTOMER

What is the benefit for me?

Reduction in customer interruptions and customer minutes lost; better access to accurate view of flexibility options/constraints

How will I feel the impact of digitalisation?

- Truer visibility of flexibility options/constraints in the area through up-to-date comprehensive asset data records
- Real-time sensors allow less unscheduled time off supply due to maintenance schedule's increased relevance to asset health and assets not being replaced prematurely

Figure 68 Connected Assets Persona Spotlights

4.2.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Asset Analytics, Asset Location Tagging
Agile + Waterfall	Comprehensive Asset Records

Table 55 Connected Assets Approach and Initiatives

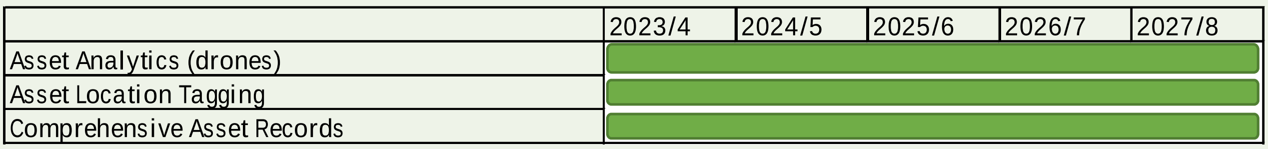


Figure 69 Connected Assets Timeline

4.2.5 Resources

Resource Type	Purpose
Scrum Squad	Responsible for delivering project scope (see scrum squad profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Change Manager	Prosci accredited change practitioner to manage business change
Project Manager	Manages timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysis/Architects	Required for image analytics
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Software	Supports the needs of each project: Roames for LiDAR, analysis of thermal data capture, visual analytics of images captured via photo/video
Trainers	Build and deliver training to stakeholders
API	Platform Integration
Data Experts	Assist with creation, integration, and analysis of data systems

Table 56 Connected Assets Resource Types and Purpose

4.2.6 Functional Model

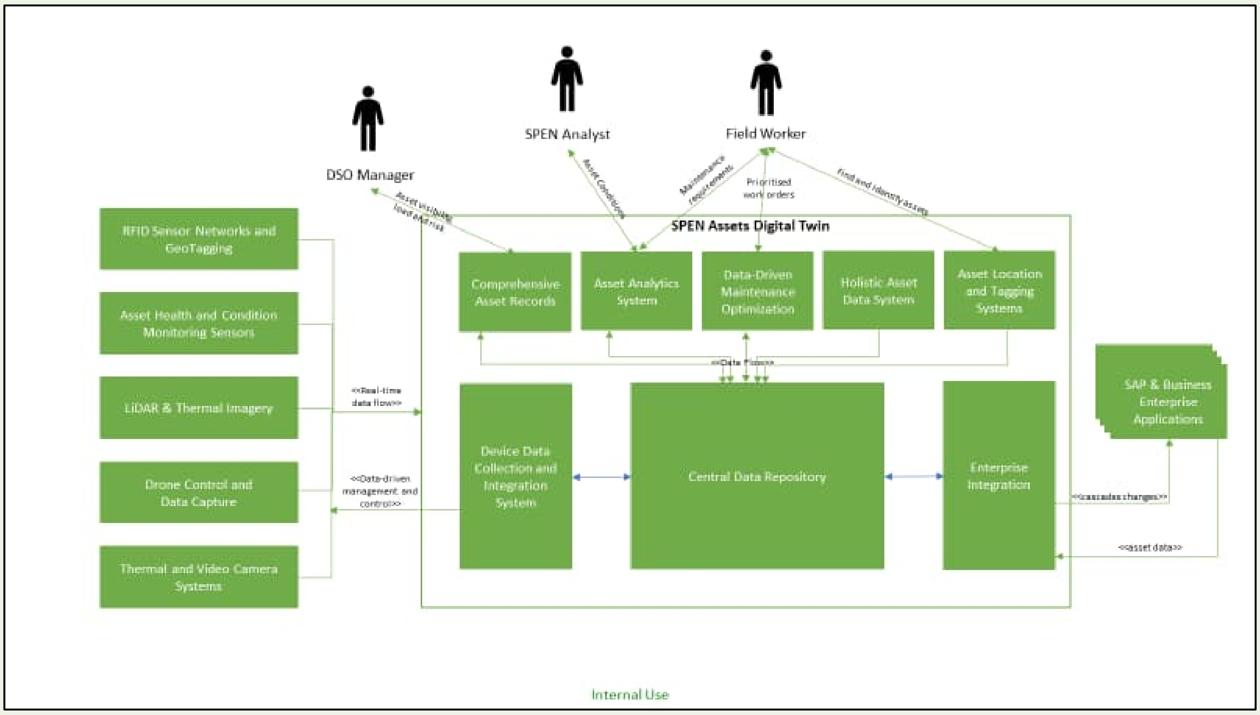
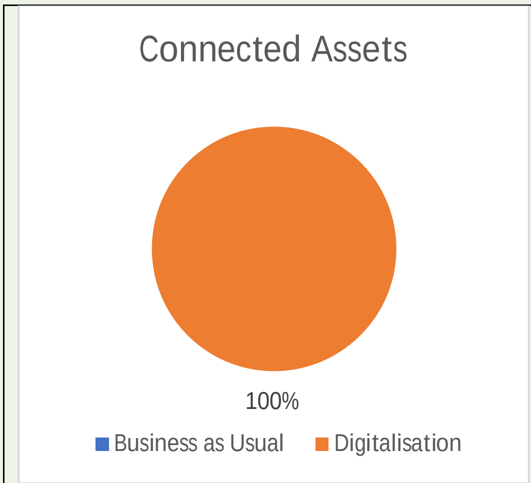


Figure 70 Connected Assets Digital Twin

4.2.7 Costs

	**BAU Rationale:** Our asset management platforms already support our asset related activities. It would be possible for us to continue operating with these and hence none of the costs for connect assets have been included in BAU.
	Digitalisation Rationale: We believe that the opportunities to collect more data from and about our assets will enable us to make better decisions about their operation, inspection, maintenance, utilisation, replacement, etc. We have therefore allocated the costs for this initiative fully to digitalisation.

The costs for this initiative have been estimated based on the scope of the work, technology and licensing required, an estimated resource profile. Historic costs such as drone technology and training were also incorporated in the basis of estimation.

Cost Element	Breakdown
Asset Analytics (drones)	Unit costs and training for chosen technologies (minimum 1x each device per district, with additional as mitigation): • Drones with Thermal imaging • UAVs with thermal cameras • NDVIs • Analytics and flight software • Licences • FTE Cost
Asset Location Tagging	Unit costs, training, and FTE for chosen technologies/solutions: • Technology • Application Development • Hardware required for RFID/QR codes • Licences • FTE cost
Comprehensive Asset Records	Unit costs, training, and FTE for chosen technologies/solutions: • Full E2E upgrade and implementation of solution development • Analytics • Licences • FTE cost

Table 57 Connected Assets Cost Breakdown

4.2.8 Performance Metrics

Project	Measures of Success
Asset Analytics	• % increase in asset lifecycle • Field worker visibility of environmental risks • Reduced CI/CML penalties • % time saved for line inspections from use of drones for data capture • Predictive modelling and analytics opportunities
Holistic Asset Data	• Single view of the asset • Visibility of assets present on the network • Understanding of flows and constraints on the network
Asset Location Tagging	• % time saved for field workers • Visibility of assets available in stores • Visibility of asset information

Table 58 Connected Assets Projects and Measures of Success

4.2.9 Assumptions and Dependencies

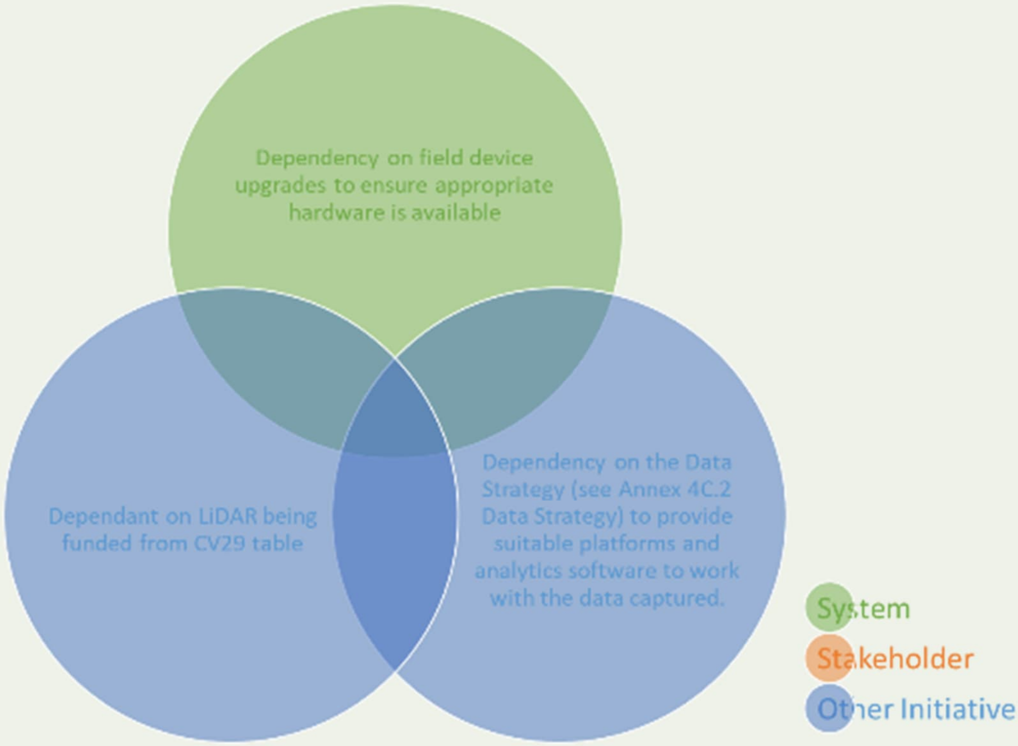


Figure 71 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Connect Assets Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Secure platform to store all GPS/Geographical locations of assets
Asset sensors fitted through IOT strategy
Funding for LiDAR scan is covered by SPEN central business

Table 59 Connected Assets Assumptions

4.2.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Inaccurate location data due to lack of signal	Ensure maps are downloaded in advance and updated automatically in areas with signal	Medium	High
2	Cyber threat of using real-time sensors and relying strongly on data	Collaborate with IT Cyber plan to mitigate risks	Medium	High

3	Danger of drones in rural locations, bad weather etc	Ensure that routes are planned in advance and a risk assessment undertaken before flight to avoid drone damage	Medium	Medium
4	Legislative barriers to unmanned drone flights	Continuation of current model of manned flights with optimised frequency of inspections	Medium	Medium

Table 60 Connected Assets Risks, Mitigations, and Impact

4.3 Connected Worker

4.3.1 Overview

With greater penetration of DER and electrification of transport, heat, and industry, we forecast a significant increase in the volume of field work we must deliver to ensure that our network facilitates the energy transition to Net Zero. We have modelled several scenarios which all show total customer peak demand increasing, which can be attributed to the combined effect of EVs and heat pumps. Hence, it is crucial we streamline our field work management processes and equip our field force with the right tools to deliver on customer and stakeholder expectations in a timely and cost-effective manner.

Our vision for our field force is to have simplified and digitally enabled processes for managing and delivering field work, using a consolidated and integrated suite of technologies and systems. In addition to enabling efficient delivery of a higher volume of work, achieving our vision will maximise productivity, safety, and user experience of our field force (internal staff and contractors) and improve service for our customers and stakeholders.

4.3.2 Projects

4.3.2.1. Field Resource Optimisation

This project focusses on implementing an optimisation tool for field work operations. This will reduce manual input to planning, as well as improving efficiency of resources.

Current Position	Change Drivers
Manual and inefficient process to schedule and despatch field workers to jobs. There is no optimisation based on proximity to job location and required skillset.	To meet significant increased work volumes, efficient work allocation and resource optimisation is critical for timely delivery of work without an unsustainable headcount increase or comprising customer service.
Field workers currently perform manual time writing of their activities. This is an inconvenient and time-consuming process and this data in not used to produce helpful insights to feed resource optimisation.	To maximise field force productivity, it is imperative that we eliminate unnecessary time-consuming processes to focus staff on value-adding activities. This will be enabled by benchmarking task duration and tracking worker productivity trends.
Lack of integration between systems means there is no “single view of the plan” and automatic aggregation of activities in a vicinity. This can often lead to duplication of effort.	As we look to improve the sustainability of our operations, field work optimisation provides ample opportunity to reduce our greenhouse gas emissions, material use and waste generation.

Work package issuing is a one-way process and does not allow for easy amendments of a live version. There is no solution to monitor location and status of field workers in lone working situations outside of normal working hours.	Realising full benefits from improvements to asset management and CRM systems is contingent on the ability to efficiently deliver field work.

Table 61 Field Resource Optimisation Current Position and Change Drivers

Solution

We aim to implement a consolidated system for optimised work package allocation, scheduling (including remaining miles left on a vehicle's charge and optimising charging queues), and despatch. Our key objectives are to optimise speed of work delivery and maximise resource utilisation, while retaining flexibility to re-optimise the work plan in response to faults or emergencies.

We will evaluate commercially available field work management systems and implement a combined solution that meets our requirements and ease of integration with our current systems. Our requirements for the system include functionality that enables optimisation of labour and services and interfacing with logistics systems to optimise availability of materials and tools. These include:

- Single view of the plan. The system will pull information on planned activities across different field work categories including statutory, condition based, post fault inspection, emergency work etc. This data will be visualised to help planning teams identify risks, redundancies, and clashes in advance.
- Integration with asset management systems. The system must be integrated with other existing systems, particularly SAP and ESRI GIS, to bring in information on the location of assets and tasks to be delivered. This will be enabled by our wider initiative around data and systems integration.
- Interface with supply chain and logistics systems to ensure material and tools availability for planned work. Functionality will also enable tracking of materials and tools field workers carry in vans. This will enable identification of available resources that may be closer to a short-handed field worker on-site than returning to the supply depot.
- Scenario modelling and resource capacity stress testing. The system will enable efficient forward planning of resources in the medium / long term. We will model scenarios like adverse weather events and expected uptake of load on the network for optimal allocation of resources across districts including internal workforce, contractors, tools, and materials.
- Intelligent aggregation of activities. With visualisation of the location of assets and tasks, planning teams can aggregate activities into work packages that optimise the number of site visits to a certain vicinity.
- Automation of scheduling and despatch of field work. Work will be allocated to workers based on their proximity and skill profile to increase speed and efficacy of work completion. Work packages will also allow flexibility to update information retrospectively.
- Analysis of real-time data, across parameters including job location, traffic, staff availability and skills/certifications, the materials, tools they are carrying, and the priority of each job. This will be a capability of the system or enabled by analytics capabilities from other systems.
- Automated time writing. We will pilot automated recording of activity duration and evaluate a rollout depending on performance and feedback from our field workers. If successful, this will enable analysis of productivity trends and creation of benchmarks of task duration to optimise work allocation.
- Lone worker monitoring. In addition to asset location, real-time field worker location can be integrated to enable extension of lone worker monitoring to workers doing so outside of normal working hours.

Key Outcomes

- Improved customer service. Faster delivery of work, especially faults or emergencies, with optimisation based on resource location and expertise. Customers can get better visibility of scheduled work and estimated duration.
- Improved TOTEX productivity. Single view of the plan will eliminate spending on redundant or clashing activities and enable consolidation of activities

- Timely delivery of work. Optimised resource allocation will speed up delivery timelines and curb manual work reallocation
- Better long-term forecasting and optimisation of resources across districts to ensure adequate capacity to deliver field work.
- Improved field force productivity and user experience. Teams can reallocate time spent on manual time writing to higher value activities.
- Improved productivity of planning and scheduling teams with less time spent manually assessing and assigning work orders. This frees up more time for scenario and capacity modelling for longer term resource planning
- Reduced human error in manual work assignment
- Scaling the capacity to handle projects and field teams without requirement for additional Work Programme Administrators (WPAs).
- Reduced environmental impact. Consolidation of work packages will reduce the required fleet mileage and associated carbon emissions.
- With increasing proliferation of electric vans in our fleet, mileage can also be optimised to battery range for maximum journey efficiency.
- Improved worker safety from extended lone worker support functionality.

4.3.2.2. Digital Mission Control

This project focusses on improvements to reporting and analytics functionality for capital project delivery. This will increase efficiency, flag issues, and reduce risks.

Current Position	Change Drivers
There is limited visibility of capital project delivery. Historic reporting means it is difficult to identify risks to meeting targets based on progress of in-flight projects. This lack of visibility on the status and output of in-flight capital projects can lead to a blend of over-delivery of certain work types and under-delivery on others. There are challenges tracking and reporting on delivery against targets our current visual planning board.	Significant upturns in supply and load will increase stress on our network and require capital projects to be delivered on time and to the targets set to ensure network reliability and adequacy. Efficient and accurate project delivery will be critical to the safety of our assets and operations. As we gather more and more data from various field devices, it is more important than ever that this can be viewed in a simple, compelling digital visual to allow effective decisions to be made based on the data. Clear project visibility is needed to make early interventions to in-flight projects.

Table 62 Digital Mission Control Current Position and Change Drivers

Solution

We aim to deploy an intelligent visualisation layer for reporting and analytics on capital project delivery. This will provide visibility on progress, enable interventions to in-flight projects and mitigate risks to meeting delivery targets.

This is a use case for the reporting and analytics functionality discussed in our Data Strategy. The visualisation layer will pull data from several of our core systems of record including SAP PPM and SAP PM, used for project planning and project management respectively. It will need to ingest data from our contractors and suppliers currently in disparate sources such as spreadsheets, databases, and cloud storage, and will require new data points from project managers, to frame a holistic picture of delivery progress. The aim of this is providing a simplified, actionable view and supporting data-driven decision making.

Some advanced project control functionalities will enable:

- Higher frequency (weekly or monthly) monitoring of physical progress
- Tracking cost and volume performance for in-flight projects against regulatory reporting targets to identify risks of under (or over) delivery

- Benchmarking against historic performance and tracking delivery against KPIs and deliverables
- Document control to identify backlogs and/or delays in document exchanges
- Identifying bottlenecks from contractors and supply chain – materials issue, payment applications, dispute resolution etc.
- RAID logs (Risks Assumptions, Issues & Dependencies) and escalation
- Contract management

We will deliver this mission control layer iteratively, gathering requirements and expanding functionality with subsequent releases to an initial minimum value product.

Key Outcomes

- Better delivery on output commitments. Project visibility allows for escalation and intervention to ensure delivery against targets
- Adaptable metrics which evolve in line with the delivery lifecycle
- Optimise TOTEX and reduce whole system costs. Greater project financial visibility and performance management allows for early identification of the risk of cost overrun or delivery issues with downstream cost consequences.
- Improved risk management and opportunity realisation
- Increases efficiency in report production, greater focus on report analysis

4.3.2.3. Contractor Field Application

This project aims to improve current processes for field workers (both internal staff and contractors) in relation to information provided about jobs, forms that must be completed, digitisation of documentation and the ability to pick up materials.

Current Position	Change Drivers
We currently have a contractor portal which is a desktop-based solution. Information on jobs is sent via the portal and picked up by office staff of the contractor who issue physical work instructions to field staff. Paper-based work instructions are required for regulatory compliance.	Multiple handoffs of data and manual digitisation creates significant exposure to human error in data entry and stage gates in the process that can act as bottlenecks causing delays. Manual steps make it difficult to have visibility of root causes of project delays.
Contractor field staff complete paperwork on field work and return this to office staff for validation and submission of data returns along with payment applications. Upon receipt, project managers must validate information and our data management teams digitise this and input into our systems.	Lack of effective governance over data collection for contractor field staff often leads to incomplete or inaccurate data collection. This results in extensive manual effort for our project managers and data management team in validating and inputting data into our systems.
Internal staff have an application they can access in the field to submit data, and this has governance processes built in for data quality and completeness.	Without in-built governance requiring submission of key documents and data, contractors might not complete pre-work site risk assessments and post-work 'site-clear' notifications exposing them to health and safety risk.
When materials are issued for a job, a reservation number is given to field staff for collection from our stores. While internal staff have an app that allows them to scan barcoding and check out materials with records created automatically, contractors do not have a similar solution. This causes difficulty in establishing an audit trail for materials used by contractors.	To digitalise our logistics function and implement sustainable initiatives around material use and waste reduction, we will require better visibility of material flows. To enable this, we need a solution that lets us monitor the issue, tracking and consumption of materials by our contractors.

Table 63 Contractor Field Application Current Position and Change Drivers

Solution

We will develop a mobile-compatible field user application for our contractors to collect site data and interface with our asset management systems. Key functionality we will incorporate in this solution include:

- Integration to GIS to provide contractors on site with visibility of asset information. It will also enable them to directly input proposed changes to asset records, based on their work, in our asset management systems for our team to review and approve. This will eliminate the convoluted process of submitting hard copies of drawings to be digitised.
- In-built governance and automated front-end data validation. This will ensure contractors submit all required data and documentation to proceed through all project stages – enabling internal teams to save on time spent following up missing information, often a source of delays to project closure.
- Workflow that enables validation prior to submission. Contractor office staff usually complete an internal validation before submission of data returns and payment applications. The solution will need to preserve this key control step.
- Materials and logistics functionality. This solution will contain functionality that enables contractors to be issued materials, scan QR codes or barcodes to check out materials and complete data return with output linked to issued materials.

This application will be a key enabler of initiatives around improving field data quality, project visibility and worker productivity. Collaboration with our ecosystem of third-party partners is a key means through which we deliver our services hence, improving the efficiency of this collaboration is integral to delivering on higher volumes of activity in RIIO-2.

Key Outcomes

- Greater productivity for project managers and data management team as they can reallocate time spent on verification and digitisation of field data to complex value-adding activities and managing project risk and issues
- Contractor field access to asset management systems aids job execution and improves data quality with fewer handovers and manual re-entry steps
- Better governance and reporting on projects with in-built requirements for data collection and greater front-end validation of data input
- Improved visibility of material flows in supply chain and project delivery to enable more sustainable resource use

4.3.2.4. Field Image Capture

This project focusses on increasing image captured in the field, utilising several different technologies. This will provide an audit trail of work completed, be a method of identifying health and safety risks and will allow more proactive monitoring of environmental factors such as habitats.

Current Position	Change Drivers
Capturing images in the field is currently a manual and time-consuming process using handheld devices. In addition to the inconvenience experienced by field staff, there are situations where capturing images with handheld devices poses significant safety risks. Images are taken during field work on an ad-hoc basis with no requirement for this. As a result, many jobs are completed without a visual record of the work done for reference. Images captured in the field are stored in disparate locations with little to no analysis carried out.	With increasing maturity of image capture and analysis solutions, opportunities are arising to extract greater value from images captured in the field for intelligent asset management. We plan on significantly increasing field image capture in a manner that is efficient, safe and causes minimal disruption to current field staff ways of working. Our current process of manual image capture and limited analysis derives minimal value relative to the time and effort required. Introducing automation is key to process the image volumes required for implementing artificial intelligence and machine learning solutions.

	Automated solutions for field image capture and analysis have the potential to yield significant benefit in monitoring the condition of assets and their habitat. Increasing activity volumes for fieldwork in the coming years will require more efficient record-keeping with images tagged against all jobs for an audit trail of work completion and quality assurance.

Table 64 Field Image Capture Current Position and Change Drivers

Solution

We will roll-out a range of solutions to boost the volume of images of our assets and their habitats that are captured and analysed for intelligent asset management. To implement this vision, we will:

- Roll-out hands-free image capturing hardware to field crews with cameras that can be helmet-mounted, vehicle-mounted, or body-worn. This will allow field staff to capture images unimpeded during their regular activities.
- Expand our use of unmanned aerial vehicles, i.e., drones, to increase safety, efficiency, frequency, and coverage of large-scale asset image capture.
- Leverage our planned big data platform to create a central repository for storage of the large volumes of image data to be collected.
- Implement image processing software to analyse data. Results can be extracted, transformed, and loaded into several other applications, e.g., SAP and ESRI GIS, through our enterprise service bus or other integrations.

Key Outcomes

- Increased field force productivity and safety with less time spent capturing images with handheld devices
- Better audit trail and quality control of field work with more image capture
- Utilisation of drones will enable greater coverage and frequency of inspections as well as reduced carbon footprint from asset inspections
- Automated analysis of field images will enable quicker detection of potential issues with asset health and more proactive monitoring of the entire network
- Better reporting will enable greater transparency and accountability to our customers and stakeholders on our emissions reduction progress
- More proactive monitoring of asset habitat will enable assessment of site health and safety risks prior to visit of field crews
- Image storage in a central repository provides accurate records of field work done and a means of verifying work was done correctly and to specification.

4.3.2.5. Field Mobile Device Upgrade

This project focusses on upgrading handheld devices (mobile phones and tablets) and required applications for those working in the field.

Current Position	Change Drivers
Currently, many processes in field work rely on information in an offline format including hard copies and data that is downloaded from and re-uploaded to enterprise systems. A variety of devices are in use for field work including mobile phones, Toughpads and Toughbooks – the latter two being older generation devices with limited functionality and poor user experience. Field workers have trouble switching back and forth between devices for different activities and maintaining proficiency in using all device types.	Field user feedback has shown that current devices are difficult and time-consuming to use on site. This has led to limited utilisation of currently available mobile solutions. Upgrading our field mobile device hardware and software capability is crucial to improving data access and data capture capability in the field. It is also required to reap benefits of planned upgrades to other enterprise systems. Consolidating the majority of mobile functionality into one device will save time and reduce difficulty for field users. Offline data collection does not allow for front-end data validation and requires retrospective assessment of field data, leading to issues downstream with missing or incorrect fields. Making field data collection mobile-compatible will allow increased front-end data validation and real-time assessment of field data being entered into enterprise systems.

Table 65 Field Mobile Device Upgrade Current Position and Change Drivers

Solution

We will issue field workers best-in-class mobile devices to improve the quality and efficiency of job execution and data collection. Building on core functionality, which is accessible in current field devices, key additions will include:

- Materials and Logistics – Mobile devices will have access to solutions for booking equipment and materials and checking them out by scanning barcodes, QR codes or other smart tags, linked to project financials
- GIS mobile – Access to GIS for real-time updates of asset header data from the field to eliminate a currently convoluted and highly manual process
- Field Online – Access to application used in installation and maintenance of field IoT devices
- PowerOn – Mobile access to PowerOn will enable field workers to provide more accurate times to customers on outage durations
- LiDAR – LiDAR functionality to enable several use cases including measuring the size of excavations or length of cables
- Network Maps – Access to maps of key assets on network like EV fleet charging points.

We will involve our field workers in the evaluation of available mobile device options (tablets and smartphones), to ensure we pick standard devices with robust capability and high user acceptance.

While we will maximise the centralisation of functionality onto one device, likely a mobile phone, some key use cases such as “redlining” on asset technical drawings in GIS might not be easily compatible with mobile phones. These use cases will require field workers to use rugged tablets, so we will continue replacing and upgrading existing rugged tablets as part of our wider infrastructure upgrades programme.

Key Outcomes

- Field access to data in enterprise systems will improve quality and speed field work execution
- Increased efficiency and quality of field data capture with automated and streamlined process
- Improved user experience for field workers by minimising switching between devices and expansion of mobile-compatible functionality

- Increased productivity of data management team with reduced manual effort in data entry and validation.

4.3.2.6. THOR Hammer Pole Tester

This project focusses on the capture, storage, and analysis of data from the THOR Hammer Pole Tester. This data will contribute towards creating our digital twin, as well as allowing data-driven decisions to be made as part of our condition-based maintenance activities.

Current Position	Change Drivers
Overhead line wooden poles are visually inspected and tested by field workers who use hammers to manually assess pole strength (a technique known as sounding poles) and decide, based on experience, if replacement is required. Pole strength tests are usually carried out in advance of planned line replacements and used as an opportunity for field workers to manually record asset location to update or verify records held on our systems.	Overhead line pole replacement is very expensive, costing ~£15M annually. In addition to cost, it generates bulky waste materials. It is key that we look to safely extend asset life for cost saving and improvement in resource efficiency. Digitising asset health records will aid the transition to condition-based and predictive maintenance. Likewise, we need accurate records of asset location for the development of asset digital twins.

Table 66 THOR Hammer Pole Tester Current Position and Change Drivers

Solution

In RIIO-ED1, we explored recent technology developments for solutions and identified the THOR Hammer developed by New Zealand-based engineering firm, Groundline. Using cutting-edge seismic technology, vibrations are sent through the timber poles, allowing engineers to gather data on pole health and geographical location.

We trialled this technology during RIIO-ED1 and found it to offer considerable improvement on current methods, facilitating accurate measurement of pole strength and ensuring that pole life is maximised. We will look to scale our use of this technology beyond pilot-scale to embed it across our license areas.

While the organisation and expenditure on the roll-out of this tool will be the remit of our engineering department, the Digital team has a key role to play in enabling the storage, integration, and analysis of data captured from the THOR Hammer. This data on asset location and condition will feed our asset management systems to inform condition-based maintenance and our digital twin of the network.

Key Outcomes

- Savings of up to £600,000 annually on overhead line pole replacement
- Reduced risk of user error in pole health assessment and high-quality data capture enables improved pole health monitoring
- Accurate assessment of pole strength allows for extension of pole life and reduction of waste generated
- Automated recording of pole location reduces manual effort and improves accuracy of field worker data returns.

4.3.2.7. Integrated Smart Forms

This project focusses on simplifying the documentation processes that field workers must adhere to. Through utilising a combination of location services and user details to auto-fill generic information, only presenting job-specific fields, and providing drop-down options as much as possible, this should save time and improve accuracy and consistency of forms completed.

Current Position	Change Drivers
The nature of work conducted by SP Energy Networks and our contractors requires completion of high volumes of documentation. This is a time-consuming activity requiring repetitive entry of certain data fields (e.g., engineer information, location, asset type). The number of forms to complete has been flagged as a source of frustration and delay for field staff. Some data collection applications currently in use are not integrated with source systems, leading to limited visibility of data captured e.g., Survey123, used for asset condition assessment.	The volume of documentation to complete after doing work imposes a constraint on the volume of activity a field worker can accommodate during working hours. Reducing the effort required in completing documents will be a key step in the direction of lean operation and improved workforce productivity. It will also improve the quality of data returned from the field and repetitive manual entry of data creates significant exposure to human error. To maximise the value of data collected, it must be integrated into our source systems so it can be easily accessed for analysis.

Table 67 Integrated Smart Forms Current Position and Change Drivers

Solution

To improve user experience for our field workers and increase the value of the data they submit, we will implement solutions to streamline and tailor form completion and ensure integration with source systems. The solutions will include:

- Autofill of appropriate fields in documentation based on the field worker's role, selected on-site job, and GPS location. Robotic Process Automation will be utilised for this
- Forms with logic that deactivates data fields not required for job
- Drop-down menu options and automated suggestions based on historical documentation input for streamlined form completion
- Re-usable and customisable saved document templates
- Integration of all forms with source systems, particularly Survey123 which feeds condition-based maintenance schedule.

Key Outcomes

- Improved productivity and user experience for field workers
- Improved data quality with auto-filled data fields
- Greater value derived from field data with integration to source system

4.3.2.8. Digital Toolbox

This project focusses on providing employees with one easy-to-navigate application which allows them to access all digital tools that may be required to fulfil their role, an online training catalogue and digitised authorisations.

Current Position	Change Drivers
At present, employees can access digital tools required for their role through Citrix. Each employee has a bespoke set of applications dependent on what access they have requested. To access a new digital tool, the user must submit a formal request with justification to obtain approval from management. This process is often delayed, and users are unable to complete tasks they need the tool for until the request has been approved and fulfilled. The current process for booking training courses is slow, with employees required to either fill in	With the anticipated upturn in volume of activity, we must ensure that we eliminate unnecessary delays and process inefficiencies that inhibit timely delivery of work. Our staff need streamlined access to the tools, training and authorisations needed to effectively carry out their work. These modest process improvements will alleviate a major source of employee dissatisfaction.

online forms to request specific training or contact HR directly. Operational staff, once they have completed their authorisation course, are required to wait for their authorisation details to be manually updated and printed out to be presented on site.	

Table 68 Digital Toolbox Current Position and Change Drivers

Solution

We will create a “Digital Toolbox” landing page for our employees to access resources needed to carry out their work. The main use cases to be developed are:

- Role-specific access to required applications and tools. Staff will be able to login to the landing page which will automate access approval to all the tools required for their role and allow them to request any tools.
- Online training catalogue. The landing page will show staff all available courses relevant to their role and allow them to book training slots.
- Digital authorisations. Employees will be able to access digital versions of their authorisations via the landing page and present these details on a mobile field device.

Key Outcomes

- Improve employee satisfaction and user experience with less bureaucracy
- Improved employee productivity and faster project delivery with quick access to tools and information needed to complete work

4.3.2.9. Automatic Speech Transcription

This project focuses on implementing technologies to automatically transcribe speech, whether captured on a mobile field device or in meetings.

Current Position	Change Drivers
While Personal Protective Equipment is required on site for the safety of field workers, it makes detailed notetaking on the job inconvenient. This increases the likelihood of accidental omission of valuable observations. This same risk is pertinent for internal meetings and as such, we have begun to record them. However, reviewing hours of meetings for valuable insight is an inefficient and time-consuming process and we are trialling solutions to remove this inefficiency.	The drive for efficiency and reduction in wasted time requires consideration of alternative forms to traditional note taking. Automatic conversion of voice memos to text is one proven alternative that bypasses this issue and opens further analysis opportunities.

Table 69 Automatic Speech Transcription Current Position and Change Drivers

Solution

We will deploy automatic voice-to-text technology to capture observations during field work and internal meetings. This can be implemented via a pre-built transcription software or by using Python packages. Most transcription tools rely on artificial intelligence technologies like machine learning, natural language processing and a deep learning process called Automated Speech Recognition (ASR) to convert speech to text quickly and accurately.

This technology can be applied to audio recordings captured by field workers in real time via their mobile devices and retrospectively applied to meeting recordings. The transcripts produced will be stored digitally, creating a valuable repository of information that can be used for reference, analysis, and training purposes.

There is currently software we have built in-house to convert video to audio then to text. This can be expanded to process audio-text conversion of voice recordings sent in by field workers. We will also evaluate "off-the-shelf" cloud cognitive services that can be implemented for speech-text analytics.

Key Outcomes

- Time savings and productivity enhancement through reduced manual effort required in meeting notes transcription or note taking
- Improved field worker safety through hands-free note taking
- Opportunity to use stored transcripts for training purposes and mine them for key words, trends, and other useful insights

4.3.2.10. Underground Asset Mapping

This project focusses on a proof of concept to map the underground network to a high standard, so that underground assets will be easier to locate. This will contribute towards an underground digital twin, reducing time required on-site to identify asset locations, and provides health and safety benefits.

Current Position	Change Drivers
Currently, underground asset maps are purely for guidance and are not accurate enough to be relied upon. When a field worker goes to site to excavate an area, they must drill holes in the ground and use a 'sniffer' tool to identify cables. This is time-consuming process with limited future benefit as asset location, when confirmed, is not captured for future reference.	In the short term, getting an accurate mapping of underground assets will help us avoid repeated drilling of holes to locate underground assets. This will save time on site and reduce disruption to nearby residents and the natural environment. Mapping our underground assets will allow for better coordination with other holders of underground assets and give visibility of potential hazards if they are excavating near our cables. In the long term, mapping underground assets will help us build a digital twin of our underground network and aid our transition to efficient, data-driven network operation.

Table 70 Underground Asset Mapping Current Position and Change Drivers

Solution

Ground penetrating radar devices can be used to capture image data for underground assets and can provide field staff with more accurate geospatial information. Due to the scale of SPEN's underground network, we aim to run a proof-of-concept trialling the use of ground penetrating radar for underground asset mapping of a small section of the network. This will allow us to perform a cost-benefit assessment of the technology and evaluate the feasibility of a large-scale rollout.

We will look to test out layering the output from ground penetrating radar scans with our existing asset mapping tools to build a geospatial digital twin of the underground network. Field workers will be able to use this model to accurately identify asset location using GPS functionality on their mobile devices.

Key Outcomes

- Improves efficiency of on-site delivery with reduced time to locate assets
- Eliminating repeated drilling to locate assets reduces disruption to residents and the environment and reduces health and safety risk to field workers
- More accurate asset location information enables better coordination of activities with other holders of underground assets

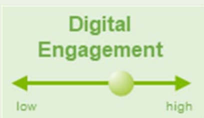
4.3.3 Persona Spotlights

DOMESTIC CUSTOMER

What is the benefit for me?
Quicker delivery of work with minimal disruption

How will I feel the impact of digitalisation?
- Optimised selection of field workers for quick delivery of field work
- Aggregated field activities to minimise repeat visits and disruption in an area
- Better medium to long-term planning of work to provide advance notice of upcoming activities or outages in area

FIELD TEAMS



What is the benefit for me?
Greater productivity, less low value manual activity and better user experience

How will I feel the impact of digitalisation?
- Optimised aggregation and allocation of work
- Improved lone worker safety
- Hands-free note and image capture and time writing
- Streamlined completion of documentation
- Field access to enterprise systems
- Digital access to training, and authorisations
- Accurate mapping of underground assets

CONSTRUCTION/DESIGN ENGINEER

Digital Engagement

low high

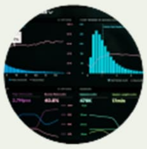
What is the benefit for me?

Greater visibility and control of projects, reduced data validation effort. Optimised planning and scheduling of work and improved delivery performance

How will I feel the impact of digitalisation?

- Reduced manual effort validating data sent from field
- Better visibility of performance against delivery targets
- Automation of field work scheduling and despatch
- Single view of the plan prevents redundant or clashing field work

REPORTING/ASSET MANAGEMENT



Digital Engagement

low high

What is the benefit for me?

Reduced manual data entry and validation, high quality information on asset condition and location for analysis

How will I feel the impact of digitalisation?

- Direct data upload from field with front-end validation
- More time spent focusing on risks and issues to implement corrective or mitigating actions
- Higher quality and updated asset location data for time-series analysis
- Higher frequency monitoring of visual condition of assets

THIRD PARTIES/SUPPLIERS

Digital Engagement

low high

What is the benefit for me?

Streamlined and less manual process of collating and submitting data

How will I feel the impact of digitalisation?

- Access to asset management systems in field to make direct updates
- Digital data upload in field

Figure 72 Connected Worker Persona Spotlights

4.3.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Digital Mission Control, Contractor Field Application, Integrated Smart Forms, Digital Toolbox, Automatic Speech Transcription, Underground Asset Mapping, THOR Hammer Pole Tester
Agile + Waterfall	Field Resource Optimisation, Field Image Capture, Field Mobile Device Upgrade

Table 71 Connected Worker Approach and Initiatives

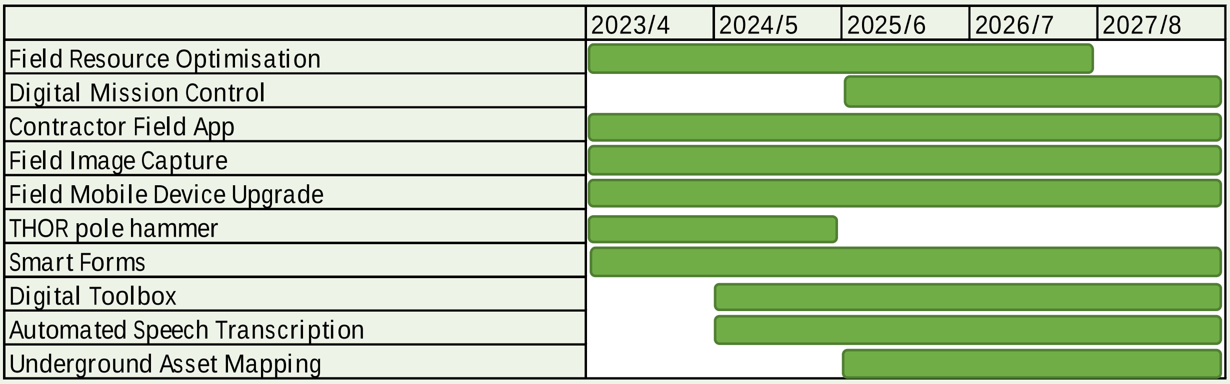


Figure 73 **Connected Worker Timeline**

4.3.5 Resources

Resource Type	Purpose
Scrum Squad	Responsible for delivering project scope (see scrum squad profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Technical Analysts/architects	Platform integration of new systems and platforms
Change Manager	Prosci accredited PM supporting business change and adoption
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to end-users
Business Sponsors	Ensuring success of project and leading awareness

Table 72 Connected Worker Resource Types and Purpose

4.3.6 Functional Model

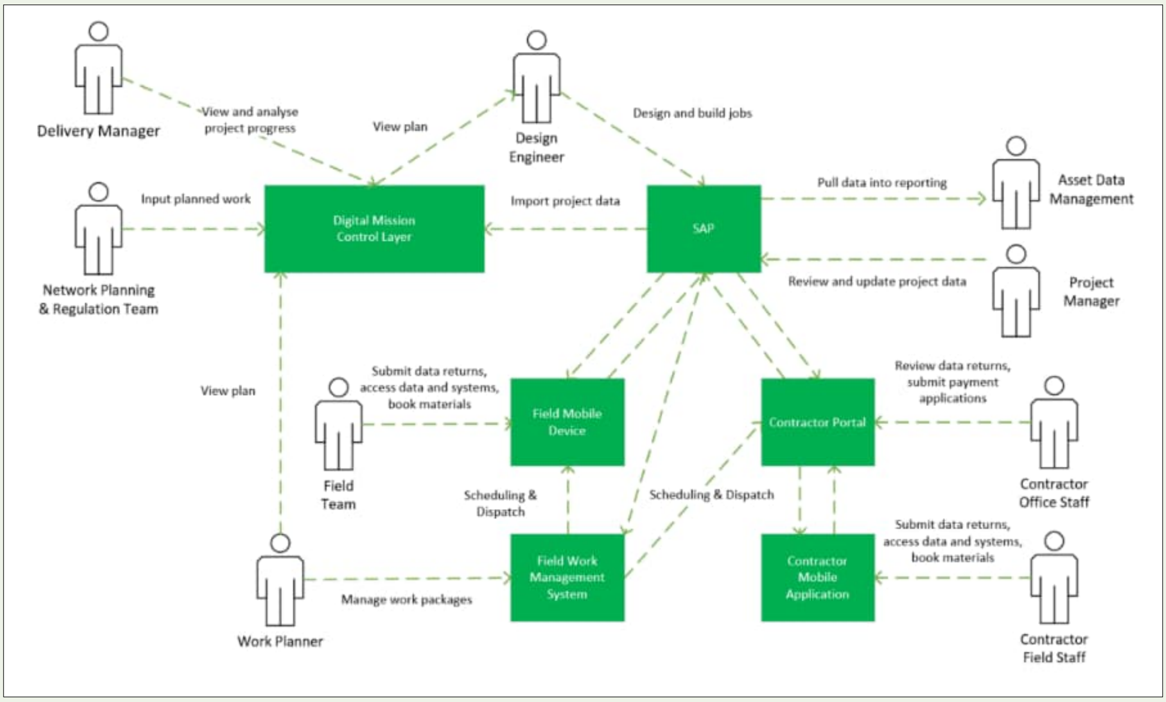


Figure 74 Field Work Management Future State

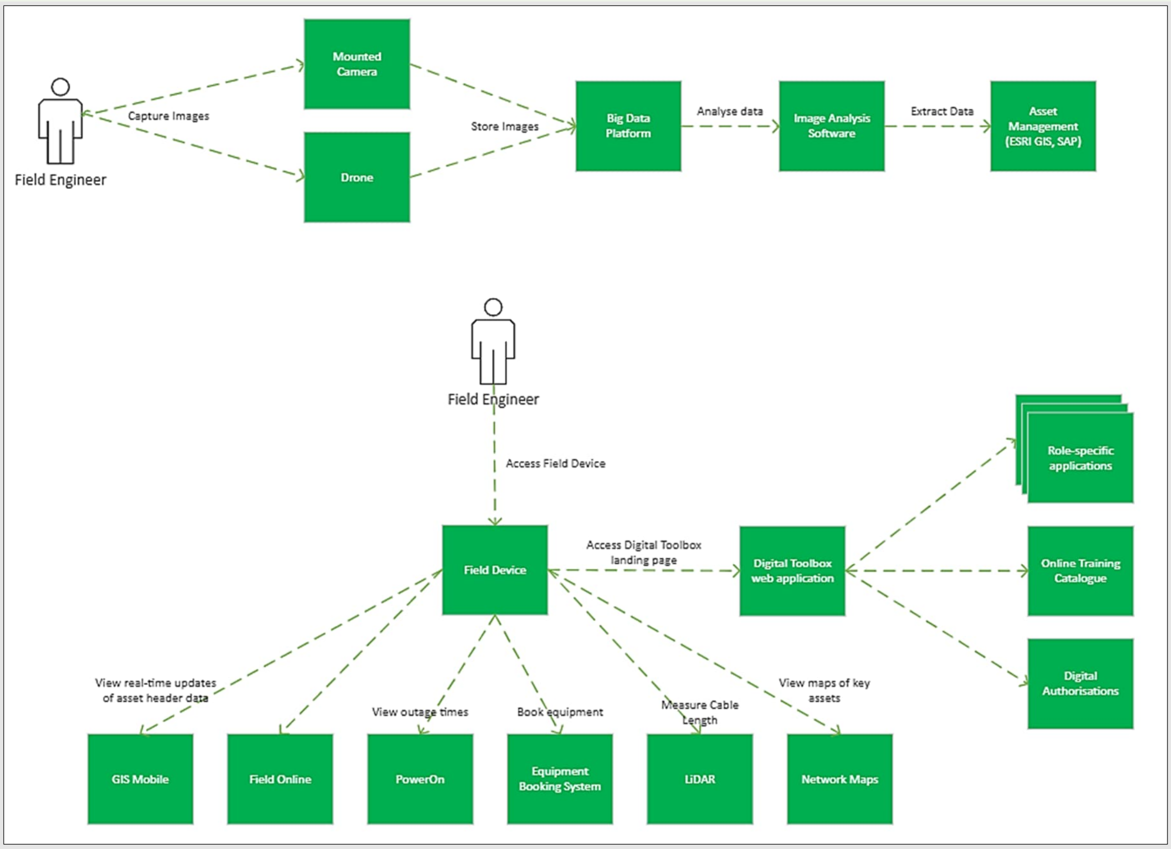


Figure 75 Image Capture and Mobile Device Future State

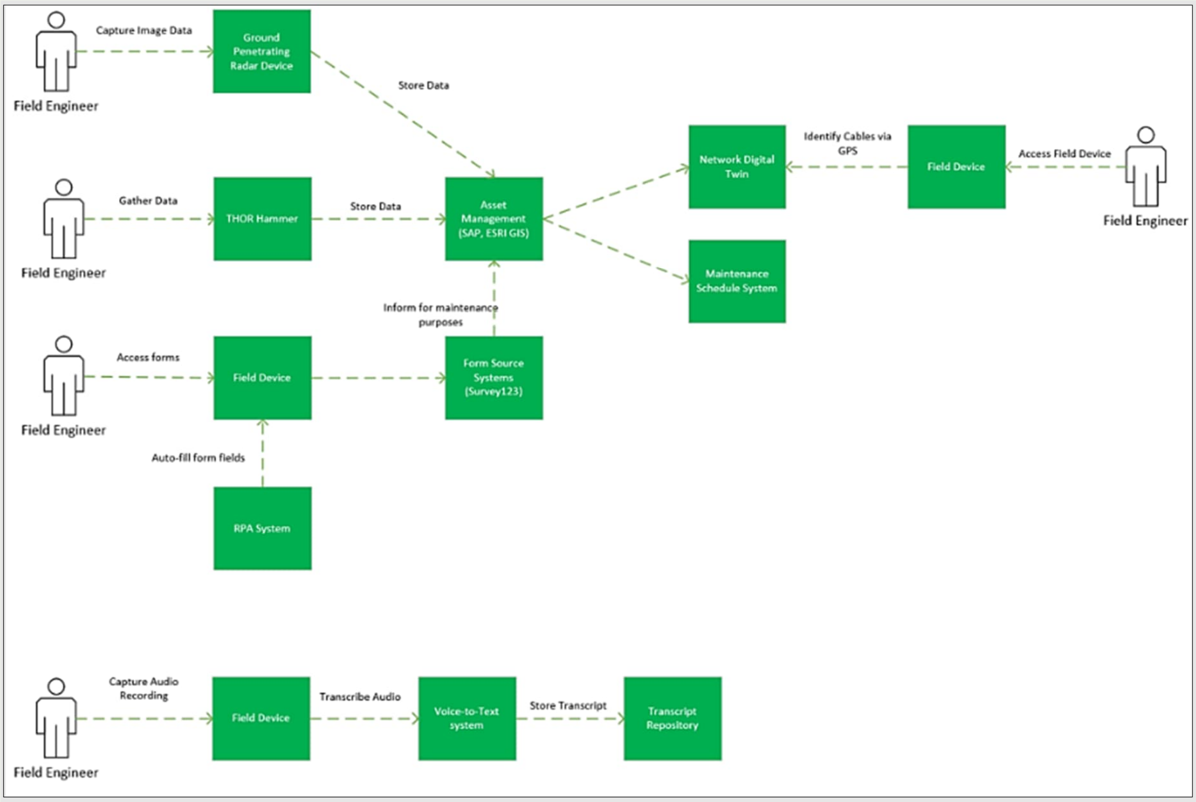


Figure 76 Field Technology Future State

4.3.7 Costs

<table>
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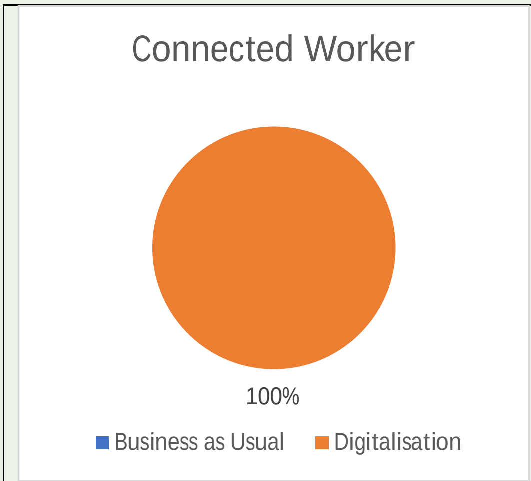
<td rowspan="2">
</td>
<td>BAU Rationale:
Our field workforce already has the tools required to perform their activities. It would be possible for us to continue operating with these and hence none of the costs for connect worker have been included in BAU.</td>
</tr>
<tr>
<td>Digitalisation Rationale:
We believe that our field workforce will be able to deliver more efficiently and effectively with the use of enhanced digital field tools. We have therefore allocated the costs for this initiative fully to digitalisation.</td>
</tr>
</table>

The costs for this initiative have been estimated by evaluating each of the projects in terms of scope and resources that will be required. This includes development, hosting, integration and training costs for new digital tools, and a suite of new field devices for all field workers.

This will include thermal cameras, body/van mounted cameras, mobile devices with LiDAR capability, speech transcription applications, and an underground asset mapping POC, as well as image and data analytics for all output. In addition, there are costs allocated to the development and training associated with the proposed smart forms and digital toolbox for field workers.

4.3.8 Performance Metrics

Project	Measures of Success
Field Resource Optimisation	• % of jobs meeting SLA • Field and planning teams feedback survey • % increase in productivity • % Reduction in project duration
Digital Mission Control	• Delivery on target costs and volumes
Contractor Portal Application	• Feedback from contractors and data management team • % Reduction in time to technical closure of products
Field Image Capture	• % Completed field work orders with images captured • User survey on camera performance
Field Mobile Device Upgrade	• Change in average time to complete similar field activities • User survey on new mobile devices
THOR Pole Hammer Tester	• % Change in overhead line pole replacement cost and volume
Integrated Smart Forms	• % reduction in forms needing follow-up • Reduction in time to fill out forms
Digital Toolbox	• Increase in training uptake and completion • Reduction in average lead time to gain access to digital tools
Automatic Speech Transcription	• % of work orders with supporting detailed notes • Reduced time to capture notes on-site
Underground Asset Mapping	• Cost-benefit analysis of underground asset mapping • Reduction in time spent identifying underground assets on site

Table 73 Connected Worker Projects Measures of Success

4.3.9 Assumptions and Dependencies

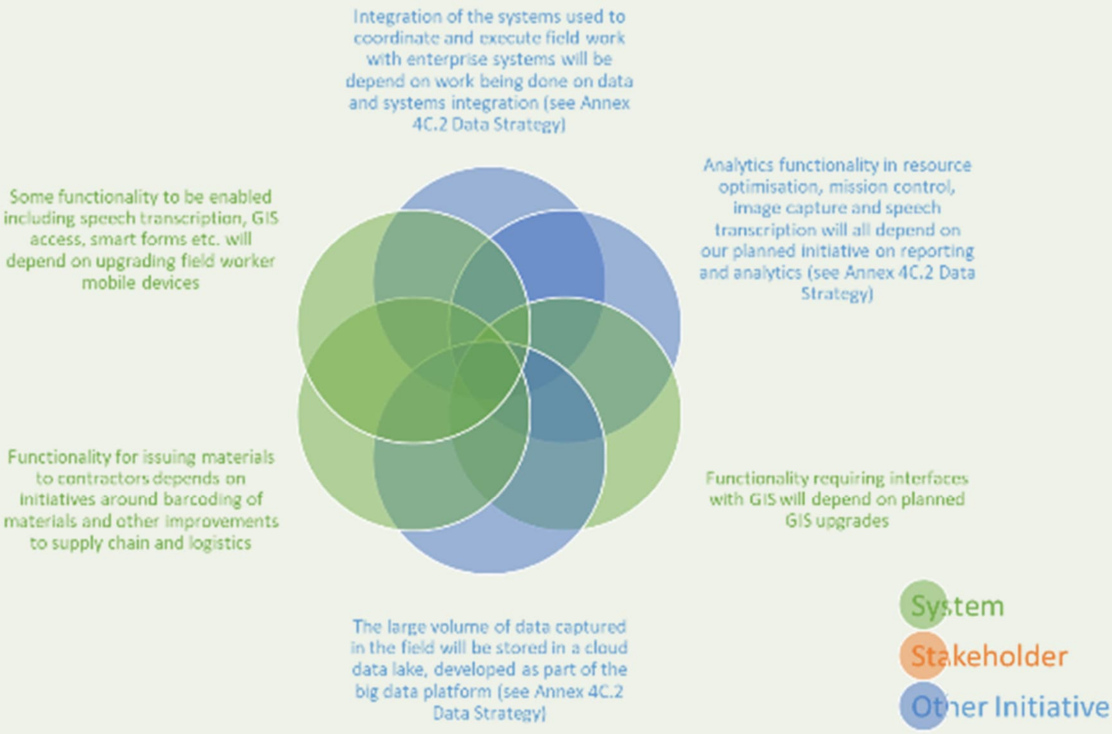


Figure 77 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Connected Worker Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Contractors have mobile devices capable of running web applications
Good internet connection in remote areas for field workers with roll-out of 5G
Availability of high-quality GPS devices to capture the geographic coordinates accurately (for EV charging points mapping)
The voice user interface in the speech-to-text functionality can overcome common challenges such as dialect/accent comprehension, disruption from background noises and sentence semantics

Table 74 Connected Worker Assumptions

4.3.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Behavioural inertia and slow adoption of new digital ways of working	Managing business change will be prioritised with our planning, scheduling and field teams involved early to get their buy-in and input in solution design. Iterative releases will enable response to user feedback	High	High
2	Lack of internal skillset to deploy diverse suite of technologies proposed	Define project scope and required skills in discovery phase well in advance of project to commence upskilling or external engagement (recruitment or contracting)	Medium	High
3	Privacy issues with field worker location and time monitoring	Field teams will be fully involved in the design of the solution. Consent will be requested, and trackers will be in vans rather than on their person	High	Medium
4	Cybersecurity risks with connecting to third-party systems	Any external interfaces will be made secure by design, security due diligence will be carried out as appropriate and contractor solution will be a web application separate from our core IT estate	Medium	High
5	Cybersecurity risks with mobile access to digital tools and core enterprise systems	New digital tools will pass through rigorous security testing prior to purchase and during deployment. Mobile device users will be trained in appropriate security behaviour	Low	High
6	Internet connectivity issues in the field	Solution design will allow offline manual data input and submission when connectivity is regained	Medium	Medium

7	Contractor field device capability	Solution will be a web application not requiring high specification devices	Low	Medium

Table 75 Connected Worker Risks, Mitigations, and Impact

4.4 Supply Chain, Procurement & Logistics

4.4.1 Overview

This initiative aims to digitalise the logistics and warehouse workflows and optimize processes by improving the use of data, adopting an Integrated Supply Chain solution, and streamlining manual processes. Mobile apps, wearable technologies, and in the long-term predictive analytics, will support the drive to digital transformation in logistics, warehousing, and transportation.

4.4.2 Projects

4.4.2.1. Warehouse Optimisation and Consumables Catalogue

This project will drive digitalisation of our warehouses and reduce manual input and interactions whilst building on our new barcoding functionality introduced in July 2021. This moves SPEN towards its strategic vision of a self-service stores model. As the volume of work increases this project will bring benefits to SPEN staff, customers, and suppliers.

Current Position	Change Drivers
At present, we employ staff in each of our warehouse locations across SPD & SPM to carry out manual processes related to management of stock material deliveries, issuance of stock to field staff and contractors and posting paper invoices. The process of booking equipment from warehouses is often on paper and there is no efficient method of checking equipment availability prior to arrival at the warehouse. Payments are not automatic, and many transactions are manual with very little automation. Our current catalogue is accessible only as a data list in our work management system SAP, or via a MS Database with photographs which are updated manually on a periodic basis.	During the RIIO-2 period we are expecting a significant increase in the volume of work we will need to execute across our network which will drive a significant increase in the volume of requests through our supply chain and logistics function. It is imperative that our fundamental logistics processes are digitalised, and manual processes eliminated or mitigated, to enable us to meet the needs of our field staff, customers, and suppliers. As it stands, there are many opportunities to improve efficiency and minimise human interaction in the warehouse process to reduce the annualised cost of lost time due to rework or manual administration tasks.

Table 76 Warehouse Optimisation and Consumables Catalogue Current Position and Change Drivers

Solution

To enable accurate stock taking and tracking of every piece of inventory that enters and leaves the warehouse, the foundation of smart tag scanning linked to a centralised database needs to be in place. This will be partially addressed by the SPEN barcode application project, now live. The scope of this project includes introducing barcode scanning functionality accessible via smartphones and the mCompanion app, which enables booking of materials from warehouses through the app (after order has been placed on SAP). This also includes the digitisation of the current process of populating forms for equipment booking and updating the SAP systems in the back end.

However, the strategic vision is to move to a self-service model in our warehouses, automating our processes and therefore reducing the number of our staff needed.

The transition from fixed desktop workstations to smartphones and mobile devices will be a major step forward in gaining warehouse efficiency. The use of devices and apps will substantially reduce walking time and allow warehouse staff to work and access data on the go within as well as outside of the warehouse.

This will be achieved in phases through RIIO-2 and will require the following inventory management system capabilities:

- **Creation of a user interface through web and mobile app** which is connected to the SAP database, and displays the consumables catalogue and inventory levels at each warehouse with the functionality to reserve equipment at the warehouse, i.e., for PPE, tools, equipment etc. Where levels show no stock, the lead time will also be displayed for the user. This needs to include the functionality that enables placing an order and request for the material, linked to a valid work order.
- **Transaction digitalisation:** The ability to order and pay for equipment with the order number using the mobile or web app instead of the current process of having to raise a purchase requisition. Secondly, improving the current cumbersome process of issuing purchase orders to suppliers requires streamlining of data flow between SPEN SAP to supplier systems to enable issuance of Purchase Order to the suppliers.
- **Reduce the number of people working in our stores by improving workforce efficiency:** Employing artificial intelligence and augmented reality/wearable technologies that encompass hand-worn or head-mounted devices which will drive efficiency around picking operations in the warehouse and will provide hands-free guidance to field staff and contractors. The result will be better flow of information, greater visibility, decrease in error rates, superior safety, and increased service levels at lower operating costs. Additionally, the use of voice recognition will be maximised to record data and send back to the system as required. The advantages of functions such as imaging (pictures & video), tracking, cloud integration, voice/facial recognition, and even personal assistants open a wider scope for transformations that these technologies will bring to warehousing operations.

Key Outcomes

- Reduced excess inventory due to more accurate stock levels leading to more sustainable and environmentally friendly operations (reduces waste, low carbon).
- Real-time access to up-to-date consumables catalogue leading to time savings for field staff who can check stock availability prior to commuting to the warehouse
- Warehouses will play a key role in increasing customer satisfaction, effectively predicting product demand, and making better use of the resources at hand.
- Reduction of labour costs through technology enablement
- Increased efficiency in the delivery and receipt of goods by minimising transactional and invoicing effort for both warehouse staff and suppliers
- Predictive analytics, together with artificial intelligence (AI), will increase effectiveness for recommending optimised stock levels, replenishing stock, and increasing operational efficiency as well as warehouse optimisation (refer to Stock Supply and Forecasting project for more details)

4.4.2.2. Management of Internal Vehicles and Supplier Deliveries

This project will enable the drive towards digitalisation of our warehouses and moving SPEN towards its strategic vision of a self-service model by ensuring that our logistical model is fully supported, and our materials can be in the right place at the right time.

Current Position	Change Drivers
SPEN Logistics manage a fleet of vehicles to transport materials from the main Warehouses (Bonnybridge and Queensferry) to local depots. There are also HIAB vehicles (lorry mounted crane or lorry loader) to transport cable and plant to site. The lead time for booking a vehicle is currently 4 weeks. This is due to the onerous, manual planning and schedule management process. Currently, internal vehicles are under-utilised due to the cumbersome and inefficient booking process. Instead, external contractors are being employed for this task at an increased cost. Additionally, suppliers' delivery schedules are currently manually managed using MS Excel spreadsheets within our warehouses and delivery vehicles are often left waiting for extended periods or even need to reschedule on occasion.	Improving the management of our internal vehicles is crucial in helping us manage the expected increase in demand. This also enables cost savings in the logistics area, highlights if there are any vehicles under-utilised, allocates equipment to projects, schedules equipment availability and allows bookings to track past and future usage. There is an opportunity to optimise the management of suppliers' deliveries to ensure there are warehouse staff available to unload stock and reduce delivery vehicles waiting in the depot. Being able to fulfil numerous daily orders efficiently is a critical driver for this change. We need to ensure our vehicles arrive at the correct addresses at the right time, with the lowest mileage possible.

Table 77 Management of Internal Vehicles and Supplier Deliveries Current Position and Change Drivers

Solution

We will incorporate a full internal vehicle booking system into our new scheduling optimisation tool, detailed within our Field Work Management initiative.

This will also include the deployment of online scheduling software to enable suppliers to select suitable delivery time slots to avoid stock arriving during periods where warehouse staff are not ready to receive or, as currently happens, out of normal working hours. This is inefficient for both SPEN staff and the suppliers.

The first phase of the project will involve an in-depth assessment of the requirements to determine the appropriate application development approach.

Key Outcomes

- More effective delivery management with fewer delays and rescheduling required
- Ability to schedule and maximise the utilisation of internal vehicles for projects
- Deliver cost savings in the logistics area by maximising use of existing internal vehicles over the use of contractors
- Increase efficiency in staff productivity through efficient supplier deliveries and scheduling of internal vehicles

4.4.2.3. Supplier Framework Visibility

This project will enable the drive towards digitalisation of our warehouses and moving SPEN towards its strategic vision by ensuing full visibility of supplier framework stock and depletion levels which in turn will improve lead times and availably of stock to staff as required on site.

Current Position	Change Drivers
Currently, SPEN Supply Chain have no visibility of supplier frameworks agreed by the corporate procurement team, this coupled with a disconnect between contracted volumes in a framework compared to the actual volume usage can lead to a potential unexpected ending of a framework agreement. This in turn results in the need to hold excess stock and to resolve this a framework extension requires to be setup; this can have a lead time of up to 16 weeks. In addition, there is no system prompt to enable Supply Chain to measure usage level of the framework agreement until the allocated budget has run out, therefore the staff are having to create budget tracking using manual records (spreadsheets) in order to manage supplier frameworks.	SPEN cannot afford to have service delays due to stock replenishment lead time, therefore has to hold significantly more stock to avoid the risk of running out of equipment and materials. With the forecast increase in network demand, there is a high likelihood that this amount will increase without some form of digital intervention. Additionally, having visibility of the correct framework to procure from provides greater efficiency of management of framework

Table 78 Supplier Framework Visibility Current Position and Change Drivers

Solution

System integration is required between the Procurement team's SAP SRM database and SPEN supply chain and logistics team's SAP system to provide better visibility of data points such as usage pattern, Service Level Agreements (SLAs), and remaining values on the frameworks. There will be functionality incorporated for automated alerts once the framework is at a certain percentage spend, e.g., notification when there is 6 months left, percentage budget used. This will improve collaboration between the procurement and supply chain function and enable the supply chain team to advise on framework extension requirements.

Key Outcomes

- Accuracy of stock inventory and avoid accumulation of surplus stock
- Reduced manual effort required in the supply chain team to maintain offline versions of the framework records
- Improved reporting dashboard of frameworks, showing start/end dates and percentage budget spend at any time.

4.4.2.4. Stock Supply and Forecasting

This project will enable the drive towards digitalisation of our warehouses and moving SPEN towards its strategic vision by ensuing the correct stock levels. This will be achieved by identifying the most appropriate inventory forecasting software which will integrate with our existing data on real-time inventory levels within our current corporate system SAP.

Current Position	Change Drivers
Currently, SPEN are holding more stock than required due to the move towards an un-manned store/warehouse, staff are required to book out materials. With this self- service, there is a risk of human error involving incorrect dates entered or staff not booking out materials creating inaccuracies of stock levels and surplus of stock creating storage issues.	There is an opportunity to utilise the stock data held in our warehouses and required need to manage the accuracy of stock held, reduce storage issues and waste management of perishable goods e.g., consumables with a life span. There is a need to understand variable lead times for different stock items and ensure they are not over or under-stocked at any time.

Table 79 Stock Supply and Forecasting Current Position and Change Drivers

Solution

We will identify the most appropriate inventory forecasting software which will integrate the existing data on real-time inventory levels with asset analytics generated by connecting plant, materials, and equipment to enable the visibility of stock and assist in forecasting of provisions required. There is an option to adopt zero-based principles in stock forecasting and explore automation of the re-ordering process, which will require installation of cameras within the warehouses to detect when equipment stocks are running low and automatically re-order inventory. This can be based on a combination of usage patterns, lead times and seasonality of stock items. The drive is to have and effective inventory forecasting software which will have an immediate impact on inventory levels, reducing inventory where it is not needed for upcoming projects, but increasing those that are historically prone to stock outs.

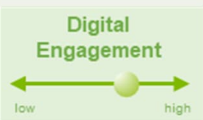
This will involve maximising the use of current systems such as SAP, tagging of equipment and stock in addition to utilising the appropriate inventory forecasting tool which has predictive analytics capabilities to provide the powerful insights needed to optimise our inventory, develop accurate future usage projection and re-order points.

Key Outcomes

- Accuracy of stock inventory and avoid accumulation of surplus stock or stock shortages.
- Reduced inventory carrying costs and saves time for warehouse management and staff due to ability to predict labour needs and account for changes in order volume
- Avoid perishable consumables from going out of date
- Management will gain meaningful reporting of inventory performance and trends

4.4.3 Persona Spotlights

FIELD TEAMS



What is the benefit for me?
Time savings, convenience

How will I feel the impact of digitalisation?
- Controlled access to stores/ warehouses to collect materials booked out against planned work in SAP, for faults, at time out of hours, or for unplanned work
- Ability to access consumables catalogue remotely for items such as PPE, First Aid, Tools, Equipment, to check stock, place an order (subject to controls, approval etc.), plan transportation and/or track delivery and delivery schedules
- Ability to efficiently schedule internal vehicles for projects

Figure 78 Supply Chain, Procurement & Logistics Persona Spotlights

4.4.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Warehouse Optimisation and Consumables Catalogue, Management of Internal Vehicles and Supplier Deliveries, Stock Supply and Forecasting
Agile + Waterfall	Supplier Framework Visibility

Table 80 Supply Chain, Procurement & Logistics Approach, and Initiatives

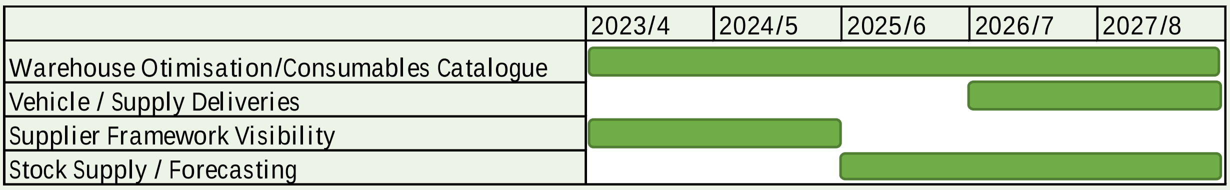


Figure 79 Supply Chain Procurement and logistics Timeline

4.4.5 Resources

Resource Type	Purpose
Scrum Squad	Responsible for delivering project scope (see scrum squad profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Change Manager	Prosci accredited PM supporting business change and adoption
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/Architects	Platform Integration
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to stakeholders
Communications Manager	Internal and external communication of change
Telcom / Social media Consultant	Advisory role for new Omnichannel
Data Experts	Assist with creation of Big Data Platforms, Data Repositories and Reporting & Analytical Tools

Table 81 Supply Chain, Procurement & Logistics Resource Types and Purpose

4.4.6 Functional Model

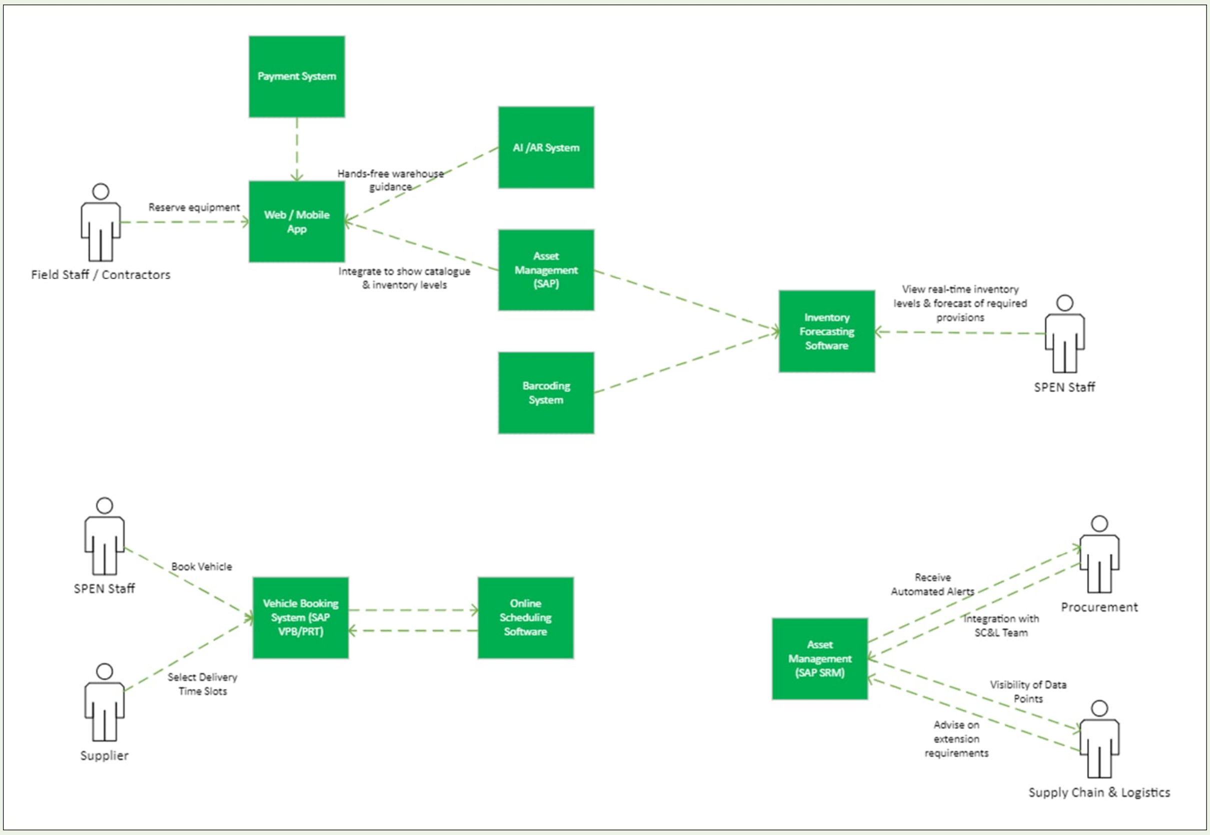
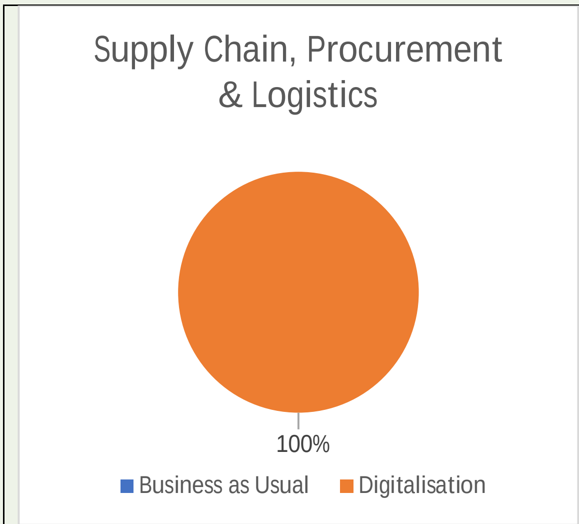


Figure 80 Supply Chain, Procurement and Logistics

4.4.7 Costs



BAU Rationale:

Our supply chain, procurement and logistics functions are already supported by a range of solutions. It would be possible for us to continue operating with these and hence none of the costs in this initiative have been included in BAU.

Digitalisation Rationale:

We believe that our supply chain, procurement, and logistics activities will be able to deliver more efficiently and effectively with the use of enhanced digital field tools. For example, by utilising automated re-ordering, just-in-time delivery and recognising our fleet as virtual stores we will be able to optimise our logistics processes. We have therefore allocated the costs for this initiative fully to digitalisation.

The costs for this initiative have been estimated by evaluating the scope of each project and resource profile required to execute the change. This includes elements such as AR/VR proof of concept, application development, SAP integration, predictive analytics software and IOT and camera hardware. We reviewed and compared the figures against comparable projects, similar in size and scope. These estimations are made on the assumption that the existing Barcoding application project will provide the core technology needed and the investment required are for additional apps and wearable technologies that integrate with existing systems.

4.4.8 Performance Metrics

Project	Measures of Success
Warehouse Optimisation/Consumables Catalogue	• % reduction of excess stock • % increase of staff productivity with the removal of manual processes
Stock Supply	• % reduction of excess stock • % reduction of waste
Supplier Framework Visibility	• % framework agreements utilised • % increase of staff productivity from visibility of access of data to make informed decisions
Management of Internal Vehicles and Supplier Deliveries	• % reduction of contractor costs • % reduction of under-utilised vehicles • % increase of staff productivity with the removal of manual processes

Table 82 Supply Chain, Procurement & Logistics Projects, and Measurements of Success

4.4.9 Assumptions and Dependencies

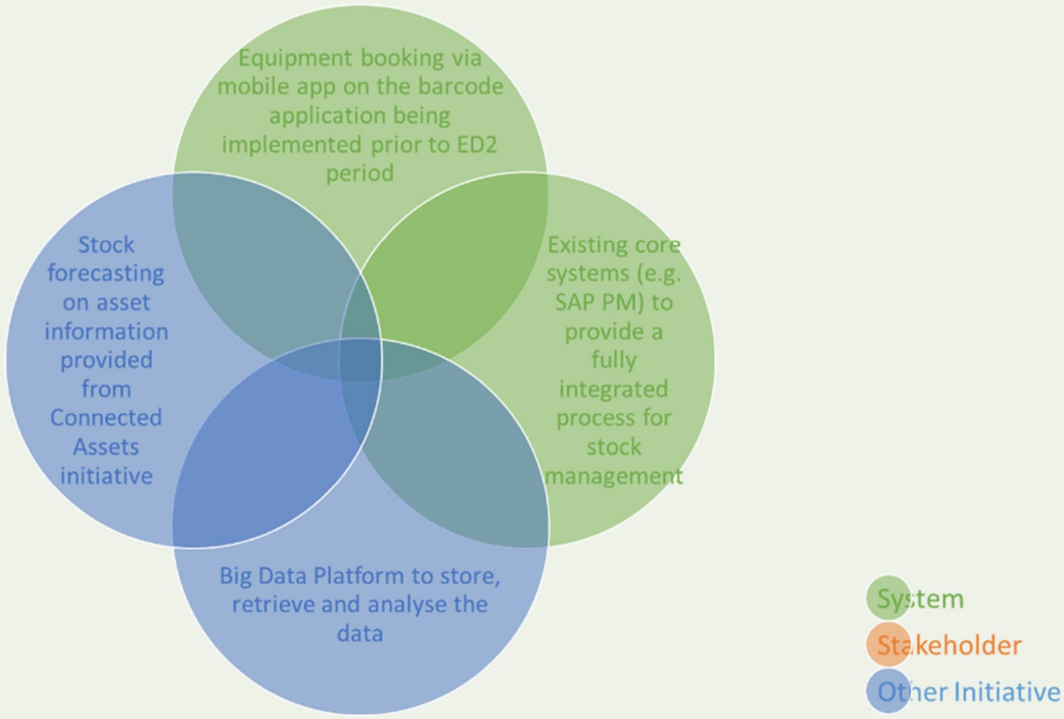


Figure 81 Supply Chain, Procurement & Logistics Assumptions

The diagram above illustrates the Dependencies required for the implementation of the Supply Chain, Procurement & Logistics Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Ability to overcome any security constraints related to integrating the SAP invoicing functions between SPEN and suppliers
There will be an initial assessment and planning period to confirm if a UI platform is required before application development commences
Existing support provisions (system administrators, support desk, etc) will be extended to cover the new platforms, portals, and solutions.
There will be no duplicate effort between delivering these projects and the Connected Assets projects such as asset location tagging
Compliance with Iberdrola global corporate models around logistics, purchasing and financial control

4.4.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Late delivery of the barcode application project, pushing back timeline for other initiatives	Delivery team to collaborate with the Barcoding application project team and discuss dependencies	Medium	High
2	Disparate apps will be created in silos, leading to an inconsistent user interface and duplicate effort required to maintain the apps	Assessment and planning period built into the timeline plan	Low	Medium
3	Incomplete asset and material records	Audit period for gathering the asset and materials inventory stored in databases and ensuring it is in a central repository	Medium	Low

Table 83 Supply Chain, Procurement & Logistics Risks, Mitigations, and Impact

4.5 IOT Smart Initiatives

4.5.1 Overview

SPEN anticipate deploying a significant increase in monitoring, particularly in LV. These LV monitors will be connected by secondary comms, and it is envisaged the data will largely be non-SCADA and so will require an alternative collection mechanism more akin to an Internet of Things (IOT) system. FieldOnline is the proposed solution where any required staging of data into the corporate systems will be facilitated i.e., where disparate collection points, protocol conversion, data conversion or cyber checks need to be managed.

In addition to LV monitoring, many monitors at HV (Earth Fault/Passage Indicators, Network Controllable Points, etc.) are also capable of providing more information than is currently collected (battery alarms, detailed I/V measurements) which would be useful in longer term trending, fault and design analysis. Where we have comms capability with sufficient bandwidth and devices capable of sending data to SCADA and non-SCADA endpoints simultaneously this data can be collected by FieldOnline and used for these longer-term analytics.

Despite the view that network edge intelligence in monitors should reduce the amount of detailed information returned to a central system we expect the need for longer term trending and forecasting will require an overall increase in data collection.

At the current time, SPEN has no, fully productionised, common IOT solution and relies on expensive vendor hosted and point solutions. However, the FieldOnline system is currently deployed in SPEN supporting data collection from Power Quality Monitors at 11kV. Hence, this proposal supports the extension to this platform.

The SCADA systems in SPEN provide a clearly defined and secure route for monitoring/alarm data coming back into the control system. However, not all data is required for real time operations, and it is not advisable to use the control system simply as a route to the data historian as this could have impacts on essential operational performance and is not cost effective.

Historically non-SCADA data has been stored in ad-hoc standalone systems, often provided by the vendor supplying the monitors. This has led to very disparate systems which makes management, consistent cyber security compliance and re-use of functionality difficult. In addition, there is a significant OPEX cost associated with these services, approaching £500k per annum in some cases. There is a clear need to rationalise the data collection in this area from a cost and operations perspective.

4.5.2 Projects

4.5.2.1. System Data Integration Fabric (SDIF)

The SDIF platform currently facilitates the sharing of large volumes of monitoring/transactional information between SPEN systems and allows the management of workflows for existing SPEN systems to work together to achieve a specific business task, e.g., identifying a fault from multiple different pieces of data stored in multiple systems.

The SDIF platform provides the optimal solution as it overlays our existing systems rather than requiring a complete replacement or restructuring. The solution is now demonstrating new ways of working with data and SPEN's approach is to maximise this investment by extending its use, using SDIF as the default integration platform, to become our de facto integration and common data model solution.

Current Position	Change Drivers
The SDIF platform first went live in Dec 2020 with a fault location service. The remainder of RIIO-ED1 will see a selection of further use cases deployed to the platform to facilitate the automation of complex, data rich business processes.	The demands on the electricity distribution system are anticipated to increase dramatically as we move towards net zero with more DER and electrification of heat and transport. This will result in much closer monitoring of network behaviour and consequently more data.

Table 84 System Data Integration Fabric (SDIF) Current Position and Change Drivers

Solution

The main components of SDIF are as follows:

- An enterprise service bus: Manages interfaces between multiple different systems, facilitating re-use.
- A Process Automation Manager (PAM): Picks up data from one or multiple sources, applies a defined set of processing and delivers the data to one or more locations.
- An Integrated Network Model (INM): This is a central reference network model allowing SDIF, and the use cases it operates, to understand how data relates to network connectivity, location, and status of the assets.

Network related data is often stored in multiple, discrete systems and hence, using the data can often lead to multiple, complex, point-to-point integrations between systems to allow data exchange and use. The SDIF solution seeks to avoid this by allowing SPEN's existing systems to present common data services to SDIF which are then used by multiple business processes.

This has the impact of:

- Creating consistent, re-usable interfaces between systems
- Reducing the number of interfaces and maintenance costs significantly
- Abstracting interfaces into functions which can be used in business processes, hence breaking tight system dependency e.g., a "find location" function could be fulfilled by ESRI or another GIS system

- Enabling complex business processes which would have been impossible/manual to be automated Ensuring consistency of processes for audit, cyber and efficiency

The original use case was to facilitate the use of smart meter information in multiple systems. This has changed, with the focus now on how the SDIF solution can develop to become the de facto method of processing, sharing and actioning non-SCADA monitoring/event data. To facilitate this goal, we need to develop the product further.

Key Outcomes

- To reduce the risk of network damage and/or longer network outages due to failure to exploit the associated increasing network data available. To reduce the cost of exploiting this data
- Consumers will benefit from reduced network risk immediately as the different components of the project are completed
- The SDIF solution will facilitate exchange of information with other parties in the energy ecosystem

4.5.2.2. IOT Gateway

SPEN anticipate deploying a significant increase in monitoring, particularly in LV. These LV monitors will be connected by secondary comms, and it is envisaged the data will largely be non-SCADA and so will require an alternative collection mechanism more akin to an Internet of Things (IOT) system. FieldOnline is the proposed solution where any required staging of data into the corporate systems will be facilitated i.e., where disparate collection points, protocol conversion, data conversion or cyber checks need to be managed.

In addition to LV monitoring, many monitors at HV (Earth Fault/Passage Indicators, Network Controllable Points, etc.) are also capable of providing more information than is currently collected (battery alarms, detailed I/V measurements) which would be useful in longer term trending, fault and design analysis. Where we have comms capability with sufficient bandwidth and devices capable of sending data to SCADA and non-SCADA endpoints simultaneously this data can be collected by FieldOnline and used for these longer-term analytics.

Despite the view that network edge intelligence in monitors should reduce the amount of detailed information returned to a central system we expect the need for longer term trending and forecasting will require an overall increase in data collection.

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The SCADA systems in SPEN provide a clearly defined and secure route for monitoring/alarm data coming back into the control system. However, not all data is required for real time operations, and it is not advisable to use the control system simply as a route to the data historian as this could have impacts on essential operational performance and is not cost effective.

Historically non-SCADA data has been stored in ad-hoc standalone systems, often provided by the vendor supplying the monitors. This has led to very disparate systems which makes management, consistent cyber security compliance and re-use of functionality difficult. In addition, there is a high OPEX cost associated with these services, approaching £500k per annum in some cases. There is a clear need to rationalise the data collection in this area from a cost and operations perspective.

Current Position	Change Drivers
FieldOnline has had early operational deployment during ED1 and proven to be a cost-effective method of data capture.	As described in section 2, SPEN have a need to collect more data from more monitors but in a more coherent and cost-effective way. FieldOnline is currently deployed in SPEN supporting data collection but will need additional functionality and scalability enhancements to cater for the increased monitoring. Without the FieldOnline solution, SPEN will continue to outsource and develop point solutions and we do not believe that will fulfil our functional or cost efficiency requirements.

Table 85 IOT Gateway Current Position and Change Drivers

Solution

FieldOnline has been proven during ED1 to be capable of collecting data from field devices in a manner that is cyber secure and cost effective. In 2021 it is undergoing an architecture refresh to ensure it can maintain cyber security and scalability moving forwards.

In its current form, FieldOnline has been deployed with no CAPEX and less than £5k of OPEX during its first year of operation. Although the first collection method is relatively simple this cost base compares with costs exceeding £1m for an on premise commercial IOT solution.

The solution is currently supported by IT on the Iberdrola Azure platform and uses off the shelf components and configuration to tailor data collection solutions for specific field devices. Given the transition to the new UK IT Target Operating Model, which involves more in-house expertise, it is proposed we stay with this model. This will give SPEN full flexibility to change the scope and scale of its non-SCADA data collection requirements quickly without the commitment to a large CAPEX spend on an on-premises solution. The security risks of a hosted solution must be managed but these are to an extent already mitigated using Iberdrola's virtual private Azure cloud. In addition, the scale of the solution must be managed and at some point, the solution may be more cost effective hosted on premise or by a COTS solution. The current assumption is that the CBA for a COTS IOT solution would be reached much later in RIIO-2 if at all and at that point our use of FieldOnline would allow us to accurately specify the requirements for a new solution.

However, the current assessment of risk (£1m+ capital outlay for a COTS solution that may not be used) & efficiency (growing a solution organically & cost effectively on a needs basis) indicates the optimal solution is to commence on the cloud hosted solution and transfer functionality on premise as needed when growth in the volume of data is more clearly understood.

Key Outcomes

- The FieldOnline solution will create a scalable cyber-secure IoT infrastructure that SPEN will build on to enable the connectivity of thousands of network monitoring devices, particularly in LV
- The IoT infrastructure created by FieldOnline will enable data collection and processing on the Edge (i.e., Edge Computing) which enables a more efficient, near real-time responses to incidents and critical events occurring on the network
- The FieldOnline platform links to the Smart Data Integration Framework (SDIF) platform (ED2-NLR(O)-SPEN-004-SMS-EJP) and onward into our data historian (ED2-NLR(O)-SPEN-002-SMS-EJP) to allow collected data to be processed and used effectively in SPEN
- FieldOnline can help replace the services marked in the diagram below:

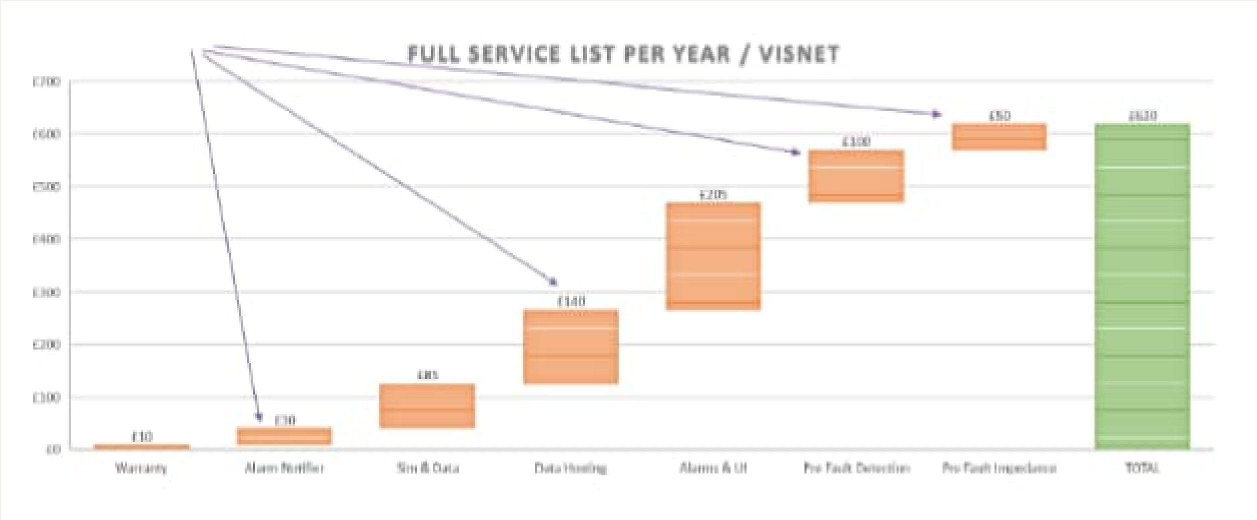
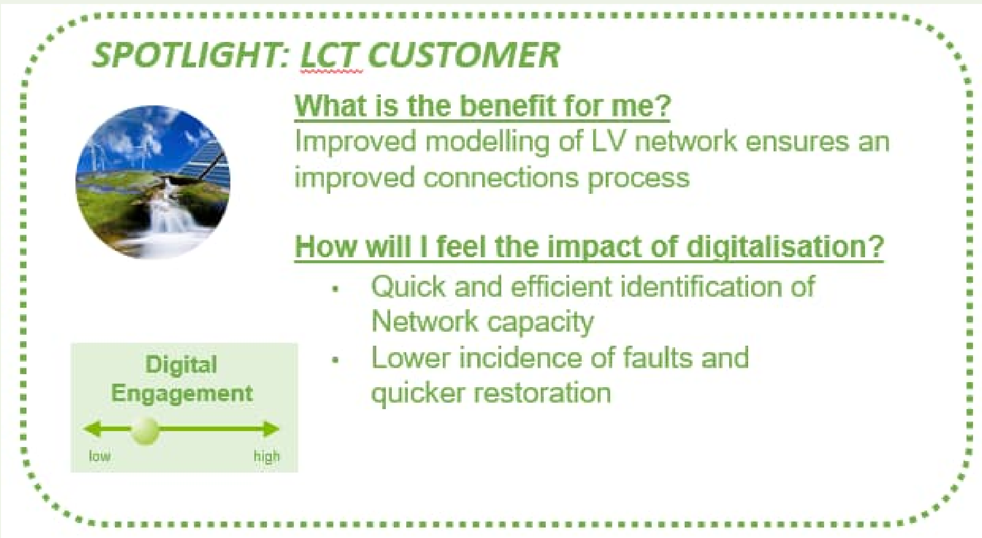


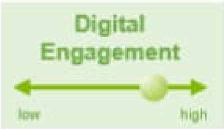
Figure 82 Services replaced by FieldOnline Solution

4.5.3 Persona Spotlights



SPOTLIGHT: NETWORK DATA VIEWERS

What is the benefit for me?
Make more informed decisions by having better visibility of the LV network through near real-time data



How will I feel the impact of digitalisation?

- Get better real-time visibility of LV network data

SPOTLIGHT: FLEXIBILITY SERVICE/EV CP./DEMAND AGGREGATOR

What is the benefit for me?
Provide a key source of data for new energy technology sector

How will I feel the impact of digitalisation?

- Application of new energy scenarios
- Improved forecasting of network capacity
- Asset optimisation

FIELD TEAMS

What is the benefit for me?
Time savings, convenience

How will I feel the impact of digitalisation?

- Controlled access to stores/ warehouses to collect materials booked out against planned work in SAP, for faults, at time out of hours, or for unplanned work
- Ability to access consumables catalogue remotely for items such as PPE, First Aid, Tools, Equipment, to check stock, place an order (subject to controls, approval etc.), plan transportation and/or track delivery and delivery schedules
- Ability to efficiently schedule internal vehicles for projects

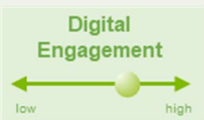


Figure 83 Smart Persona Spotlights

4.5.1 Delivery Approach and Timeline

The diagram below shows the overall proposed plan for the build to start in 2023 and progress through RIIO-2:

Approach	Initiatives
Agile	SDIF and IoT Gateway will adopt an agile delivery methodology

Table 86 SMART IOT Approach and Initiatives

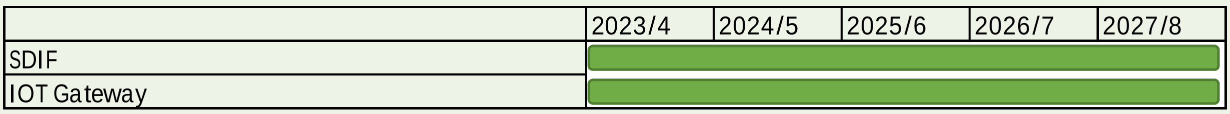


Figure 84 Smart IOT Timeline

4.5.2 Resources

Resource Type	Purpose
Internet of Things Consultants	Effectively capitalize on IoT technology and solutions implementation, linking technology, vendors, and customers through a holistic business model
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies
Programme Manager	Manages the overall programme of work
Change Manager	Prosci accredited change practitioner to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms

Table 87 Resource Types & Purpose

4.5.3 Functional Model

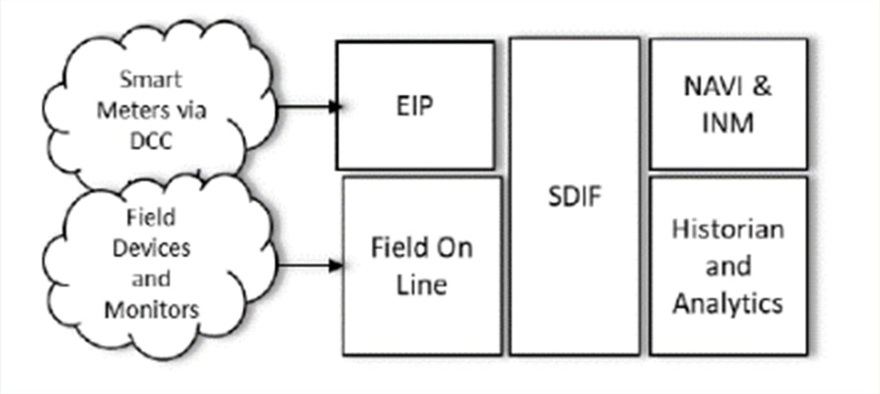
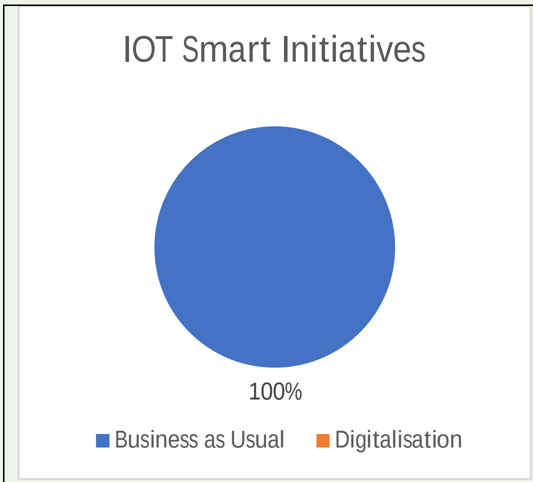


Figure 85 IOT Smart Initiatives

4.5.4 Costs

	**BAU Rationale:** Our systems need to continue to support the rollout of Smart meters. The costs for this initiative have been allocated 100% to BAU. **Digitalisation Rationale:** See above.

The costs for the SDIF solution are based on costs already experienced with the procurement of the solution in ED1 and quotes from external vendors for implementing custom integration in other related IT projects.

4.5.5 Performance Metrics

Project	Measures of Success
IOT Gateway	• %age reduction to the risk of network damage and/or longer network outages due to the complexity of the network increasing by facilitating the use of network monitoring data.
SDIF	• % increase in use cases e.g., non-SCADA networking and event information
SDIF	• % increase in reusable interfaces

Table 88 Smart Projects and Measurements of Success

4.5.6 Assumptions and Dependencies

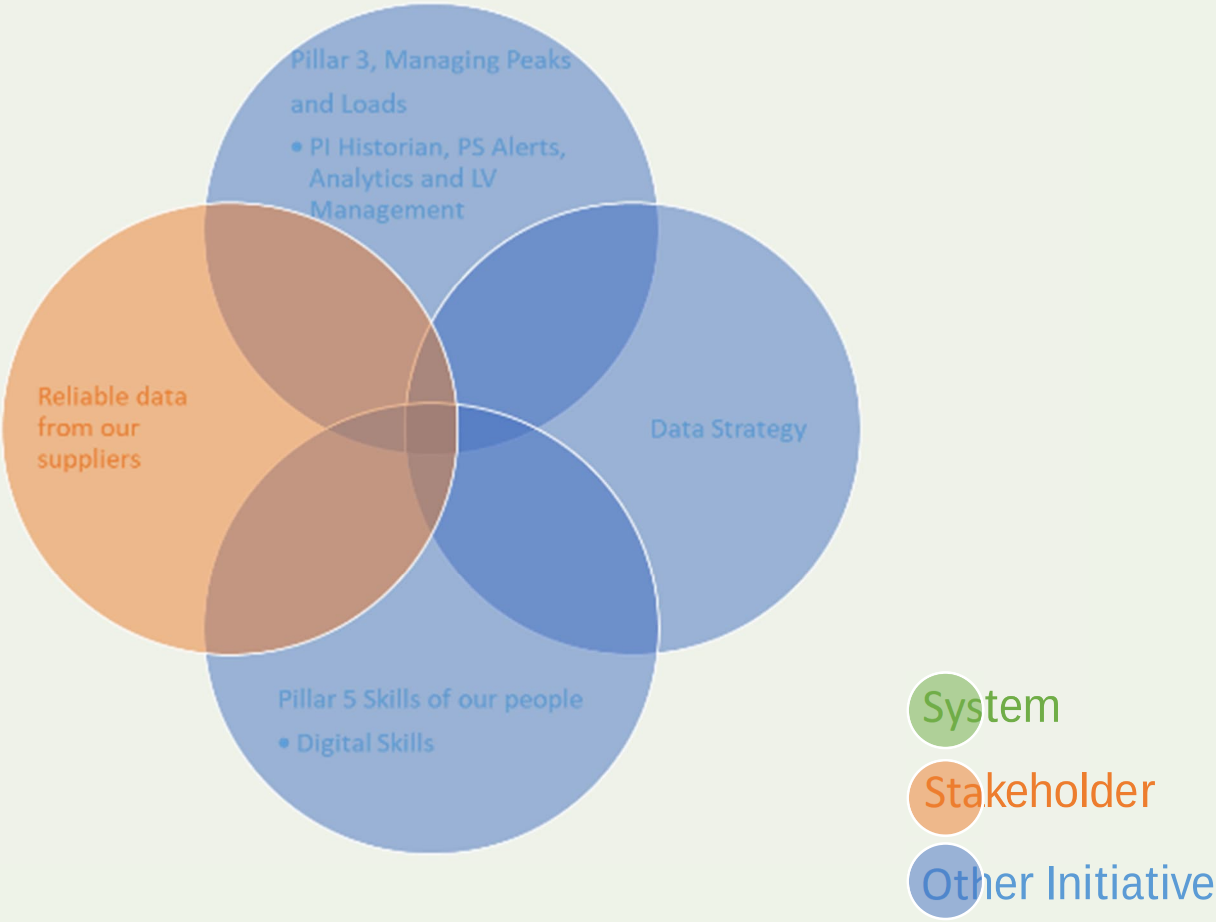


Figure 86 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Smart Initiative and breaks down those from other initiatives, Systems and Stakeholders. There are no assumptions for this project.

4.5.7 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Asset Stranding Risk	The solution is regularly refreshed and updated hence the stranding risk is very low within the lifetime of the refresh period.	Low	Low
2	Availability of suitably experienced staff to continue to support and enhance the platform (SDIF)	Our approach to improving our digital and data skills	Low	Low

Table 89 Smart Risks, Mitigations, and Impact

5. Pillar 3: Developing Options to Manage Peaks in Load

Significant increases in Distributed Energy Resources (DER) and the electrification of transport and heat will dramatically expand load on our network, particularly our 'last mile' low voltage network that is not designed to cater for this high utilisation and is therefore less resilient to the expected change. To address this, we will need to manage vast increases in volume and frequency of data from technologies such as remote sensors, IoT devices, wearable technology, and drones. This is critical to support our customers' transition to a Net Zero future.

We need to manage this load increase using a combination of traditional engineering (business as usual) and new digital solutions to reduce costs for customers and enable the low carbon transition. The distribution networks are on the front line of customer decarbonisation, particularly at these lower voltages. The safe, timely and efficient transition to Net Zero will require step changes in data-driven, automated, and integrated systems for network design and operational management. Without these initiatives, when customers continue to install EVs and heat pumps without there being sufficient capacity, it will overload the network, leading to power outages, shortening of network asset life, higher overall costs for customers, and possible safety concerns.

In this section we will explain how we will deliver the capacity that our customers and communities need, and why these are the right interventions. We will deliver this through:

- Deployment of advanced digital monitoring and control equipment on our low voltage network including 14,000 monitors at 50% of our local substations
- Deployment of 10 constraint management zones in SPD and 12 in SPM enabled by data and digital solutions
- New technology to enable new choices for our customers 'beyond the meter' to support the low carbon transition

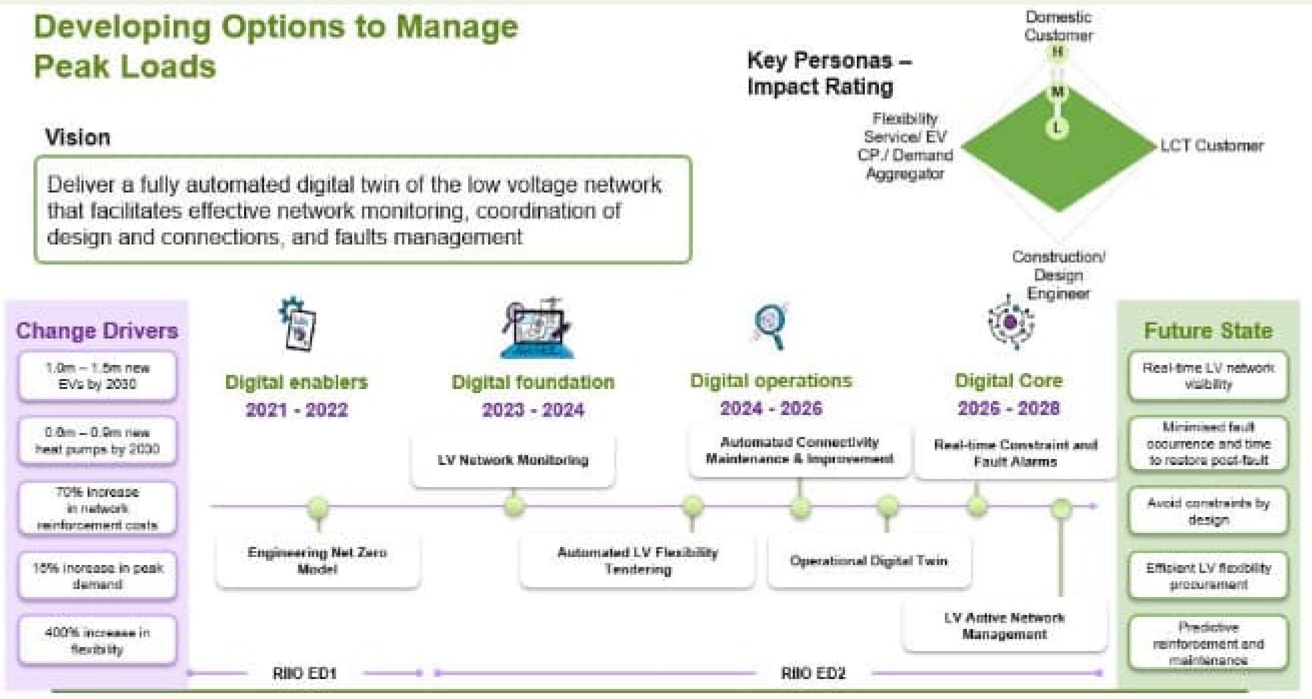
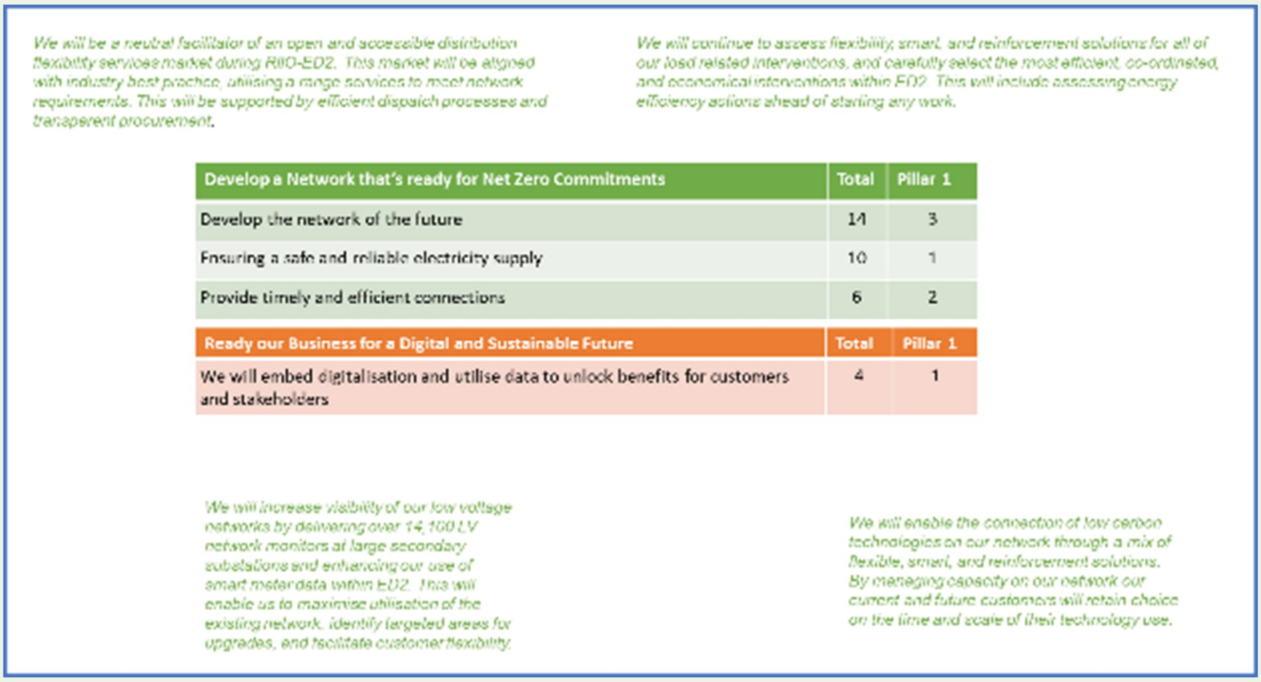


Figure 87 **Summary View of Pillar 3**

The diagram below shows the commitments which these initiatives will drive and contribute to, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.



We will be a neutral facilitator of an open and accessible distribution flexibility services market during RIIO-ED2. This market will be aligned with industry best practice, utilising a range services to meet network requirements. This will be supported by efficient dispatch processes and transparent procurement.

We will continue to assess flexibility, smart, and reinforcement solutions for all of our load related interventions, and carefully select the most efficient, co-ordinated, and economical interventions within ED2. This will include assessing energy efficiency actions ahead of starting any work.

Develop a Network that's ready for Net Zero Commitments	Total	Pillar 1
Develop the network of the future	14	3
Ensuring a safe and reliable electricity supply	10	1
Provide timely and efficient connections	6	2
Ready our Business for a Digital and Sustainable Future	**Total**	**Pillar 1**
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	1

We will increase visibility of our low voltage networks by delivering over 14,100 LV network monitors at large secondary substations and enhancing our use of smart meter data within ED2. This will enable us to maximise utilisation of the existing network, identify targeted areas for upgrades, and facilitate customer flexibility.

We will enable the connection of low carbon technologies on our network through a mix of flexible, smart, and reinforcement solutions. By managing capacity on our network our current and future customers will retain choice on the time and scale of their technology use.

Figure 88 Key commitments driving the initiatives

Deliverables

Deliverables	Timeline
Develop an ENZ Platform, built directly on the NAVI and Smart Meter Data Integration Fabric (SDIF) solutions to provide an integrated system with enhanced real-time data-driven visibility and control of the LV network.	Incremental deliveries from 2023 – 2028.
Adopt a new historian solution which manages both SCADA event data and time series data from edge devices and provides easy access to the data for analytics activities.	Incremental deliveries from 2023 - 2028 with the first delivery due 2025.

Table 90 Developing Options to Manage Peak Loads Deliverables

5.1 Engineering Net Zero Platform

5.1.1 Overview

The Engineering Net Zero (ENZ) Platform is a significant step forward in the creation of a digital twin of our network and will in time aid the development of a National Digital Twin. We are working with the National Digital Twin programme (NDTp), run by the Centre for Digital Built Britain (CDBB) to ensure data collected is in line with the recommendations laid out in the Gemini Principles, specifically that it has clear purpose, that it is trustworthy and that it functions effectively for the public good.

The ENZ Platform will build on technologies introduced in RIIO-1 e.g., NAVI, LView, analytics and RIIO-2 ENZ modelling, and will apply across all voltage levels. These systems are already delivering benefits internally and externally for both our customers and stakeholders. In ED1, they have yielded efficiency benefits, enabling the repurposing of up to 8 FTE within the low voltage (LV) Connections team.

The ENZ platform will be extended to integrate granular network usage data with forecasting, asset health risk criticality and performance.

Connections volumes are expected to dramatically increase, therefore self-serve connections portals, underpinned by network data, are required to provide quotes for simple connections. The ENZ platform will provide critical data to ensure efficiency and accuracy within the connections self-serve process (see Section 3.2). Connecting the forecast volumes of LCTs will not be achievable without these automated solutions (see Section 3.1).

The ENZ Platform is required to facilitate the DSO Strategy, LV Management Strategy and Digitalisation Strategy. Responsibilities for development and upkeep will align with the SPEN Digitalisation Strategy and many of the specific responsibilities will require further analysis. The management of data quality and a standing integrated network model to support continuous analysis is a significant change in our current approach.

Context

The facilitation of Net Zero through the electrification of heat and transport will have the most immediate impact on the low voltage networks increasing:

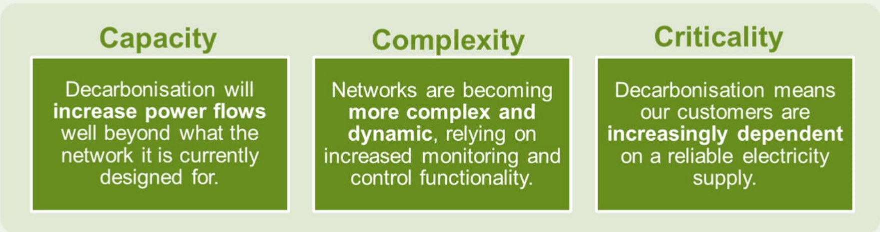


Figure 89 **Increases in Low Voltage Networks through Net Zero Facilitation**

To manage the pace of the low carbon transition a step change in network monitoring, design, and network management systems (NMS) is required. This work began in ED1:

ED1

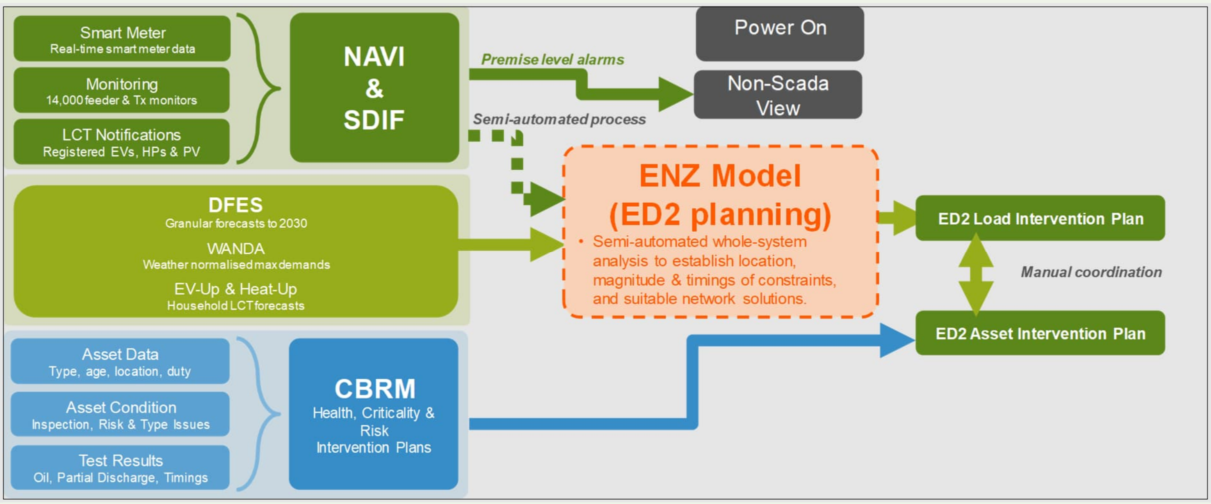


Figure 90 ED1 ENZ platform development

The ENZ platform will further integrate four previously independent data sources which are network monitoring, smart meters, forecasting, and asset condition. This will facilitate real-time data-driven planning and operational decisions. This solution builds directly on the NAVI and Smart Meter Data Integration Fabric (SDIF) solutions put in place during ED1. Our RIIO-1 investments in the ENZ platform will enable us to deliver value and services quicker to customers and stakeholders with further platform development in RIIO-2.

RIIO-2

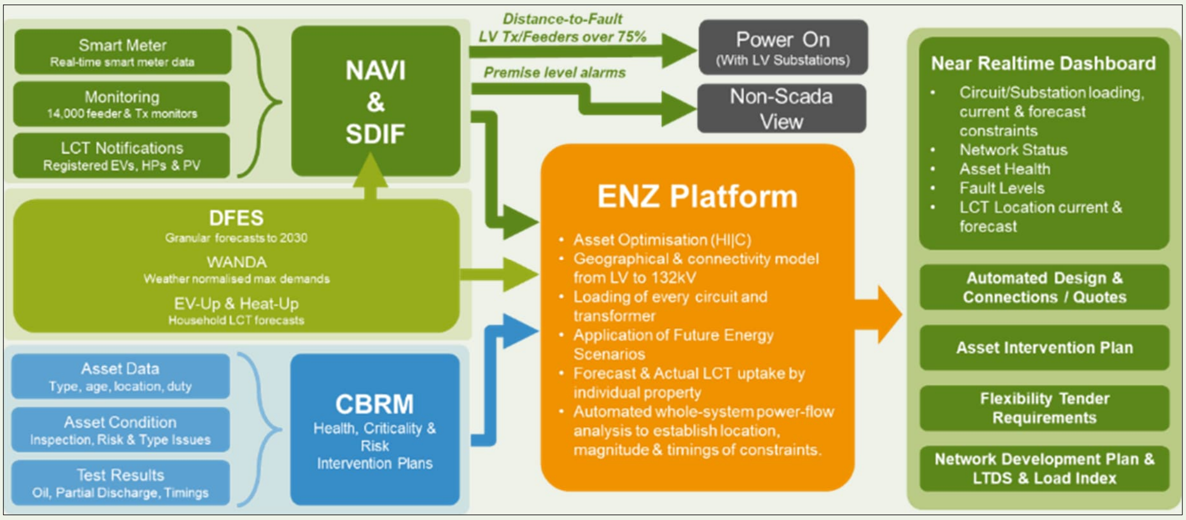


Figure 91 Further development of the ENZ platform in RIIO-2

We will increase the platform's capability by the widescale roll out of LV network monitors and the incorporation of this capability will be enabled by the big data platform.

This industry-leading approach means that, for the first time, we will have an integrated system with enhanced real-time data-driven visibility and control of the LV network. This will bring a range of benefits, including:

- Improvements to our CI/CML, as our control engineers will have live visibility of the LV network and so can respond more quickly.
- Customers will not wait as long for LV connection offers because they will be able to self-generate them from our website.
- Reduced impact on customers' bills, as network planners will have asset condition and utilisation data at their fingertips for all voltages, meaning we can coordinate capacity and asset health interventions and prioritise them appropriately.
- Flexibility providers will have an increased awareness of potential constraints, giving them more time to participate.

Figure 92 Distribution Future Energy Scenarios (DFES) LCT Forecast

The platform will be a significant move forward for us as a network owner, and for our customers. It will allow us to predict and respond to customer needs quicker, increase the reliability of supply, and operate the network more efficiently.

Bringing together granular network usage data with forecasting, asset health, risk, criticality, and performance data in one platform will enable us to coordinate, prioritise and efficiently deliver interventions across all drivers - reinforcement, asset modernisation, faults, and connections.

In the longer term it is proposed to enhance the approach to LV network control to incorporate elements of the current arrangements at the higher voltages, complemented with automated design and network management systems. The scale of this transition requires a staged implementation across RIIO-1, RIIO-2 and RIIO-3.

Needs Case

Our Distribution Future Energy Scenarios (DFES) have identified several scenarios in which there is a dramatic increase in the volume of LCT connected to our network. The capacity requirements are well beyond what the network was originally designed for, and the levels of activity on the lower voltages of network are forecast to increase rapidly with uptakes of LCTs. For example, we will need to upgrade nearly 50,000 looped services cables into our customers' homes. This is 50 times the present intervention rates on these assets. Interventions on the LV feeder network are expected to be greater than 10 times current levels, and 4 times current levels at HV/LV substations. To manage a Net Zero transition, a coordinated LV Management Platform is required to be embedded across multiple business functions (including Smart Grid Operations & Digitisation, Control Room, Network Planning, Districts) to enable:

- Widescale **LV network monitoring** to increase network visibility
- **Automated utilisation and constraints assessments** to understand where overloads are occurring or forecast to occur
- **Automated design and connections tools** to cater for the forecast rapid increase in LCT connections
- **Automated faults management** using monitoring and LV network devices to improve network performance which is particularly important with increasing criticality of networks

The risk of not automating connections and design activities is that the rapid uptake of LCTs will not be deliverable because we identify network constraints too late. Consequently, if we do not implement the systems, we potentially could act as a bottleneck in LCT adoption.

Real-time data-driven planning is required to underpin capacity constraints early warning systems. These systems identify network constraints in a timely manner, facilitating coordinated and efficient interventions. They will use automated systems joining real-time network usage, granular forecasts, and automated power-flow analysis. Without these we risk identifying network constraints late risking asset failures, potentially increasing fault rates and reducing network performance.

Automated network connections and design tools are required to streamline the connections activities to be able to cater for 2.5 million LCT connections across SPD and SPM by 2030. The existing desktop quotation process is unable to scale to this volume.

Aims & Objectives

Our aim is to develop our internal capability to be able to handle:

- ~2.5M LCT connections by 2030
- ~14k LV monitors by 2028
- ~3M+ smart meters by 2025
- Increased integration of automation systems

Substantial increase in LV monitoring data, turning this into network management enhancements

5.1.2 Projects

5.1.2.1. Streamlining design and connections

Automated network connections and design tools are required to streamline the connections activities to be able to cater for an anticipated 2.5 million LCT connections by 2030, in addition to our current workload.

Current Position	Change Drivers
SPEN is currently unable to offer any automated self-generated quotations online for customers. Each quote is currently bespoke and whilst accurate, can be labour intensive.	To cater for the increase in demand for quotations, there is a need to integrate the proposed self-generation of fixed price quotations with our current NAVI/INM models to allow a full picture of capacity constraints, flexibility, and power flow.

Table 91 **Streamlining Design and Connections Current Position and Change Drivers**

Solution

The automated power-flow analysis in the ENZ Platform will be used to underpin an automation/wizard process to enable customers to self-generate quotations from our website. This process is based on the network model maintained by NAVI/Integrated Network Model (INM) and will integrate with the self-serve portal being developed (see Section 3.2) and be enabled by the work being done on data and systems integration.

The ENZ platform will add further detail using data sources from NAVI and INM through our SDIF platform to allow automated refinement of these quotations to include information such as capacity constraints, flexibility and power flow at all voltages including, and especially, LV.

Key Outcomes

- Improved customer experience from the reduced time to produce a connections quote
- Increased staff productivity with reduction in manual evaluation, design, and creation of quotes for LV connections
- Reduced cost due to efficiency with avoidance of headcount increase and repurposing staff from connections team to other roles within the business. Depending on the scale and nature of the upturn in connections, we anticipate avoided costs of between £20m and £130m.

5.1.2.2. Automated LV Network Model

Advanced network models for the LV and HV network have been developed as part of the design process, building on extracts from the NAVI platform with load flow and fault level analysis to understand the location and magnitude of network constraints based on DFES forecasts. An example is shown in the figure below.

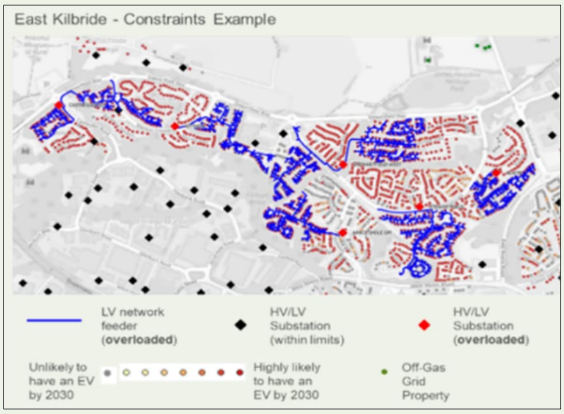


Figure 93 Constraints map from ENZ model

It is proposed to further develop these models and integrate with corporate systems to support the design and operational management of the LV network. This system will build on NAVI and SDIF as well as the RIIO-2 ENZ model. Inputs to the system will include LV monitoring, smart meter data, LCT notification data, DFES forecasts and forecast LCT uptake (based on EV UP and Heat UP).

Current Position	Change Drivers
Current analysis of network constraints at the LV and HV network levels is very time consuming and labour intensive. Users need to access several sources of data across disparate systems and carry out manual calculations to see a clear picture of load and/or power flow for any given circuit or substation.	To meet our evolving customer needs, we are developing smarter, more flexible network solutions to help mitigate the need for traditional reinforcement and reduce costs for our customers. There is a need to understand network constraints and power flow quickly and in an accessible manner to expedite quotations to customers. There are several critical data sources which need to integrate through a single platform (ENZ) to provide this picture for users to allow improved services to be offered to our customers.

Table 92 Automated LV Networks Model Current Position and Change Drivers

Solution

The ENZ platform will include a full LV network connectivity model (based on NAVI), asset parameters, phase balancing, power system analysis (power flow and fault level).

The system will be capable of performing automated power flow analysis in near real time for the entire LV network for current and forecast demand.

The system will facilitate:

- Tracking and forecasting of LCT uptake
- Identification of real time and forecast network constraints.
- Automated design of connections and reinforcement activity.
- Dashboarding alerts and constraints based on monitored and modelled data.
- LV fault management including impedance mapping.
- LV flexibility tendering requirements and management.

NAVI will underpin this system and therefore LV network monitoring, smart meter data and LCT notification will feed into NAVI.

Key Outcomes

- Streamlining of the detailed network design studies to deliver the digitalisation strategy, including the assessments required to roll-out ~700 smart substations and over ~800km of cable
- Tracking LCTs improves risk prioritisation of proactive looped service program

5.1.2.3. Real-time Alarms into Control and Faults Management

This project will provide our control engineers with real-time information on areas of network with high utilisation and networks that are presently under fault or being operated abnormally.

Current Position	Change Drivers
Lack of clarity of forecasted constraints on the network. Decisions are generally made based on visiting substations manually, or by lengthy interrogation of disparate systems.	As levels of activity increase on LV and HV networks due the expected increase in the uptake of LCTs it is imperative that real-time information of our network is made available to control engineers to make data-driven decisions.

Table 93 **Current Position and Change Drivers**

Solution

The ENZ platform will provide dashboarding of alerts and constraints based on monitored and modelled data joined with granular forecasting data and power-flow analysis. Using the network monitoring and smart meter data, it will enable identification of constraints in near real-time, enabling us to intervene before constraints escalate.

Joining with LCT notifications, forecasting and power-flow analysis enables the platform to identify areas of LCT growth coupled with network capacity shortfalls. This will play an important role in being able to stay ahead of the curve, i.e., reinforcing the network prior to constraints affecting LCT uptakes.

We aim to limit the data flows into PowerOn to only information that is useful for control engineers. This will comprise real-time data for HV/LV transformers and LV circuits that are approaching thermal limits; feeders that have gone off-supply; and locations of faults.

We will also build on our "Sinepost" project, applying automated impedance mapping to current measurements for calculation of 'distance to fault' which will reduce the time to restore faults.

Key Outcomes

- Improved service reliability. Realtime alarms allow us to identify and monitor emerging constraints, improve operational management of constraints, and intervene before escalation to a fault
- Improved customer satisfaction from reduced restoration time post-fault
- Reduced cost to customers as proactive constraint management enables reduced flexibility dispatch
- Better tracking and management of the health of highly utilised substations reduces risk of more expensive reactive reinforcement being required

5.1.3 Persona Spotlights

DOMESTIC CUSTOMER

What is the benefit for me?

Improved reliability of service at minimal cost increase

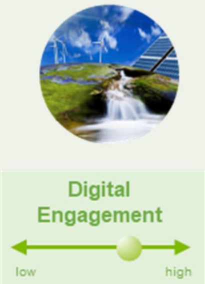
How will I feel the impact of digitalisation?

- Better constraints management reduces incidence of faults and time to restore after a fault
- More efficient utilisation of flexibility and avoidance of expensive network reinforcement reduces cost to customer

Digital Engagement

low high

LCT CUSTOMER



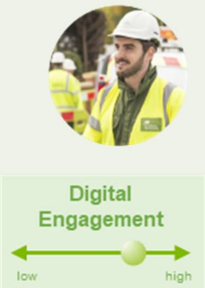
What is the benefit for me?

Quick delivery of LCT connection quote and design, reliable service

How will I feel the impact of digitalisation?

- Self-service generation of connections quote
- Adequate network capacity to accommodate LCT uptake
- Lower incidence of faults and quicker restoration

CONSTRUCTION / DESIGN ENGINEER



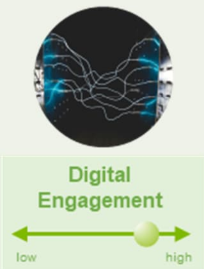
What is the benefit for me?

Better visibility of network and increase in productivity

How will I feel the impact of digitalisation?

- Reduced manual effort in LV connections process
- Streamlined and real-time view of network for proactive management

FLEXIBILITY SERVICE / EV CP. / DEMAND AGGREGRATOR



What is the benefit for me?

Enabling environment for new energy technology sector

How will I feel the impact of digitalisation?

- Improvement in efficiency of connections process facilitates rapid uptake of LCTs
- Flexibility providers will have more notice of potential constraints, giving them more time to participate
- Network digital twin and historical view of constraints can inform where to locate flexibility provision on the network

Figure 94 Engineering Net Zero Platform Persona Spotlights

5.1.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Streamlining design and connections, Automated LV Network Model, Realtime Alarms into Control and Faults Management

Table 94 Engineering Net Zero Platform Approach and Initiatives

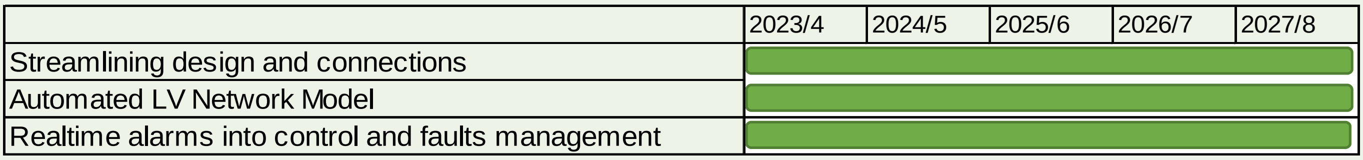


Figure 95 Engineering Net Zero Platform Projects Timeline

Short term (1-3yrs): **Connect & Manage**

- Integrate LV monitoring from substations, smart meter data and LCT notifications data.
- Integration of granular forecasting (DFES, EV-Up, Heat-Up, WANDA).
- Integrate with detailed asset condition data (CBRM).
- Tools and abilities to handle the scale of the challenge, including:
  - Automated design and connections tools
  - Automated utilisation and constraints assessment tools
  - Automated faults management tools (distance to fault etc.)
- Hybrid systems inform control room & operational engineers (this is a mix of control and non-Scada information). - start to integrate LV monitoring from substations and smart meter data.
- Use NIA/NIC projects to build on existing capabilities and to refine requirements for LV management.

Medium term (3-5yrs): **Automated design and connections**

- Automate LV flexibility tendering.
- Improving integration to support LV control.
- Automated connectivity maintenance & improvement
- Integrated front end for LV management (view control and non-control in consistent way)

Long term (5-10yrs): **LV network Active Network Management (ANM)**

- LV network control and active network management, pair with smarter assets.
- Predictive maintenance

5.1.5 Resources

Resource Type	Purpose
Network Planning & Regulation (NP&R) Team	NP&R design teams will take ownership of the ENZ model configuration, scenario definition and BaU process definition
Smart Grid Operations (SGO) Team	SGO will continue to develop and support automatically updated network models that facilitate ENZ scenario analysis. In addition, they will facilitate best practice in analytics environments and data science use. They will further support the supply of network data and automation of business processes as required
Data Stewardship Team	Asset Data team will continue to maintain the master data sets for assets and networks ensuring the collection and quality assurance of data, as well as the underlying connectivity model. Opportunity will be taken through the changes noted above, to back-fit information where necessary, and to improve the data quality of the historic assets. In addition, the future upgrade to

	the ESRI GIS platform may afford opportunities to integrate datasets to the core asset system, as well as offering advanced analytics.
Centre of Excellence (CoE)	Overall governance of IT estate, management and reporting of performance
Control Room	The control room will evolve additional LV management capability which may be distributed to districts rather than centralised
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Change Manager	Prosci accredited PM supporting business change and adoption
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.

Table 95 Engineering Net Zero Platform Resource Types and Purpose

5.1.6 Functional Model

The Engineering Net Zero Platform will build on the technologies already introduced through ED1 – NAVI, LView, SDIF, INM, GIS, PowerOn and analytics. NAVI is designed to be a central network data model suitable for supporting analysis. The strategic direction for NAVI is to incorporate it into the Integrated Network Model (INM) which is part of the Smart Data Integration Fabric (SDIF) solution. The INM brings together GIS, SAP and PowerOn data into a single model enhancing the network representation currently available in NAVI.

We intend to ensure the overall solution becomes a fully supported corporate solution with a managed roadmap.

Working within SDIF NAVI/INM for the ENZ platform can leverage the interfaces built with our core systems and hence effectively collate and share information. All of this will be underpinned by the data and systems integration and big data platform.

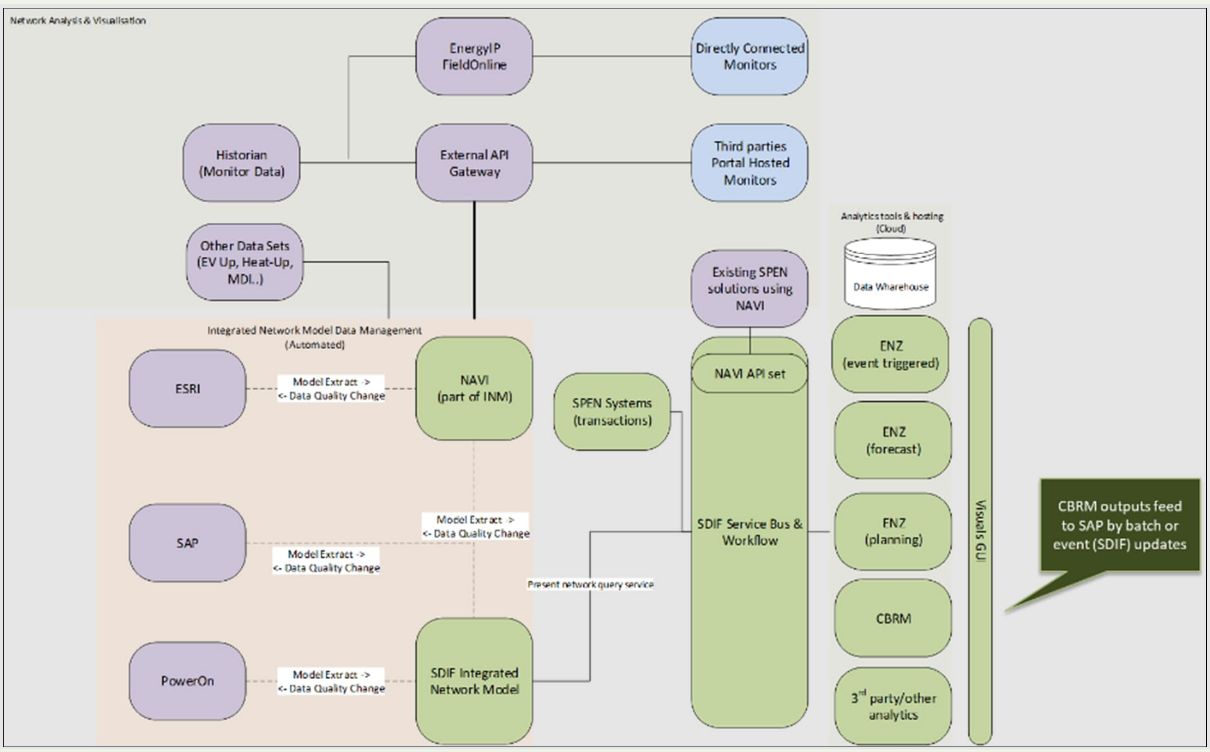
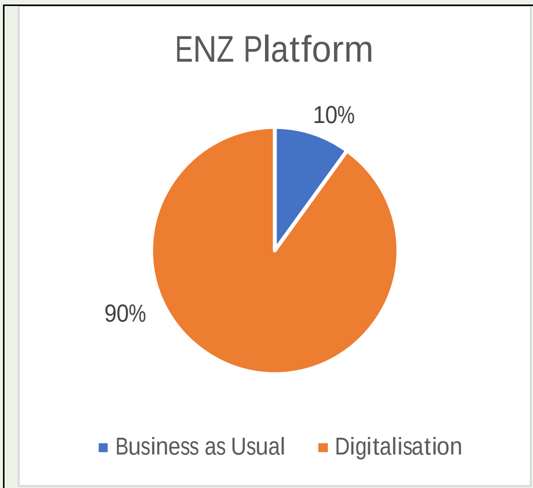


Figure 96 ENZ Functional Model

5.1.7 Costs

<table>
<tr><td rowspan="2">
</td>
<td>BAU Rationale:

We already have a suite of modelling tools and platforms which could potentially be extended to create a skeleton ENZ platform. This forms our BAU proposal.</td></tr>
<tr><td>Digitalisation Rationale:

We envisage our ENZ being an integrated, real time, multi vector digital twin of our network which will underpin many of our activities. Our digitalisation proposal embeds our ENZ platform into our IT estate and our business processes enabling us to optimise decisions about our activities and the operation of our assets.</td></tr>
</table>

The ENZ Platform is compiled of several different elements as described in the Functional Model above. The cost of implementing the platform and its various components has been calculated based on the following:

- Inclusion of the purchase of the licenses for the NAVI system
- Cost estimates for Historian, Visualisation and Analytics
- Integration between systems to provide a single platform
- Facilitation of our network management aspirations by extending functionality into the Engineering Net Zero Platform

5.1.8 Performance Metrics

Project	Measures of Success
ENZ Platform	• Number of faults prevented and overall reduction in fault volumes • % reduction in average time to quote for LV customer connections • Increase in traffic to connections self-serve portal • Change in volume of flexibility dispatched

Table 96 Engineering Net Zero Platform Project Measurements of Success

5.1.9 Assumptions and Dependencies

Dependencies

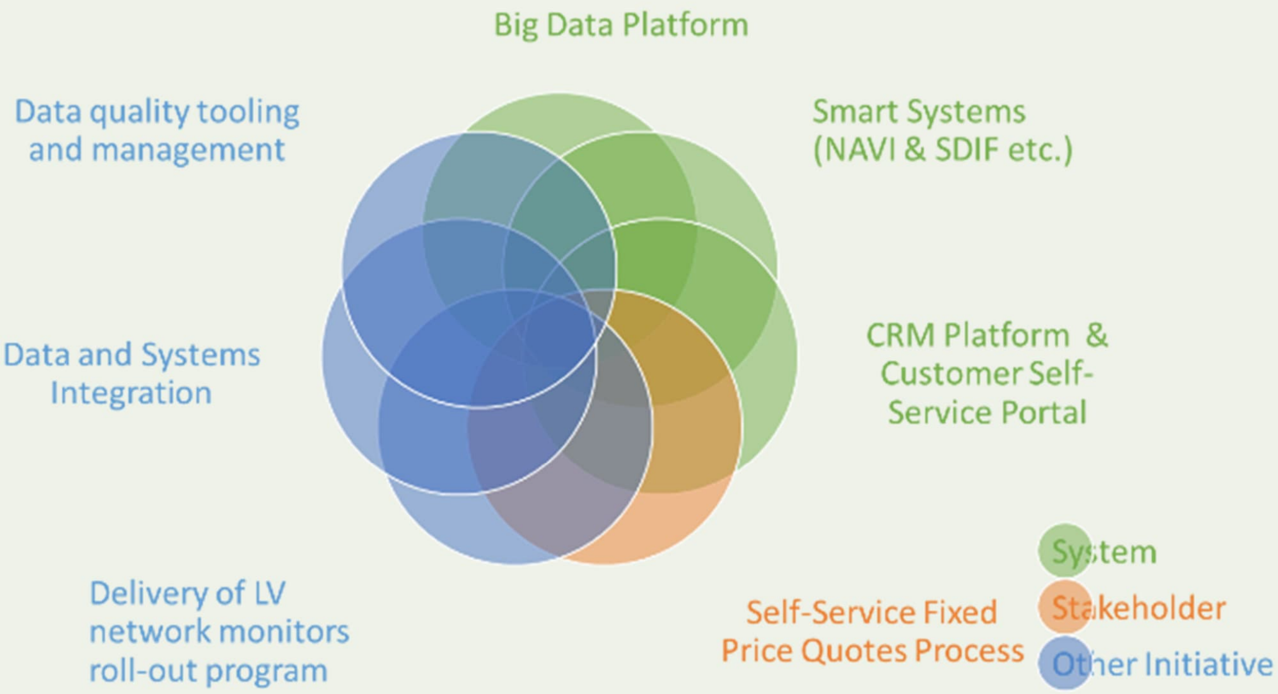


Figure 97 Dependencies By Type

The diagram above illustrates the Dependencies required for the implementation of the ENZ Initiative and breaks down those from other initiatives, Systems and Stakeholders.

5.1.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Existing platforms and services require extensive integration with existing systems which can be costly and time consuming to deliver	Develop using API standards that can be re-used by multiple applications or Open APIs reducing cost and speed of delivery	Medium	Low
2	ENZ platform is an evolving capability for SPEN, and there is a risk from business change and adoption of new technology into the core business	Engage with business stakeholders early, use personas to explain the new ways of working and how existing roles will change over time	Medium	High
3	ENZ platform will rely on accurate data from several sources. There is a risk that our current data does not fully meet data quality requirements	Invest in data quality tooling and data quality management activities to identify, measure, and improve data quality for critical data attributes needed for the ENZ platform	Low	Medium

Table 97 Engineering Net Zero Platform Risks, Mitigations, and Impact

5.2 Smart Data and Analytics

5.2.1 Overview

SPEN anticipate deploying a significant increase in LV monitoring. There are plans to install an additional 14,400 LV monitors, with a projected estimate of up to 1.8 million data points to be managed by a Historian. Our current historian has capacity for 100k data points.

In addition, we also need to increase capacity to store LV and potentially Low Carbon Technology (LCT) related information.

We also seek a greater level of information from our HV network, which would be useful in the longer-term trending and design analysis. This forms the baseline capability to enable a DSO.

To do these activities, we need to facilitate a long-term data storage solution and provide the associated analytical capabilities.

SPEN currently uses PI historian to record time series analogues from monitors, and an in-house solution called PSAlerts to store SCADA event data. The current set-up will not facilitate the support of key Digitalisation and DSO strategy goals, such as

- Forecasting
- Self-serve connections
- Near-real time capacity/carbon/voltage/fault heatmaps (internal & external use)
- LV (LCT) visualisation & active management
- Predictive maintenance

Analysis has been done to assess the options of refreshing or replacing PI and PSAlerts and following careful analysis the recommended option is replace. Please see ED2-NLR(0)-SPEN-001-SMS-EJP – SMS Historian Analytics for further information on this analysis.

5.2.2 Projects

5.2.2.1. PI Historian, PS Alerts, Analytics and LV Management

This project will deliver a new historian solution to manage both SCADA event data and time series data and will provide easier access to the data for analytics activities. To maximise the use of the data stored in the historian in the provision of services, we need to have an analytics environment capable of manipulating a high volume of data in a short timeframe. The most cost-effective route to do this is leveraging flexible cloud-based analytics environment. This will allow us to mix in-house and externally developed analytics flexibly. In addition, we require visualisation of data to end users particularly for LV Management

Current Position	Change Drivers
PI is a trusted historian, but our current solution is out of date, moving out of support and use is not maximised. Data being difficult to understand and extract for non-technical users.	Significant increase in LV monitoring Receipt of a higher volume of HV data Increase capacity required to store LV and potentially Low Carbon Technology (LCT) related information is needed as the update of LCT increases.

Table 98 PI Historian, PS Alerts, Analytics and LV Management Current Position and Change Drivers

Solution

Our vision is that the historian needs to be able to feed multiple analytics platforms and potentially provide information to third parties, allowing the data to be presented in readily usable format to end users. Consequently, we will require functional and capacity enhancements to our current historian systems to achieve this.

The proposed solution is to use a Commercial Off The Shelf (COTS) analytics product to provide a dedicated cloud analytics environment to give SPEN access to a cost effect solution which provides a wide range of tools so that even imperfect data can be exploited to provide insights to network operations.

As large-scale use of analytics is still a relatively new area this provides the most scalable option and lowest risk of stranded/unused assets. Our ongoing investment in data science skills also requires this environment for this resource to be fully utilised. In addition, this analytics base allows us to further enhance dashboards for visualising our LV network to support our fault management and connections facilitation in this area.

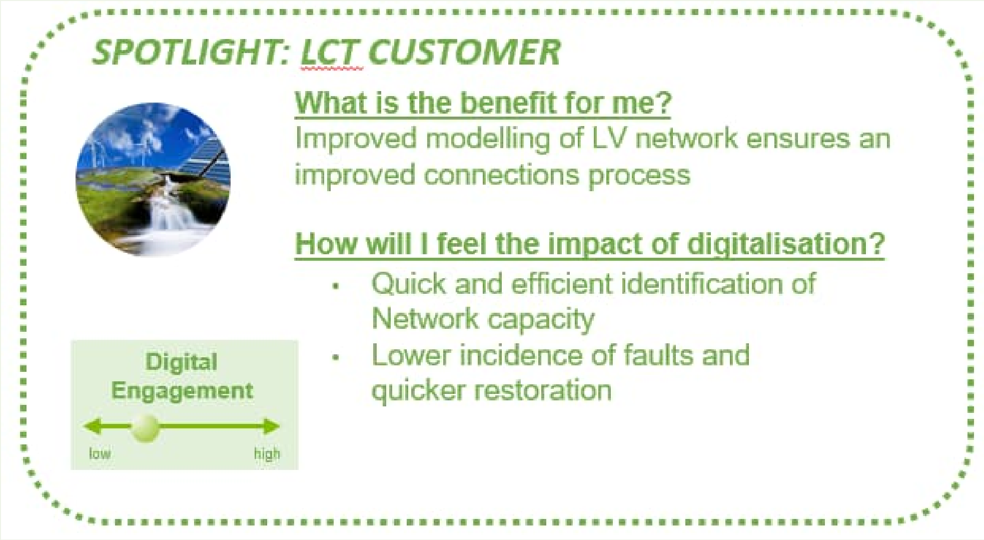
SPEN currently has multiple network visualisation tools with varying functionality and usage levels (Geofield, Geoview, UMV, ESRI, LView). This part of the project would look both at further developing the LV visualisation capability put in place during in ED1 but also at how the multiple visualisation options could be rationalised to support efficient operational processes.

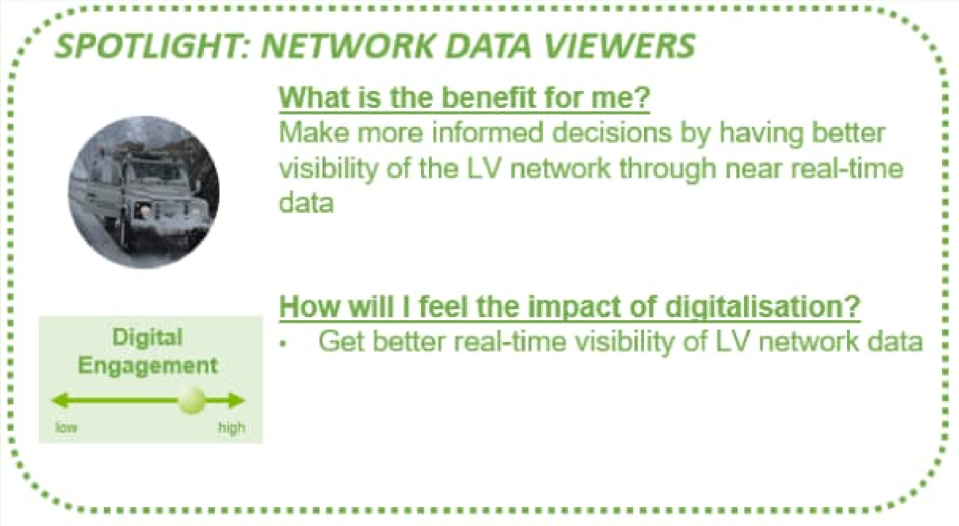
These solutions existed in RIIO-1 and will be extended by procuring additional services during RIIO-2 i.e., we plan to maintain our existing Historian & analytics environments whilst we extend or procure additional Software as a Service capabilities in these areas. This will mitigate the risk of these solutions.

Key Outputs

- Reduce the risk of network damage and/or longer network outages due to the complexity of the network increasing through access to and the ability to exploit high volumes of monitoring data.
- Consumers will benefit from reduced network risk immediately as the different components of the project are completed.
- The proposed option is consistent with the SPENs DSO Strategy, other Digitalisation initiatives and Distribution Future Energy Scenarios.
- The proposed solutions are based on open cloud technology which avoids lock-in to an obsolete solution.

5.2.3 Persona Spotlights





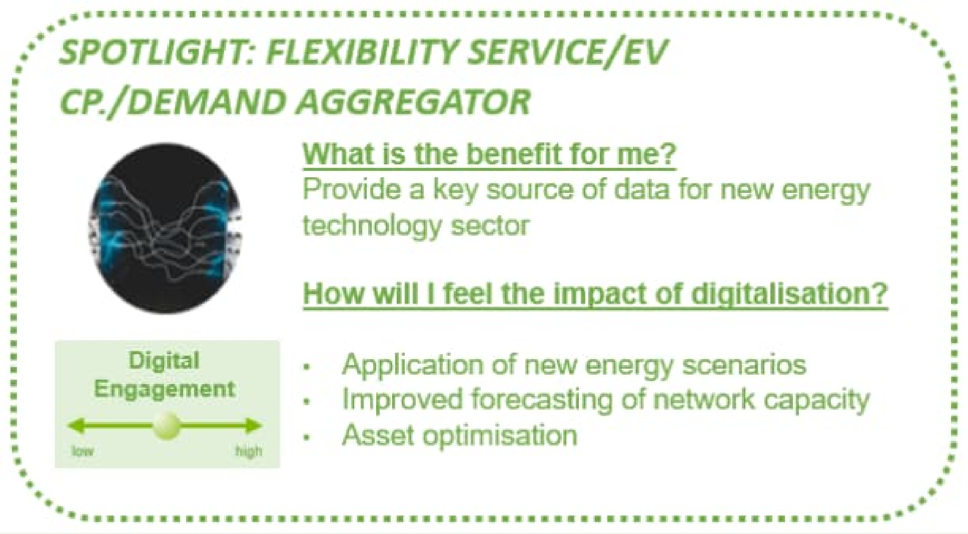


Figure 99 Smart Data & Analytics Persona Spotlights

5.2.4 Delivery Approach and Timeline

Approach	Initiatives
Waterfall	PS Alerts will adopt a waterfall delivery methodology
Agile	Analytics will adopt an agile delivery methodology
Agile	LV Management will adopt an agile delivery methodology

Table 100 Smart Data & Analytics Approach and Initiatives

The diagram below shows the overall proposed plan for the build to start in 2023 and progress:

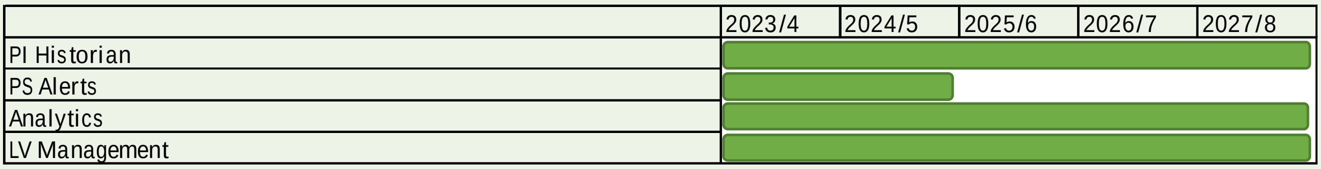


Figure 101 Smart Data & Analytics Overall Proposed Plan and Timeline

5.2.5 Resources

Resource Type	Purpose
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages the project in terms of timelines, scope, budget, risks, and interdependencies
Programme Manager	Manages the overall programme of work
Change Manager	Prosci accredited change practitioner to manage business change
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms

Table 102 Smart Data & Analytics Resource Types and Purpose

5.2.6 Functional Model

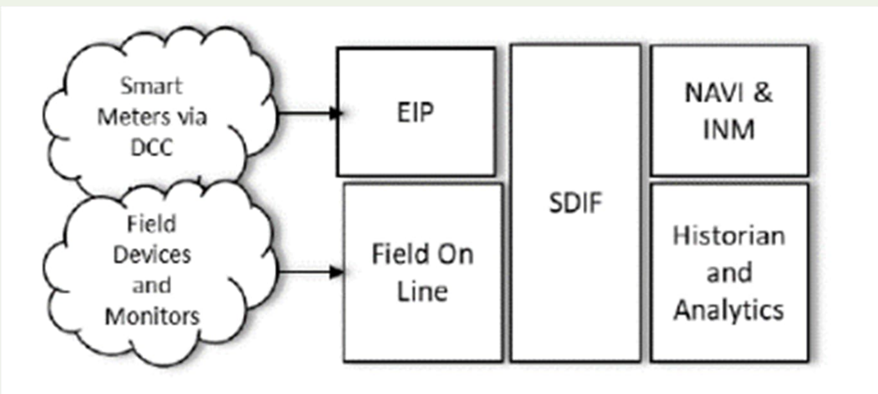
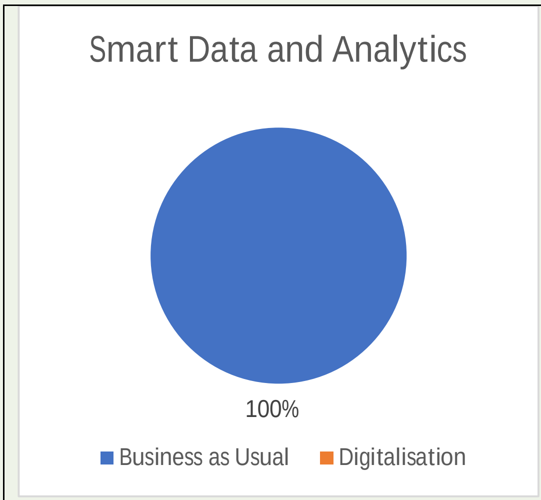


Figure 103 Smart Data & Analytics Functional Diagram

5.2.7 Costs

	**BAU Rationale:** Our systems need to continue to support the rollout of Smart meters and the capturing and processing of Smart meter data. The costs for this initiative have been allocated 100% to BAU.
	Digitalisation Rationale: See above. The integrated analysis of Smart metering alongside other datasets is covered under pillar 6.

5.2.8 Performance Metrics

Project	Measures of Success
PI Historian	• % increase of SPEN users of data and tool
LV Management	• % increase in LV Monitors monitored

Table 104 Smart Data & Analytics Measurements of Success

5.2.9 Assumptions and Dependencies

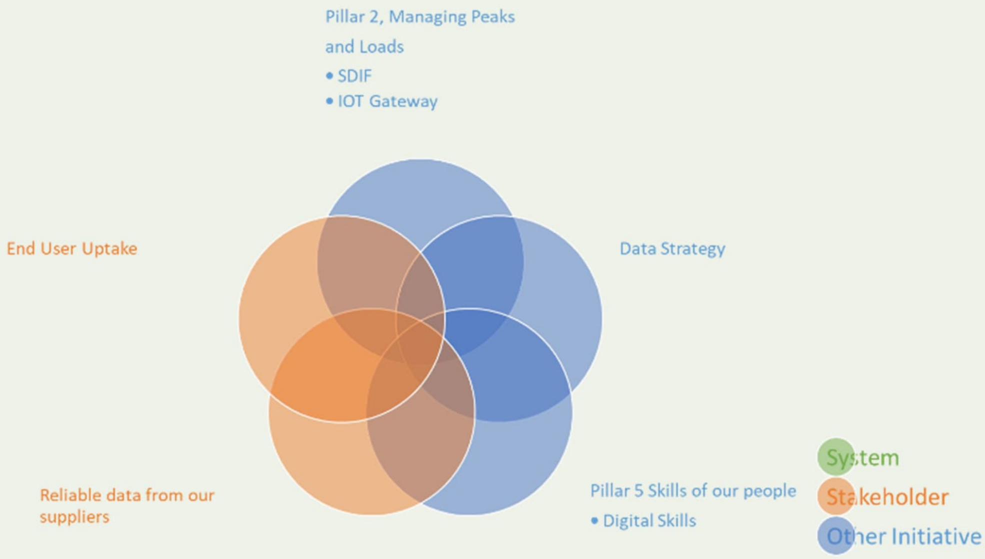


Figure 105 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Smart Data and Analytics Initiative and breaks down those from other initiatives, Systems and Stakeholders. There are no assumptions for this project.

5.2.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Potential alternative Historian solution contains cost uncertainty and deployment risks	Cost contingency Flexible Cloud based approach Fallback to existing solution	High	Medium
2	A new analytics environment also contains a high risk for delivery to cost given the uncertainty of a completely new solution.	Experience gained during final years of ED1 Digitalisation plan accommodates upskilling	Medium	High
3	Data volumes far exceed predictions	Cloud based solutions should scale cost effectively Predictions based on networks expertise	Medium	Medium

Table 106 Smart Data & Analytics Risks, Mitigations, and Impact

6. Pillar 4: Supporting New Business Models & Markets

We play a critical role in meeting the UK's ambitious climate change targets for a sustainable, Net Zero future. While we do this, we must reduce our own environmental impacts, adapt our world-class, resilient network to the effects of climate change, and continue to deliver sustainable value for all our customers.

Our commitment to reaching Net Zero will require alternatives to traditional working practices such as network reinforcement. By adopting an open, collaborative approach across the ecosystem we will harness innovation to lower costs for customers, accelerate the low carbon transition and take steps on our journey towards becoming a DSO.

We will achieve this by developing flexibility markets and solutions, actively participating in cross industry initiatives to identify and develop whole system solutions and by sharing operational and market data with our customers, stakeholders, and market participants through our online data portal.

In the longer term, open data and digitalisation will help promote cross-vector markets which can address whole energy system challenges.

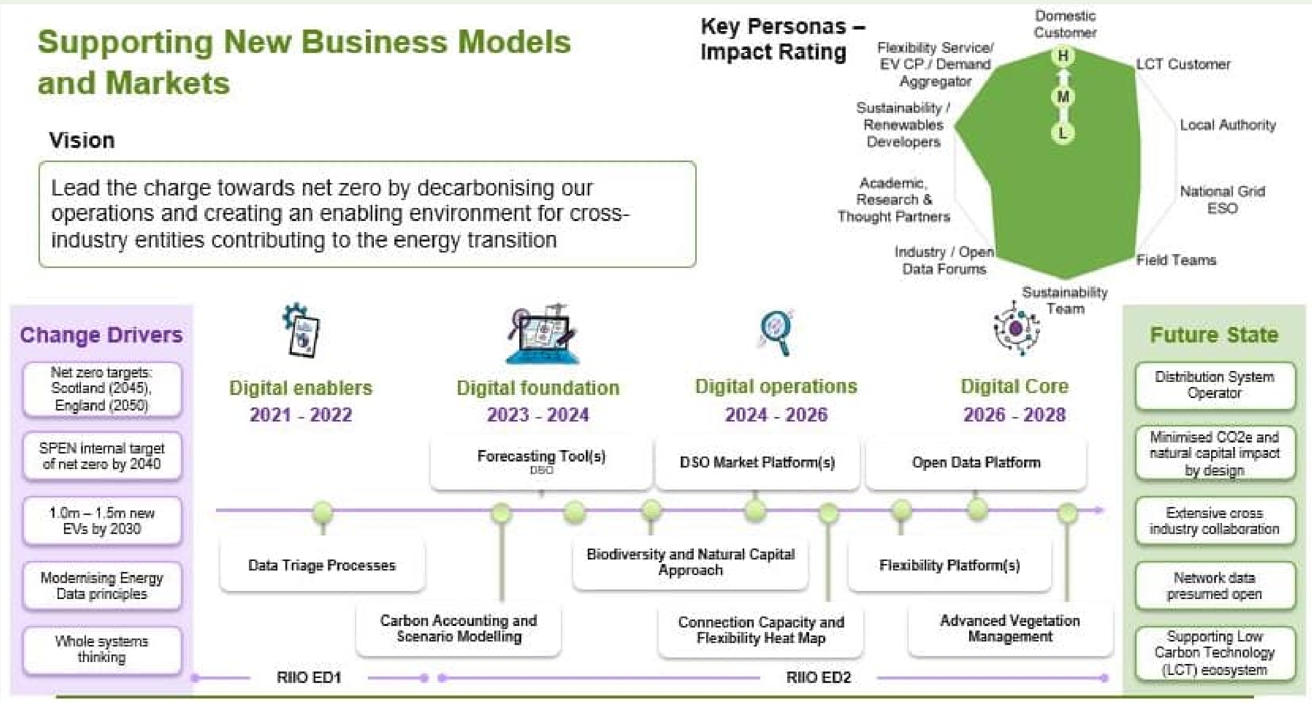
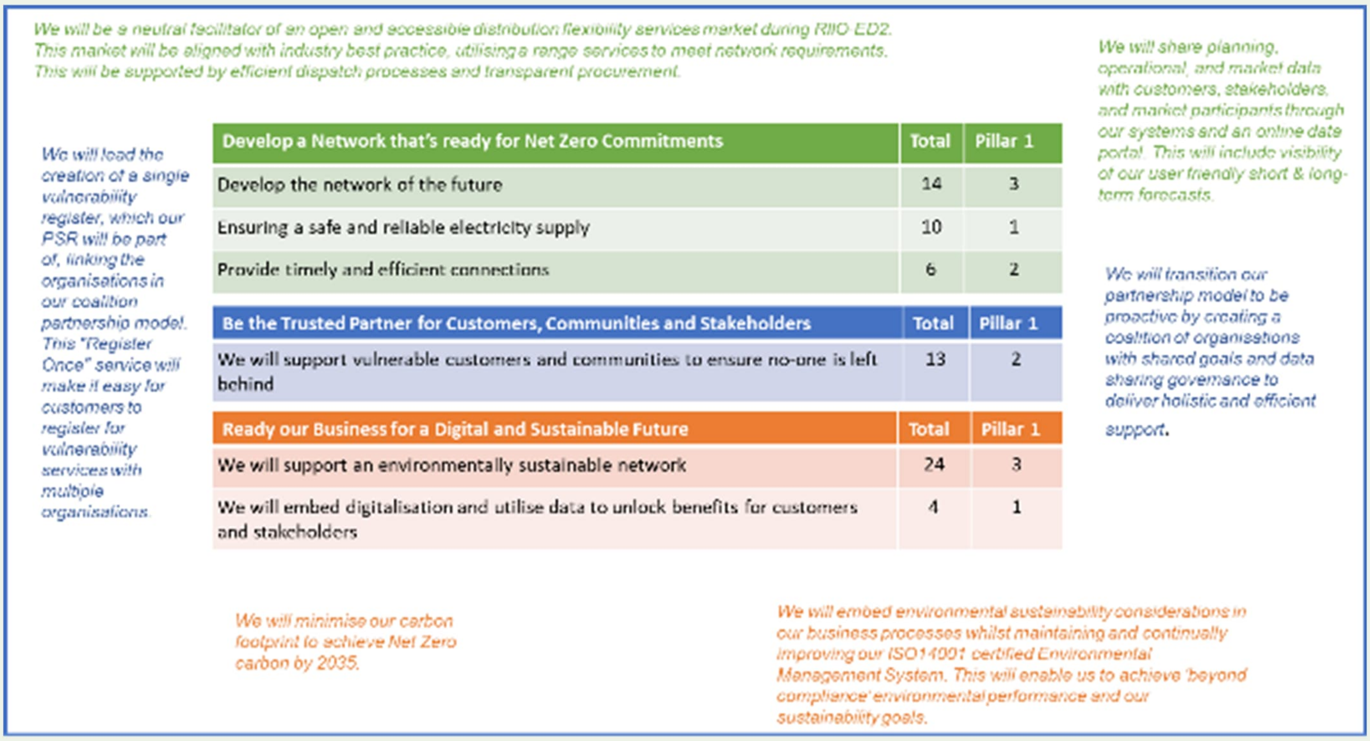


Figure 107 Summary View of Pillar 4

The diagram below shows the commitments which these initiatives will drive and contribute to, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.



Develop a Network that's ready for Net Zero Commitments	Total	Pillar 1
Develop the network of the future	14	3
Ensuring a safe and reliable electricity supply	10	1
Provide timely and efficient connections	6	2

Be the Trusted Partner for Customers, Communities and Stakeholders	Total	Pillar 1
We will support vulnerable customers and communities to ensure no-one is left behind	13	2

Ready our Business for a Digital and Sustainable Future	Total	Pillar 1
We will support an environmentally sustainable network	24	3
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	1

Figure 108 Key commitments driving the initiatives

The overall costs for this pillar are 26% Business as Usual and 74% digitalisation, with further cost splits detailed for each initiative explained within the costs section.

Deliverables

Deliverables	Timeline
Implement a Biodiversity and Natural capital tool to capture and store data to ensure environmental impacts are considered in our operating activities.	Delivery of Biodiversity & Natural Capital tool by 2024 and incrementally enhanced
Carbon accounting is captured and integrated in our corporate systems to monitor our carbon activities to facilitate the transition to Net Zero.	Incremental deliveries from 2023 - 2028
Embed circular economy principles (BS8001) to principles in our supply chain by using heat maps to track material use using corporate business intelligence and analytics tools. Our target is 95% landfill avoidance by 2023 and 98% by the end of 2028.	Incremental deliveries from 2023 - 2028
A DSO infrastructure that will enable SPEN to manage its systems and deliver new and enhanced projects and services to our customers more actively.	Incremental deliveries from 2023 - 2028
Open data platform to enable data transparency and data sharing to drive change in decarbonising our society.	Open Data Platform is available now with key upgrade release in 2023/24. Incremental deliveries as required by stakeholder feedback.

Table 98 Supporting New Business Models & Markets Deliverables

6.1 Sustainable Operations

6.1.1 Overview

It is our vision to embed sustainability into the fabric of how we operate, ensuring decisions are made with a detailed consideration of environmental impacts upstream and downstream of our activities. Digitalisation will play a critical role in enabling the execution of our Environmental Action Plan and help us to decarbonise our operations in an efficient and data-driven manner.

Using digital technology, we will be able to drive forward our commitment as a business to Net Zero operations by 2040 while enabling the wider system to deliver on Net Zero in Scotland by 2045 and England by 2050.

6.1.2 Projects

6.1.2.1. Biodiversity and Natural Capital

This project aims to ensure that the electrical infrastructure projects delivered by SPEN do not cause a net loss of natural capital and biodiversity. We will achieve this by building a digital repository for the data gathered, in line with our commitment to implement a Biodiversity & Natural Capital Action Plan.

Current Position	Change Drivers
Biodiversity data is gathered through onsite ecological surveys, which will always be required on larger works, however this method is expensive and resource intensive. While a biodiversity tool has been piloted in some license areas, there are no systems in place to track, or a central repository to store, information on biodiversity baselining and natural capital enhancements. There is no natural capital tool in use to evaluate sites and aid planning decisions.	We are an infrastructure intensive business and are constantly interacting with the natural environment to manage our assets and deliver our services. With sustainability as a key priority, we need to ensure our projects do not cause a net loss of natural capital and biodiversity. In time, we aim to transition to a model of natural capital net gain. Planning authorities in England are being required to generate 'Nature Recovery Network Maps' and this requirement could extend to Scotland. Additionally, implementation of tools for baselining and monitoring natural capital will aid our compliance to Ofgem Baseline Requirements.

Table 99 Biodiversity and Natural Capital Current Position and Change Drivers

Solution

We will build a digital repository of natural capital and habitat information of our assets and utilise this data to aid business decision making processes for projects and management of existing sites. We will evaluate and trial the implementation of available biodiversity and natural capital tools for the purpose of biodiversity baselining and natural capital enhancements.

We have committed to implement a Biodiversity & Natural Capital Action Plan to identify targets to increase environmental value across our network. Incorporating a natural capital approach into our decision-making processes will be a significant shift in our ways of thinking and working, some of the planned outcomes for this project will include:

- Capturing and storing data on the natural environment of our assets. We will identify key environmental information required, such as habitat imagery, wildlife surveys and other ecological data. We will evaluate the best means of data capture; sources include the drones we plan to use for asset inspection, satellite imagery and free source habitat data. Storage of this data will be a use case for our planned big data platform and will be made accessible to our corporate systems such as GIS.
- Implementing a tool for assessing biodiversity impact. The Department of Environment, Food and Rural Affairs (Defra) biodiversity tool assigns biodiversity units to a site, details how many are lost doing work and indicates reparative actions. It was piloted in the SP Manweb distribution area but is unsuitable for

Scottish habitats. We will be developing a biodiversity tool tailored to Scotland in collaboration with another DNO for SP Distribution and for SP Manweb, we plan to use the soon to be released Defra 3.0 tool.

- Implementing a natural capital tool. We will consider "off-the-shelf" solutions that are mature and available by the time of implementation of this project. One potential option is the Innovate UK funded natural capital tool called NATURE, currently being developed by WSP and the Ecosystems Knowledge Network, in partnership with Northumbria University. This free and publicly accessible tool will calculate the impact of the land-use change on up to 20 ecosystem services, physical and mental health, and biodiversity, assessing the extent to which net gains for the environment will be achieved.
- Ensuring data is integrated and accessible in design and planning. To maximise final impact on our operations, biodiversity and natural capital information must seamlessly feed into project design and planning. We will look to develop an environmental layer in GIS which enables easy extraction of information and if possible, integration with the biodiversity and natural capital tools. This will help planning and design teams adequately factor environmental impact into their decision making.
- Ensuring data is integrated and accessible during field work. Our field teams currently use hard copy handbooks to record environmental compliance on site. We will create an application on our field mobile device to digitise this data capture and provide field teams with access to biodiversity and natural capital information to inform their site activities.

Key Outcomes

- Better protection of the natural environment. With a data-driven biodiversity and natural capital approach we will minimise negative environmental impacts and move towards natural capital enhancements.
- Reducing climate impact. The natural environment is an important carbon sink and proper valuation of its benefits in our operations will aid climate change mitigation.
- Environmental data captured while surveying our asset habitat can be made publicly available through our open data portals to support collaboration with other organisations, data sharing and other initiatives for the public good.

6.1.2.2. Advanced Vegetation Management

This project will utilise the use of drones with light detection and ranging (LiDAR) software to capture data that will enhance our condition-based approach to vegetation management allowing it to be more predictive. The use of drones will increase the frequency of surveys and the height they can be carried out at therefore the quality of data.

Current Position	Change Drivers
Currently, we scan our overhead assets on a 3-year cycle using light detection and ranging (LiDAR) equipped small planes to create a 3D representation. Image analysis is applied to LiDAR data for vegetation management, but data captured at current flight altitudes is not granular enough to model asset habitat. Drones are currently used primarily for assessing damage after significant bad weather events.	Vegetation management needs adequate attention to balance minimising safety and operational risks with maximising protection of the natural environment. The use of drones for inspections is set to significantly increase and will enable a transition from triennial flights with a light aircraft to more regular inspections. Drones will also enable lower altitude flights and more granular image capture. This can be exploited for more proactive monitoring of vegetation.

Table 100 Advanced Vegetation Management Current Position and Change Drivers

Solution

We will analyse data collected on our asset habitat and leverage advanced technologies such as digital twin and artificial intelligence to enable a more predictive, condition-based approach to vegetation management.

Trees too close to power lines pose a significant fire safety hazard in dry conditions and are a major cause of power failures during high winds and storms. Mitigating this risk is core to ensuring safety of our personnel and assets as well as reducing faults and outages for our customers.

A drone flying at a low altitude can capture high-resolution images of asset habitat if mounted with the right camera. Equipped with light detection and ranging (LiDAR), it can determine vegetation height and distance of the vegetation from distribution conductors. Utilising a multispectral camera will allow the drone capture data that can be used to determine vegetation health using the Normalized Difference Vegetation Index (NDVI).

This technology will be applied for data capture in vegetation management; drone flights will be carried out more frequently, enabling proactive monitoring of asset habitat. Monitoring vegetation growth cycles can be coupled with artificial intelligence and machine learning to enable predictive analytics for targeted interventions.

This intelligent vegetation management approach will be deployed, building on the strengthening of our analytics capabilities (particularly in image processing) and data storage capacity. We will also investigate the feasibility of using our vegetation management data to build a digital twin of our asset habitat.

Key Outcomes

- Reduced faults and outages for our customers. Proactive management will reduce the incidence of outages caused by vegetation and identify any possible issues.
- Better management of natural environment. Efficient vegetation management will eliminate unnecessary tree cutting and protect trees which are a carbon sink and provide natural protection against landslides and flooding.
- Reduced carbon footprint. More efficient vegetation management will reduce the number and duration of trips and their associated emissions.
- Reduced expenditure on vegetation management. Proactive monitoring of asset habitat will facilitate the implementation of an efficient vegetation management programme.
- Maximised utility of drones. Utilising drones to capture data on assets, biodiversity, and natural capital in planning and design as well as for vegetation management.

6.1.2.3. Carbon Accounting

This project will facilitate the transition to Net Zero by ensuring that the correct carbon accounting is in place to measure and monitor our journey. We will measure non-financial sustainability metrics as well as all direct carbon activities and deploy tools to measure these. We aim for these to integrate with our corporate SAP systems.

Current Position	Change Drivers
At present, there are no systems for quantifying the embodied carbon associated with the infrastructure we design and build, or for collating carbon data that has been collected from suppliers at procurement stage. Current carbon footprint calculations focus on our sites and do not include our IT equipment. They have not factored the emissions impact of the servers that have facilitated the move to online meetings and storage.	To facilitate the transition to Net Zero and support our ambition to reduce our carbon footprint in line with our science-based targets, we must take active measures to manage and reduce the carbon associated with the infrastructure we design and build (including the embodied carbon). A more holistic approach is needed to monitor our scope 3 emissions linked to IT and our supply chain. We work closely with our supply chain on sustainability and have committed, by 2023, to consider environmental sustainability in our procurement processes in line with the ISO20400 Sustainable Procurement Standard, including a carbon metric as a minimum.

	The implementation of tools to baseline and monitor embodied carbon are Ofgem Baseline Requirements.

Table 101 Carbon Accounting Current Position and Change Drivers

Solution

We will implement a measurement tool to track and account for non-financial sustainability metrics such as the embodied carbon impact of our operations and supply chain. This tool will be developed in collaboration with other Distribution Network Operator's (DNO) and the Electricity Networks Association (ENA).

Carbon accounting must be deployed to cover all direct business activities, as well as our supply chain and services like cloud data storage. It is important that this information is collated to monitor organisation-wide progress and drive behavioural and operational change towards more sustainable, lower emissions alternatives.

Some key technical challenges to the integration of carbon intelligence in our processes include:

- Manual effort required to aggregate and analyse data
- Batch processing of climate and carbon data (annual reporting)
- Lack of granularity in carbon data – too high level to use for optimisation
- Limited scope 3 emissions data visibility

We will evaluate available carbon accounting solutions and adopt one based on cost-effectiveness and ease of integration into existing processes. One promising option that has been identified is the SAP Product Carbon Footprint analytics module released by SAP in 2020 as part of their Climate 21 program. This platform enables carbon footprint data and analytics to track, optimise and highlight hotspots for CO_2e scope 1, 2 and 3 emissions across raw materials, energy usage, and transportation.

SAP are currently developing other solutions to enable sustainability activities including optimisation of carbon footprint in supply chain and procurement, waste management, scheduling etc. SAP Product Carbon Footprint analytics is the first product in the SAP Climate 21 roadmap with modules set to be fully released by 2023. This is a promising as a solution that can be easily integrated into our current enterprise architecture.

We are currently adopting a tool called SYGRIS, a customisable platform capable of linking with multiple systems to collect data on sustainability into a central data bank for reporting. This tool will collect data at shorter timescales, enabling us to better track progress and make interventions.

Key Outcomes

- Reducing the carbon footprint of our activities. Leveraging reporting and analytics on carbon footprint will enable us to embed CO_2e emissions consideration in our activities and optimise on this variable
- Better data collection and reporting will enable greater transparency and accountability to our customers and stakeholders on our emissions reduction progress.
- Continually improving our ISO14001 certified Environmental Management System, with the aim of achieving 'beyond compliance' environmental performance and our sustainability goals.

6.1.2.4. Social Return on Investment

This project will expand our existing Social Return on Investment to include environmental impacts such as carbon footprint. To enable this, we will consider and evaluate different sources of social value proxies, work with other DNOs and expand our social return measurements within SPEN.

Current Position	Change Drivers
Currently, SPEN has a Social Return on Investment tool that is used primarily for retrospective measurement of the value delivered through services to vulnerable customers and in stakeholder engagement. This tool makes use of proxies identified through research to quantify the social impact of different actions in financial terms. The current version of the tool has been agreed across UK DNOs and enables benchmarking.	As a responsible business, we believe it is vital that we are able the measure and track the positive externalities our operations deliver to our customers, stakeholders, and society at large. Measuring the Social Return on Investment across a wider set of activities and doing so proactively will enable us to set targets on maximising our social impact. Given the pressing nature of climate change, it is also important that we widen the proxies used to include CO2e related measures to promote emissions reduction in our operations.

Table 102 Social Return on Investment Current Position and Change Drivers

Solution

We will expand our framework for calculating Social Return on Investment to include environmental impacts such as carbon footprint and will take a more proactive approach towards maximising the wider societal value of our activities.

The key steps needed to enable the expansion of the Social Return on Investment approach within SPEN include:

- Evaluation of different sources of social value proxies to create a more robust framework. It is vital that we include more proxies considering impacts on the environment such as CO2e emissions. A key source we will consider is the National TOMs measurement framework, which has pre-validated proxies and is closely aligned to the *HM Treasury Green Book* principles as well as the requirements of the *Public Services (Social Value) Act 2012*. This framework is continuously evolving to reflect the demands of society and is updated on an annual basis.
- Communication of our proposed updates to the social value tool to other DNOs through industry forums. We will aim to reach agreement on the updates to ensure consistency and enable cross-industry benchmarking on social value.
- Expansion of Social Return on Investment measurement across business activities. We will iteratively expand the use of this tool across our business and into our field services and evaluate the optimal way of integrating it with other sustainability-related reporting with minimal additional effort for our staff.

Key Outcomes

- The inclusion of carbon footprint impact in our Social Return on Investment calculations will enable us to drive greater action towards emissions reduction by making the impact on society more tangible in financial terms. It will also enable a more holistic quantification of the social benefits we deliver.
- Pushing for the standardisation of decarbonisation proxies in the Social Return on Investment tool will foster healthy competition with DNOs benchmarking against other to deliver value to our customers and wider society.
- Expanding the use of the Social Return on Investment tool to other parts of the business will help embed a responsible business mindset across SPEN and result in greater benefit to society across all our operations.

6.1.2.5. Sustainable Resource Use and Waste Reduction

This project will enable our Environmental Action Plan by introducing additional digital tools and a database to move the reporting of waste further upstream in our operation activities. An output of the database will be a heat map that will identify inputs, environmental impact and low recycling potential and innovative approaches.

Current Position	Change Drivers
In RIIO-ED1, we diverted 87% of our operational waste from landfill. We also enlisted the help of SmartWaste, an online environmental reporting tool, to monitor and report on areas such as waste generation and carbon impacts of our contractors. While progress is being made, we do not have a comprehensive inventory of our materials and lifecycle approach to minimising replacement while promoting reuse and recycling.	We have committed as part of our Environmental Action Plan to: • Embed circular economy principles (BS8001), establish a baseline and set targets • 95% landfill avoidance by 2023 and 98% by the end of 2028 Sustainable resource use and waste reduction will also create opportunities to improve TOTEX productivity.

Table 103 Sustainable Resource Use and Waste Reduction Current Position and Change Drivers

Solution

We will utilise digital technology to embed circular economy principles in our supply chain, reducing the waste we generate and increasing our recycling rates.

Tools are currently in place to facilitate tracking waste to promote recycling and landfill avoidance, however, to maximise sustainability more needs to be done upstream to prevent waste generation and prolong the life of assets and materials.

We will create a database that inventories our assets and materials and use this to develop a heatmap of material use using corporate business intelligence and analytics tools. The aim of this heatmap is to identify:

- Large volume material inputs into our processes
- Materials with major environmental impact and low recycling potential
- Innovative approaches for prolonging material life, refurbishing instead of replacing, and symbiotic opportunities for circularity across processes

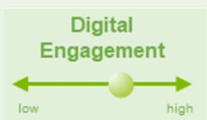
We are part of the Supply Chain Sustainability School (SCSS) and can leverage this forum to collaborate with other utilities and supply chain partners to innovate on ways to reduce our material footprint.

Key Outcomes

- Reduced environmental impact. Elimination of waste to landfill and general waste reduction will reduce the environmental impact of our operations.
- Greater re-use and recycling will reduce demand for virgin materials.
- More efficient expenditure. Reducing replacement through wider adoption of a condition-based approach will enable better use of TOTEX.

6.1.3 Persona Spotlights

GOVERNMENT / LOCAL AUTHORITY



What is the benefit for me?

Protection of the natural environment and publicly available environmental data

How will I feel the impact of digitalisation?

• Protection of areas of outstanding natural beauty
• Conservation of biodiversity, wildlife habitat, and natural flood and landslide protection
• Access to publicly available environmental and ecological data
• Reduced carbon emissions and waste generated

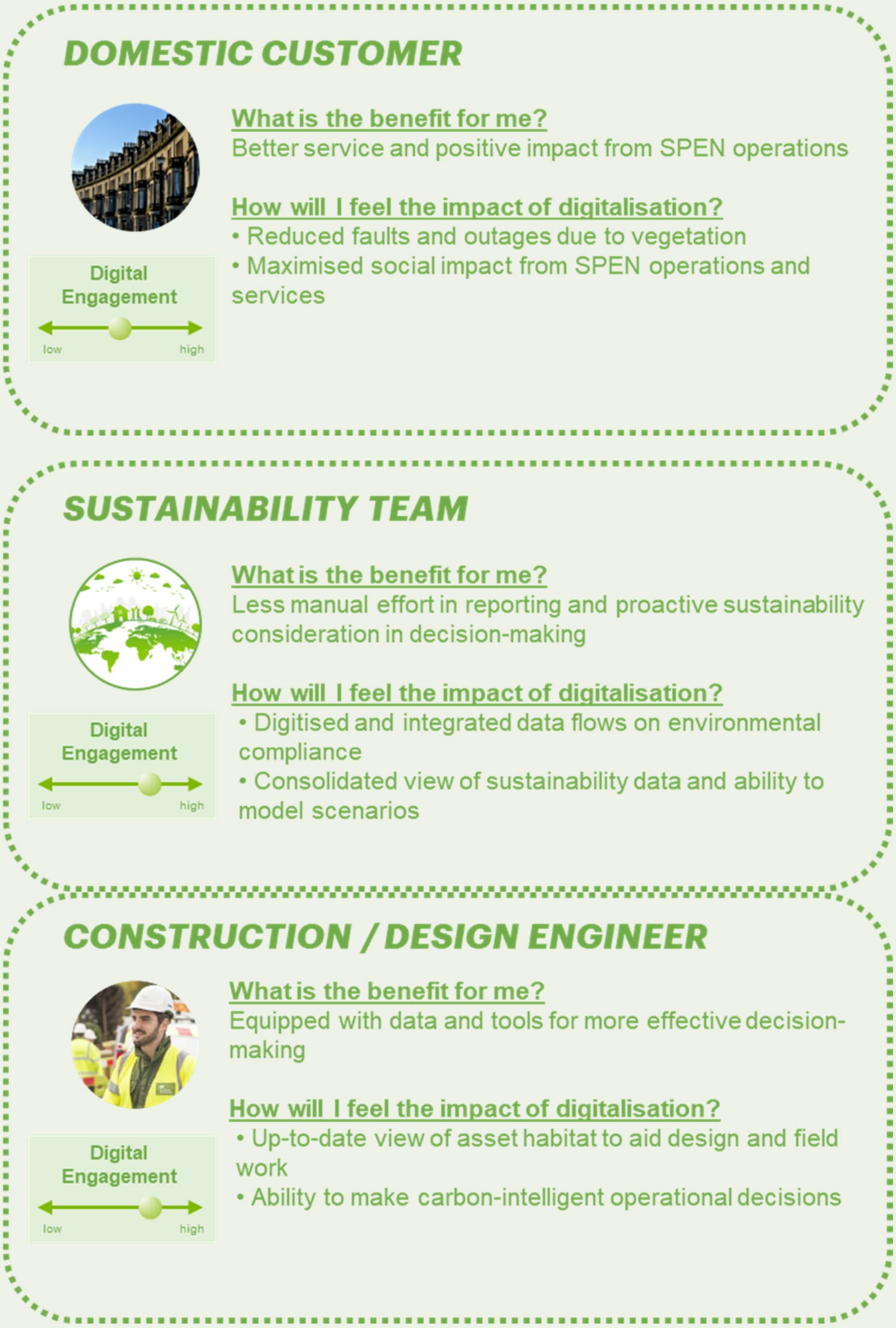


Figure 109 Sustainable Operations Persona Spotlights

6.1.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	Social Return on Investment, Advanced Vegetation Management, Sustainable Resource Use and Waste Reduction
Agile + Waterfall	Biodiversity and Natural Capital, Carbon Accounting

Table 104 Sustainable Operations Approach and Initiatives

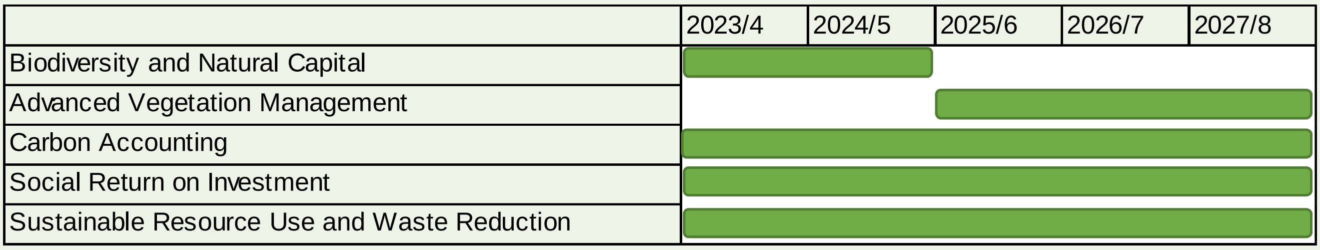


Figure 110 Sustainable Operations Project Timelines

6.1.5 Resources

Resource Type	Purpose
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Change Manager	Prosci accredited PM supporting business change and adoption
Trainers	Build and deliver training to end-users
Business Sponsors	Ensuring success of project and leading awareness
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.

Table 105 Sustainable Operations Resource Types and Purpose

6.1.6 Functional Model

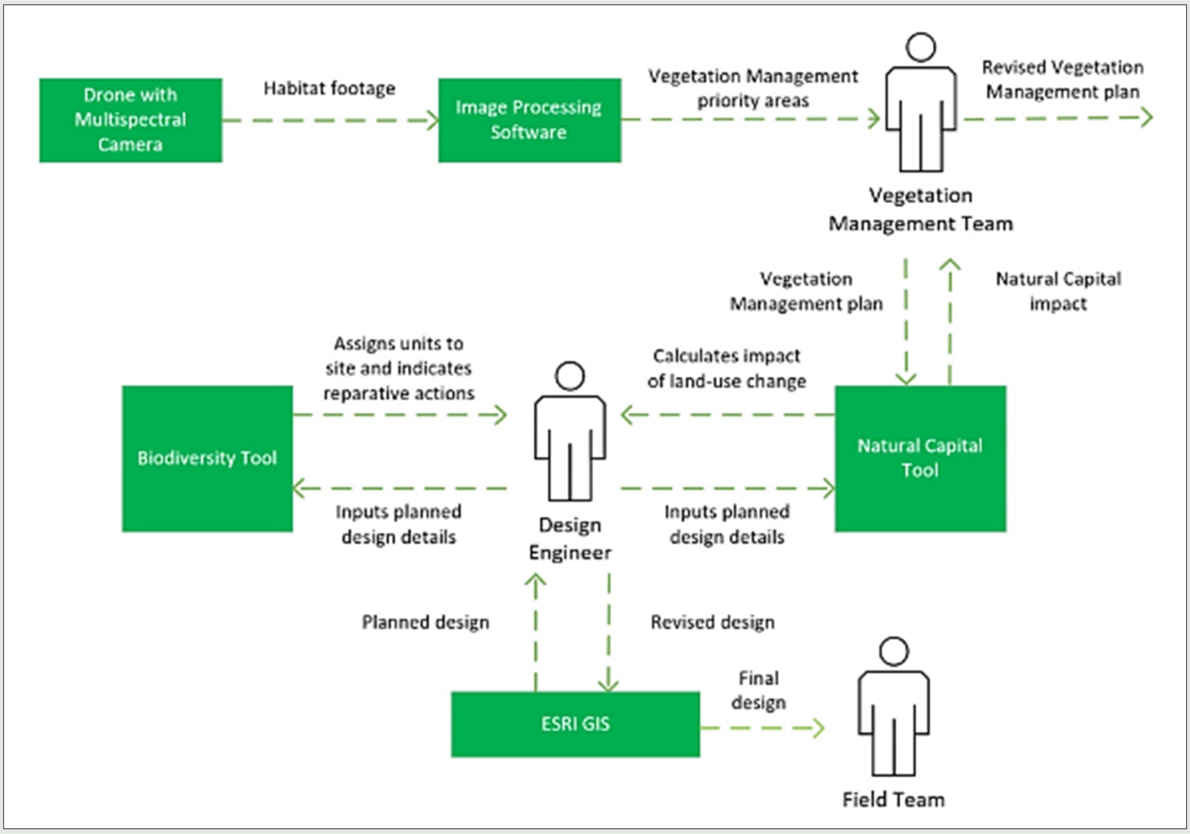


Figure 111 Biodiversity, Natural Capital, and Advanced Vegetation Management

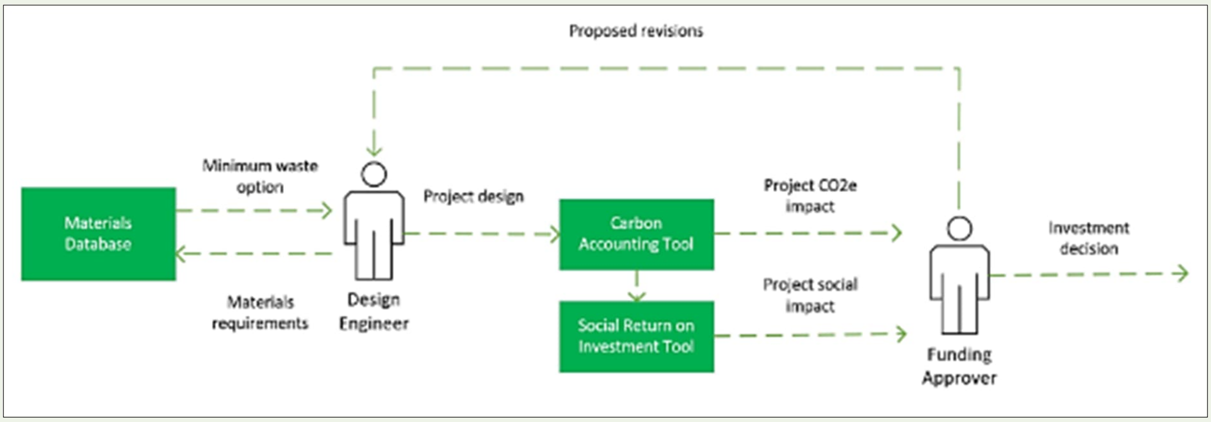
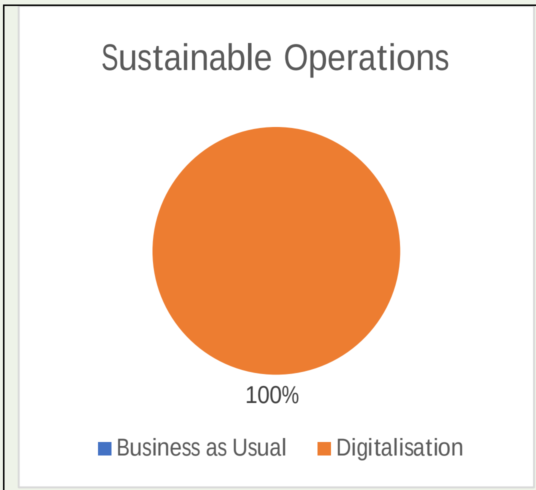


Figure 112 Sustainable Resource Use, Carbon Accounting and Sustainable Resource Use and Waste Reduction

6.1.7 Costs



BAU Rationale:

Our existing environmental data capture, analysis and reporting systems are suitable for our current obligations. There are no costs associated with maintaining our solutions.

Digitalisation Rationale:

Our SPEN Digitalisation Plan is driving towards decarbonisation and the delivery of ambitious environmental and sustainability targets. Our digital and data platforms underpin this and will enable us to make informed decisions and monitor our impact. The costs for this initiative have been fully allocated to digitalisation.

The costs for this initiative have been estimated based on the scope of the work, an estimated resource profile and using historic costs where appropriate. Benchmarking is difficult due to proposed functionality being under development and the lack of mature and commercially available "off the shelf" solutions. Consequently, we have had to tolerate a lower confidence level relative to some other initiatives. It is important to flag that while investment in this initiative is for projects whose primary objective is increasing sustainability, this will also be a by-product of several projects with across other initiatives.

6.1.8 Performance Metrics

Project	Measures of Success
Biodiversity and Natural Capital	• % of overhead line circuits with habitat mapped • % projects with no net loss in biodiversity or natural capital
Advanced Vegetation Management	• % reduction in vegetation management inspections • % reduction in vegetation management expenditure
Carbon Accounting	• % infrastructure base with embodied carbon information • % procurement spend with associated carbon measured • Progress towards science-based targets
Social Return on Investment	• % increase in SROI • % growth in spend with associated SROI measured
Sustainable Resource Use and Waste Reduction	• % waste recycled • % landfill avoidance • % decrease in expenditure on asset / material replacement

Table 106 Sustainable Operations Project Measurements of Success

6.1.9 Assumptions and Dependencies

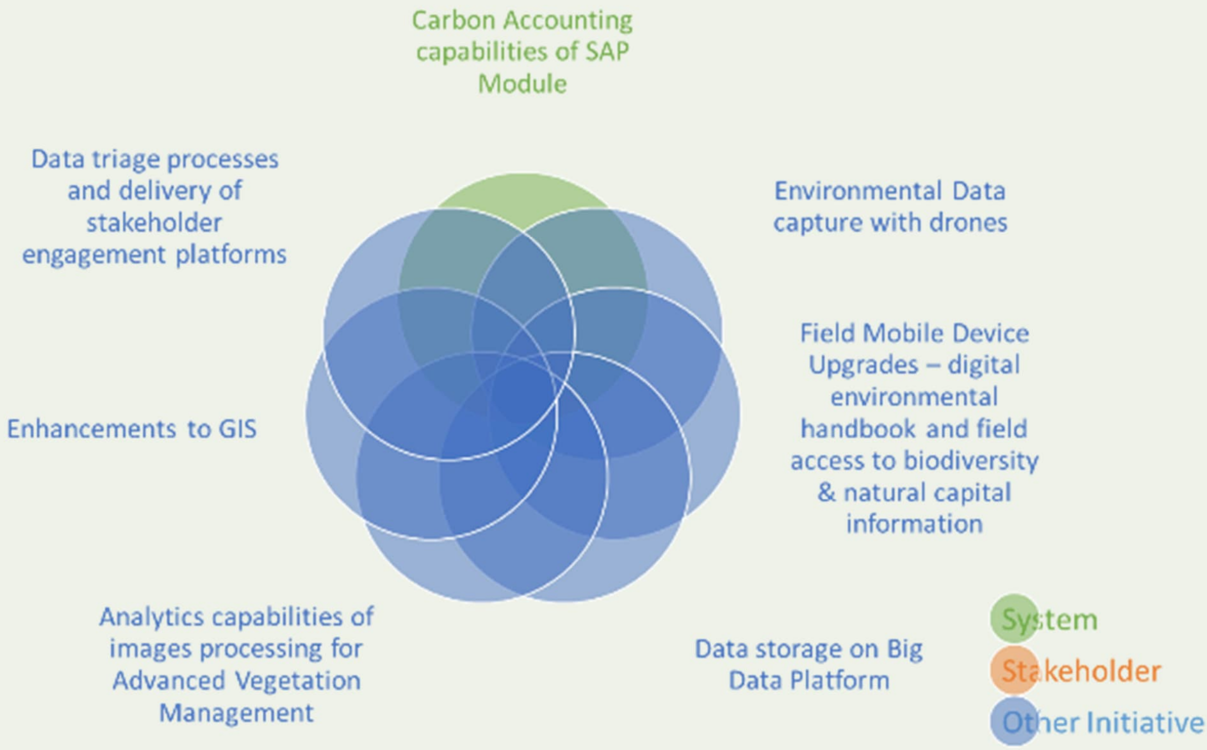


Figure 113 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Sustainable Operations Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Business-wide adoption of carbon accounting assumes availability of the right skills and tools to effectively integrate this into current ways of working

Table 107 Sustainable Operations Assumptions

6.1.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Late delivery of GIS enhancements that enable creation of environmental layer	Projects have been staggered and provided with buffer to minimise bottlenecks	High	Medium
2	Unavailability of suitable and mature natural capital tools	Manual evaluation of captured data on asset habitat can be a short-term compromise for early benefits	Low	Medium

3	Slow adoption of carbon accounting in business activities	Sustainability expertise is a priority in recruitment and solutions adopted will aim to maximise ease of integration with existing systems and processes	Medium	High
4	Late or inadequate delivery of required carbon accounting modules by SAP	If we decide to adopt the SAP carbon accounting product suite, we will work with SAP as early adopters to communicate functionality requirements and run beta testing	Medium	High
5	Inability to benchmark against other DNOs on social value due to different framework	Minimise alterations to existing tool and prioritise incremental change (adding new proxies). Engage other DNOs to agree on additions and benchmarking approach	Medium	Low
6	Incomplete asset and materials records	Most of the asset and materials inventory is stored on databases and can be gathered into a central repository.	Medium	Low

Table 108 Sustainable Operations Risks, Mitigations, and Impact

6.2 DSO Market Operation

6.2.1 Overview

The energy landscape is changing fast as the way our customers generate, distribute, and use energy evolves. The magnitude of these changes means there is a clear need for a set of functions and activities to meet our customers' evolving needs, deliver Net Zero, and ensure the continued safe, reliable, and efficient operation of the distribution network and wider energy system for all customers. These functions and activities in turn require new enabling tools, systems, and capabilities.

This initiative outlines the required infrastructure across our IT estate to enable DSO. Those areas highlighted in the following table will be covered within this initiative. A summary of the functions and activities from SPEN's DSO Strategy and a summary of Ofgem's DSO Roles from the Sector Specific Methodology Determination (SSMD) are included within the below tables.

C4 – IT and Telecoms (Non-Op)
• Forecasting Tool(s) • Flexibility Platform(s) • Market Platform(s)

Table 109 IT System and Project Overview

SPEN DSO Functions & Activities	Ofgem DSO Roles
• **Smart Networks:** Coordinating DSO and network actions to optimise the capacity, security, and reliability of the network. • **Flexibility:** Working with our customers' ability to operate flexibly. • **Neutral Market Facilitator:** Enabling our customers to access new markets and creating a new operating model to improve co-ordination between Distribution & Transmission.	• **Planning & Network Development:** Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability. • **Network Operation:** Promote operational network visibility and data availability. Facilitate efficient dispatch of distribution flexibility services.

• **Value Added Services**: Offering additional value to our customers through services, or as provider of last resort where the market fails to deliver.	• **Market Development:** Provide accurate, user-friendly, and comprehensive market information. Embed simple, fair, and transparent rules and processes for procuring distribution flexibility services.

Table 110 SPEN & Ofgem DSO Overview

This is what Distribution System Operation (DSO) is to us: the set of functions, activities, and enablers that we plan to deliver, so that we can continue to serve our customers and communities. In ED1 there were a series of initiatives and requirements regarding DSO. These activities mainly focused on Flexibility and ANM (Active Network Management). These requirements are set to change significantly and our published DSO Strategy lays out these in more detail (https://www.spenergynetworks.co.uk/pages/distribution_system_operator.aspx).

Our changing energy systems will result in a more complex, dynamic, and interactive energy system. However, these changes also require new tools to share information, the enablement of new providers and markets, the ability to make better and coordinated intervention decisions, and the requirement to increase transparency. We plan to deliver DSO infrastructure that will enable SPEN to manage its systems and deliver new and enhanced projects and services to our customers more actively. We have already started delivering these DSO functions and activities, but there remains much to do on this journey.

This initiative covers specific elements of the required DSO infrastructure that are not justified elsewhere. The specific elements discussed are required to support the activities and infrastructure within our DSO strategy and the baseline expectations as defined by Ofgem within the Sector Specific Methodology Determination (SSMD) and the Business Plan Guidance published on the 1st of February 2021.

6.2.2 Projects

6.2.2.1. Forecasting Tool(s)

Detailed forecasting means we can understand how our customers' demand and generation requirements will change in different areas of the network. Enhanced modelling means we can understand the network impact of those customer changes and assess possible network interventions.

Current Position	Change Drivers
SPEN is currently using a software tool created by Sia Partners which forecasts the localised energy demand present throughout the network. It uses historical network data, detailed weather forecasts and artificial intelligence to enable SPEN to maximise the network capacity.	Further investment in this forecasting capability is vital in managing an increasingly complex and evolving network. As flexibility becomes the standard approach to managing the network it is crucial that we can more accurately identify when and where constraints will arise as well as duration. This will allow us to send signals to the market earlier than where our needs for flexibility exist and the volume of our need, which in turn provides the incentive for flexibility providers to invest in those areas. Forecasts are also a critical facet in determining the economic dispatch of flexibility services. The optimality of flexibility services dispatch is correlated with forecasting accuracy.

Table 111 Forecasting Tool(s) Current Position and Change Drivers

Solution

Our engineering strategy is to deploy all necessary DSO infrastructure including the centralised DSO platform(s) and all network / field infrastructure to enable DSO services. Deployment will be prioritised based on capacity requirements with our Distribution Future Energy Scenario (DFES) forecasts. The DSO Infrastructure will build on the infrastructure developed during RIIO-1.

Key Outcomes

These enablers combined with data from network monitoring and other sources, help us to make the right interventions at the right time, so we can meet our customers' needs cost-effectively and on time. They support greater use of competitively procured flexibility services by allowing us to give more notice and details of network requirements to the market.

- Early investment into this system will greatly improve system planning and operations.
- Improves accuracy of the signals sent to the market about the opportunities to provide flexibility services feeding into investment cases for those provider organisations. This will in turn increase the population of providers in the areas of need with the competition driving down prices and benefitting customers.
- Improvements in forecasting both in accuracy and in coverage of our network leads to savings through more optimal dispatch of the flexibility services as we reduce the need to over dispatch to provide safety margin to cover forecast error or unreliable forecasting.

6.2.2.2. Flexibility Platform(s)

To meet evolving customer needs, we are developing smarter, more flexible network solutions to help mitigate the need for traditional reinforcement and reduce costs for our customers. This is cheaper for our customers as it allows us to schedule expensive reinforcement work as required, rather than carrying it out on a cyclical basis.

Resources connected to our networks will provide both additional capacity and additional generation to assist in key areas that have specific challenges during periods of network constraint.

We are exploring markets for flexibility with new and existing customers who are able and willing to control how much they generate or who can control their demand.

Flexibility Platform(s) provide Flexibility Service Providers (FSPs) with a mechanism through which they can dispatch services in response to network requirements. These platforms will allow SPEN to procure greater volumes of flexibility to unlock capacity and avoid or defer reinforcement.

Figure 114 Flexibility Services Roadmap

Current Position	Change Drivers
SPEN currently utilises the Flexible Power Platform which is a joint enterprise between other DNOs to provide flexibility providers with a single platform through which they can access multiple distribution networks. This platform will signpost each of the DNOs flexibility requirements, lower the barriers for market participation and provide a simple way to engage in the distribution flexibility markets. It will also be used to indicate the presence of CMZ (Constraint Management Zones); this will be useful for companies seeking to invest in assets to provide services.	To meet our evolving customer needs, we are developing smarter, more flexible network solutions to help mitigate the need for traditional reinforcement and reduce costs for our customers. We recognise that resources connected to our networks will provide services to assist in key areas that have specific challenges during periods of network constraint. So, we are exploring markets for flexibility with new and existing customers who are able and willing to control how much they generate or who can control their demand.

Table 112 Flexibility Platform(s) Current Position and Change Drivers

Solution

Flexibility is the ability of a customer to change their import/export position in a controlled manner in response to an external signal. With the push towards electrification of heat and transport, being able to flexibly utilise demand and generation will help minimise the amount of additional network capacity required, balance the system, and provide system stability – these can all help reduce customer electricity bills.

Key Outcomes

- Reduce the need in some areas for costly, traditional reinforcement. Eliminating the need to invest in permanent upgrade to meet a temporary spike in demand.
- Accommodating the growth in low carbon technologies.
- Allow consumers to capitalise on the opportunities arising from a transition to a smarter grid and participate in the low carbon future.
- Assist Distribution Network Operators (DNOs) to transition to Distribution System Operators (DSOs) allowing us to plan and operate our networks more dynamically to meet changing customer needs.

6.2.2.3. Market Platform(s)

As the requirement to procure products and services from those who are connected to our network increases, there is the requirement to facilitate and interact with markets that allow customers to respond to network requirements. The direction being provided by Ofgem, BEIS (now DESNZ) and the Energy Data Taskforce, is likely to show an increase in obligations to share data and deliver greater flexibility in a co-ordinated way. SPEN is currently utilising the Piclo platform across its entire licence geography to support the identification of flexible assets on our network to meet our network requirements.

Current Position	Change Drivers
SPEN is currently utilising the Piclo platform across its entire licence geography to support the identification of flexible assets on our network to meet our network requirements.	Further investment in Market Platform(s) is required to improve the visibility and participation of flexible assets and to support our Neutral Market Facilitator role.

Table 113 Market Platform(s) Current Position and Change Drivers

Solution

To enable the scaling of flexibility services required by a drive to Net Zero and the volume of transactions and interaction with market participants the market platform is required to evolve from a collection of systems with loose integration into a fully-fledged market platform with strong integration between the systems that provide the market functions. Integration with other systems and OT devices is covered elsewhere in our plan.

From the advertising of needs through the registration of assets to procurement of services, settlement and billing the market platform needs to ensure interoperability between these functions data transfer between them.

The Market Platform(s) will be the controlled access-point to the DNO and DER data registers for third parties and will also enable flexibility service providers to register their assets.

Key Outcomes

In addition, improvements to the market platform extending the functionality of the components and the interoperability between them will drive benefits from being able to automate a lot of the process, especially any data transfer between systems and the triggering of processes, e.g., settlement and billing runs.

This capability will also:

- improve the identification of assets
- support further market participation
- highlight areas where there are sufficient flexibility assets to meet network requirements
- improve the customer experience for flexibility providers

6.2.3 Persona Spotlights

LCT CUSTOMER (PASSIVE)

Digital Engagement

low high

What is the benefit for me?

Easy and quick process to connect LCTs such as heat pumps and EV chargers

How will I feel the impact of digitalisation?

- Able to get more out of existing capacity, meaning more connections and capacity can be offered to customers immediately
- Enhanced forecasting (e.g. via the EV-Up project) and modelling will give more insight into where capacity will be needed in the future; combined with the right regulatory framework, this gives more confidence to efficiently invest ahead of need, meaning that customer ambitions aren't delayed by insufficient network capacity
- Supports coordinating transport planning and distribution network planning (e.g. via the Charge project), accelerating the connection of EV charging points

LCT CUSTOMER (ACTIVE)

Digital Engagement

low high

What is the benefit for me?

Access to non-service market revenue opportunities (directly or via an aggregator) and a quicker connection application process and flexible connection arrangements, resulting in a quicker or lower cost connection.

How will I feel the impact of digitalisation?

- Quick assessment of connection options enabled through innovations (e.g. via the NCEWS project) which has reduced design time by two thirds
- Access to flexible connection options, resulting in quicker and lower cost connections enabled by ANM and wide-scale communications
- Network is able to be safely operated nearer limits, reducing the periods that flexible connections are constrained, enabled by increased network monitoring and more detailed network modelling
- enable access to a range of markets, whilst ensuring a safe, efficient, and reliable whole system, enabled by the DSO's role as a neutral market facilitator

DOMESTIC CUSTOMER

What is the benefit for me?

A safe and reliable network; In the event of a loss of supply, supply is quickly restored

How will I feel the impact of digitalisation?

- Safety issues and faults quickly identified and mitigated due to enhanced network monitoring, data and network analytics
- Minimised impact due to faults, enabled by the network's ability to auto automatically reconfigure itself
- DSO will enable a reliable and resilient supply through improved whole system planning and operational coordination (i.e. coordinating the optimal use of DER services for transmission and distribution needs), greater distribution asset monitoring, and smarter network infrastructure.

FLEXIBILITY SERVICE / EV CP. / DEMAND AGGREGRATOR

What is the benefit for me?

A range of connection options to best meet my operating model, i.e. unrestricted network access or lower cost flexible connection; A near-time (e.g. day or week-ahead) understanding of likely network capacity availability and likelihood of service use; The ability to participate in multiple markets; Alignment of different service markets where possible to facilitate service stacking

How will I feel the impact of digitalisation?

- Able to better assess what a flexible connection means for me, enabled by greater data provision and sharing of network models (e.g. via SDIF initiative)
- Access to accurate near-time forecasts through forecasting, modelling, and analytical developments (e.g. via Enhanced Network Forecasting project)
- Secured way of accessing data
- Able to access a range of markets facilitated by the DSO's role as a neutral market facilitator
- Able to participate in a range of markets without risking system stability due to the DSO's role coordinating the optimal use of DER services for distribution and transmission needs

Figure 115 DSO Market Operations Persona Spotlights

6.2.4 Delivery Approach and Timeline

Given the key role the distribution network plays in our customers' lives, timely delivery of the functions and activities is essential to meeting our customers' requirements.

Approach	Initiatives
Agile	Flexibility Platform(s)
Waterfall	Forecasting Tool(s)

Table 114 DSO Market Operation Approach and Initiatives

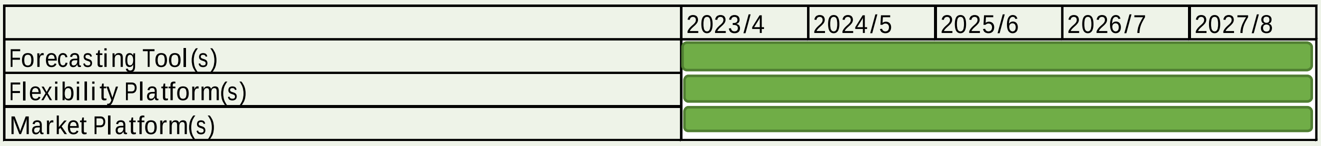


Figure 116 DSO Market Operations Project Timeline

We already have some of these tools and platforms in place therefore the plan reflects the phased approach to building upon these platforms at different times to ensure we have an integrated solution.

6.2.5 Resources

Resource Type	Purpose
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Business Analysts	Identify process improvements, identify functional solutions, and document these
Developers	Build solutions
Testers	Test solutions – this includes System testing, integration testing and user verification testing.
Project Manager	Manages timelines, budgets, risks, and scope for each project
Programme Manager	Manages the programme of work, and the underlying initiatives
Design Authority	Responsible for overall technical design and integration of solutions
Change Manager	Prosci accredited PM supporting business change and adoption
Business Sponsors	Ensuring success of project and leading awareness
Technical Analysts/architects	Platform integration of new systems and platforms
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.

Table 115 DSO Market Operations Resource Types and Purpose

6.2.6 Functional Model

The figure below captures all the enabling infrastructure and components that will deliver the DSO Functions and specific use cases. Descriptions of what is contained within each Smart Grid Architecture Model (SGAM) layer is contained below. Note that this initiative focusses only on the orange section.

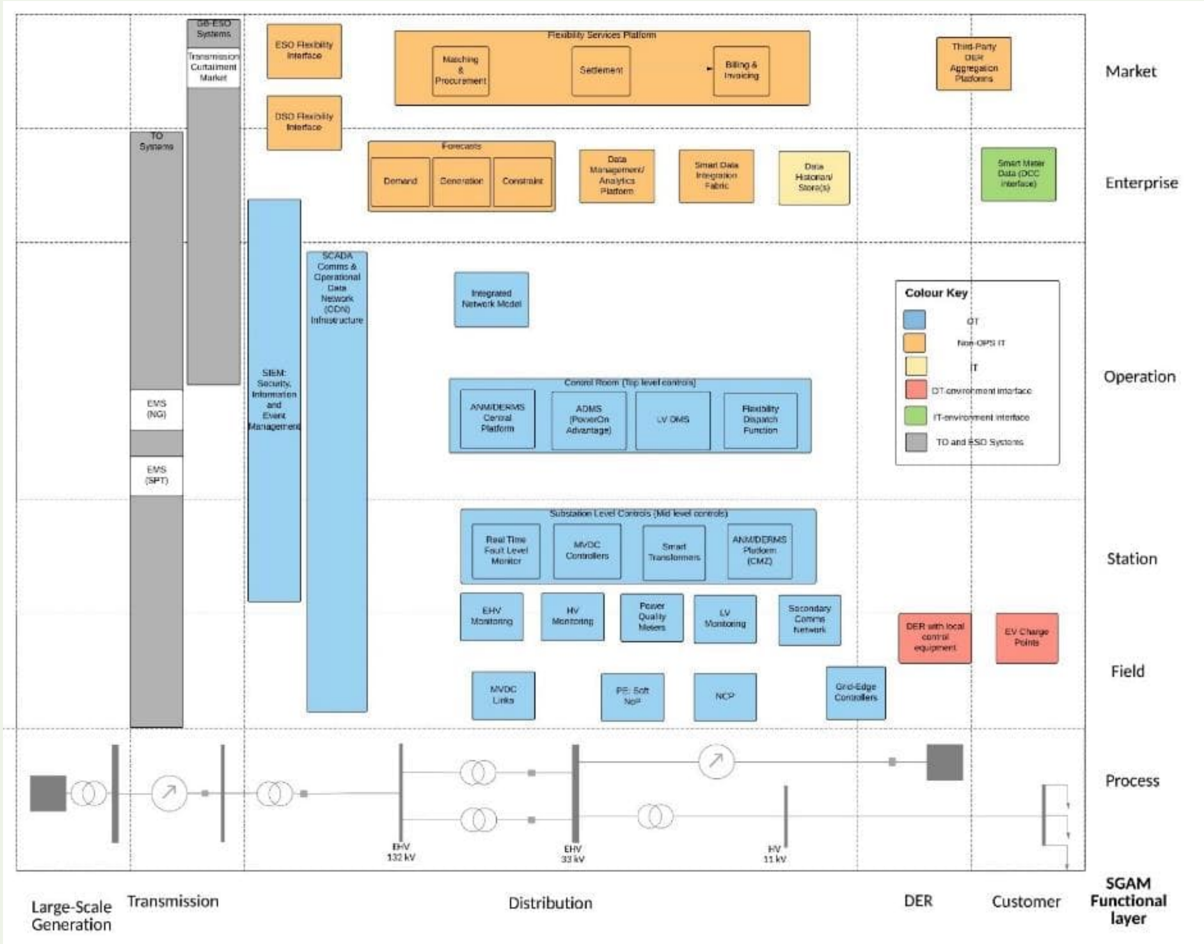


Figure 117 DSO Market Operations Architecture Diagram

Market & Enterprise

The market & enterprise level focuses on establishing coordinated flexibility services (both upstream and downstream) and the development forecasting capabilities with integrated data exchanges and commercial systems.

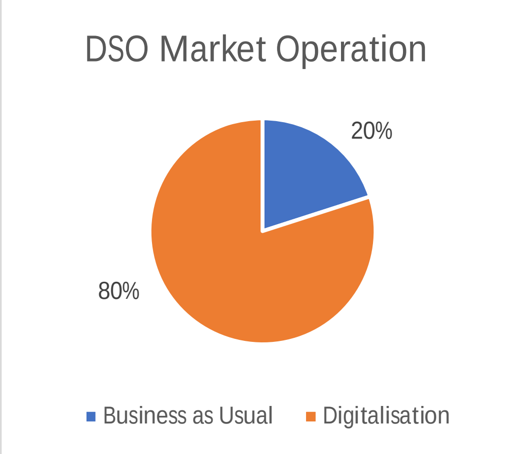
The following projects are included within this initiative:

- **Forecasting Tool(s):** Supporting the Sia Partners tool and providing a framework for future forecasting capabilities.
- **Flexibility Platform(s):** Supporting Flexible Power and future flexibility platforms to schedule and dispatch our contracted flexibility.
- **Market Platform(s):** Supporting existing and new market-based platforms to gather market participants.

The following projects have been justified elsewhere in our plans:

- **External Data Connectivity:** Supporting data exchange externally with a range of stakeholders, including specific projects such as Flexr.
- **Data Sharing:** Processes and systems to facilitate the sharing of data.
- **Dynamic Purchasing / Commercial Management System(s):** Delivering new commercial systems to support the contracting of flexibility.
- **Settlement / Billing System(s):** Integrating with existing and supporting new settlement / billing systems.
- **Smart Systems (NAVI & SDIF etc):** IT support for NAVI and SDIF.

6.2.7 Costs



BAU Rationale:

We have a suite of solutions that are currently facilitating or trialling a range of DSO functions (for example, our FUSION, Flexible Power, Piclo and ANM platforms). Our BAU investment supports the continuation and extension of these to provide limited DSO functionality and represents a low-end view of DSO functionality.

Digitalisation Rationale:

Our DSO plan presents an opportunity to change the way we operate of our network and assets, creating significant efficiencies for our customers and stakeholders. DSO activities will be informed by data and enabled by digital solutions in our digitalisation plans for DSO.

Since each of the projects within the DSO initiative are building upon existing platforms and systems, the costs have been estimated based on ongoing contracts and projected future uses with same or similar developers.

6.2.8 Performance Metrics

Project	Measures of Success
Forecasting Tool(s)	• ability to plan actions to protect assets and maintain network security • improve the granularity of network knowledge and enabling targeted investment • improve system planning and operations
Flexibility Platform(s)	• ability to signpost each of the DNOs flexibility requirements • lower the barriers for market participation • reduction or deferment in reinforcement of network • ability to indicate the presence of CMZ (Constraint Management Zones)
Market Platform(s)	• enhanced collaboration between DNOs & ESO • whole system co-ordination • increased portfolio of market participants • improved identification of assets

Table 116 DSO Market Operations Project Measurements of Success

6.2.9 Assumptions and Dependencies

The table below lists all assumptions that have been made.

Assumptions
For the full DSO model to be implemented, there is a reliance on other areas of DSO, justified elsewhere: • External Data Connectivity • Data Sharing • Dynamic Purchasing / Commercial Management System(s)

- Settlement / Billing System(s)
- Smart Systems (NAVI & SDIF etc.)

Table 117 DSO Market Operations Assumptions

6.2.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Evolving DSO requirements and regulation may result in stranded investment and additional costs for customers	Deliver with a 'product mentality' to deliver early working iterations and use agile delivery methods to maintain a backlog of features that can be prioritised according to user needs and regulatory developments	High	Medium
2	Existing platforms and services require extensive integration with existing systems which can be costly and time consuming to deliver	Develop using API standards that can be re-used by multiple applications, reducing cost and speed of delivery	Medium	Low
3	DSO services rely on accurate forecasts and historical network data. There is a risk that our current data does not fully meet data quality requirements	Invest in data quality tooling and data quality management activities to identify, measure, and improve data quality for critical data attributes needed for DSO services	Low	Medium
4	DSO is an evolving capability for SPEN, and there is a risk of business change and adoption of new technology into the core business	Engage with business stakeholders early, use personas to explain the new ways of working and how existing roles will change over time	Medium	High

Table 118 **DSO Market Operations Risks, Mitigations, and Impact**

6.3 Open Data

6.3.1 Overview

One of the headline recommendations of the Energy Data Taskforce (EDTF) is the core principle that to maximise the value of data, energy system data should be *presumed open*. In addition, open data should be discoverable, searchable, understandable, adopt a sensible approach to structures, interfaces and standards and ensure that it supports a secure and resilient energy system. This actively encourages open data and data sharing which will enable decarbonisation, stimulate innovation, and help feed the growing number of UK based digital energy innovators.

We at SP Energy Networks have already launched our data landing page, the "Energy Data Hub" (https://www.spenergynetworks.co.uk/pages/energy_data_hub.aspx).

We recognise that we are both a consumer and supplier of data and that to decarbonise our society we will need to be part of a wider network of sharing data to help everyone to drive change. The key to much of this is understanding the value of data and how it can be used.

A key challenge we hope to address through our Data Strategy is that of open data, shared data, and closed data. A robust data triage process is currently being implemented to ensure that any data published has been rigorously assessed and is safe and secure to share.

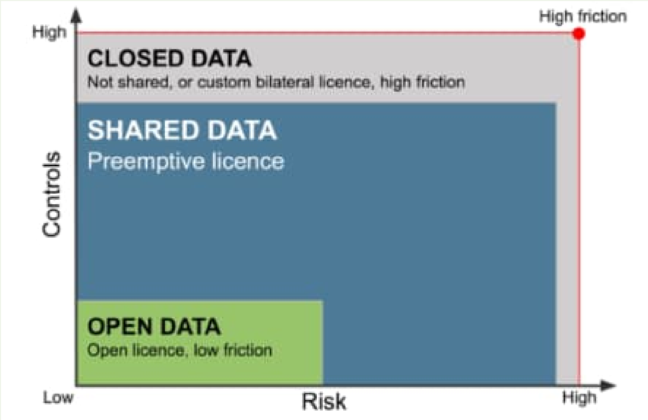


Figure 118 What is shared data? (Icebreaker One, 2020)

6.3.2 Projects

6.3.2.1. Open Data Platform

Our current data landing page is in its infancy and will evolve and be updated regularly. New datasets will be made available, both proactively and through external data requests, via our robust data triage process. We will extend the functionality we offer on the Energy Data Hub in line with stakeholder feedback.

This will be the central point of access for all open data including the GIS and heat map data covered under our Geospatial Visualisation and Analytics platform (see Section 4.1.2.5). Data will be discoverable, searchable, and understandable in line with the EDTF recommendations. We are currently exploring the Common Information Model (CIM) to define our data. We have representation on the ENA's DDSG sub-group on CIM to explore this further and to collaborate with other organisations on this methodology.

SPEN are actively participating in several industry fora to collaboratively deliver the recommendations from the Energy Data Taskforce's report on "A Strategy for a Modern Digitalised Energy System." Our organisation chairs the ENA's Data and Digitalisation Steering Group and has active members on 3 sub-groups: Data Triage, National Energy System Map (NESM) and Coordination. SPEN actively contributed to the creation of the central "Energy Data Request Tool". We have participated in and contributed to the development of Ofgem's Data Best Practice Guidance. We are supporting the work of the UKRI Modernising Energy Data Access and BEIS (now DESNZ) Energy Data Visibility competitions.

Through our work with the NESM sub-group, we will ensure that our current and forecast network capacity is published on the ENA's NESM platform. Our GIS platform for open data (see section 6.3.2.3) provides the ability to visualise the network asset capacity information and share this externally through the appropriate authentication channels. We will develop Application Programming Interfaces (APIs) to enable system-to-system exchange of data. We will apply the Data Best Practice Principles in our approach to the management and sharing of data.

Current Position	Change Drivers
We already have a data landing page on our SP Energy Networks website, the "Energy Data Hub", referenced previously. The current page has a limited amount of data that is available for users, with limited visualisation and export options. Export options are restricted to .csv and .pdf file formats.	The main driver for change is the presumed open data initiative. The launch of the data platform also opens opportunities to link the customer capacity and flexibility heat maps and other data focused applications. The drive from the EDTF is to open up energy system data and create a searchable 'data catalogue' which businesses and regulators can access. Establishing these open repositories for data will be an essential part of using digitalisation to discover new solutions to the problem of carbon emissions, in addition to unlocking the potential of existing energy assets.

	A key change driver will be stakeholder feedback. We will provide a platform and associated services that enable open energy data stakeholders to participate in the development of our Energy Data Hub and our wider response to the EDTF recommendations.

Table 119 Open Data Platform Current Position and Change Drivers

Solution

The application will be an enhanced data landing page for SPEN's presumed open energy data. This service will allow users to view, combine, visualise, share, and export different datasets. Users can navigate through the site browsing through different categories and/or using search criteria to identify the datasets that they are looking for. Users will have the option to add additional fields to create their own bespoke dataset, visualise their selected data, and finally have the option to download or share a link to both the raw data and the visualisation dashboard.

Platform usage will be monitored, and we will collect feedback and reflect learnings back into the platform development.

Key Outcomes

- Having a centralised landing page will help to facilitate our understanding of how maximum value can be sought from the data
- Individual data items themselves may not provide much initial value, however collating different Datasets together can provide valuable information
- Providing data externally provides more opportunities to collaborate with SPEN and for SPEN to seek value in other organisation's datasets
- Data can be used to feed into the overall aim of having a full digital twin of the Energy System infrastructure in the UK

6.3.2.2. Connection Capacity and Flexibility Heat Map

A heatmap is designed to provide an early indication of locations which will be most suitable to connect demand or generation to our network. Applicants can select specific areas of our network and based on their demand or generation capacity; the results will display a red/amber/green category of suitability to connect. Our intention is to display demand, generation, and flexibility across all voltage levels.

The heatmap will address the barriers that our stakeholders face in our Community Energy Strategy such as:

- Difficulty connecting assets to the grid due to grid constraint
- Difficulty in assessing the viability of non-firm connections
- Difficulty identifying the best grid locations for the development of distribution level flexibility services
- A lack of available information on optimal grid locations for local supply

Visibility of our network will benefit our ongoing Zero Carbon Communities initiatives in providing support to individuals and communities who wish to explore low carbon technology activities and community energy schemes in their local area.

Current Position	Change Drivers
SPEN's current heatmaps allow users to choose from several pre-set datasets to view on the map, it is effectively an interactive mapping tool showing available capacity at grid supply point, bulk supply, and primary substation level down to 11kV to connect generation. It also shows EHV and HV circuits and displays flexibility tender locations. The mapping tool allows the user to view the legend, remove layers, use an interactive measurement tool and search for a location on the map. By clicking on a substation or circuit more information on any constraints for that asset is displayed in a pop-up window. The detail presented to the user is adequate but basic.	The current application has been in place for a number of years; SPEN being one of the first DNOs to publish heatmaps of this type. There is however a need to revamp and upgrade the information provided, together with an enhanced front end to aid applicants through the process. There is a need to provide more detailed information behind the layers and points on the map. Controls currently available are adequate for applicants however requests from customers and stakeholders have been made to provide the ability to export the data. Having improved data collation will help to realise the value of the data both internally and externally. This is critical in meeting the ethos of discoverable, searchable, and understandable data.

Table 120 Connection Capacity and Flexibility Heat Map Current Position and Change Drivers

Solution

The enhanced heat map interface will continue to be accessible from our data landing page, the Energy Data Hub, referenced previously. We will continue to provide an enhanced applicant experience when connecting demand or generation to our network. The current heatmaps were industry-leading when launched but need further investment to provide the information our customers and stakeholders have asked for. It is our intention, through a phased approach, to display heat maps for capacity even at low voltages.

The enhanced solution will add upgraded mapping with more detail around capacity and flexibility and will make use of automation to provide the customer and their communities with a better overall picture of our network to help decision making around their connection needs. We also intend to provide applicants the ability to view capacity and constraints over time. Our current heatmaps are based on the network operation at a particular, historical, point in time however using connected data we will be able to link our investment plans (from SAP & GIS) and forecasted network loading (from Engineering Net Zero Platform) to display capacity and constraints forecast into the future.

The sprint planning at delivery stage will include links with the 'CRM Platform & Customer Service Enhancement' initiative to ensure that where customers make use of the self-serve quotations or automated quotations, the system will automatically check the heatmaps functionality.

The flexibility elements of the heatmaps also align with our DSO proposals (outlined under our DSO initiative) and will display the DNO constraint management zones.

Key Outcomes

- Improving the accessibility of the application will improve the user experience
- The enhanced detail on the application will allow SPEN and external applicants to make better educated decisions
- Information on where to connect large scale demand or generation will be clearer
- Enable local energy and flexibility opportunities to be clearer and more accessible to individuals and their communities as 'new market entrants' who wish to take part in innovation projects and future services
- The application upgrade will help to meet the criteria for presumed open by making more information public
- Data can be used to feed into the overall aim of having a full digital twin of the Energy System infrastructure in GB

6.3.2.3. Geographic Information System (GIS) Platform for Open Data

Through implementing best practices for data, including interoperability, visibility, and accessibility of data, one of the key enablers for Ofgem's Long-Term Development Statement (LTDS) includes the need for asset data, which includes GIS, static network topology data and network single line drawings to be shared. This data effectively acts as parameters for network modelling and analysis and can enhance the forward view of network needs.

Current Position	Change Drivers
Access to information from the GIS platform is currently enquiry-based. Applicants must enquire via email to a SPEN system administrator. Applicant requests are then individually assessed and approved on a case-by-case basis to a level of access within the application.	The work done by the EDTF and Icebreaker One's Modernising Energy Data Access ("MEDA") is a large driver to provide more open platforms. The push for presumed open requires that the data held within the system can be made available to everyone, subject to privacy and security policies. One of the key EDTF recommendations is that the Government and Ofgem commission an open and interoperable digital system map of the energy system. Additionally, implementation of tools for baselining and monitoring natural capital will aid our compliance to Ofgem baseline requirements. Information from our Disruptive Technology project enables us to capture a clear picture of where DERs are located on our network. This allows decision making around investment and flexibility options.

Table 121 GIS Platform for Open Data Current Position and Change Drivers

Solution

In support of the open energy data initiative, the data represented in our GIS needs to be made openly available to the public. Data needs to be properly triaged to ensure that sensitive data is not published (covered by provisions of data governance). The map viewer needs to be modernised with a presumed open approach.

Key Outcomes

- A new platform will greatly improve the customer experience and removes the manual step of contacting SPEN when requesting information
- Applicants will be able to access the application considerably quicker without the need for internal resources having to approve users
- The platform will make SPEN more transparent with their data, encouraging external stakeholders to be informed and use our data
- This will ultimately feed into a digital system map of the UK network infrastructure with the overall goal of developing a full digital twin of the energy system infrastructure

6.3.3 Persona Spotlights

Figure 119 Open Data Persona Spotlights

6.3.4 Delivery Approach and Timeline

Approach	Initiatives
Agile	GIS Platform for Open Data, Heat Map, Open Data Platform

Table 122 Open Data Approach and Initiatives

	2023/4	2024/5	2025/6	2026/7	2027/8
Open Data Platform and GIS Platform					
Connection Capacity and Flexibility Heat Map					

Figure 120 Open Data Project Timeline

6.3.5 Resources

Resource Type	Purpose
Scrum Team	Responsible for delivering project scope (see scrum team profile in Section 1.5)
Change Manager	Prosci accredited PM supporting business change and adoption
Service Designer and Experience Designer	Ensures the newly built and integrated software is easy to use, accessible and conforms to modern standards.
Trainers	Build and deliver training to end-users
Business Sponsors	Ensuring success of project and leading awareness

Table 123 Open Data Resource Types and Purpose

6.3.6 Functional Model and Architecture Diagram

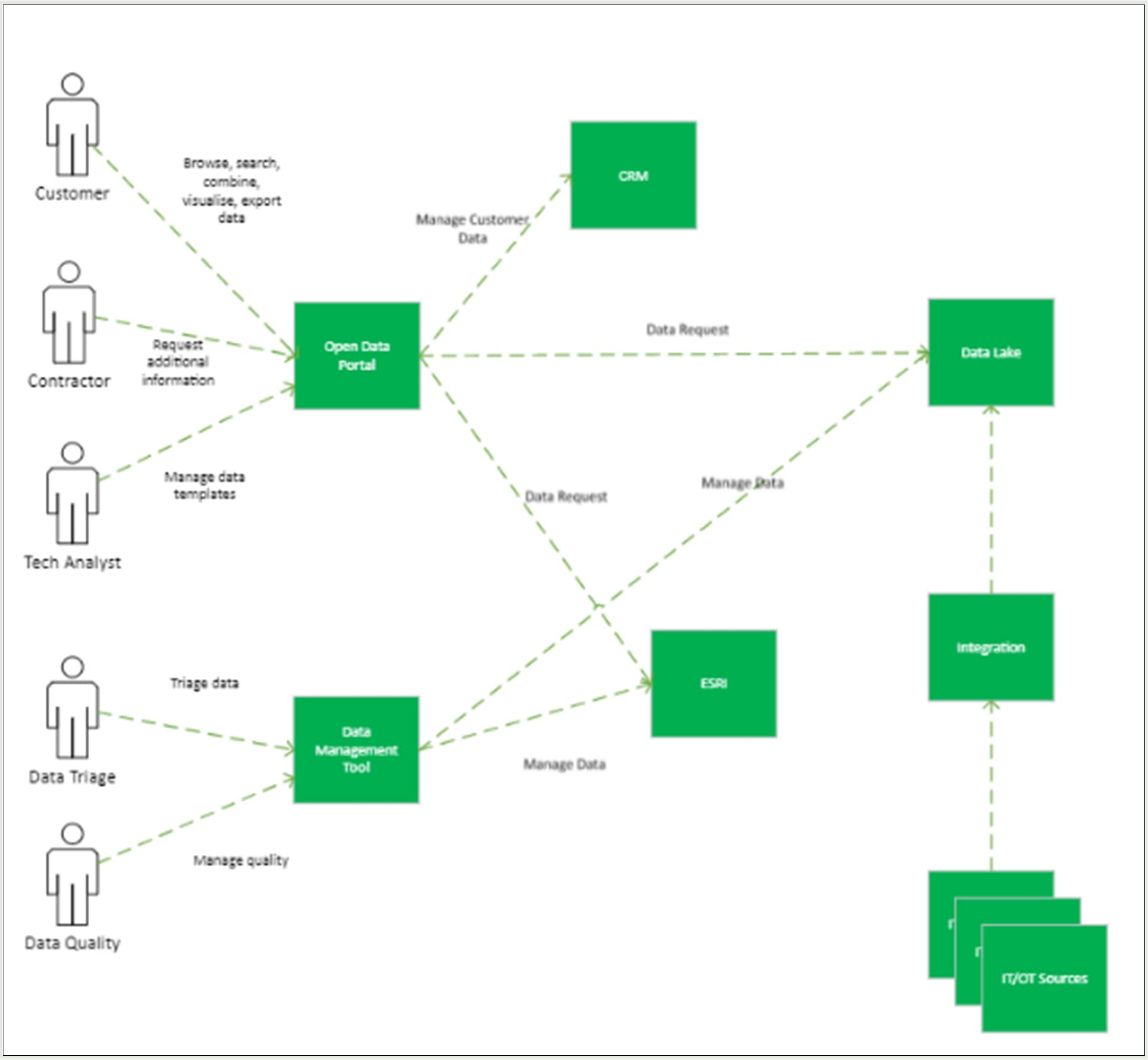


Figure 121 Open Data Functional Model

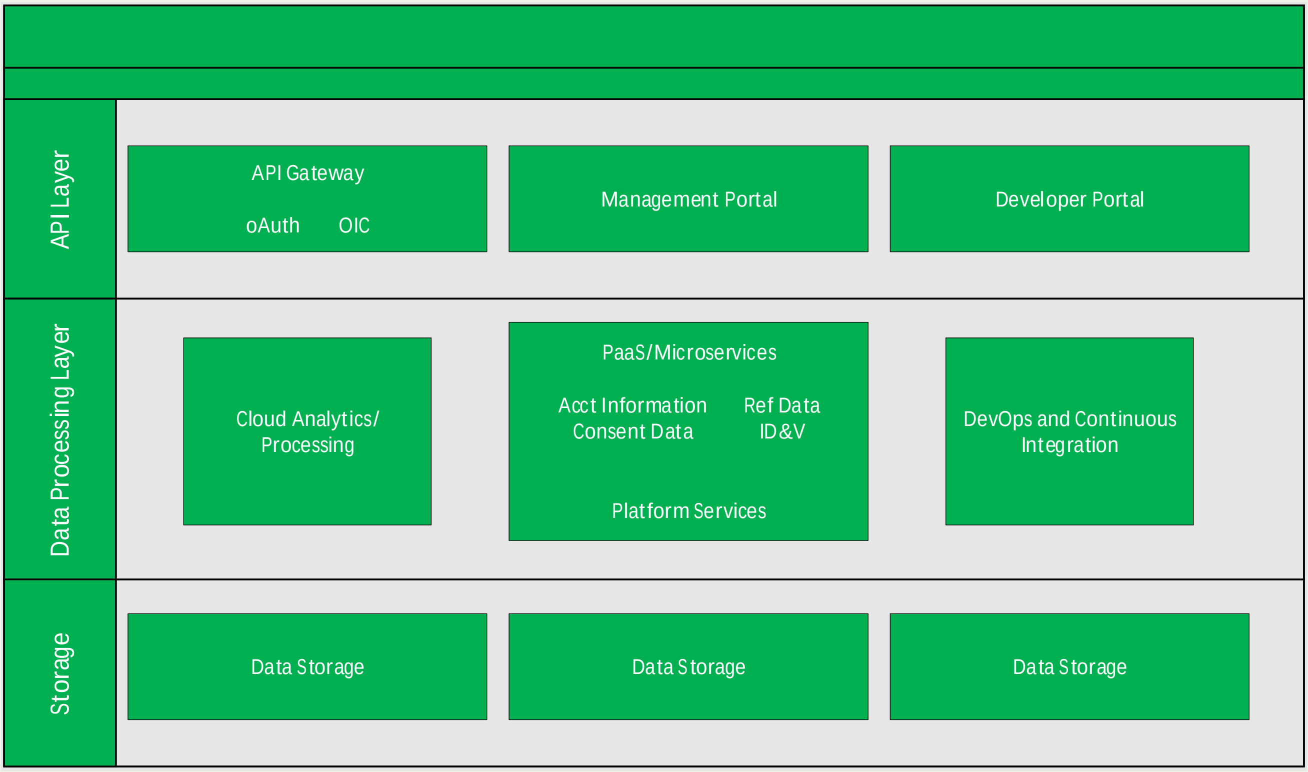
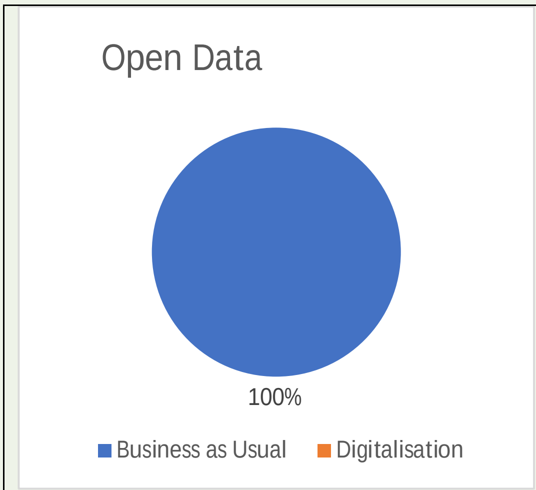


Figure 122 Open Data Architecture Diagram

6.3.7 Costs

	**BAU Rationale:** Our transmission licence already requires us to comply with Ofgem's DBPG and we envisage this licence obligation extending to our distribution licenses. We have therefore allocated all costs for this initiative to BAU.
	Digitalisation Rationale: See above.

The cost estimation for this initiative is based on evaluation of the technical scope and components of each project. We have assumed that the Enterprise Service Bus and API management components are covered by Data & Systems Integration initiative within the Data Strategy.

6.3.8 Performance Metrics

Project	Measures of Success
GIS Platform for open data	• Fully accessible platform for external users 'live' on SPEN data landing page, with channel for collecting feedback • Full data triage process in place, managing regular requests for data and triaging pro-active datasets being made available publicly • GIS data will be downloadable • Data available will be catalogued and will follow a common information model (such as CIM) • % increase in platform usage
Heat Maps	• Ability to view an interactive map showing where the network is potentially constrained, unconstrained, or partially constrained (subject to conditions) • This will be available at each voltage level, EHV, HV, LV (though will be implemented on a phased approach) • Data will be downloadable in a useable format • Data available will be catalogued and will follow a common information model (such as CIM)
Open Data Platform	• Fully accessible platform for external users 'live' on SPEN data landing page • Full data triage process in place, managing regular requests for data and triaging, pro-active datasets being made available publicly • Data available will be catalogued and will follow a common information model (such as CIM)

Table 124 Open Data Project Measurements of Success

6.3.9 Assumptions and Dependencies

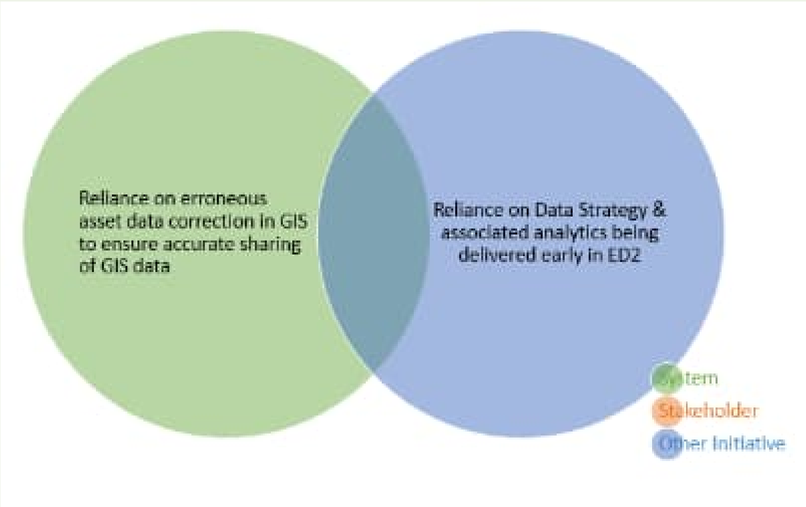


Figure 123 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Open Data Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Data needs to be appropriately tagged, in line with CIM where appropriate
Data cleanse and triage process in place to ensure security of data

Table 125 Open Data Assumptions

6.3.10 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Exposing sensitive information on the public Open Data Platform (CNI)	Data Triage process will detect any exposure before its published	Low	High
2	Data quality is not consistently maintained on the application (and refresh)	Data Quality assurance before it's released to the API	Medium	Medium
3	Overstepping any GDPR regulations	Data Controller will be responsible for the purpose and reason of data	Low	High
4	Security around open data platform	We will carry out ongoing security testing and penetration testing for the open data platform	Low	High
5	Security around data triage	We will carry out ongoing security testing and penetration testing around data triage	Low	High

Table 126 **Open Data Risks, Mitigations, and Impact**

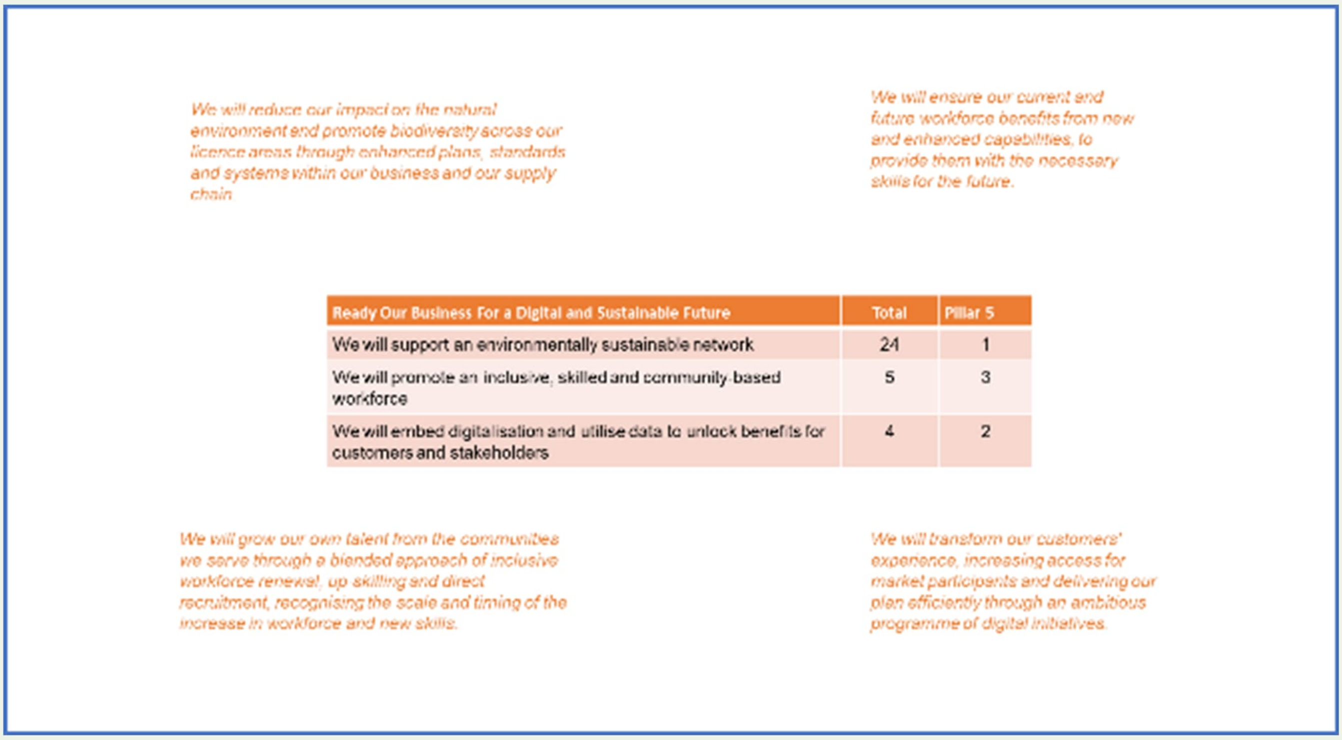
7. Pillar 5: Investing in the Digital Skills of Our People

Investing in our people will accelerate adoption of digital technology and enable our people to identify new and innovative ways of performing their tasks. We will create highly skilled, digitally inclusive jobs in our local communities. We will recognise the value that these skills bring to our organisation and provide exciting opportunities for our people to play their part in a modern digitalised energy system.

We will deliver this through:

- Implementation of a cultural change programme so that our people recognise the importance of data and digital skills, and the value it can unlock for our customers, stakeholders, and our own organisation
- Supporting our people in this transition by equipping them with the right agile and digital skills
- Increasing awareness for the need of specialist skills to support our transition to net zero. External and internal specialists will be engaged to form and deliver specialist training programmes
- Expanding our graduate programme and recruitment policies to focus on digital talent
- Use of digital technology such as gamification of training and knowledge-based AI assistants to enhance our learning and development programmes

The diagram below shows the commitments which these initiatives will drive and contribute to, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.



Ready Our Business For a Digital and Sustainable Future	Total	Pillar 5
We will support an environmentally sustainable network	24	1
We will promote an inclusive, skilled and community-based workforce	5	3
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	2

Figure 124 Key commitments driving the initiatives

Deliverables

Deliverables	Timelines
Workforce Awareness of change	These processes have all kicked off in 2021 and will continue.
Upskilling to enhance existing skills sets	
Training to teach new skills	
Recruitment where a gap is highlighted	

Table 127 Investing in the Digital Skills of Our People Deliverables

7.1 Our Agile Upskilling Strategy

Our digital strategy will undoubtedly change how our people work. People sit at the heart of our transformation, and we recognise that they are key in this transformation. We will use an agile form of the Prosci ADKAR model, which puts a key focus on the individual contributors to incremental change – those who are implementing the change or those affected by it. We will break down our transformational changes in people skills into multiple smaller, incremental, and adaptive programs of change.

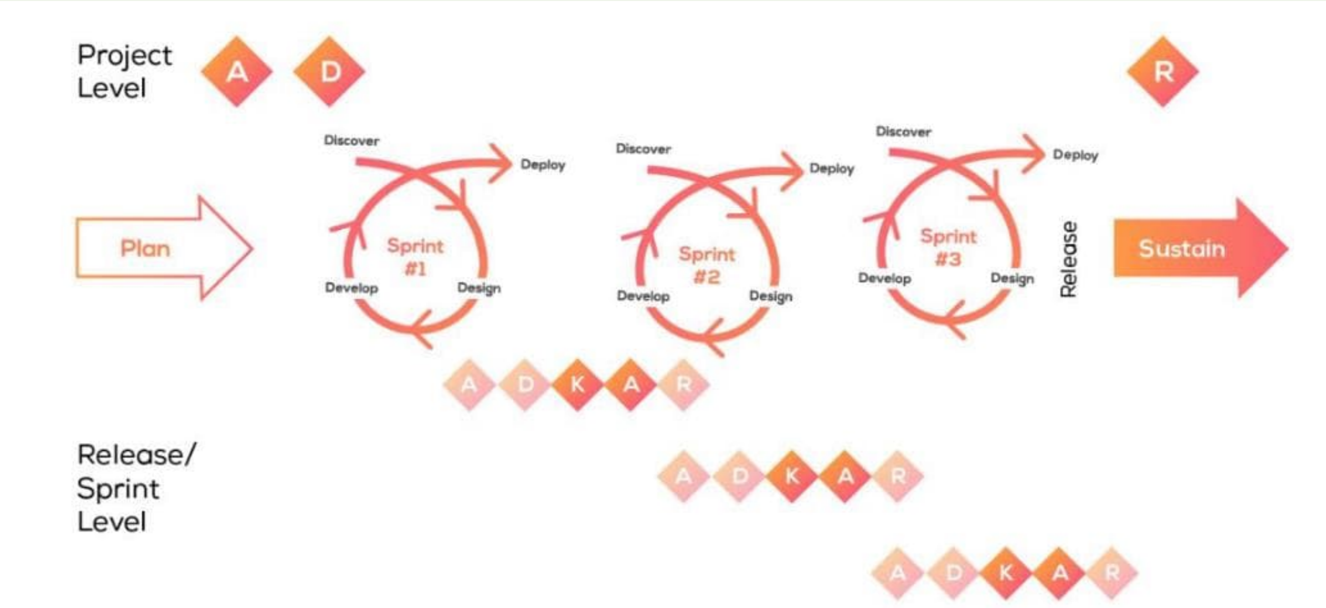


Figure 125 Multiple sprints during Knowledge and Ability stages [2]

The ADKAR model describes successful change at the individual level. Each increment will ensure our people are confident that they have the:

1. Awareness – of the need to change
2. Desire – to participate and support the change
3. Knowledge – of what to do during and after the change has been implemented
4. Ability – to implement the required skillset and to adapt to new behaviours and mindsets
5. Reinforcement – activities aim at making the change long-lasting

7.2 Digital Support

Embracing an agile approach to support delivery of our business transformation and digitalisation strategy will require a shift in mindset and culture within SPEN. As we start to make this transition for our customers and stakeholders, it is essential that support is available for staff in a timely, and accessible manner.

Digital Foundation 2021-23	Digital Operations 2023-25	Digital Core 2025-28
IT upskilling to enable digital transformation. Targeted support based on current capability.	Skills are developed in parallel as new digital technology is deployed	Digital becomes the norm

Table 128 **Digital Support Levels to Support Staff**

Digital training and upskilling are already underway for CoE and IT support staff to make sure they can support business users. We now consider this in all new projects to ensure support staff are trained in advance of go-live. Our agile, multi skilled pool of staff will provide this support.

[2] https://www.nexum.eu/article-0

7.3 Increasing Workforce Awareness

As well as training and upskilling staff on how to use new and existing technology, it is essential to raise awareness of why the change is being introduced and make sure the context is understood in terms of processes and systems. This includes:

- What the purpose of the system is and the organisational need for it
- Why it is being introduced
- What the impact is if not fully adopted
- Business and personal impact if not adopted

Particular attention is given to raising awareness on the importance of accurate data capture and how important it is in the context of the end-to-end process, demonstrating for example where poor data captured in the field can result in our asset data records being incorrectly displayed and reported.

This sits alongside training on new skills that help to mitigate errors in data capture and is a key enabler of the digital transformation.

7.4 Improving Training Delivery

Training on new digital desktop solutions needs to match the standard of our operational training to ensure all staff have the skills to carry out their roles effectively. We will improve how we deliver our training using a broad mix of techniques ultimately our learning pathways will be combined to be role relevant, and the same rigour applied to their planning, reinforcement and follow up. These techniques are described in the table below.

7.4.1 Training Provided by Internal Specialists

Type	Description
Mentoring	Require training to close skill gap between experienced and new staff.
New System Training / System Updates	When new systems are launched, full training will be provided to all relevant staff. Staff roles and capability will be reviewed in advance of training to ensure that all training is relevant and timeous.
New Digital Platform Training	Prepare staff for changes to IT systems as well as providing education on the reasons for the change.
Combined System approach	Multiple systems can be required in one business process, e.g., our maintenance process will use LIDAR, GIS, SAP, and our Vegetation Management System. The correct skills and qualifications are required to fully understand the process and systems from end to end.
Computer Literacy	Ensure any skills gap around computer literacy are addressed in advance of the introduction of new digital platforms.
Emerging communities of Practice	Empower staff to build groups to share a common training or role needs by working together share ideas on key topics.
Continuous Improvement	Digital and Data skills incorporated into staff improvement plans to ensure they continue to grow their digital skills.

Table 129 **Improving Training Delivery Techniques**

7.4.2 External Specialist Engagement

Two key partnerships have been planned to provide external support for our upskilling strategy:

1. **HALO/ScottishPower Partnership**
    - The HALO's Innovation and Enterprise Centre will collaborate with ScottishPower to create a cyber and digital training and learning facility at the forefront of the "Fourth Industrial Revolution". The partnership will drive a new workforce of people with digital & cyber skillsets leading to further innovation & digitalisation within the energy sector
2. **Skills Development Scotland (SDS) - Climate Emergency Skills Action Plan**
    - Supporting a green labour market recovery from COVID-19
    - Building better understanding and evidence of future skills needs to support Scotland's transition to net zero
    - Developing the future workforce for the transition to net zero
    - Driving awareness and action to support reskilling and upskilling for the transition to net zero
    - Ensuring fairness and inclusion in the skills system as part of a just transition to net zero
    - Taking a collaborative approach to ensure a skills system responsive to changing demands

7.5 Skillsets for Digital Recruitment / Upskilling

We need to employ and upskill a wide variety of digital skillsets within the organisation. The following sections contain a selection of skills already identified as essential. Skills will be required in central functions such as the CoE and Asset Stewardship as well as across the wider business in operational areas. These skills will be either upskilled from current employees within the organisation or recruited via routes such as the Graduate Scheme or ScottishPower's partnership with HALO.

7.5.1 Agile Skills

An Agile Academy has been developed in collaboration with our corporate IT to support SPEN in developing a suite of agile skills and concepts. These skills and concepts can provide the basis of our agile upskilling requirements. We have identified and grouped these skills into 5 main learning pathways for different types of learners:

1. Agile Leadership (aimed at upskilling our managers and executive teams)
2. Agile Practitioners (upskilling our centre of excellence, business change, and the wider business)
3. Agile Teams (just-in-time training for agile teams)
4. Agile Enthusiasts (next-level training for keen agile learners through our Agile Academy)
5. Agile for All (raising awareness via comms and tailored courses focusing on agile values and behaviours)

Skills are currently being delivered at two proficiency levels i.e., entry-level and advanced skills:

Learning Pathway	Entry-level Skills	Advanced Skills
Agile Leadership	• Leadership styles and development • Cultural adaptability	• Vision & Strategy • Communication • Empowering People
Agile Practitioners	• Experimentation & Learning • Agility & adaptability	• Planning • Incremental value delivery

	• Product vision	• Agile values & principles
Agile Teams	• Agile values & principles • Value streams & product lifecycles • Stakeholder Management • Influencing Skills	• Technical Practices & Frameworks • Team Dynamics & Collaboration • Feedback Loops
Agile Enthusiasts	• Understanding of new ways of working • Agile values & principles	• Engagement • Communication • Cultural adaptability
Agile for All	• Cultural awareness • Agile and change readiness	• Engagement • Communication • Cultural adaptability
Agile Leadership	• Leadership styles and development • Cultural adaptability	• Vision & Strategy • Communication • Empowering People

Table 130 **Learning Pathways for Agile Skills**

Our agile upskilling and continuous improvements plans are based on quarterly evaluations for the agile maturity of our teams. We will build a baseline maturity model to assess and evaluate our progress while identifying and improving the speed, style, and scope of further trainings and interventions.

Agile skills will be used predominately for projects where Subject Matter Experts need to be involved to ensure stakeholders needs are at the heart of all solutions built. Therefore, it is important that staff have the relevant training in the use of agile methodologies.

Resource Type	Purpose	Agile Training
Scrum Master	Drive agile delivery of software platform coordinating with development team and product owner	Formal Scrum Master training & qualification
Product Owner	Helps the team best use Scrum to build the product	Formal Product Owner training & qualification
Development team	Builds the product	Formal training
Subject Mater Experts (SMEs)	Business experts in area of product build	Awareness/Agile Handbook

Table 131 **Agile Skills Resource Types, Purpose and Training**

7.5.2 Data Skills

The Data Strategy contains a detailed section on data skills required; this can be referenced in Pillar 4 ‘People and Culture’.

Skill	Skill Description	Area
Data Analysis	Data analysis skills to improve presentation of data, analyse self-service insight and to use data to created evidence-based approach to decision making for improved	Process & Technology SPD/SPM

	performance; and leveraging tools for visualisation to make insight more accessible to people across the business	
Data Science	Use statistics, computer science and problem-solving skills to solve business problems through advanced analytics	Process & Technology
Open Data Experts	Correct skills needed to catalogue, produce, and provide data via the SPEN Data Landing Page	Process & Technology
Common Information Model (CIM) / Other Model	Data Engineers and Architects to codify business logic about how data relate to one another and the standards (whether open or not)	Process & Technology
Internet of things (IoT) experts	Skills in Big Data, data lakes, predictive modelling, cybersecurity, network technologies, machine-to-machine communications, network design and architectures, cybersecurity, and data modelling and design	Process & Technology
AI Experts	Configuration and API skills for new AI applications	Process & Technology
Data Stewardship	Increase skills of existing Data Stewardship as new digital tools are introduced. Within teams dedicated to the maintenance of asset data and operational staff who trigger the asset maintenance process.	Process & Technology SPD/SPM
Small App/Low code Citizen Data Science	Increase skills and build mobile and online applications alongside the three levels of citizen data science • Level 1 - Self-service reporting and data driven decision making and then • Level 2 - Data analysis • Level 3 - Data science	Process & Technology

Table 132 Data Skills and Technical Areas

Citizen data scientist is a term initiated by Gartner. They define it as “a person who creates or generates models that use advanced diagnostic analytics or predictive and prescriptive capabilities, but whose primary job function is outside the field of statistics and analytics.”

Type	Description
Coding/Scripting Training	Increase number of resources and/or upskill to code and script enterprise systems, allowing the business to become more agile and not rely on IT; instead operate a self-serve business owned data model.
Big Data Training	Increase knowledge of big data

Table 133 Citizen Data Scientist Creation and Training Types

7.5.3 Digital Analysis Skills

A range of new digital analysis skills will be required across the business, some in central functions such as the CoE and Asset Stewardship as well as across the wider business in operational areas. The tables below describe the skills needed and where it is anticipated that they will be required, however as our digital journey progress it may emerge these skills are required in all other areas.

Skill	Skill Description	Area
Sustainability Analyst	Ensure that future environmental data requirements (of which there are many) are identified and embedded in the relevant improvement programmes to deliver and manage suppliers to deliver to SPEN standards	SPD/SPM
Specialist GIS analytics professionals	Upskilling or hire of GIS professionals.	Process & Technology
Website / Self-Serve Portal	Ensure we have the correct skills to react in a timely manner on receipt of feedback from our stakeholders, "you said, we did".	Process & Technology
Systems and Applications Architects	To ensure the correct digital components and combinations are used to achieve our ambitious Digitalisation Strategy. Assist with the integration with corporate systems, and non-out-of-the-box development.	Process & Technology

Table 134 Digital Analysis Skills and Technical Areas

7.5.4 Cyber Resilience Skills

The following groups will facilitate any cyber training required therefore cyber training needs are not listed in this document:

- UKIT Serco Team
- Global Serco Team
- ScottishPower Cyber Security team

7.5.5 Regulatory & Compliance Skills

Type	Description
Code Review Management and Forward Charging Changes Training	A DSO organisation will need to undertake and manage significant code reviews and forward charging changes. For example, for the Common Distribution Charging Methodology (CDCM) and Extra High Voltage Distribution Charging Methodology (EDCM) models reviews, we need the skills to review to understand what will be happening in the network, 15 months in advance.
Compliance Training	Training is required to meet environmental compliance and to change behaviours around the importance of non-financial data - all data is important.

Table 135 Regulatory & Compliance Training Types

7.5.6 Skills for External Stakeholders

Ensure our external stakeholders have the correct training and access to training on our existing portals and when any digital updates are made.

Type	Description
Contractor Portal	The Contractor Portal is a customised SAP portal, we will ensure that training is provided to all new parties when a new framework agreement is set up. Ensure internal staff are also trained to support our contractors when required; in addition, digital wizards and/or chatbots will be developed to assist.
Vegetation Management System	Ensure that training is provided to all new Vegetation Management Contractors when a new framework agreement is set up. Ensure internal staff are also trained to support our contractors when required.
Self-Serve Portal / Virtual Town Hall	Create 'how-to' videos and introduce chatbots to assist stakeholders who are more digitally inclined.
Open Data	Create guidance to assist stakeholders understand what open data available is already available, access existing data sets and how to request new data.

Table 136 External Stakeholder Training Types

7.5.7 Skills for using existing SPEN Systems

The following section details the existing systems that will benefit from additional staff training, throughout the business.

Training Type	Description
iBuy	Improve training, user guides and awareness of our purchasing systems to allow faster purchasing.
GIS Analytics	Need to increase number of staff across the business who have GIS analytical skills - broader requirement in the core team, in Future Networks team, and in our Network Planning & Regulation team.
BIM	132kV staff in SPM for use of BIM, and 33kV staff in SPD & SPM.
Photo Submission via Toughbook	Ensure staff know how to accurately upload photos of assets (useful for defects) to corporate systems.

Table 137 Existing Systems Training Types

7.5.8 Augmented & Virtual Reality Skills

A number of initiatives will use AR and VR technology therefore training of its use will be required for the relevant staff.

AR/VR Usage	Skill Description	Training Required
Staff Training	Off-site training reduces travel time and carbon emissions whilst allowing staff to complete training at a time convenient to them. VR headsets and/or AR will be used to simulate real training scenarios and allow practise; only final training or assessment will require staff at a training centre.	Staff will require software and hardware training.
Present to customers on site	The use of AR/VR on site to show customers new asset routes e.g., an overhead line across their land and ways of working.	Staff will require software and hardware training. H&S / Customer Service training for customers to use on site

AR/VR Conferences	Prepare materials and present to internal and external stakeholders using software such as Altspace. Further information can be found within the Virtual Town Hall initiative (see Section 3.2.2.9)	Staff will require training in AR/VR software as well as upskilling to display data from SP corporate applications on conference software

Table 138 AR & VR Training and Usage

7.5.9 Reporting Skills

The Reporting Strategy will inform the reporting tools that will be used. If these tools are considered self-service then the correct training must be provided; in addition, any existing solutions which run in parallel to new solutions may require further training.

Type	Description
Existing Solution – Power BI / Future Solutions	Training staff to at least level one citizen data scientist to self-serve report and drive data decision. Where applicable borrow level 2 for data analysis

Table 139 Reporting Tool Skills and Training Types

7.5.10 Resource Optimisation

The table below describes the consideration of the use of Internal and External staff to resolve or mitigate the digital skills gap.

Skill	Pros	Cons
Internal Staff	More agile, for example the creation of the Digital Hub within ScottishPower where we have created the Opportunity for collaboration and knowledge transfer and to draw down on central pool of resource and assets as accelerators Growth opportunities for existing staff	• Time to train and upskill staff • Potential challenge to retain
External	• Can help upskill internal staff • Quick solution to buy in the required skills • Able to ‘borrow’ resources via when required.	• Reliance on externals makes us less agile • Potential challenge to retain • Expensive and doesn’t equip organisation on critical skills for future commercial success • Procurement process can slow down access to digital staff

Table 140 Considerations to Resolve or Mitigate the Digital Skills Gap

7.6 Approach and Timeline

This sets out our approach to the delivery of the SPEN Digitalisation Strategy and assesses deliverability, the necessary resource requirements, and the readiness plans.

The diagram below highlights the deliverability assessment model used which shows the interdependencies and key assessment areas.

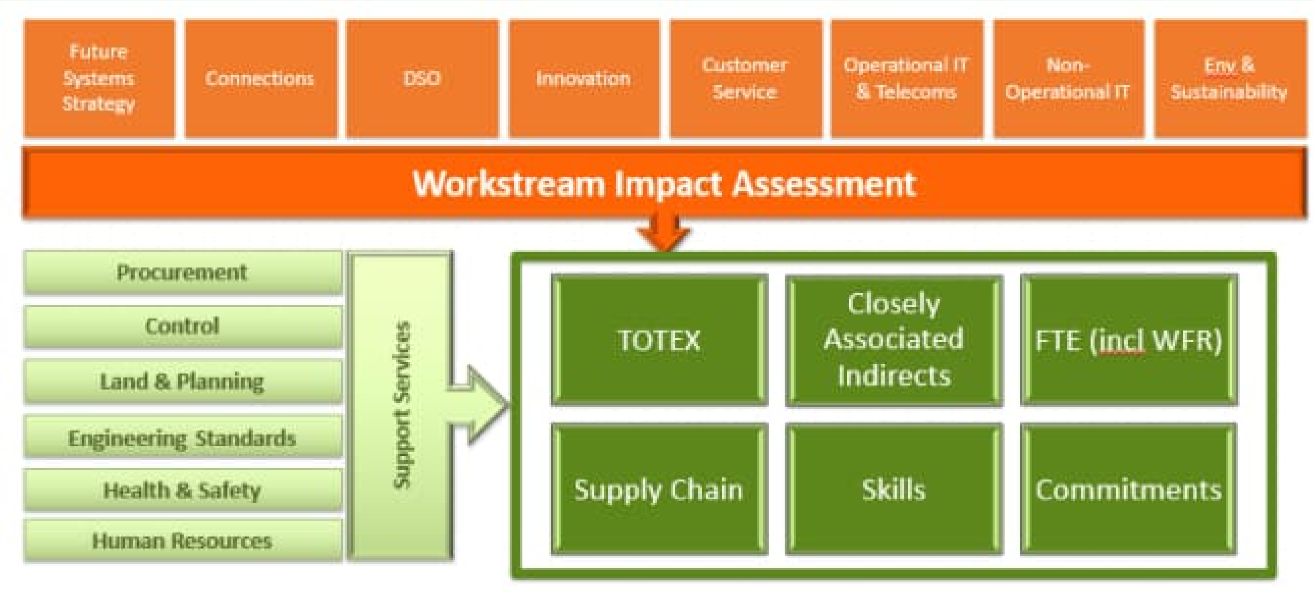


Figure 126 Deliverability Assessment Model

This strategy also reviews the challenges we'll face in terms of deliverability and how we meet those challenges, how we prepare for the scale of change, the use of a Governance and Risk Management Framework, and the people and cultural impact.

In terms of timelines, we have already started to upskill, recruit, create partnerships, and kick-off cultural change by initiating digitalisation sessions.

8. Pillar 6: Improving Mastery of Our Data

Between 2010 to 2020, the amount of digital data in the world increased from 1.2 trillion gigabytes to 59 trillion gigabytes – a growth of almost 5,000%. To put that in perspective, if this trend continues, humans will create the same amount of data in the next 3 years as we have in the past 30[3]. But some types of data are growing faster than others. The fastest is Big Data (38.6% CAGR, 2015 - 2020), Cognitive (23.3%) and Content Analytics (17.3%)[4]. The primary reason for Big Data growth is that sensors are being embedded everywhere. The signals that come from these sensors will let us contextualise other data to derive more value. There has also been a massive increase in metadata, i.e., data about data. This type of data is very useful because it presents opportunities to manage our data more effectively. The volume of metadata being created will very soon will surpass that of all other data types[3].

Digitalising the energy system and improving access to this growing, rich data landscape will unlock stakeholder benefits and accelerate the transition to Net Zero.

We recognise the criticality of investing in data to deliver a better future quicker for more people through a digitalised energy system. To this end, we have created a Data Strategy which sets out 6 critical data capabilities which will underpin our broader digitalisation plans supported by around £14M of investment.

These capabilities will enable us to manage and use our data effectively. We will quality assure our data and make it more accessible for more people (internally and externally), so that we can deliver more value for our stakeholders. There is a particular focus on making our data open within our strategy because we recognise the important role that data will play in enabling a flexible energy market. This will be an important building block in stimulating the product and service innovations that consumers need to accelerate their transition to Net Zero. Our strategy also places a strong emphasis on our people. More specifically, we consider how we can best support them on this journey through data to deliver a better future quicker.

Our strategy for data has taken Ofgem's Data Best Practice Guidance to heart because we recognise that strong data management principles will underpin our digital journey.

The vision for our Data Strategy is illustrated in the figure below:

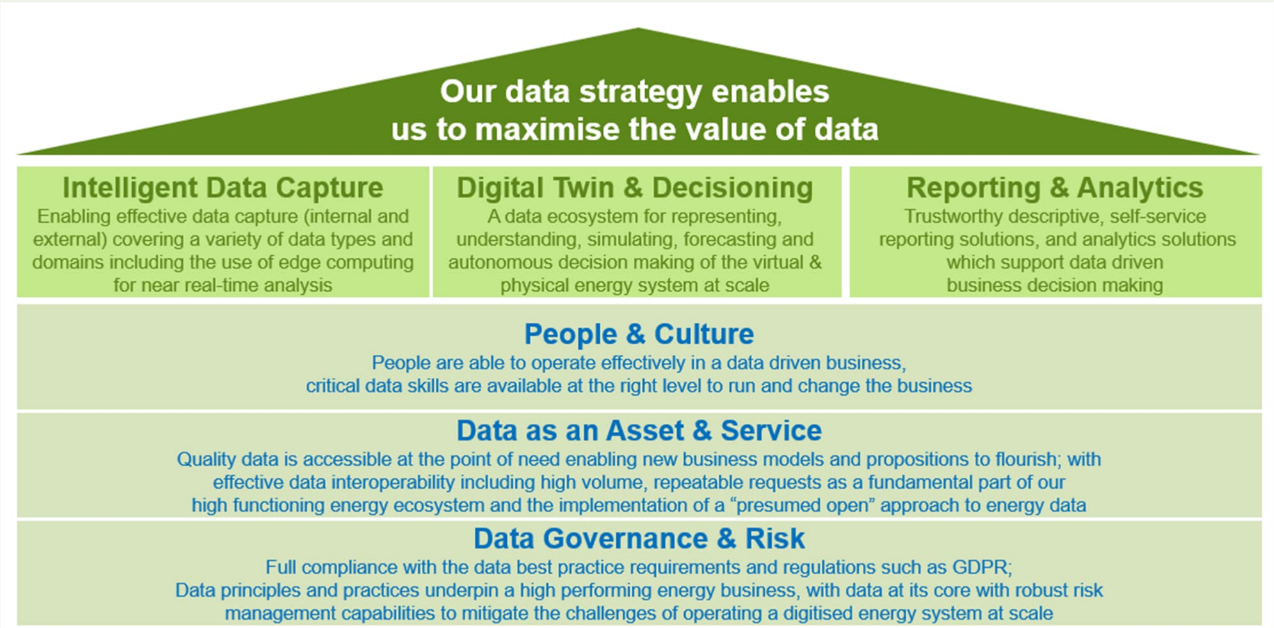


Figure 127 SPEN Data Strategy

[3] Global DataSphere Forecast, IDC (2020). https://www.idc.com/getdoc.jsp?containerId=prUS46286020
[4] 54 Predictions about the State of Data, Forbes (2020). https://www.forbes.com/sites/gilpress/2021/12/30/54-predictions-about-the-state-of-data-in-2021/

This document explores our Data Roadmap shown below:

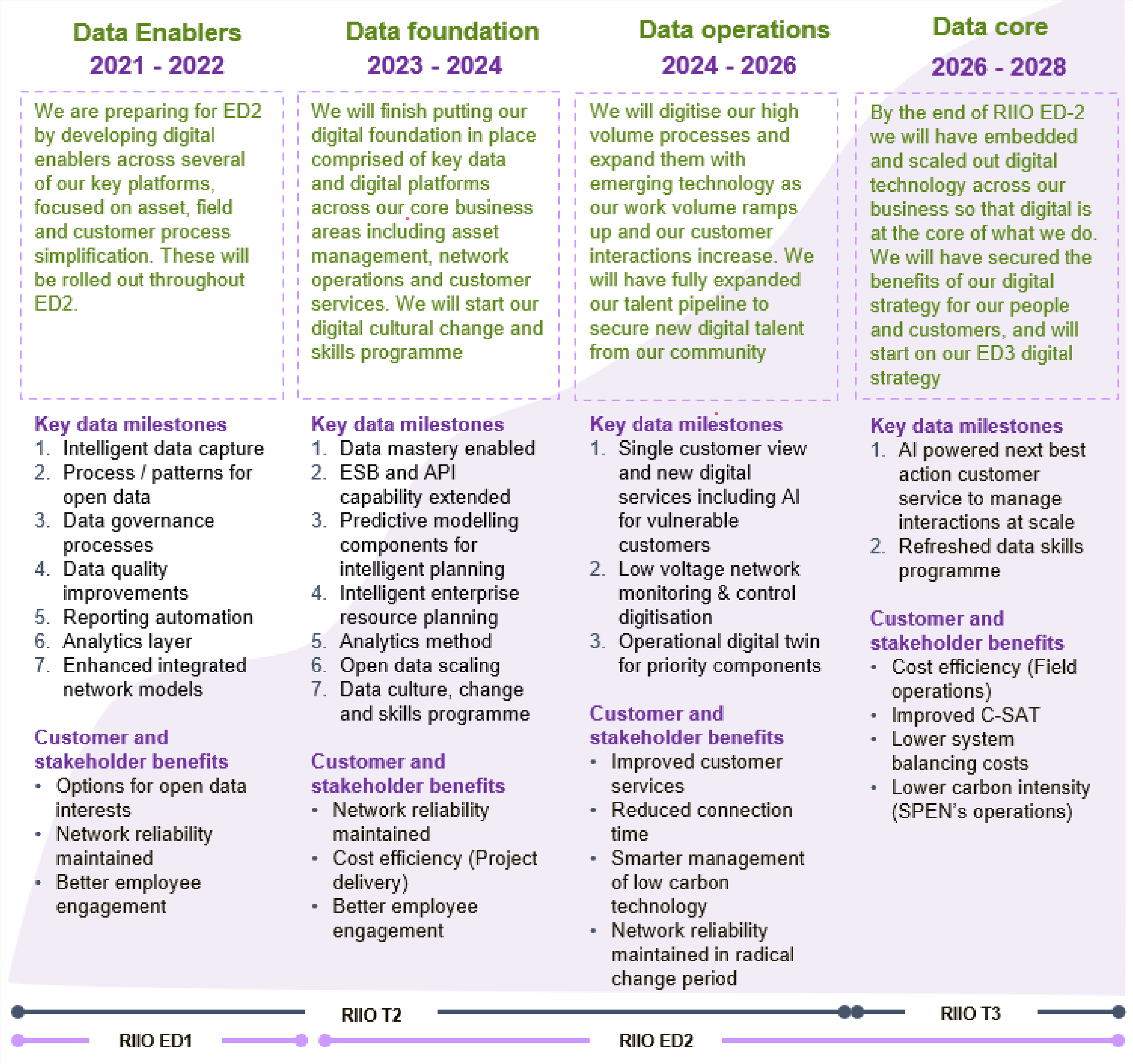


Figure 128 SPEN Data Strategy Roadmap

The role and identity of our customers and stakeholders is also covered, alongside our value propositions, roadmap and data maturity ambitions, and our proposed delivery approach.

As referenced previously, extensive engagement was done in collaboration with our Stakeholder team to understand our customer and stakeholder needs.

The diagram below shows the commitments which these initiatives will drive and contribute to, highlighting key areas relating to improved customer service, the total SPEN commitments that the SPEN Digitalisation Strategy satisfies and facilitates and lastly how many of these commitments are covered within this particular pillar.

Develop a Network that's ready for Net Zero Commitments	Total	Pillar 6
Develop the network of the future	14	2
Ensuring a safe and reliable electricity supply	10	1

Be the Trusted Partner for Customers, Communities and Stakeholders	Total	Pillar 6
We will support vulnerable customers and communities to ensure no-one is left behind	13	3

Be the Trusted Partner for Customers, Communities and Stakeholders	Total	Pillar 6
We will support an environmentally sustainable network	24	4
We will promote an inclusive, skilled and community-based workforce	5	2
We will embed digitalisation and utilise data to unlock benefits for customers and stakeholders	4	2

Figure 129 Key commitments driving the initiatives

The key customer priorities, taken from the customer and stakeholder feedback, which we have used to inform this pillar are:

- A focus on the quality of data. Ensuring effective data management, enhanced visibility, and timelines.
- Ensuring the cyber resilience of our data platform.
- Using data to understand individual behaviours, allowing for more accurate energy usage trends

The initiatives within this pillar are split 44% BAU and 56% digitalisation. These are:

1. Big Data Platform
2. Data and Systems Integration
3. Operational and Regulatory Reporting
4. Data Mastery and Governance

The figure below shows an overview of how each of these 4 data initiatives fit within the wider plan:

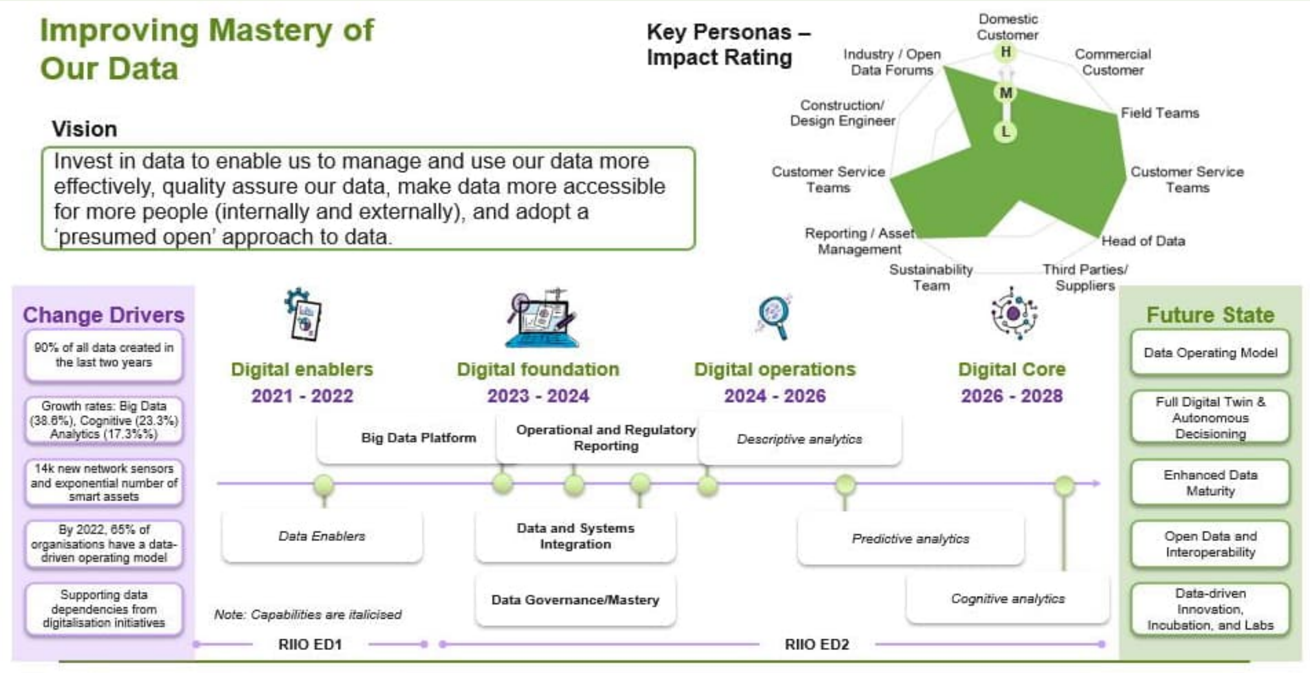
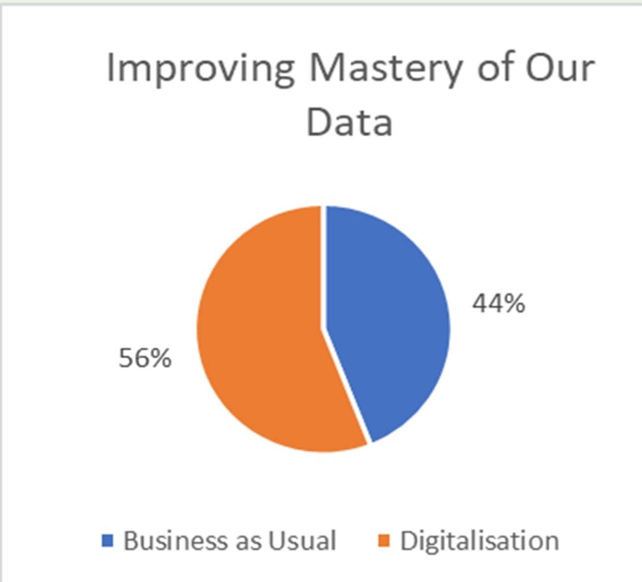


Figure 130 Summary View of Pillar 6: Improving Mastery of Our Data

The initiatives within this pillar are split 44% BAU and 56% digitalisation. Details on the cost split for the overall 'Improving Mastery of Our Data' pillar can be seen below:



Deliverables

Deliverables	Timeline
Introduction of a new reporting portal containing dynamic automated reporting across all areas of our organisation.	Incremental deliveries from 2023 - 2026
Introduce new data capture mechanisms allowing new types of data to become available and its associated metadata. Big Data tooling will also be introduced to manage the size and complexity of our data landscape.	Incremental deliveries from 2023 - 2025
Introduce new technologies, platforms, and models to support the integration between data platforms and systems.	Incremental deliveries from 2023 – 2028 with API and ESB capability extended by 2025
Introduction of Data Governance and Mastery to ensure good practices in our data creation, curation, and management.	Implemented from 2023 to 2024

Table 141 Improving Mastery of Our Data Deliverables

8.1 Operational & Regulatory Reporting

8.1.1 Overview

SP Energy Networks must invest in our reporting and insight capabilities. Through the introduction of a new reporting portal, people throughout the organisation will have access to automated and trustworthy reporting, allowing for data to help better inform decision making.

Our reporting suite will span throughout many areas of the business. With the benefit of fewer metrics that are

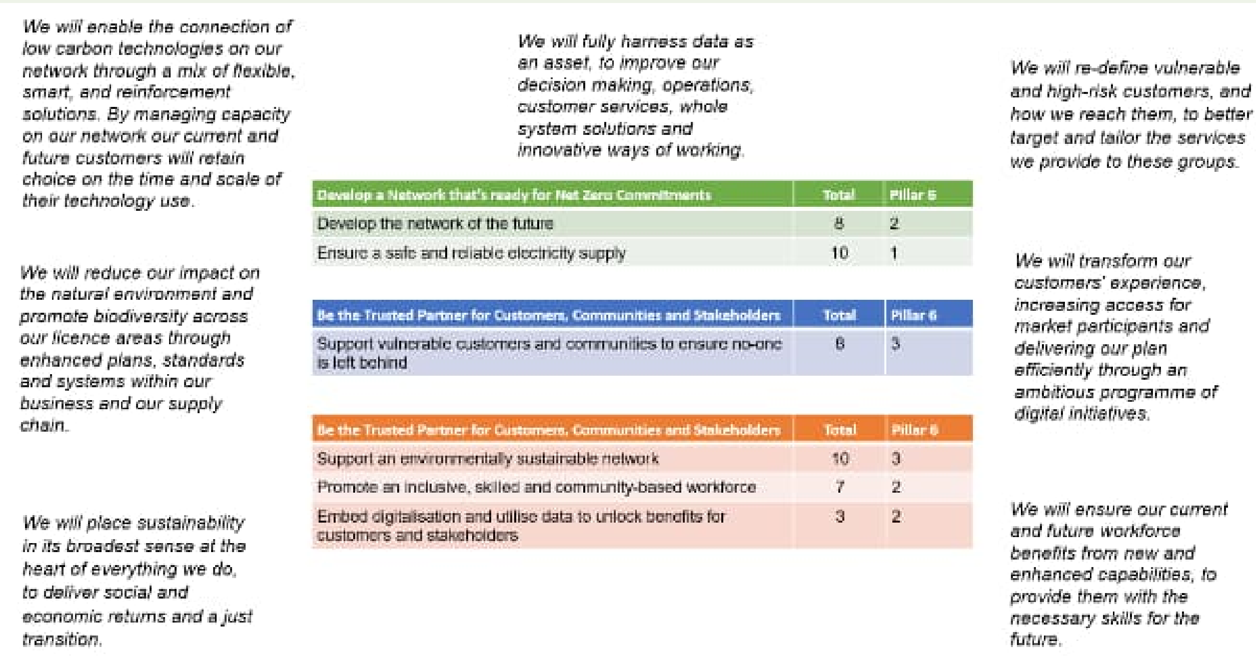


Figure 131 Operational & Regulatory Reporting Suite

more robust and have more dynamic features such as drill through and filters. This will mean that it will be easier for users to extract and use the required data, while also ensuring that the process is quicker and more efficient.

8.1.2 Projects

8.1.2.1. Regulatory Reporting Pack (RRP)

This initiative will enable us to deliver robust regulatory reporting with minimal manual effort or data manipulation in line with Data Best Practice Guidance.

Current Position	Change Drivers
Our core systems are used to capture the data required to create our RRP submission. However, we rely on a number of manual activities to translate this data into the relevant formats for submission to the regulator (Ofgem) for SPD & SPM. As a result, some data is stored in end user applications (EUAs) such as MS Excel or MS Access databases which limits the potential for automation. Historic data is often not available or is available at a level of detail which is insufficient for diagnostic activity to identify the root cause of issues. Siloed data repositories (whether EUAs or otherwise) mean significant effort and time is needed to bring the information together to achieve a joined-up view of performance.	There is an opportunity to automate the extraction of data for RRP reporting, and some of the transformations required to calculate and organise the data, to improve efficiency. This will also reduce the potential for human error in the reporting process and free up capacity to focus on analysis and drawing inferences from the insights. Moreover, the range of services to be supported by networks business is growing so it is imperative that a scalable solution for reporting is implemented to avoid further increase in the reporting burden.

Table 142 Regulatory Reporting Pack (RRP) - Current Position and Change Drivers

Solution

Automation of feeds from SAP/ ESRI system will be needed for key data items with change controls applied for updates/ additions. Fully auditable costs and volumes will need to be enabled in line with defined programmes of work.

The ability to enter assets that are not recorded in the current SAP/ESRI system will be required; albeit there are plans for upstream changes to address this issue through SAP enhancements. Resource for efficient updates to models or exploration of insights will be required sporadically and within an agreed service level and can be drawn down from a central hub of experts.

Key Outcomes

- Create a central data repository for Regulatory Reporting
- Implement a robust data governance process for Regulatory Reporting
- Improved speed and agility
- Scalability to support increased range of responsibilities for our business
- Capacity creation via reduction in headcount required to produce reports
- Regulatory reports might be produced on a more regular basis, e.g., monthly/ quarterly

8.1.2.2. Operational Reporting

We will establish an Insight Portal to enable our people to self-serve a suite of trustworthy reporting, via data visualisation tools, to make informed decisions using data.

Our tools will be intuitive to avoid potential barriers to use. New, role relevant learning pathways will be available for our people to build the data skills that they will need for the future to evaluate performance on key metrics, and improvement opportunities.

Current Position	Change Drivers
The SPEN Commercial and Performance team (SPD & SPM) is manually producing ~150 reports to support the business in their monthly reporting with the use of databases and excel spreadsheets for: • Financial Management • Project Management • Efficiency Reporting • Faults Reporting A legacy version of Business Objects (now unsupported) hosts a series of reports but many of these are not dynamic in nature so there is considerable duplication. This involves significant manual effort on a monthly basis.	Overall, the use of spreadsheets – in lieu of a common metric dictionary and data layer for reporting – results in inconsistent practices which undermines confidence in the data and reporting results. There is considerable manual effort in collating insights across these reports; and there is a risk of inaction due to the multitude of metrics being applied which makes it harder to prioritise where to take effective action. As we gather more and more data as we move towards a digitalised organisation, the need to automate and 'trust' data becomes critical.

Table 143 Operational Reporting – Current Position and Change Drivers

Solution

The implementation of new enterprise reporting tools is recent. Further work is needed to develop clear guidelines, processes, and assets for managing metrics and sources, and promoting/ reskilling the business for the adoption of tooling and the embedding of good practice. Together with a focus on critical thinking skills this should increase the effective use of data in driving decision making across our business.

Moreover, there are instances where we may choose to make reporting to stakeholders accessible externally via our Open Data portal - the data landing page. This is an opportunity we intend to explore with a view to scaling any solutions should they prove successful.

Key Outcomes

- Key suite of reports common across our Districts and License areas, accessible by the appropriate staff level e.g., managerial reports, local team reports, etc.
- Full visibility of projects to show efficiencies of teams and full cost and volume metrics
- Total visibility that puts an end to duplication across multiple systems and performs an end-to-end track of customer engagement.
- Reporting functionality will be able to identify new services and improve customer engagement.
- Enhanced quality due to fewer errors and more robust metrics.

8.1.2.3. CBRM Reporting

There is a requirement to capture and model Condition Based Risk Management data (CBRM) for asset health and criticality (Safety, Environment, Performance and Repair costs).

Current Position	Change Drivers
The current reporting solution for Condition Based Risk Management (CBRM) is not adequate to meet the requirements for RIIO-2 reporting.	• Models are built from scratch each weekend, and previous versions are overwritten leading to rework • Poor Quality Assurance (QA) features exist • Input handling is prone to errors • Future Year modelling is not user-friendly and has led to errors

Table 144 CBRM Reporting - Current Position and Change Drivers

Solution

A functional CBRM system is required that can support the following needs:

- Record historical data (inputs with timestamps) and model versions with ability to rerun any combination
- Land all results into a suitable format stored in an enterprise accessible location e.g., a data lake or data warehouse
- Improved Quality Assurance (QA)
- Improved calibration options
- System capability to track data errors
- Facility to select regulatory year as well as calendar year
- Auditability on changes

Key Outcomes

- Efficiency
- Quality of results
- Increased accessibility for use for relevant role families and downstream model outputs
- Enhanced forecasting for better decision making

8.1.2.4. Customer Service Reporting

We will take steps to address the following requirement to report on the effectiveness of our customer service with due consideration for relationship management and workflow (spanning SPEN staff and contractors).

Current Position	Change Drivers
The current Customer Service IT estate is made up several disparate systems performing different functions; Faults Contact Centre, Customer Connections CRM, Complaints and General Enquiries Database, Workflow Management (WFM) and Power Outage MS Access databases. Due to the lack of integration, there is no single view of the customer for operational or insight needs. Additionally, there is no central repository to pull the data together making analytics and reporting challenging.	The introduction of a CRM tool will enable meaningful interactions across structured journeys and support digitalisation of processes and joined up omni channel experiences and it will be important to provide a lens onto the effectiveness of the business to use this solution to enhance customer experience and outcomes. In this period of radical change (in the opening up of the Energy Tech ecosystem to satisfy a Flexible Market approach) it will be vital to establish a strong foundation in the logic for customer data given the increasing complexity in the engagement model (bi-directional; aggregate microgrid activity, intermediary service providers) and the need to automate interactions and potentially decisions through some channels/ within some processes.

Table 145 Customer Service Reporting - Current Position and Change Drivers

Solution

We will establish a clear, logical structure for the customer entity, i.e., create a map for our customer data and the different aspects of data we need to understand to serve our customers well. This will be vital for joining the dots on both operational data (as part of our CRM solution) and for understanding improvement opportunities analytically. Data mapping will support this activity and master data management solutions will support the automation of procedures to uphold this. The same logical structure will be used to enable reporting, with due consideration given to the need to uphold data privacy by design. Note, there is a separate, complementary CRM initiative which sets out the provisions for the CRM capability to be invested in to manage customer interactions.

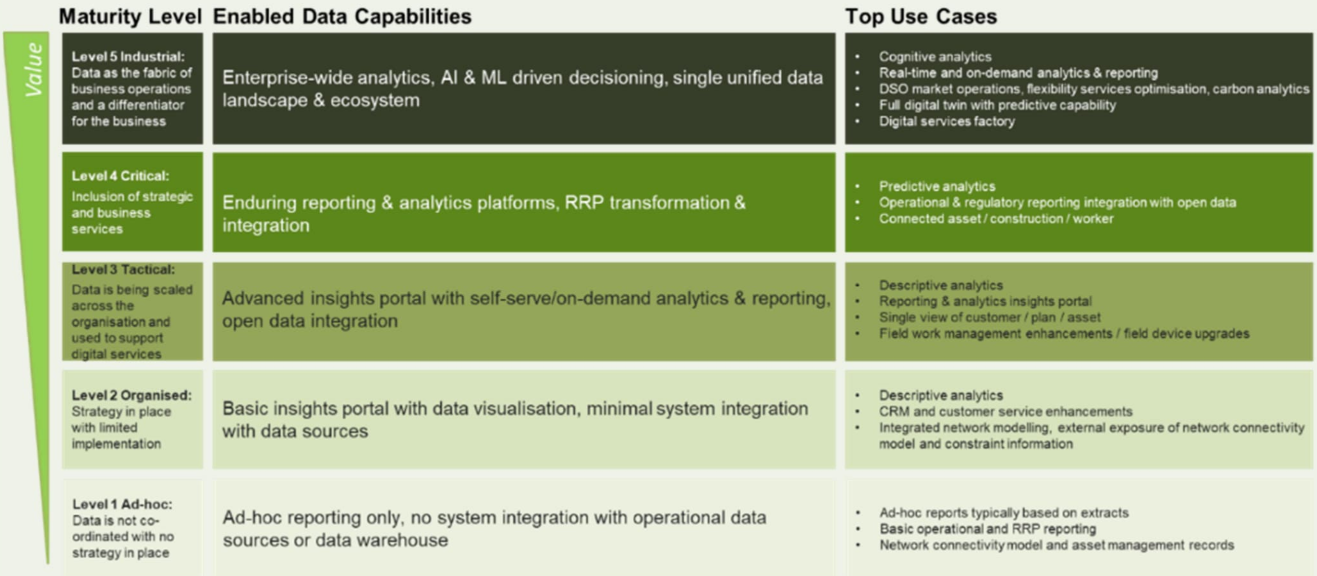
Key Outcomes

- Enhanced customer services (omni-channel offering enabled so customer can interact with preferred channel) due to availability of insight on customer preferences/ behaviour
- Reduced risk of poor service experience (avoidance of complaints/ detractions)
- Increased speed to resolution for our customer through better insight on first contract resolution, understanding failure demand and the causes of dissatisfaction and detraction so that we can tackle the root causes and take actions to rescue cases when things don't go to plan
- Increased efficiency through the identification and follow up of improvement opportunities

8.1.2.5. *Industrialising Reporting and Analytics*

As basic, repeatable reporting is automated, this will allow our people to focus their energy on actioning the insight. For those with deeper analytical skills, their time will be freed up to focus on more complex pieces of analysis. This shift will help our organisation to level up on the data maturity ladder (below) opening up opportunities to access new opportunity for value creation.

Reporting & Analytics Maturity Ladder



Maturity Level	Enabled Data Capabilities	Top Use Cases
Level 5 Industrial: Data as the fabric of business operations and a differentiator for the business	Enterprise-wide analytics, AI & ML driven decisioning, single unified data landscape & ecosystem	• Cognitive analytics • Real-time and on-demand analytics & reporting • DSO market operations, flexibility services optimisation, carbon analytics • Full digital twin with predictive capability • Digital services factory
Level 4 Critical: Inclusion of strategic and business services	Enduring reporting & analytics platforms, RRP transformation & integration	• Predictive analytics • Operational & regulatory reporting integration with open data • Connected asset / construction / worker
Level 3 Tactical: Data is being scaled across the organisation and used to support digital services	Advanced insights portal with self-serve/on-demand analytics & reporting, open data integration	• Descriptive analytics • Reporting & analytics insights portal • Single view of customer / plan / asset • Field work management enhancements / field device upgrades
Level 2 Organised: Strategy in place with limited implementation	Basic insights portal with data visualisation, minimal system integration with data sources	• Descriptive analytics • CRM and customer service enhancements • Integrated network modelling, external exposure of network connectivity model and constraint information
Level 1 Ad-hoc: Data is not co-ordinated with no strategy in place	Ad-hoc reporting only, no system integration with operational data sources or data warehouse	• Ad-hoc reports typically based on extracts • Basic operational and RRP reporting • Network connectivity model and asset management records

Figure 132 Reporting & Analytics Maturity Model

For this reason, we will also touch briefly on elements of advanced analytics within this initiative (although it is covered more fully in the Big Data Project see section 8.2). In any event, not every element of reporting will be automatable. For example, RRP, operational or customer reporting will require diagnostic activity from time to time to dig in at a deeper level on the root causes of issues or opportunities for improvement in relation to key metrics.

Our data layer will let enable those with deeper, technical data skills minimise the time that they spend on duplicative, intensive data engineering activities. Instead, they will be able to focus their efforts on creating value through deeper analytics.

Current Position	Change Drivers
Tactical point solutions for reporting and analytics are leading to duplicative work and mistrust of reporting. The solutions are labour intensive and not dynamic enough to accommodate the multifaceted nature of mature analytics practice targeted. There is significant duplication of effort on feature engineering, and practices are not in line with the Data Best Practice Guidance Principles nor scalable for future.	There is a pressing need to industrialise reporting to ensure that there is a window onto performance for critical processes.

Table 146 Industrialising Reporting and Analytics – Current Position and Change Drivers

Solution

The same data access layers that we plan to create to let us automate reporting will be accessible for more advanced analytics activities. The underpinning data will be accessible at an appropriate level of detail to enable more complex modelling to take place. There will be the option to bypass the reporting data view layer, to access common code via a library / our features store to avoid repeatedly reengineering the same features. Regardless of method of access, this focus on the same underlying data source and definitions will ensure that we can always reconcile important data back at the root of each solution. Key data items are to be landed or streamed (via Systems Integration solutions supporting microservices for extraction, transformation, and loading) into locations such as Data Warehouse or Data Lake (Big Data). All of this data is to be exposed in analytical layers which support optimal performance for reporting, analytics, operational uses. API Libraries (and equivalent pipes) will support productionised data feeds (batch/ daily/ intraday/ on demand).

Tooling and learning pathways will open up new opportunities to leverage this data layer to support activities such as optimisation (for capital planning), digital twin development (for key use cases) with enhanced interoperability ensuring we can plug those insights in directly at the point of need via connected devices. It will be easy to add new streams of data to the data layer and to build connections between data to identify new opportunities to deliver value to stakeholders.

8.1.2.6. Benefits of Reporting and Analytics for Stakeholders

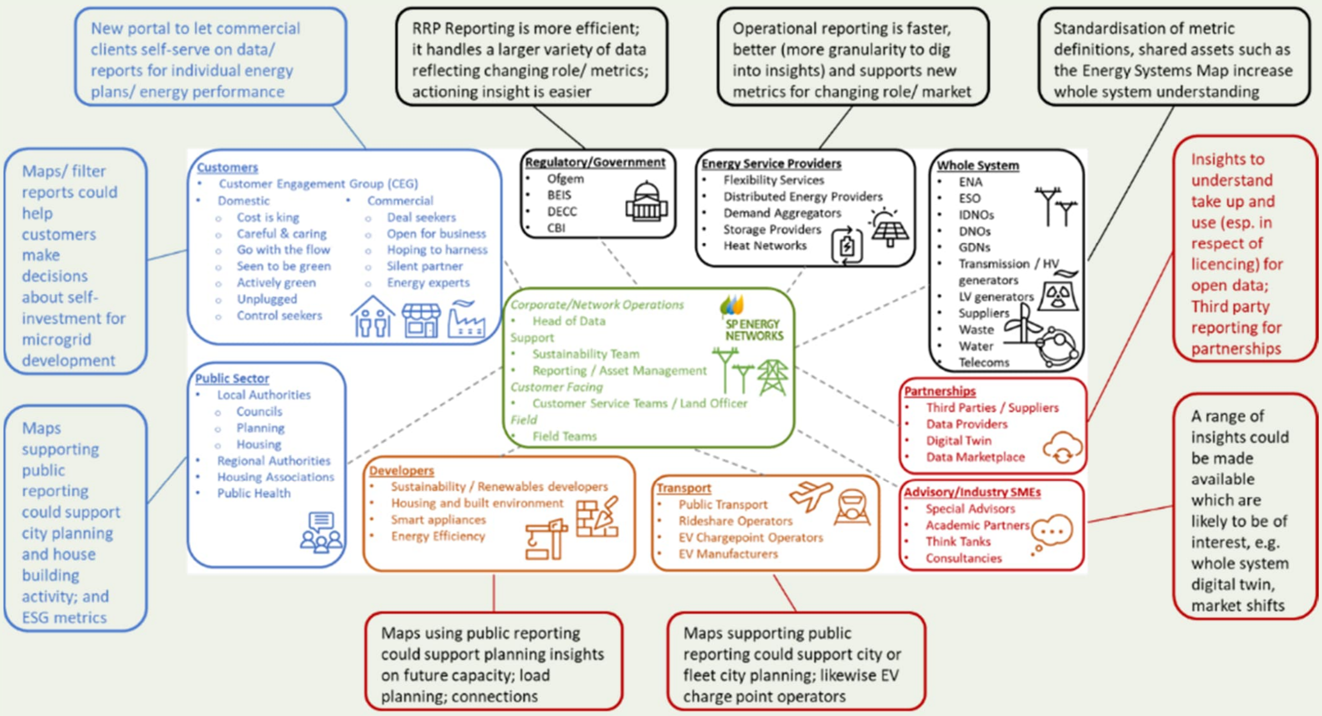


Figure 133 SPEN Stakeholder Map for Reporting and Analytics

Visualisations and metrics will be available for consumption through internal applications including an internal portal, as well as external portal. Where customisable for external partners – e.g., customers and stakeholders – access controls will operate via API Management tools and Enterprise Service Bus for internal users, and where it makes sense leveraging opportunities for cloud-based reporting and analytics particularly in conjunction with big data and event streaming. This will mean we will provide a method of exposing reusable services for consumption by any approved devices.

Key Outcomes

- Our data layer will enable those with deeper, technical data skills to minimise time spent on duplicative, intensive data engineering activities and instead to focus their efforts on creating value through analytics
- The value return from optimisation for capital planning should be significant especially when considering the need to develop analytics in the LV network space where there has traditionally been less of a need for modelling
- Insights at a deeper level will let us truly dig in to understand and tackle the key opportunities to deliver value and take a more robust approach to evaluating the impact of initiatives aimed at tapping into those pools of value
- Expert data people will be more able to do their job well because we reduce the barriers to accessing data to support the development of analytics solutions

8.1.3 Persona Spotlights

SPOTLIGHT: HEAD OF DATA

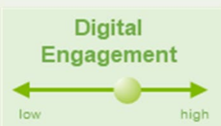
What is the benefit for me?
Access to reliable data that is up to date

How will I feel the impact of digitalisation?
Common metrics with approved sources of truth limiting potential for duplication of effort or conflicting results; significant efficiency gains through automation of data ETL processes, calculations and improved feedback from internal and external customers through visualisation techniques to improve accessibility

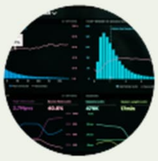
SPOTLIGHT: COMMERCIAL CUSTOMER

What is the benefit for me?
Potential to feed into energy system and save money on their energy bills.

How will I feel the impact of digitalisation?
Enhanced client reporting options enabling commercial customers to self-serve on key insights



SPOTLIGHT: REPORTING / ASSET MANAGEMENT



What is the benefit for me?

Improved visibility of asset data at a more granular level.

How will I feel the impact of digitalisation?

Connected Construction dashboard with IoT/sensor data for crews

Additional insight into infrastructure resiliency and the value of vegetation management

Digital Engagement

low high

SPOTLIGHT: SUSTAINABILITY TEAM

What is the benefit for me?

Access to reliable data that is up to date.

How will I feel the impact of digitalisation?

Potential to route ESG metrics through similar solutions and to reuse assets and methods as well as skills improvements through learning development activities.

Digital Engagement

low high

SPOTLIGHT: CUSTOMER SERVICE TEAM

What is the benefit for me?

Access to reliable data that is up to date.

How will I feel the impact of digitalisation?

Improved services because of enhanced insights on customer demand, experience and outcomes to identify opportunities to improve products and services (directly and indirectly via broader flex market); Reduced effort and greater awareness of impact on customer outcomes

Digital Engagement

low high

Figure 134 Operational & Regulatory Reporting Persona Spotlights

8.1.4 Delivery Approach & Timeline

An agile delivery approach will be used to achieve incremental value by supporting user stories and knowledge transfer within cross functional teams. A lab-based model will be adopted – to let us test and learn on what works – with a parallel workstream building out the data and metric dictionaries (Governance) and ETL feeds (Big Data) to land the necessary data into productionised views performant for reporting and analytics purposes.

	2023/4	2024/5	2025/6	2026/7	2027/8
Operational and Regulatory Reporting					

Figure 135 Operational & Regulatory Reporting Timeline

8.1.5 Implementation Approach

Cross functional teams will be mobilised using a standard lab-based approach to the development of reporting. This will ensure that the team has the requisite skills to solve the problem completely and a reporting lab playbook will ensure that best practice is adopted.

Approach	Initiatives
Agile	RRP
Agile	Operational Reporting
Agile	CBRM Reporting
Agile	Customer Reporting
Agile	Analytics Ladder
Agile	Applications

Table 147 Operational and Regulatory Reporting Approach and Initiatives

8.1.6 Project Schedule & Key Milestones

The following key milestones have been set and agreed for the project:

			Y1	Y2	Y3	Y4	Y5
	Workstream	2022/3	2023/4	2024/5	2025/6	2026/7	2027/8
Reporting	Lab Set Up						
	RRP Reporting Lab			Automation - RRP			
	Operational Reporting Lab			Automation - Operational			
	CBRM Reporting Lab				Automation - CBRM		
	Customer Reporting Lab				Automation - Customer		
	Analytics Maturity Ladder			Analytics Layer			
	Learning Pathways						
	App Development						

Figure 136 Operational and Regulatory Reporting Project Schedule and Key Milestones

8.1.7 Resources

Resource Type	Purpose
Scrum Master	To coordinate the team and ensure adoption of best practice with 1 leading on scrum of scrums
Product Owner	Business SME who helps the team best use Scrum to build the product that supports the user stories

Development team	Composed of technical and business experts to build the business and technical architecture for the solution
Subject Matter Experts/ Data Translators	Provide expertise to support the delivery team in delivering on requirements on a consultative basis to deliver the most loveable product and roadmap to success
Data Feature Engineer	To feature engineer data for use by scrum and support profiling activity to feed into design for ETLs
Data Analyst	Build Dashboard to end-users (ideally drawn from business both nascent and super users at least by end of project)
Data Lake Designer (Analytics Ladder scrum)	Data engineer and architect to ensure logical and physical design supports needs and enterprise capability into BAU and integrations are optimised
Data Engineer x 2	ETL and Data Pipeline Creation

Table 148 Scrum Resources and Purpose

8.1.8 Functional Model

The diagram below depicts a conceptual component overview of the high-level architecture/functional model solution. (Note the build activity here will take place in the platforms below rather than a need for new platforms to be instituted which is covered in the Big Data Initiative and the Systems Integration Initiative).

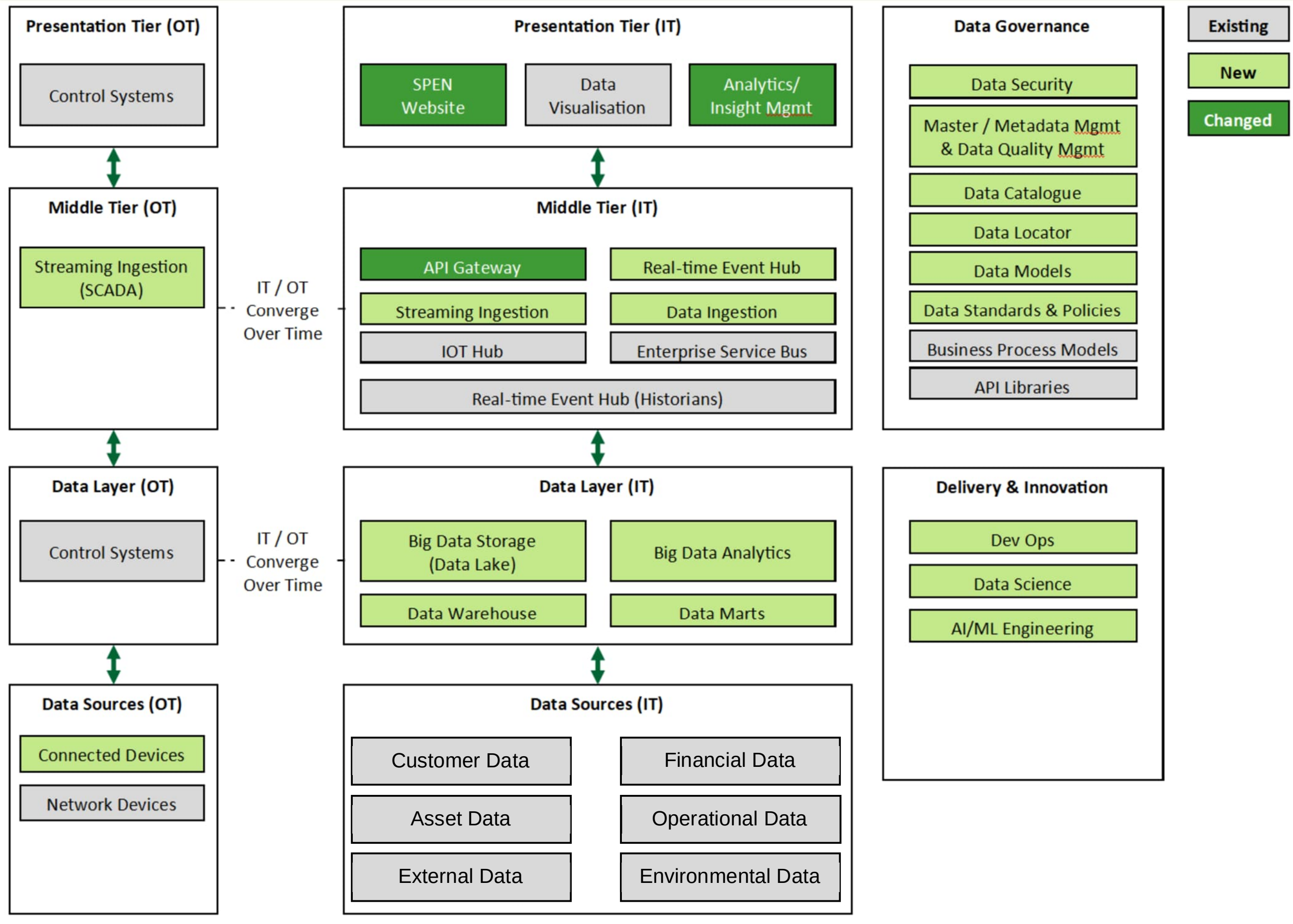


Figure 137 Conceptual Component Overview

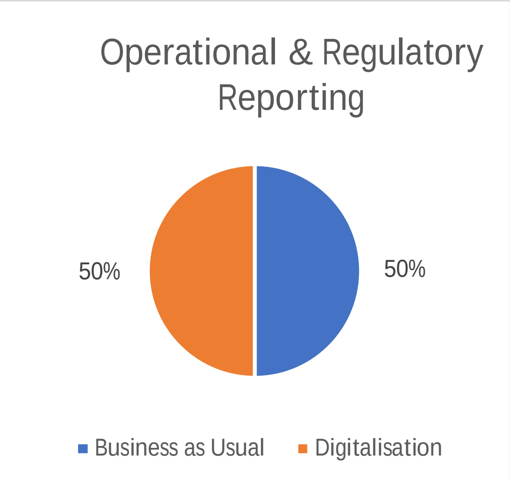
8.1.9 Costs

The resource types are an estimation for the development, run and stimulus needed to translate reporting as set out in this paper into a BAU activity in line with Data Best Practice Guidance Principles. Note there are dependencies upon other data initiatives such as Big Data and Systems Integration in order to meet the goals set out in this initiative for the resources below.

Resource Type	Purpose	Assumptions
Scrum Master	To coordinate the team and ensure adoption of best practice with 1 leading on scrum of scrums	Business Investment
Product Owner	Business SME who helps the team best use Scrum to build the product and roadmap to success	IT Investment
App Developer	Develop reporting portal and other applications	Business Investment
Subject Matter Experts	Provide expertise to support the delivery team in delivering on requirements on a consultative basis to deliver the most loveable product and roadmap to success	Business Investment
Data Analyst	Build Dashboard to end-users (ideally drawn from business both nascent and super users at least by end)	Temp Resource
Data Feature Engineer	To feature engineer data for use by scrum and support profiling activity to feed into design for ETLs	Temp Resource

Table 149 Resource Types

Note: It is assumed that any additional costs for licences or upgrades/support for the applications will be factored into the IT overhead costs as part of enterprise services. Ongoing staff costs post development and implementation are assumed to be absorbable by business in terms of FTE savings from avoided manual effort and for IT resource it will become part of the IT Overhead.



BAU Rationale:

We have some reporting and analytical capabilities from our investment in our NAMS BW/BO solution in RIIO-ED1. We have begun to develop enhanced capabilities through the use of Microsoft PowerBI and MicroStrategy platforms. Our BAU investment represents the continued investment in incremental solutions.

Digitalisation Rationale:

The creation of a big data platform (see section 8.2) and the enhancement of our various asset, operational, customer, environmental and external solutions will generate a huge volume of data. The presents opportunities for us to analyse and report on more datasets and their interrelationships. Our digitalisation investment here is part of our vision to maximise the value of data.

8.1.10 Performance Metrics

The KPIs will be used to track success of the initiative will be deemed to have been successful if the following criteria are met:

Ref.	Project	Area	Measures of Success
1	RRP Reporting	RRP Team	Sign off on metrics and sources Automation of key data feeds Visualisation of key metrics Self-service reporting enabled
2	Operational Reporting	Operations Teams Commercial & Performance Teams	As above Enablement of event-based reporting
3	CBRM Reporting	CBRM / Asset Management Reporting Team	As above
4	Customer Reporting	Customer Services	Customer entities signed off for use Sign off on metrics and sources Automation of key data feeds Visualisation of key metrics Self-service reporting enabled External self-service options enabled

Table 150 Operational & Regulatory Reporting Measures of Success Per Project Area

8.1.11 Assumptions and Dependencies

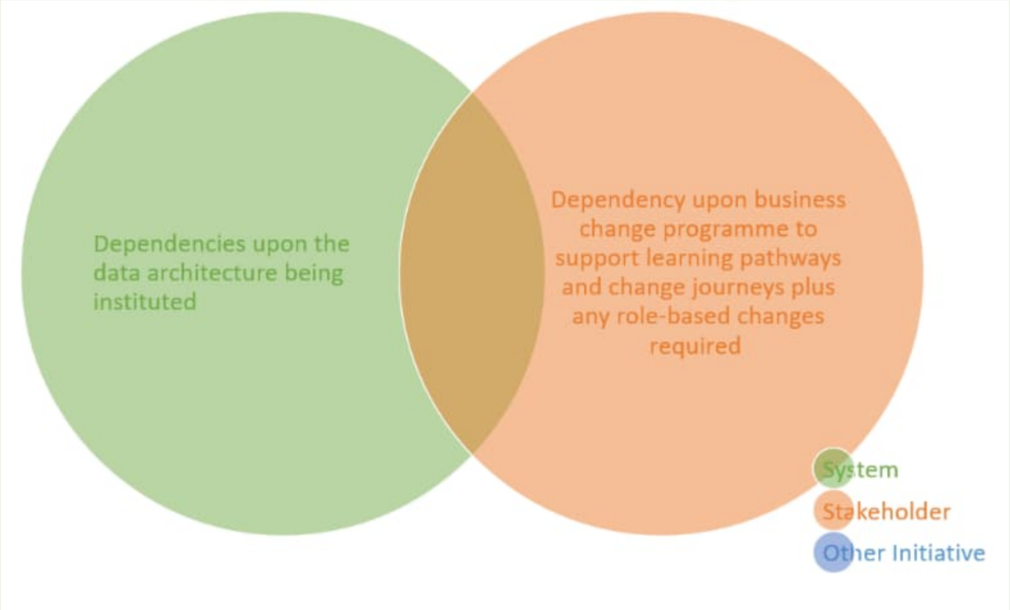


Figure 138 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Operational & Regulatory Reporting Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Data sources that need to be sourced will be digitised (already or as part of an adjacent initiative) so that sources are not drawn from End User Applications (EUAs) for reporting purposes
Development of ETL procedures will be costed through this Strategy (under Big Data) but BAU budgets will ensure service level coverage for this, and tooling needed to support continuous development or incident management should the need arise
A formal control model is agreed for metrics and sources as part of work to define an enterprise data map with control via committee.
Agreed model to support/ mandate participation in role-based learning pathways to support adoption of tooling for self-service to transition this approach to a BAU model and close off the associated tactical reporting in place today

Table 151 Operational & Regulatory Reporting Assumptions

8.1.12 Risks and Mitigations

Below are the risks and proposed mitigation strategy.

ID	Risk	Mitigating Actions	Likelihood	Impact
1	An enterprise-wide view of data cannot be achieved because of a lack of consensus upon the format, sources or definitions for key data items which means that data siloes persist and different results are achieved for key metrics	Engagement with data experts and the introduction of committee structures will ensure that an enterprise data catalogue and metrics is developed and formalised Data owners will provide a business point of escalation for resolution through to an accountable Executive	Medium – There limited formal procedures for recognising data and controlling that record across business units	High – Failure to align on definitions for key data items will mean that these cannot be exposed for use across the enterprise limiting our ability to maximise the value from our data and preventing us from reducing inefficiency and moving analytics experts up the value chain; adjacent impact for open data would also be material
2	We cannot execute good decisions because we lack clarity on the measures that matter and the skills to use data well which will limit our ability to take action to improve stakeholder outcomes	Clear comms about the need for change and the journey will set expectations about the options to build skills via role relevant training will be critical	Medium – There will be role families who are materially impacted, and the absorbability of the business will be tested throughout this period so the role of leadership in emphasising the priority of doing data well will be key and avoid falling back on ‘intuitive’ decision making	We cannot execute good decisions because we lack clarity on the measures that matter and the skills to use data well which will limit our ability to take action to improve stakeholder outcomes
3	Mistrust of data quality means few people will fully use data to make a	Validation of data with owners	Low – In areas of unfamiliarity users are less likely to invest time	Medium - Data is likely to be used (in the absence of

	difference. This mistrust stems from limited visibility of data, quality assurance measures and the absence of clear routes to resolution on potential data quality issues	ML Enabled scans for anomalies/ volatility Introduction of clear routes to escalate issues will provide more transparency on data quality Proactive publication of data catalogues will also go some way to assuring users on data accessibility, quality and exposing any relevant health warnings	exploring potential connections for opportunities to deliver value or to doubt the data when it does/ doesn't support a particular hypothesis	alternatives) but the maximum value return won't be achieved
4	It's hard to make connections through data because of siloed projects which build out ad hoc data sets which means that there is no coherent data view for analytics	Establish a community of practice drawn from all relevant areas (voluntary basis) which is afforded formal recognition to consult on role change and learning pathways and support the development and adoption of principles and policies for data use, as well as community events Introduce a baseline level of education on data, principles, and practices	High – Without buy in across relevant practitioner groups there will be significant challenge to introducing the libraries and procedures needed to accelerate the business through the data maturity curve and support practitioners to experiment and scale at pace	High - There are no common data practices nor learning options nor standardised approaches to enable reuse of solutions
5	The business' upstream processes heavily rely on EUAs and manual processes because the business processes are not fully digitised which means that the data ecosystem has holes, and the fragments may prove insufficient to give confidence in insight for action	Identify the most significant opportunities to deliver value through data Establish cross functional teams to design and deliver solutions that will digitise upstream processes and apply best practices in data for actionable insight Support knowledge transfer to participants	Medium – The prevalence of spreadsheets and point solutions is high and the pressure to develop new solutions at pace may lead to an increase in technical debt	Medium – The absence of digitised processes will severely limit the potential for our business to deliver value through data
6	The technologies in the architectures described in this document are largely new to SP and therefore significant training will be required by the company on the	Role relevant training, assets, and playbooks to mitigate risks and issues from poor practices Data principles which guide decisions and	Medium – There are mechanisms available such as expert resources via Factories upon which the teams can draw down	High - Time & cost – this may increase time to train and deploy and suboptimal performance of solutions

	new process and ways of working	actions as well as supporting policies Potential delivery partners who can guide and limit exposure to risk through experience	expertise, but execution will still be a challenge	
7	If data is downloaded to a non-corporate device, or, used incorrectly by a malicious user, there is a risk that the organisation may fail to meet GDPR compliance	Cyber policy and protocols will mitigate risk to solutions from malicious external attacks Policies and associated controls (overseen by Committee and Exec sponsor) will limit exposure internally and via approved users/ devices Protections to mask or otherwise obfuscate or anonymise any data deemed to be higher risk will be considered by committee in line with the policies to be developed	Low – Access controls within tools will plug into (staff), ID&V (customer) and authentication (3rd parties) together with access controls for data (around privileges	High – Failure to comply with GDPR and DPA regulations

Table 152 Risks and Proposed Mitigation Strategies

8.2 Big Data & Analytics

8.2.1 Overview

Our activities generate large volumes of data across supply chain, asset, business information and customer service systems. And this will only increase as we extend our activities to cover new energy vectors (e.g., heat and transport) and new markets (e.g., flexibility) and models (e.g., emerging energy technology sector). Drawing intelligence from data, applying that at scale to deliver more value for customers and stakeholders, will be critical to enable a flexible energy market and enhance and personalise service experiences. Yet handling such data at volume and making important connections between different types of data will be impossible without big data solutions.

Big data is best described in terms of 6Vs: volume, velocity, variety, veracity, variability, and value – as shown in the figure below:

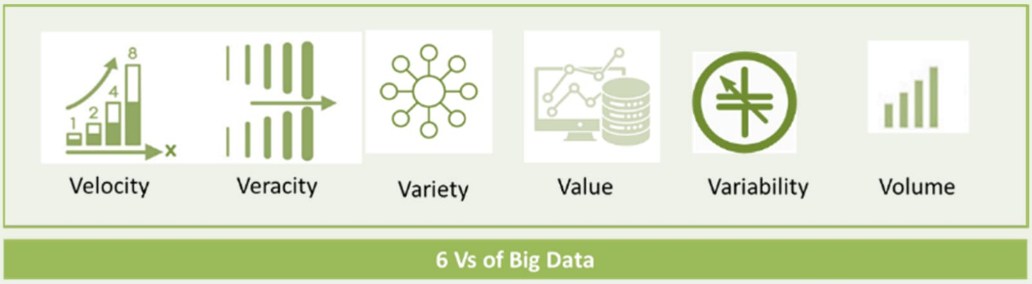


Figure 139 The 6Vs of Big Data

New data capture mechanisms will be introduced resulting in different types of data becoming available. As more devices are installed on the network, inevitably the volume of data will increase exponentially, e.g., Light Detection and Ranging (LiDAR) data and videos streamed from drones. The need for good metadata too will increase. All this growth will necessitate new methods of data storage and a higher capacity for information processing than we have today. The data landscape will be too complex and too large to be manually reviewed at speed; thereby also necessitating the type of big data tooling that can be used surface data features and insight with maximum efficiency. In this way Big Data solutions will help us handle the volume and variety of data we need, with velocity in order to deliver greater value; and complement the associated framework and procedures set out in our Data Governance & Risk initiative to actively manage and quality assure our data (veracity) and accommodate new data and new connections (variability).

8.2.2 Projects

8.2.2.1. Data Lakes and Data Processing

SPEN's current IT application architecture will need to evolve to meet this challenge. SPEN has 3 main asset and business information systems (including GIS, SAP) which are synchronised by nightly batch updates, and an SAP BW (Business Warehouse) reporting universe that is populated nightly. Landing large volumes that can be ingested and processed at the same time will let us move away from batch and this is necessary for digital twin and AI assisted decisioning. The figure below shows the current architecture with data warehouse capabilities

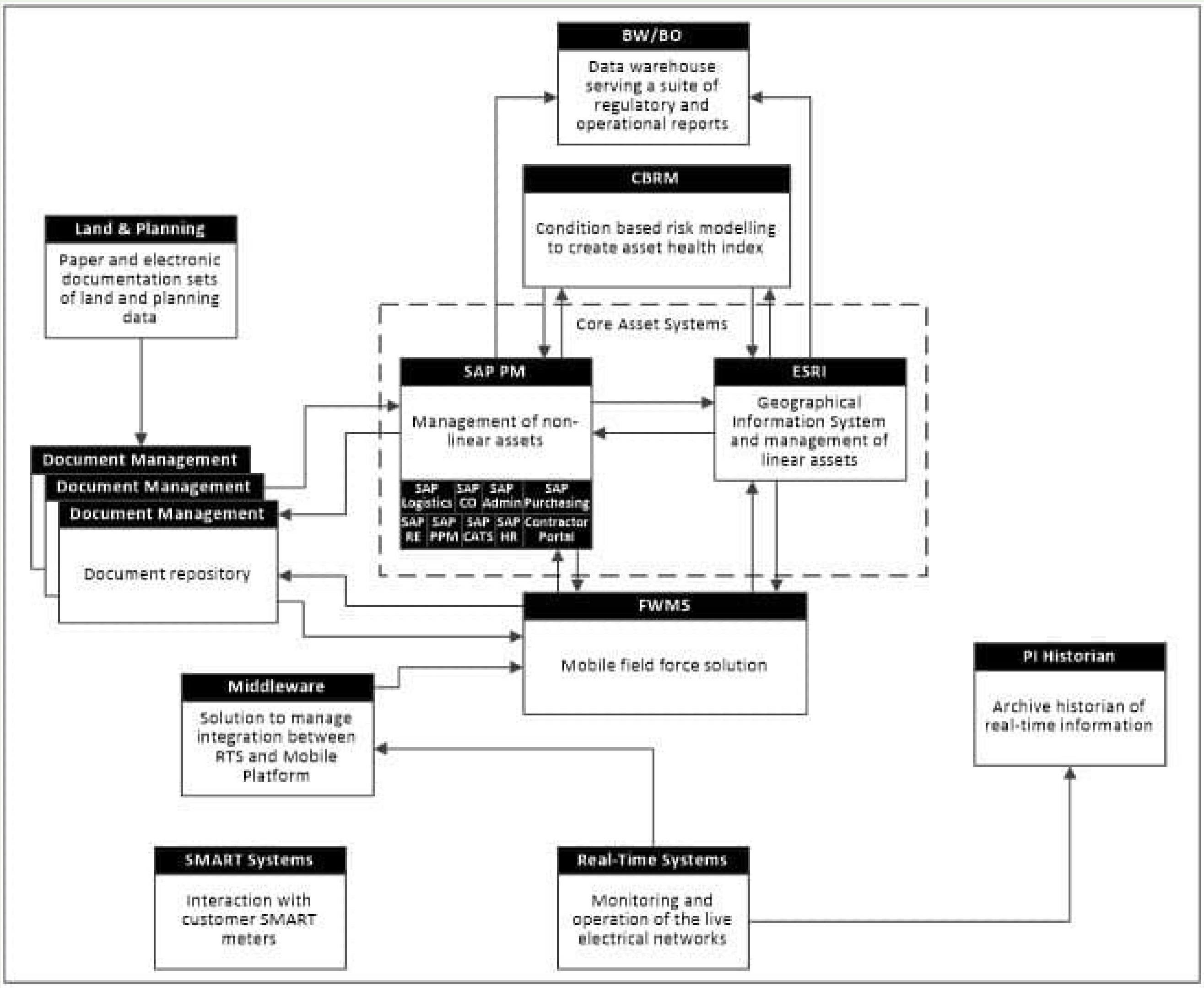


Figure 140 Current Technology Architecture showcasing existing Data Warehouse capabilities

Current Position	Change Drivers
• Data is stored across several platforms meaning that it can be difficult to make connections through data • Application integration is mainly via point-to-point interfaces utilising technologies that are not easily adapted • Data is largely transferred via overnight batch routines which is not conducive to real time decision making • In some cases, we have multiple solutions performing similar tasks (e.g., document management and collaboration) • Real-time data is not well integrated with the core asset information	• Big data tooling presents an opportunity for more data (volume and variety) to be held in a central repository which supports a higher frequency of update and facilitates making connections between different classes of data • Cloud Hyperscale technology would enable SPEN to scale to meet the new levels and types of demand for data and analytics • This includes the ability to provide and add more resources to the system that make up a bigger distributed computing network • The above change will be needed to accommodate the increasing volume, velocity and breadth of data required to operate an increasingly complex Low Voltage (LV) network • The introduction of Distributed Energy Resources (DER) and decarbonisation of transport/heat will be facilitated by digital solutions using trusted data

Table 153 Big Data Current Position and Change Drivers

Solution

Big data tools will provide an enterprise-wide hyper-scale repository to support big data; analytics work to handle data of any size and type; and support the velocity and efficiency needed to accommodate multiple use cases across reporting and exploratory analytics.

Data from multiple disparate sources – structured, semi-structured, unstructured, and real time streaming data (IOT) - will be brought into a data lake. This will include live streaming data from events and telematics which can then be leveraged using real time stream processes, at a speed of millions of events per second.

This Big Data solution not only presents the opportunity to ingest, store, transform, connect, and present data. It also offers solutions for hosting models created by Analytics experts. This will create opportunities (together with Governance section) to build a store of data features and a library of models which can be version controlled, documented an actively managed

Target State Architecture

The following diagram depicts the logical architecture for the proposed solution made up of 5 components.

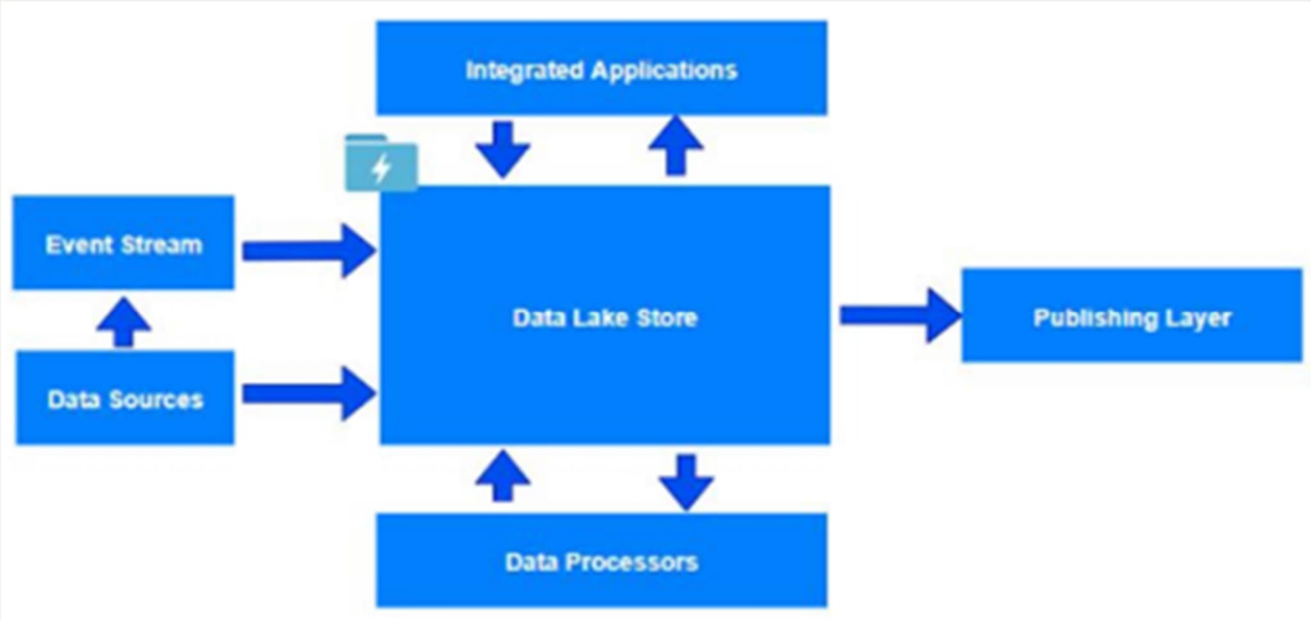


Figure 141 Logical Architecture for the Proposed Solution

- **Data Sources** – various source systems (on-premises, APIs, SAP BW etc.) could provide data to the Data Lake, landing it in a RAW format for further processing
- **Data Lake Store** – this could be the central store for data - all analytics data could be channelled through here for storage, cleaning, and presentation to downstream systems
- **Data Processor** – this component supports transformation, providing the compute power and logic required to process data, administer quality and validation changes to make data ready for downstream use
- **Integrated Applications** – event streaming would enable us to handle real time data consumption and processing; it can be used as a messaging endpoint for SPEN Applications which would then control the feed of data back into the Data Lake Store
- **Publishing Layer** – this area would expose data within Data Lake in a semantic layer, designed for performant aggregations to serve reporting and support fast analysis

This architecture will enable SPEN to focus on efficient management and operation of assets through data, systems, and processes. Some examples of how this will support use cases within the business' initiatives are below:

Use Cases

- GIS and Building Information systems need to handle 3D modelling of substations
- Video and image data on asset condition and environmental context must be readable by AI (machine learning) models to spot for degradation or risks
- Customer insight is needed to identify process improvement opportunities or to build models which integrate to CRM solutions for more personalised service
- Flex services enablement through rapid AI assisted decisions will require massive parallel processing power (MPP) to run scenarios at high volume and velocity
- Customer photographs and videos received via our CRM system which refer to our assets (cut out and meter point) could be stored within the Data Lake

This software as a service (SAAS) cloud platform will be in SPEN virtual Private cloud in Western Europe based on Iberdrola cloud policy. This will be encrypted in transit and at rest. Authentication will be Single Sign

On (SSO) using the existing Iberdrola Active Directory Federation Service (ADFS). The Big Data platform will mainly be used for IT purposes and does not support OT applications directly; but over time it is possible that aspects of the data will be leveraged for OT purposes, particularly in terms of event data streaming.

It is specifically designed to enable analytics on the stored data and is tuned for performance for data analytics scenarios. Out of the box, it includes all the enterprise-grade capabilities - security, manageability, scalability, reliability, and availability - essential for real-world enterprise use cases. Security will be managed via Active Directory, individual users can be granted Read, Write or Execute permissions on individual securables (folders/ files). The Store can also be locked down to specific IP ranges via a firewall. A Data Lake also supports data encryption for any data that is stored in the account.

Key Outcomes

- Greater clarity on definitions and sources plus availability to improve data accessibility and quality.
- The ability to easily scale the platform either in terms of compute power or storage.
- Using a distributed storage mechanism for data storage allows us to run Massive Parallel Processing (MPP) for more efficient queries and new levels of insight.
- Enhanced security
    - Encrypted at Rest
    - Securable to a more granular level
    - Managed via Active Directory, via Service Principals (aka: Service Accounts)
    - Behind a configured PaaS Firewall
- High Availability & Disaster Recovery – Data Lake Storage employs automated local replicas. Any transient hardware failure will automatically failover and be invisible to applications doing data requests.
- Data within the Data Lake Store is resilient to hardware failures within a given region as standard automated replicas are made. Reduced costs as there is no infrastructure to purchase; it's PAYGO.
- Reduced up front (capital) investment on hardware. Cloud has lower total cost of ownership (and operation) compared to on-premise solutions.
- Reduced carbon footprint as illustrated in kgCO2e figure below. IT operational efficiency, IT equipment efficiency, and data centre infrastructure efficiency reduce the energy required to deliver the services. Plus, renewable electricity will likely power 100% of electricity consumed in Cloud data centres.

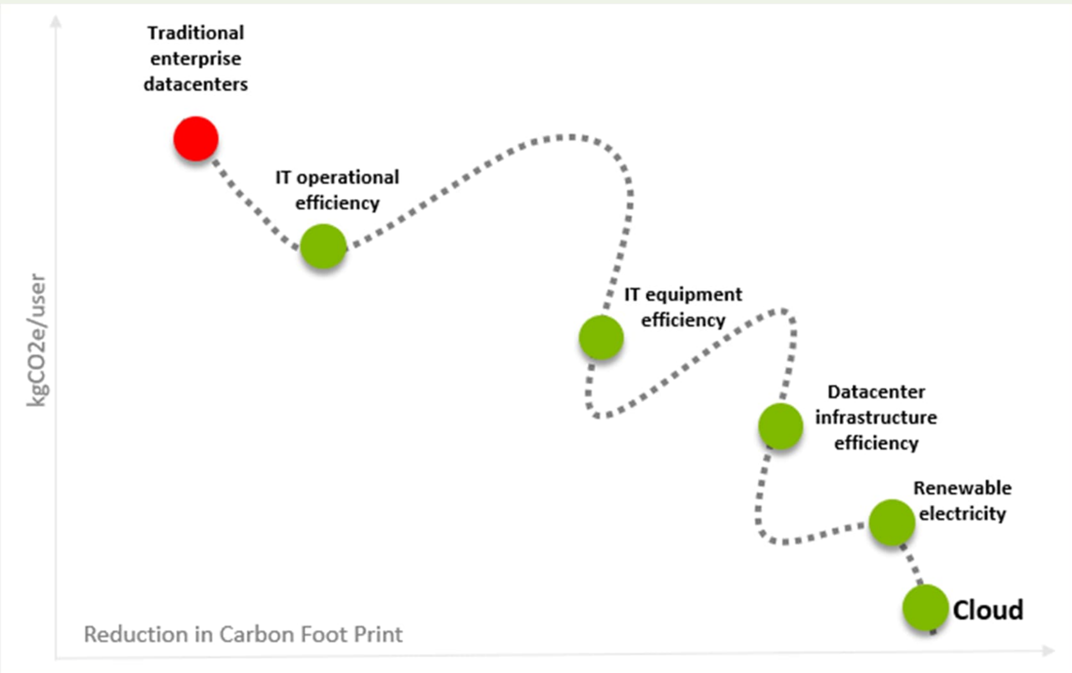


Figure 142 kgCO2e/user: The four features of the cloud that reduce environmental impact

8.2.2.2. Reporting Data Storage and Data Layer

There is a need for improved data storage and access layers to let more people gain access to the data they need for actionable insight.

Current Position	Change Drivers
Data storage and presentation layers for reporting and analytics purposes often focus (where they exist) on siloed datasets specific to 1 or 2 areas and are not accessible for the majority of people doing reporting, and are time consuming for the analyst community to make use of due to the limited nature of presentation layers available Priority use cases are emerging which require a more performant method of storing and exposing data so that it can be used with ease, e.g., Instruments at sub-stations are primarily used to collect data that is used reactively for decision making. Real-time data is held in a historian and not connected to other core asset information systems. There is limited integration with real-time data generally and this cannot be supported without Big Data tooling	We will need to enable more data to be held in central repositories and more analytics to be performed on that data. Removing the manual effort required to extract, transform, and load data for use in reporting and analytics will create greater capacity for deeper insight and action Building a more comprehensive store with features and views will also provide more people with access to data at an improved grain for insight, and let them make connections between datasets not previously / easily viewed together before Additional information on assets (IoT) and SMART metering will increase volume of data to be stored and used. Development of key components for a digital twin will require this level of data organisation particularly to enable us to create the foundation for predictive modelling for intelligent planning to optimise asset operation and maintenance; and apply AI assisted decisioning in future.

Table 154 Reporting Data Storage and Data Layer Current Position and Change Drivers

Solution

Data storage and access layers will support the automation of reporting with data exposed at an appropriate grain of detail to support aggregated views for reporting and deeper analytics activity by Data Analysts and Scientists. A data feature store will accommodate code to encourage consistency and reuse of best practice approaches when bypassing the first presentation layer and ensure that we are consistently focusing on a shared view of data sources and definitions to enable data to be reconciled regardless of method of access.

Key data items are to be landed (via Systems Integration solutions supporting microservices for extraction, transformation, and loading) into our Data Warehouse. All this data is to be exposed in analytical layers which support optimal performance for reporting and analytics uses. ESBs/APIs will support productionised data feeds (batch/ daily/ intraday/ on demand) so that the extraction, transformation and loading of data is automated for key data items.

Tooling and learning pathways will open new opportunities to leverage this data layer to support activities such as optimisation (for capital planning), digital twin development (for key use cases) with enhanced interoperability. It will be easy to add new streams of data to the data layer making it easier to build connections between data to identify new opportunities for value to stakeholders.

Examples of use cases that will be supported:

- A SPEN colleague wants to access information on global weather patterns to estimate the supply of energy needed to preserve margins using NAVI – Energy Demand Forecasting, and Energy IP Voltage Prediction and Phase Identification
- Another colleague wants to know about local events to predict and plan for future demand based upon predictions about electricity demand
- Energy Networks are driven to make real-time decisions based on many data points available in OSIsoft PI Data (historian data management platform). To ingest and process such data at high velocity data for real time anomaly detection and alerts to support asset monitoring.

The Data Storage and Data Layer solutions make it possible to connect data types and process high volumes which are necessary for accurate and timely decisions such as these. Increasingly, our data layer will let enable those with deeper, technical data skills to minimise time spent on duplicative, intensive data engineering activities and instead to focus their efforts on creating value through analytics.

Following the extraction and transformation of data within Data Lake a data warehouse Massive Parallel Processing (MPP) will be built and hosted in SQL Data Warehouse. This platform can easily scale the computing power and storage required excessively based on demand. Data will then be modelled using Semantic Layer Services from where it will be accessible by front end tools like Power BI for reporting. The reports developed using Spark Enabled Analytics (PySpark, Scala, SparkSQL or C#Spark) Data Studio or PowerBI can be shared securely within the organisation and are compatible with multiple platforms. The solution will also provide a standardised code base that supports programming in Massive Parallel Processing and other languages, like Python, Scala, and C#.

Figure 143 Extraction, Transformation, Processing, and Reporting of data within the Data Lake

Key Outcomes

- Introduce tools to perform reporting and analytics
- Faster processing for huge amounts of data and complex analytics, including AI (machine learning and deep learning) assisted decisioning
- Development of analytical solutions to enable automated processing of larger data volumes to provide insights which is currently not possible
- The opportunity to plug into a new data exchange via an enterprise service bus (see section 8.3) which can support process automation
- Improved condition assessment of assets based on broader and deeper data sets to enable better decisions on operation, maintenance and replacement/upgrading of assets.
- The integration with additional monitoring points on the network to enable system monitoring and dynamic rating calculations to be performed. Solutions will be developed that will facilitate the capture of the real-time information for use in determining optimal network operation supporting enhanced understanding of performance and more targeted actions for resolution.
- Consideration can be given to a range of scenarios to evaluate the potential impact of the transition to Net Zero on transmission and distribution asset operations.

8.2.2.3. Single View of the Customer

Due to a lack of systems integration, there is no readily available single view of the customer for customer insight making customer reporting and analytics activities challenging. Consolidation of IT solutions around key customer information, together with increased and enhanced data capture across a wider base of business operations, would enable better insight to drive out improvements for customers in experience and service offerings.

Current Position	Change Drivers
We have valuable customer data, but it isn't always available in an accessible format, e.g., legacy land records that would be useful across SPEN but are held in paper format. This makes rapid search, retrieval, and utilisation of information difficult for office and field-based	Our stakeholders expect us to be able to retrieve information much more rapidly than we are currently able to. Digitisation of records will make data more searchable and accessible across SPEN to improve our insights and ultimately our level of service.

staff. A programme is underway to digitise such records but beyond digitisation it will be necessary to make this data easily accessible for the people who need them. Due to the lack of integration, there is no single view of the customer that brings this type of data, and other relevant data about the customer, together.	Digitisation of records (e.g., those on land) will also make it easier for us to link records directly to adjacent datasets (such as data on assets). Customers expect an omnichannel experience with joined up data underpinning it. For this we need a single view of the customer based upon a modelled customer entity which can then be supported through MDM and ESB solutions for operational data. Additionally, ensuring we have access to robust information about customer contact and assets will be needed to target segments to deliver the types of new services proposed by the digitalisation strategy.

Table 155 SVC Current Position and Change Drivers

Solution

We need to map and master customer data to support multiple applications to interact with that data and associated data to help our people to make sense of and take actions with customer and client accounts. This will cover their relationship with SPEN, the status of relevant services, key events, and communications as well as feedback and vulnerabilities. Upholding privacy and protecting customer data, ensuring that it is managed actively for accuracy, is also a core part of our Governance commitments to ensure we are compliant with regulation and striving to meet the recommendations within The Data Best Practice Guidance. Examples of data types that will be important to master in relation to customers can be seen below:

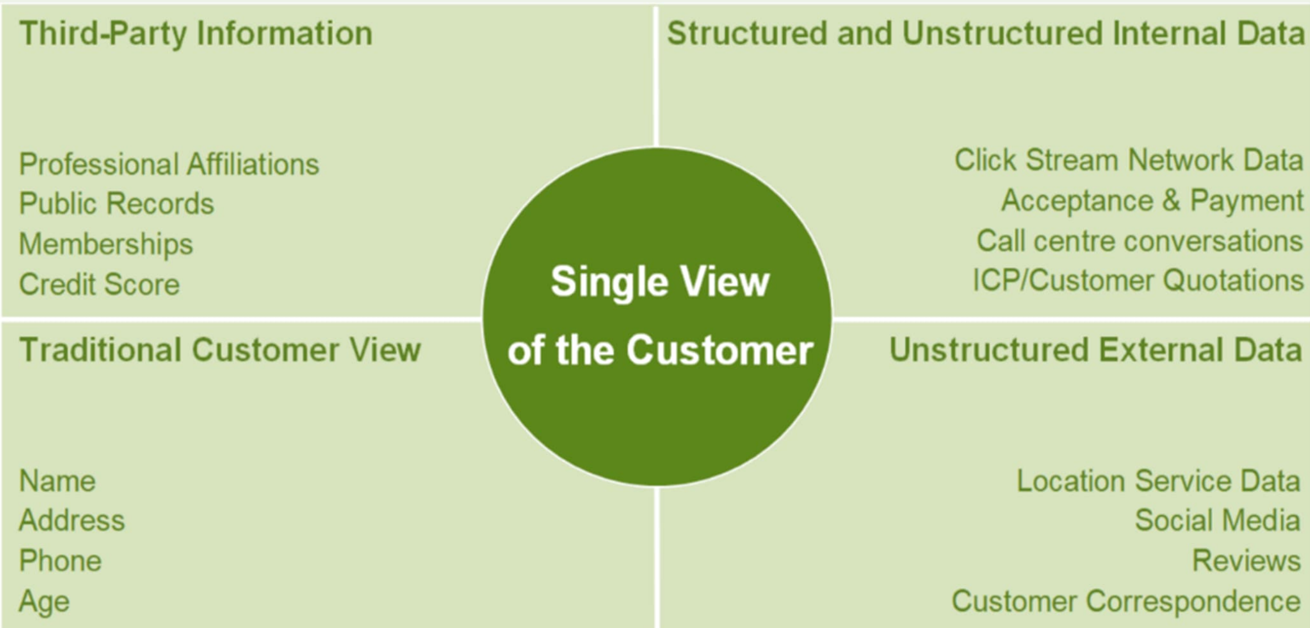


Figure 144 Examples of Types of Data that will be Important to Master in Relation to Customer

The Independent Connection Providers (ICP) / Independent Distribution Network Operator (IDNO) Interface requires the storage of commercial documentation that will be received from ICPs and INDOs be stored at a case level. The CRM system will require to retrieve insight from a virtual single view of the customer to retrieve documentation such as customer quotations and customer correspondence at a case level. The CRM initiative is dependent on existing core IT systems to provide an end-to-end view of key customer journeys, and this initiative to store the data for retrieval and analysis.

Further work is required to develop use cases and customer modelling requirements to inform this solution. However, the customer entity work will clearly need alignment to support both CRM and customer reporting projects.

Cloud Data Platform options that are under consideration for this opportunity:

- Integrate data through direct integration & cloud stack options

- Cloud Synapse, Cloud Data Lake or Cloud SQL database
- Optional NoSQL on Cloud

Key Outcomes

- Improved service experience (faster response, improved services, value for money)
- Customer satisfaction benchmark for the industry
- More relevant, personalised customer communications
- Valuable customer insight to improve services and products
- Supports the potential for AI driven personalisation such as quotations for connections

8.2.2.4. LiDAR Analysis Video Storage – Unstructured Data

Light Detection and Ranging (LiDAR) data can be used to achieve highly precise 3D models which replicate the physical world. When combined with temperature, humidity, and wind speed data (sent from inspection devices) it could provide insight on changes when assets operate under different temperatures, wind speed and ice cover and tree/ foliage coverage, through the 3D power grid model. These types of analysis would considerably improve decision support for lines management.

Current Position	Change Drivers
Currently analysis is conducted on an ad-hoc basis. Data is collected through the likes of LiDAR scanning for specific purposes; however, this data is not used beyond a single, initial purpose. LIDAR could provide a wealth of data to support multiple use cases but in current state it is not possible to handle the volume of data to realise that value.	The change to conduct more analysis comes from the business need to understand the network, the assets, and potential risks to a greater extent. There is also an opportunity to optimise the data that we are capturing (and storing) to extend its use cases and increase its value-add for the company. With massive data brings many problems on processing and deriving useful information. Processing LiDAR data demands heavy operations, and the traditional approaches require significant hardware and running time. On the other hand, we propose to have parallel approaches for analysing LiDAR data. These approaches are normally based on parallel architecture of target systems such as multi-core processors, GPU, etc.

Table 156 LiDAR Analysis Video Storage – Unstructured Data Current Position and Change Drivers

Solution

The LiDAR data is unstructured and stored in a variety of formats. Processing this data at the conventional workstation is challenging, time consuming, error prone and costly. Big data architecture and its powerful functionality would enable such processing to be done in a systematic way (without duplicating the main data set at the primary node) saving space. The Data Lake is designed to store and process a massive volume of data. This comprises the Web Hadoop Distributed File System (HDFS) and Massive Parallel Processing computation needed to effectively handle datasets such as this.

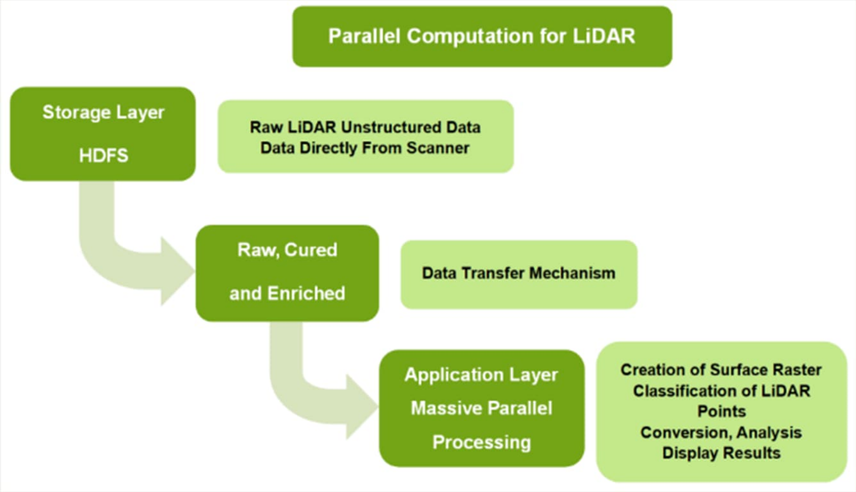


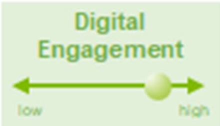
Figure 145 Parallel Computation for LiDAR

Key Outcomes

- Better capability for powerline checking to:
  - Identify dangerous points
  - Calculate distances between lines and buildings
  - Identify abnormal equipment
  - Highlight threats to power lines (Example: Lean pole, Trees, etc.)
- Improved insight for better Asset Management
- Ability to support creation of 3D models for powerlines through DOM and DEM which are created from LiDAR laser and image data to infer terrains (foliage and buildings) near the lines, staking sites and models. Combining this information with electric equipment parameters could present a very valuable opportunity to model powerline assets for avoiding or delaying spend.

8.2.3 Persona Spotlights

SPOTLIGHT: COMMERCIAL CUSTOMER



What is the benefit for me?

Potential to feed into energy system and save money on their energy bills.

How will I feel the impact of digitalisation?

Provide Highly Available Information on Area Network Performance, Power cut history specific to their business, Quality of supply information, Network capacity data, Short term forecasting data on likely constraints and opportunities, Automated alerts on network constraints, Voltage issue heat maps and Substation loading, improvements will underpin our single view of the customer aims

SPOTLIGHT: FIELD TEAMS

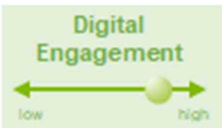
What is the benefit for me?

Making site work safer and more productive for me

How will I feel the impact of digitalisation?

- Guided risk and safety assessment to ensure that line outages have occurred
- Intelligent supply chain that proactively manages the delivery of materials and consumables for my team
- Augmented reality/virtual reality walkthrough of complex construction tasks/integration
- Automated job status reporting and time writing.

SPOTLIGHT: HEAD OF DATA



What is the benefit for me?

Vast improvement in flow of data from RTS network as well as capability to expose more data externally.

How will I feel the impact of digitalisation?

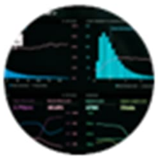
•Data strategy; emerging trends and us cases
•Increased focus on data governance and data quality.
•New training requirements for data team on integration platforms.

SPOTLIGHT: CUSTOMER SERVICE TEAM

What is the benefit for me?
Access to reliable data that is up to date

How will I feel the impact of digitalisation?
Complaints: Resolved within timescales by single point of contact, serious complaints with highly available and massive parallel Processing data.

SPOTLIGHT:REPORTING/ASSET MANAGEMENT



What is the benefit for me?
Improved visibility of asset data at a more granular level.

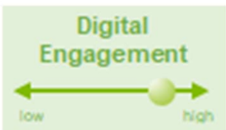
How will I feel the impact of digitalisation?
Connected Construction dashboard with IoT/sensor real time streaming data for crews.

Greater confidence with a reliable quantitative prediction that will satisfy the reporting demands of executive management and government officials. Increased focus on data computing due to availability of more asset data.

SPOTLIGHT: INDUSTRY / OPEN DATA FORUM

What is the benefit for me?
Capability to view data sets relevant to them using available data sets via APIs and web services.

How will I feel the impact of digitalisation?
Intuitively browse highly available SPEN data sets and consume them in an automated way via API.



Removal of manual tasks as technology assets will be in place to extract data from source systems and make available externally.

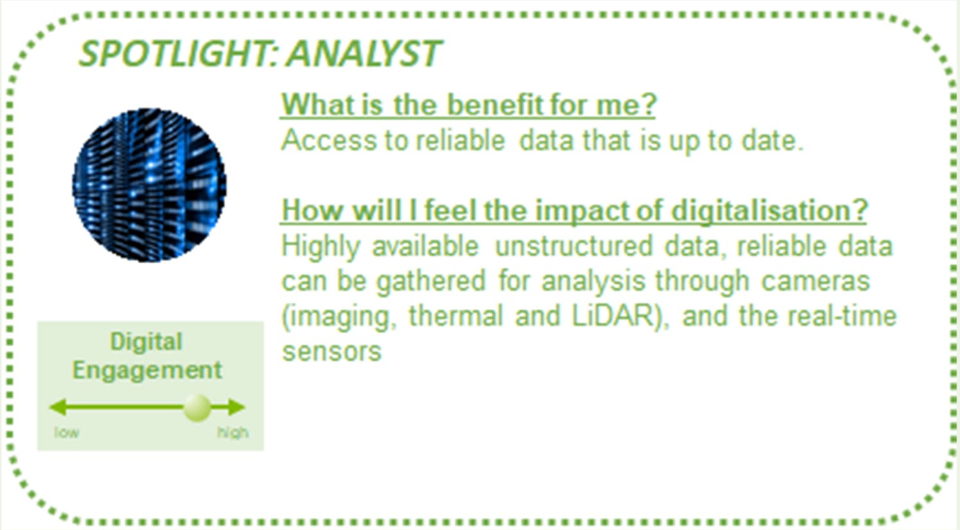


Figure 146 Persona Spotlight Benefits and Impact

8.2.4 Delivery Approach

Implementation Approach

Development teams will follow an iterative, agile approach to developing each application whilst working under the umbrella of SPEN's programme management framework.

Approach	Initiatives
Agile	Data Lakes and Data Processing
Agile	Reporting Strategy - Data Storage
Agile	Single view of the customer
Agile	LiDAR Analysis Video Storage

Table 157 Big Data & Analytics Approach and Initiatives

8.2.5 Project Schedule & Key Milestones

			Y1	Y2	Y3	Y4	Y5
	Workstream	**2022/3**	**2023/4**	**2024/5**	**2025/6**	**2026/7**	**2027/8**
Big Data & Analytics	Reporting Data Storage/ Layer: Copy Historical data from existing EDW		Enablement of data layer				
	Reporting Data Storage/ Layer: Data Integration (ETLs to repoint to store data in new solution)						
	Data Lakes / Processing: Cloud Data Lake Engineering and Design (Raw Data; Curation; Enrichment) including LIDAR Data Project						
	Data Lakes / Processing: SAP to Data Lake Completion			Enablement of data layer			
	SVOC: Customer Layer						

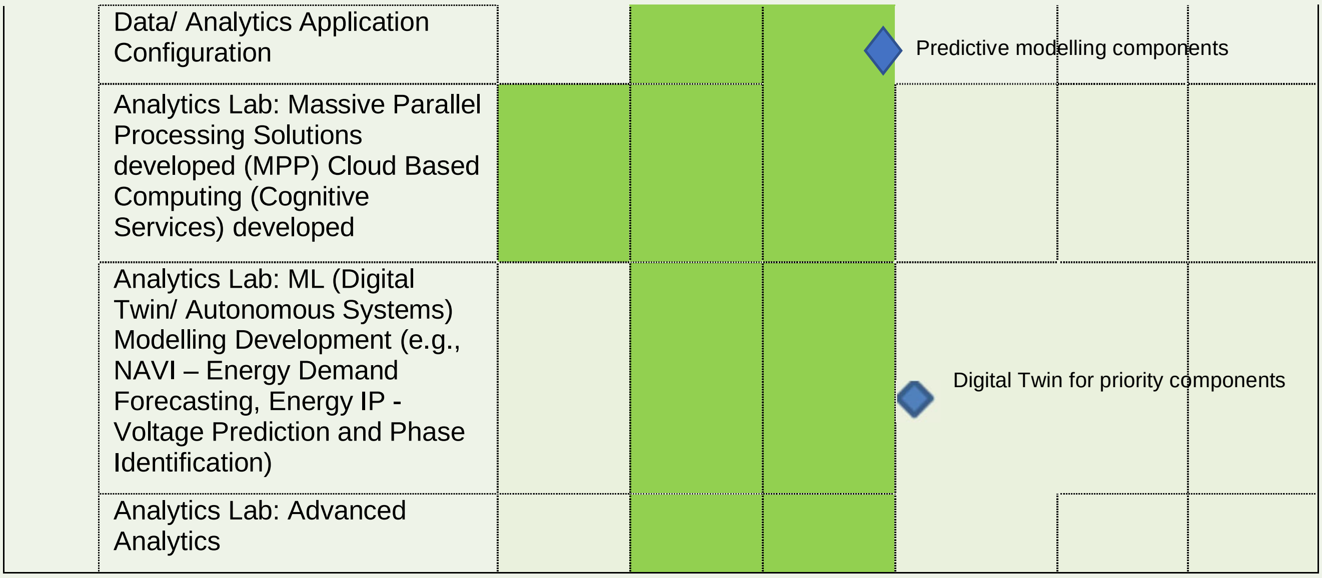


Figure 147 Big Data & Analytics Project Schedule and Key Milestones

8.2.6 Resources

Agile Methodology will be used in all projects.

Where integration between legacy platforms is required a waterfall approach will be used in advance to ready systems for integration to new platforms.

Scrum Roles & Responsibilities

Resource Type	Purpose
Scrum Master	Drive agile delivery of CRM platform coordinating with development team and product owner
Product Owner	Helps the team best use Scrum to build the product
Development team	Builds the product
Data Engineers (Enduring)	Composed of technical and business experts to build the business and technical architecture for the solution (not Factory)
Data Engineers	ETL and Data Pipeline Creation, Bigdata Engineer, Spark Engineer
Data Scientists	Analytics provider

Table 158 Big Data & Analytics Resources and Purpose

8.2.7 Functional Model

The diagram below depicts a conceptual component overview of the high-level architecture/ functional model solution. The diagram clearly identifies where the Bigdata scope begins – after the Event Stream Processing component.

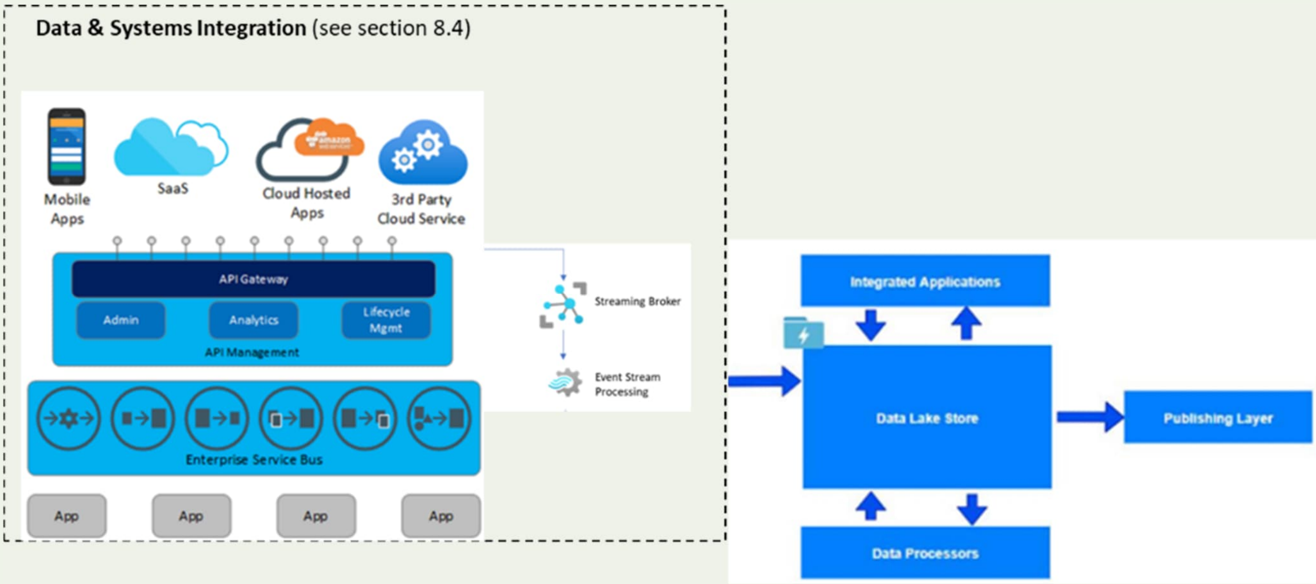


Figure 148 Conceptual Component Overview of the high-level architecture / functional model solution

8.2.8 Costs

This section describes the cost elements for SP Energy Networks (SPEN) based upon the information available at this time.

Scope

The functional model in the above diagram identifies where the Bigdata scope begins relative to the Event Stream Processing component.

The solution in scope for this document is:

- Modern architecture
- Applications integration architecture
- Data science and exploration architecture
- Resources cost
- Enduring cost

There are several architecture components which are described at a general conceptual level in this document. As our work progresses, we will clarify and refine our view of target state to include:

- Hybrid interim architecture (Transition Between On-Prem and Cloud) Please note that the migration, re-engineering or decommissioning of the interim platform will be described in subsequent documentation.
- Backend Data Compute Layer and Power BI architecture. Please note that subsequent documentation will define the approach to the enterprise deployment of Power BI.
- Other self-service reporting tools (apart from Power BI). Please note that there will be subsequent documentation of the reporting semantic layer that will include describe how other self-service tools will interact.
- General Data Protection Regulation (GDPR). The GDPR Programme will define requirements and work with SPEN to define a design that is compliant with GDPR which will include role-based access and other security model considerations.

- Data Management and Governance and Cloud Data Catalogue. The approach for data management tooling enterprise wide and how the data management capabilities in Cloud integrate with the enterprise approach will be considered subsequently.

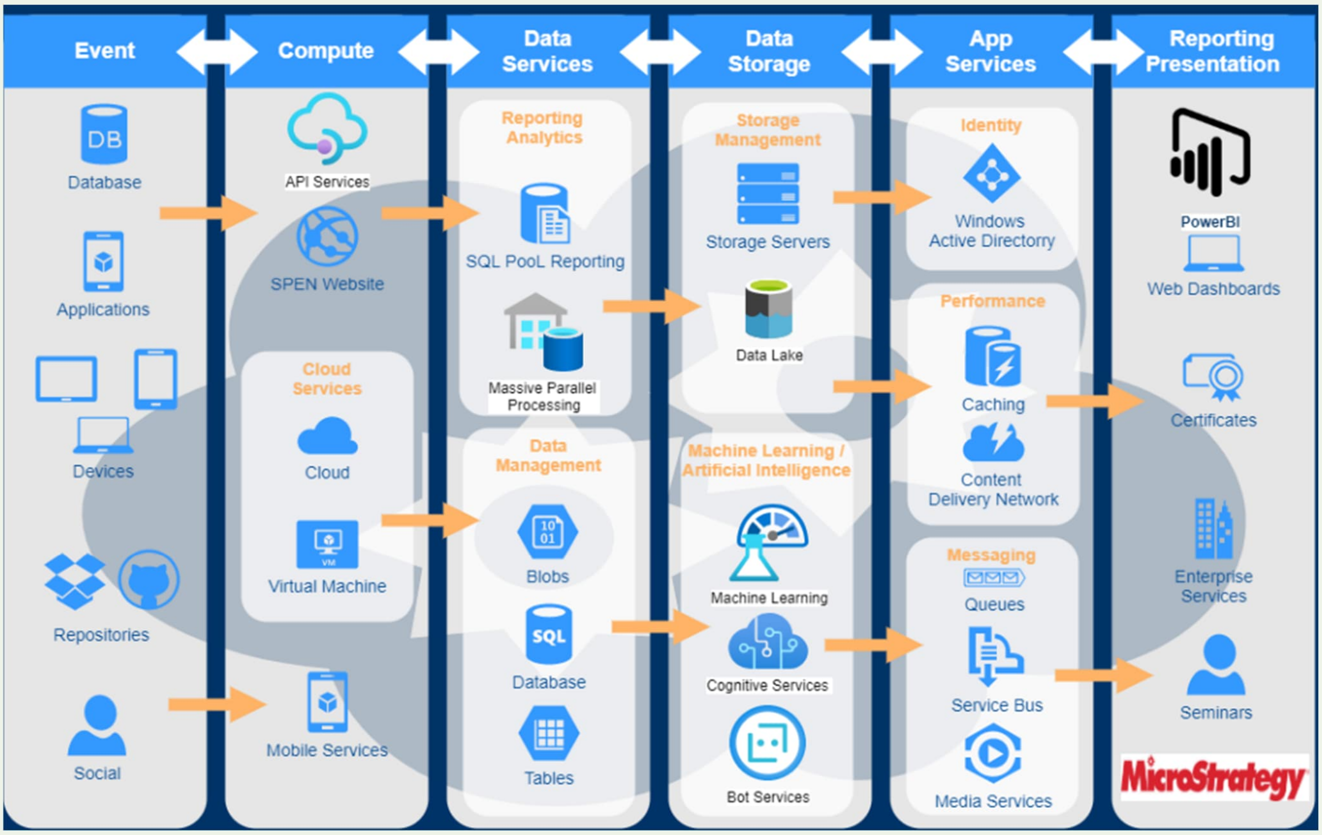


Figure 149 Potential SPEN Architecture and Technologies Involved

Proposed Solution for Cost Estimation

The solution will use Cloud Data Lake Store (CDLS) as a central repository for the data required by the Bigdata, Data Storage, and Cloud Computing (AI & ML) platform, applications integration data and to host the models created by Data Science tools. Data from multiple disparate sources – structured, semi-structured, unstructured, and real time streaming data will be brought in to the CDLS. The live streaming data from events and telematics (IOT) will be captured using Cloud real time streaming, which is capable of capturing millions of events per second.

All components of the reporting, analytics and applications architecture will be built using Platform as a Service (PaaS) services in the Cloud environment.

The key components of the solution included for the cost estimation:

- Cloud Data Lake Store – Central storage repository for all the data used by the analytics platform and for data exploration
- Cloud Data Lake Analytics – An on-demand analytics job service to develop and run massively parallel data transformation and processing programs in U-SQL, R, Python, and .NET over very large volumes data
- Extract Transform and Loading – Processes and combines the data produced by the on-premises and cloud data sources into trusted information.
- Cloud SQL Data Warehouse (Synapse) – cloud-based SQL data warehouse that seamlessly integrates with the CDLS providing a hub for the data mart and tables required by the Analytics and Reporting solution.

- Cloud Semantic Layer Services – provides a secure data model that supports a fast and straightforward way to build reports.

Solution Running Costs

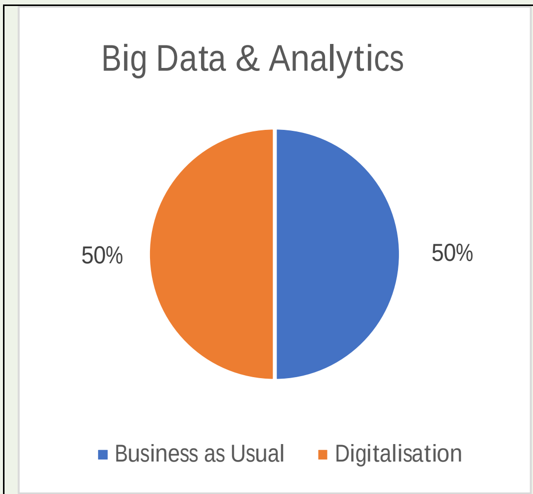
The following sections detail the estimated running costs for the SPEN Architecture in Cloud and are based on several assumptions, but the main points are:

- Pricing is based on a representative cloud provider's standard retail price.
- The pricing costs for each component are correct as of the date of publication of this document but may change in the future.
- The following prices are based on a scaling and sizing factor that assumes that all EI migration has been completed.
- The costs are based on Cloud services only and do not include any other products.

For non-production environments such as Dev/Test and Pre-Production a ratio has been applied to the production costs to determine the costs for these environments.

The following ratios have been applied for non-production environments:

- Dev/Test – 20%
- Pre-Production – 50%
- Volume - % Organic Growth per year given below



BAU Rationale:

We recognise that we will not be able to handle the vast increase in data necessary to operate our business during RIIO-2 without a big data and analytics platform. Our BAU investment represents the minimum that will be required to establish the platform and integrate it with our datasets.

Digitalisation Rationale:

Our vision to maximise the value of data is underpinned by the tools that enable us to capture, integrate, analyse, and report on the data. Our digitalisation plans will put our big data platform at the centre of our operations, enhancing our capability to use data as the evidence base for decisions and allowing us to monitor and continuously improve our activities.

8.2.9 Performance Metrics

The KPIs will be used to track success of the initiative will be deemed to have been successful if the following (or equivalent, refined) criteria are met:

Ref.	Project	Area	Measures of Success
0	Data Lakes and Data Processing	Data Retention & Life Cycle	Tier blobs to cool storage 30 days after last modification
			Tier blobs to archive storage 90 days after last modification
			Delete blobs 2,555 days (seven years) after last modification

			Delete blob snapshots 90 days after snapshot creation
1	Data Lakes and Data Processing	Security & Identity	All data encrypted at rest and in transit
			Full audit available – particularly data egress.
			Full audit available – particularly data egress.
2	Data Lakes and Data Processing	Networking	Network provides suitable connectivity between on premise and cloud environments including suitable operational bandwidth
3	Data Lakes and Data Processing	Data Extraction & Loading	% Reduced timing in Transactions per Second (TPS) in Terabytes (TB) successfully loaded into the solution
			% Reduced timing in transactional data delta successfully loaded
			% Reduced timing to process Operational and regulatory data
4	Data Lakes and Data Processing	Data Transformation	% Reduced timing in JSON data transformed into dynamic table in linear time and sessionise
			% Reduced timing in successful join of Tables, Transactional and sessionise data
			% Reduced timing in query and results
5	Reporting Strategy - Data Storage	Data Analytics	% time saved for line inspections Predictive modelling and analytics opportunities
			Single view of the asset Data-driven informed decisions)
			Reduced replacement cost for reporting
6	Reporting Strategy - Data Storage	Data Visualisation	Interactive dashboard displaying key metrics time reduced by %
			Increased Dashboard performance
7	Single view of the customer	Customer Journey Map	Contact sequencing successfully performed in an acceptable time
			Conduct Customer Journey Analytics in reduced time limits
			Reduced timing in Dynamic Behaviour-based Segments
8	LiDAR Analysis Video Storage	3D imaging and Remote Sensing	% Reduced timing to optimize raw LIDAR data integration Operations
			% Reduced timing in Data Processing Time / Parallel computing (Software)

Table 159 Big Data & Analytics Measures of Success Per Project Area

8.2.10 Assumptions & Dependencies

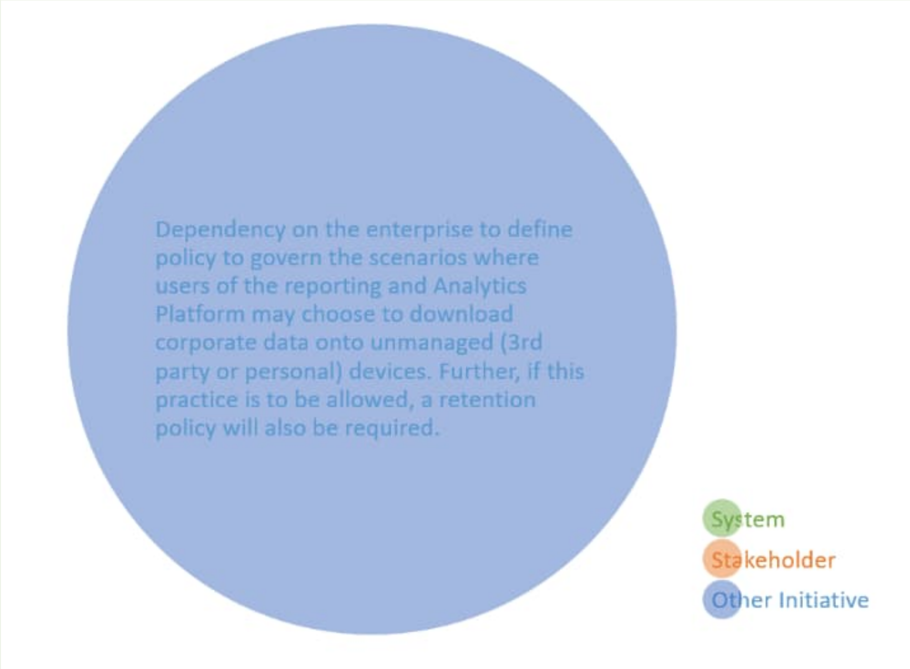


Figure 150 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Operational & Big Data & Analytics Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Data from SAP will be placed into the Data Lake via Extract Transform and Loading Replicate.
Cloud Data Factory replicate will provide a datetime stamp of when rows were added to the Data Lake.
Cloud Data Lake Store, curation and governance approach will be defined during the build phase of the project.
Sufficient bandwidth will be provided for moving data from on premise applications to the cloud.
All required data sources will be compatible with Cloud Data Factory ETL or accessible via a WebAPI.
Existing enterprise reporting tools are enough for all self-service and enterprise reporting requirements.
Access of data or reports requires that outside users must have a Cloud Active Directory account in their own tenancy or to be added to the SP Cloud Active Directory and the Systems Integration Initiative will integrate to deliver any necessary authentication actions.
As performance requirements are yet undefined, it has been assumed that the architecture can be scaled to meet the requirements within a reasonable cost parameter.

Table 160 Big Data & Analytics Assumptions

8.2.11 Risks and Mitigations

Below are the risks and proposed mitigation strategy, for each of the risks that have been identified around the architectures described in this document.

ID	Risks	Mitigating Actions	Likelihood	Impact
1	An enterprise-wide view of data cannot be achieved because of a lack of consensus upon the format, sources or definitions for key data items which means that data siloes persist and different results are achieved for key metrics	Engagement with data experts and the introduction of committee structures will ensure that an enterprise data catalogue and metrics is developed and formalised Data owners will provide a business point of escalation for resolution through to an accountable Executive	Medium – There limited formal procedures for recognising data and controlling that record across business units	High – Failure to align on definitions for key data items will mean that these cannot be exposed for use across the enterprise limiting our ability to maximise the value from our data and preventing us from reducing inefficiency and moving analytics experts up the value chain; adjacent impact for open data would also be material
2	We cannot execute good decisions because we lack clarity on the measures that matter and the skills to use data well which will limit our ability to take action to improve stakeholder outcomes	Clear comms about the need for change and the journey will set expectations about the options to build skills via role relevant training will be critical	Medium – There will be role families who are materially impacted, and the absorbability of the business will be tested throughout this period so the role of leadership in emphasising the priority of doing data well will be key and avoid falling back on 'intuitive' decision making	Medium – Failure to equip our people with the skills and knowledge to interact with data will mean that we can't prioritise the actions we need to take to make the greatest difference
3	Mistrust of data quality means few people will fully use data to make a difference. This mistrust stems from limited visibility of data, quality assurance measures and the absence of clear routes to resolution on potential data quality issues	Validation of data with owners ML Enabled scans for anomalies/ volatility Introduction of clear routes to escalate issues will provide more transparency on data quality Proactive publication of data catalogues will also go some way to assuring users on data accessibility, quality and exposing any relevant health warnings	Low – In areas of unfamiliarity users are less likely to invest time exploring potential connections for opportunities to deliver value or to doubt the data when it does/ doesn't support a particular hypothesis	Medium - Data is likely to be used (in the absence of alternatives) but the maximum value return won't be achieved

4	It's hard to make connections through data because of siloed projects which build out ad hoc data sets which means that there is no coherent data view for analytics	Establish a community of practice drawn from all relevant areas (voluntary basis) which is afforded formal recognition to consult on role change and learning pathways and support the development and adoption of principles and policies for data use, as well as community events Introduce a baseline level of education on data, principles, and practices	High – Without buy in across relevant practitioner groups there will be significant challenge to introducing the libraries and procedures needed to accelerate the business through the data maturity curve and support practitioners to experiment and scale at pace	High - There are no common data practices nor learning options nor standardised approaches to enable reuse of solutions
5	The business' upstream processes heavily rely on EUAs and manual processes because the business processes are not fully digitised which means that the data ecosystem has holes, and the fragments may prove insufficient to give confidence in insight to act	Identify the most significant opportunities to deliver value through data Establish cross functional teams to design and deliver solutions that will digitise upstream processes and apply best practices in data for actionable insight Support knowledge transfer to business participants to champion the change and promote the benefits to others	Medium – The prevalence of spreadsheets and point solutions is high and the pressure to develop new solutions at pace may lead to an increase in technical debt	Medium – The absence of digitised processes will severely limit the potential for our business to deliver value through data
6	The current Cloud stack is an extremely fast-moving environment with many of the technologies on monthly release cycles of new features.	The decoupled, "plug and play" style of this architecture will make it easier to adapt/ pivot and connect solutions where change in direction is warranted Our Agile delivery model should ensure releases are offering incremental value and avoiding long, intensive development periods with limited return	Medium - This may result in the "best practice" approach changing regularly resulting in disruption or course correction mid project or wasted effort requiring re-work	High – This is a hot development area and there are continually updates, new releases and new propositions/ models coming online which have different merits

7	The costs of Platform as a Service technologies are within the control of the cloud provider	It will be critical that designs and approaches balance performance and cost requirements by default Proper financial and quality controls should be used to support active monitoring	High - Variable costs could quickly spiral out of control	High – May have some hidden cost due to egress and ingress of data
8	The technologies in the architectures described in this document are largely new to SP and therefore significant training will be required by the company on the new process and ways of working	Role relevant training, assets, and playbooks to mitigate risks and issues from poor practices Data principles which guide decisions and actions as well as supporting policies Potential delivery partners who can guide and limit exposure to risk through past experience	High – There are mechanisms available such as expert resources via Factories upon which the teams can draw down expertise, but execution will still be a challenge	High - Time & cost – this may increase time to train and deploy and suboptimal performance of solutions
9	A Data Lake can become unmanageable if rigorous folder management is not adopted	Accountable Exec for data practices supported by the new governance org Playbook and policies (terms of use) introduced Committee structure introduced to support engagement, awareness and enforcement actions where required based upon regular reviews of use	High – Ambiguity around terms of use and a lack of accountability for enforcement actions on poor practices will most likely lead to issues	High - Cost, quality and performance will all be impacted negatively without a good design
10	A well-defined support model is not currently in place for all the technologies featured	The process of solution selection and implementation must ensure SPEN's suppliers are able to make appropriate commitments to support the service	Low – The approach and governance processes of the organisation ensure that solutions must have appropriate support models in place before productionisation	High – Cloud provider may not provide support for some services
11	If data is downloaded to a non-corporate device, or, used incorrectly by a malicious user, there	Cyber policy and protocols will mitigate risk to solutions from malicious external attacks	Low – Access controls within tools will plug into (staff), ID&V (customer) and authentication (3rd parties) together with	High – Failure to comply with GDPR and DPA regulations

	is a risk that the organisation may fail to meet GDPR compliance	Policies and associated controls (overseen by Committee and Exec sponsor) will limit exposure internally and via approved users/ devices Protections to mask or otherwise obfuscate or anonymise any data deemed to be higher risk will be considered by committee in line with the policies to be developed	access controls for data (around privileges	
12	Data storage may grow exponentially resulting in significantly more cost than envisaged	Estimations already account for a 15-20% CAGR Continual monitoring of use and culling of underutilised storage or tables will be considered both in the interests of cost and good practice	Low – Sizing estimations have been externally validated with Accenture based upon industry standard	High – Cost is largely based upon volumes of data and use of compute power
13	Cyber security doesn't approve use of streaming technologies for OT data (OT/IT)	Work closely with Cyber / IT security early in project to evaluate tools and address any concerns early	Medium – Emerging area of focus in a rapidly changing field of energy management requiring discovery and testing	High - Would prevent delivery of real-time use cases

Table 161 Big Data & Analytics Risks and Proposed Mitigation Strategies

8.3 Data & Systems Integration

8.3.1 Overview

This initiative aims to ensure the right technologies, platforms and models are in place from a data and systems integration perspective. This includes systems for making data available to our stakeholders at their point of need, as well as ensuring canonical models are utilised to guarantee a common data dialect with the smart grid and associated stakeholders.

8.3.2 Projects

8.3.2.1. CIM Model Implementation

The Common Information Model is a suite of open international standards that support the exchange of electrical network data (energy management, asset management and market systems) in a globally understood format. It has been officially adopted by the International Electrotechnical Commission (IEC). CIM standards are based on UML information models representing real world objects and information entities within the value chain of the electricity power industry.

Current Position	Change Drivers
SPEN are using the Integrated Network Model (INM), developed by CGI. INM includes a canonical model based upon a simplification of CIM and hence is not fully CIM compliant.	• Data quality and interoperability with other market entities • Open data – exchanging data with external parties in a commonly understood format • Ofgem DBP Guidance

Table 162 CIM Model Implementation Current Position and Change Drivers

A CIM plug-in or tool for Sparx Enterprise Architect will be required to model our data using the correct Syntax. With the free CIM EA plug-in users can create and edit CIM profiles as standard UML models as well as generate CIM based artefacts. This helps with maintaining the central reference model.

Ensuring that the middleware for business-critical BIM/INM driven operational applications will function correctly – for example:

- CBRM
- ESRI
- SAP
- NAVI
- PowerOn

Our SDIF platform will provide the enterprise service bus and middleware components necessary to translate data from source systems to CIM syntax. This will provide a single view of the asset – orchestrating data from multiple systems and making it available through a single interface.

Updating people, skills, and processes to educate on CIM (as part of the central change enablement costs).

Key Outcomes

- Common language for describing the data stored in our source systems. Data models not tied to any specific technology or vendor.
- Ensure interoperability with the smart grid.
- Simplify process of creating interfaces between systems (both internal and external). This will benefit stakeholders in all persona groupings.
- Maintain a central CIM reference model – no need to implement CIM on all existing source systems which would be costly.

8.3.2.2. API Management

API Management tools provide a single platform for managing APIs from their initial creation, publishing, and versioning through to API retirement. These tools include the API Gateway which provides a single access point for REST (Representational State Transfer)/SOAP (Simple Object Access Protocol) based APIs; access management; capabilities to monetise APIs; version management; load throttling and developer portals.

Current Position	Change Drivers
ScottishPower currently have a Corporate API Management solution. This is an on-premise deployment. For SPEN we will need to assess hybrid (part on-premise, part cloud solutions) given we'll have source systems in multiple locations including cloud platforms.	• MEDA (Modernising Energy Data Access) and EDTF initiatives. • We need a mechanism to securely expose data externally to comply with Open Data requirements. • Automated data feeds providing data sets on demand with no need for manual intervention by SPEN employees. • API Management solutions provide capability to embed an API library in a website, enabling consumers to browse available data items and find out how they can consume the data from their own systems.

Table 163 API Management Current Position and Change Drivers

Solution

Deploying a hybrid API Management solution will involve deploying software on premise (likely on virtual machines). There will also be a requirement to deploy a cloud component which may be within SP Energy Networks' existing Microsoft Azure private networks.

API Management solutions provide a central management pane for publishing APIs externally. It should be noted that these products do not store the code for web services. Instead, they act as a proxy which will route requests from external parties to the actual endpoint service.

Deploying the API Management solution will require various firewall rule changes to existing IT networking infrastructure.

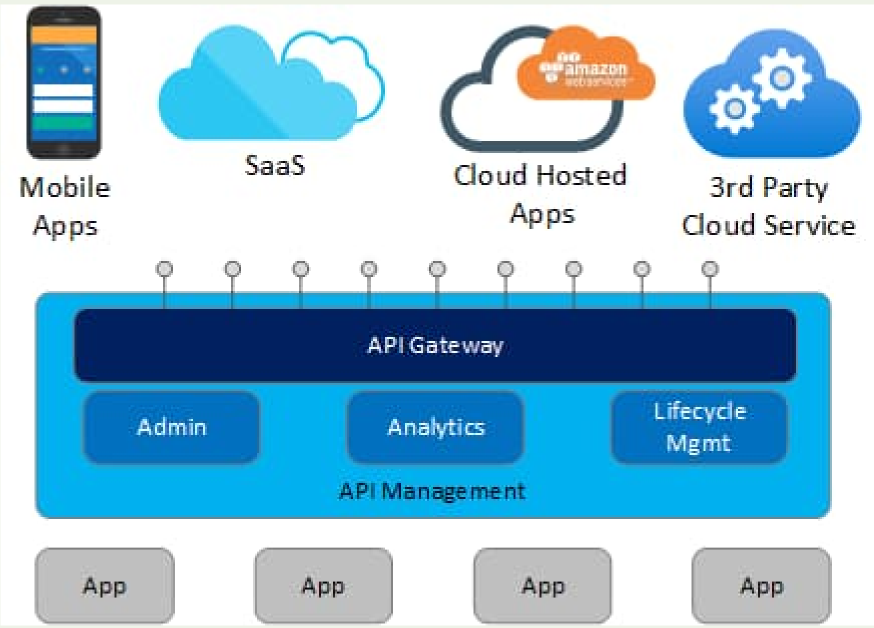


Figure 151 API Management Reference Architecture

Key Outcomes

- A secure means to expose data externally
- Central management of externally published APIs from a single management portal.
- Analytics on use and performance of APIs – providing insights on most used APIs across different stakeholder groups.
- Fine grained access controls on use of APIs.

8.3.2.3. *Event Stream Processing*

Event Stream Processing solutions deal with the task of processing streams of event data with the goal of identifying the meaningful patterns within those streams. They provide a real-time processing capability which is useful where events you want to track occur highly frequently, and where the event needs to be detected and responded to quickly: e.g., responding to smart grid events

Current Position	Change Drivers
SPEN do not currently have a solution for event stream processing.	• Analyse high-velocity data while it is still in motion, allowing you to filter, categorise, aggregate, and cleanse before it is stored • Process massive amounts of streaming events and store in big data platform e.g., LV Monitors • Respond in real-time to changing market conditions • Continuously monitor data and interactions • Scale according to data volumes

Table 164 Event Stream Processing Current Position and Change Drivers

Solution

An event streaming architecture requires technologies in the below categories. SPEN currently require technologies in the ‘Collector’, ‘Broker/Ingestor’ and ‘Stream Processor Analytics’.

The Broker/Ingestor receives events from collectors (collectors may be devices in the network) and persist them until they have been processes. Technologies in the broker space are tools like Azure Event Hub and IOT Hub.

Stream Processor Analytics tools will read events from the broker and analyse, enrich, and transform the stream data as required before storing the data in the storage/sink layer (which will be detailed in the Big Data Platform document).

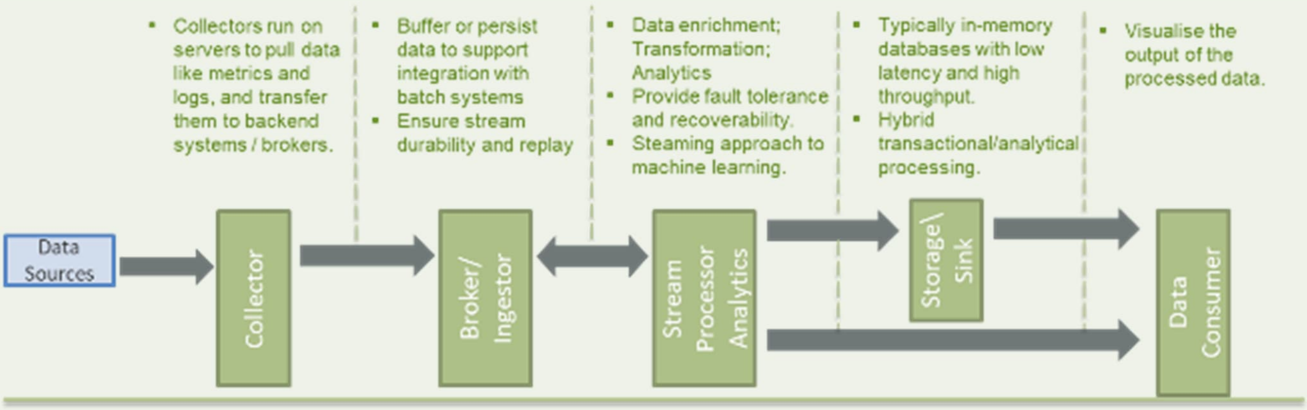


Figure 152 Event Streaming Architecture

Key Outcomes

- Analyse high-velocity data while it is still in motion, allowing you to filter, categorise, aggregate, and cleanse before it is stored
- Process massive amounts of streaming events
- Respond in real-time to changing market conditions
- Continuously monitor data and interactions
- Scale according to data volumes
- Supports Data Best Practice Guidance Principles

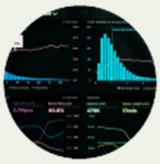
8.3.3 Persona Spotlights

SPOTLIGHT: HEAD OF DATA

What is the benefit for me?
Vast improvement in flow of data from RTS network as well as capability to expose more data externally.

How will I feel the impact of digitalisation?
Data strategy; emerging trends and us cases; Increased focus on data governance and data quality; New training requirements for data team on integration platforms.

SPOTLIGHT: REPORTING / ASSET MANAGEMENT



What is the benefit for me?
Improved visibility of asset data at a more granular level.

How will I feel the impact of digitalisation?
Increased focus on data governance due to availability of more asset data.

Figure 153 Persona Spotlight Benefits and Impacts

8.3.4 Delivery Approach & Timeline

Approach	Initiatives
Agile	CIM model implementation
Agile	Event Stream Processing
Agile	API Management
Agile	Enterprise Service Bus

Table 165 Data and Systems Integration Approach and Initiatives

			Y1	Y2	Y3	Y4	Y5
	Workstream	**2022/3**	**2023/4**	**2024/5**	**2025/6**	**2026/7**	**2027/8**
Systems Integration	CIM model implementation						
	Event Stream Processing	POC					
	API Management			API capability extended for Open Data			
	Enterprise Service Bus development			ESB capability extended			

Figure 154 Project Schedule and Key Milestones

8.3.5 Resources

Resource Type	Purpose
Scrum Master / Project Manager	Drive agile delivery of integration solutions coordinating with development team and product owner
Integration SMEs	ESB development API Management platform deployment/configuration Event Stream Processing deployment/configuration
IT Networking	Firewall / networking changes required for integration solutions.
Business Sponsors	Ensuring success of project and leading awareness
CIM Subject Matter Expert(s)	CIM implementation
Data Governance Expert(s)	Advisory service drawn down from 3rd party to guide implementation of MDM solution, data governance policies, procedures, and implementation

Table 166 Data and Systems Integration Resources and Purpose

8.3.6 Functional Model

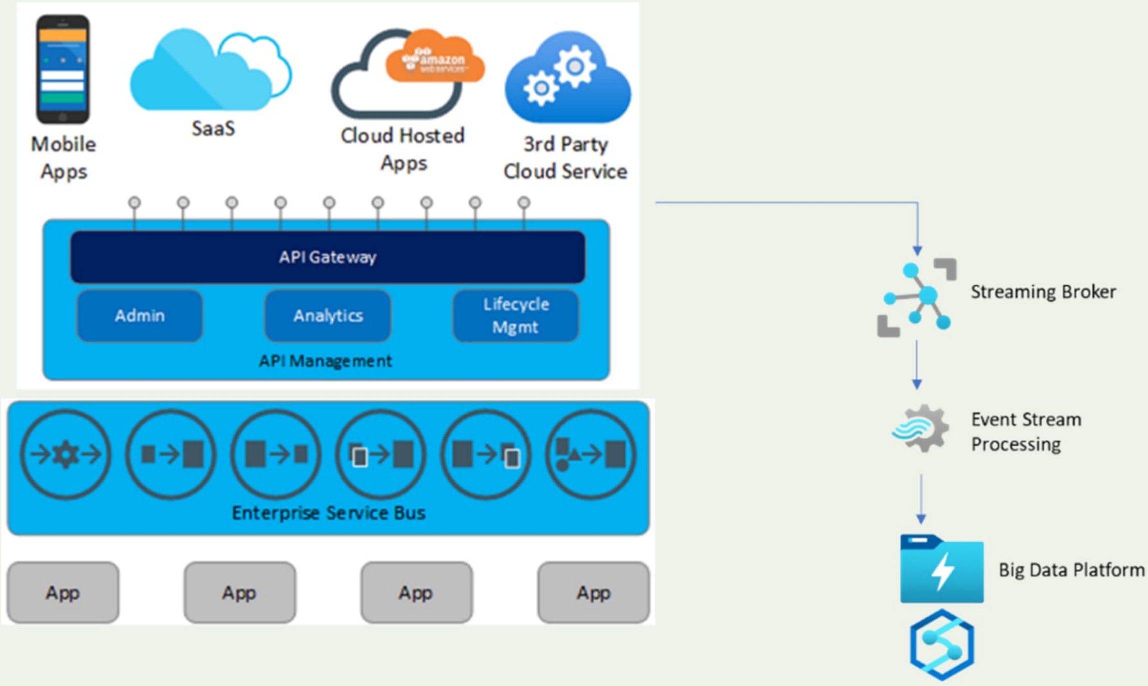
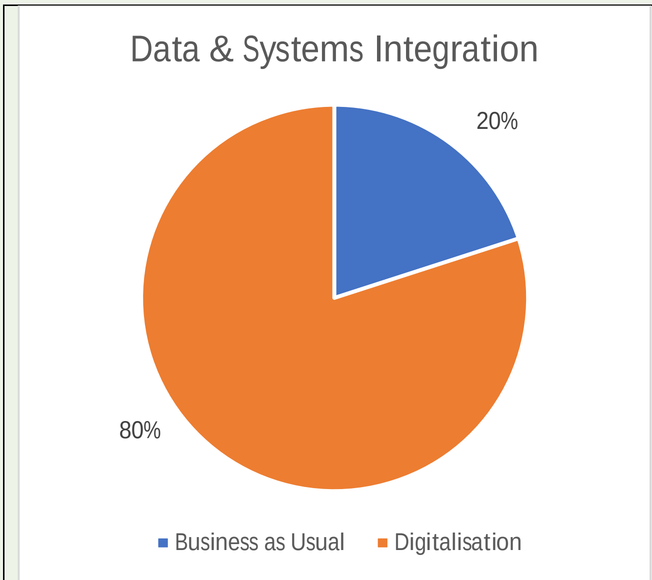


Figure 155 Functional Model

8.3.7 Costs



BAU Rationale:

Data is a key enabler for our planned activities. We will develop the mechanisms to catalogue, integrate and share datasets as required by the DBP Guidance. However, our ambition is to go further than this as explained in our digitalisation rationale below.

Digitalisation Rationale:

Our digitalisation plan for this initiative will enable us to restructure our organisation to one that recognises the value of data as an asset. We will create the solutions which, in combination with new data skills and capabilities, will enable us to maximise the value of data. Our digitalisation investment in data and systems integration is necessary to ensure data can be collated and governed to support our ambitions.

8.3.8 Performance Metrics

Project	Measures of Success
CIM model implementation	• Core apps and systems are compliant with both INM and CIM
Event Stream Processing	• X% of events we want to pull in via ESP
API Management	• Minimal bespoke APIs x% - minimal point to point integration.
Enterprise Service Bus	• X% of core systems integration made available via ESB – minimal point to point integration.

Table 167 Data and Systems Integration Measures of Success Per Project

8.3.9 Assumptions and Dependencies

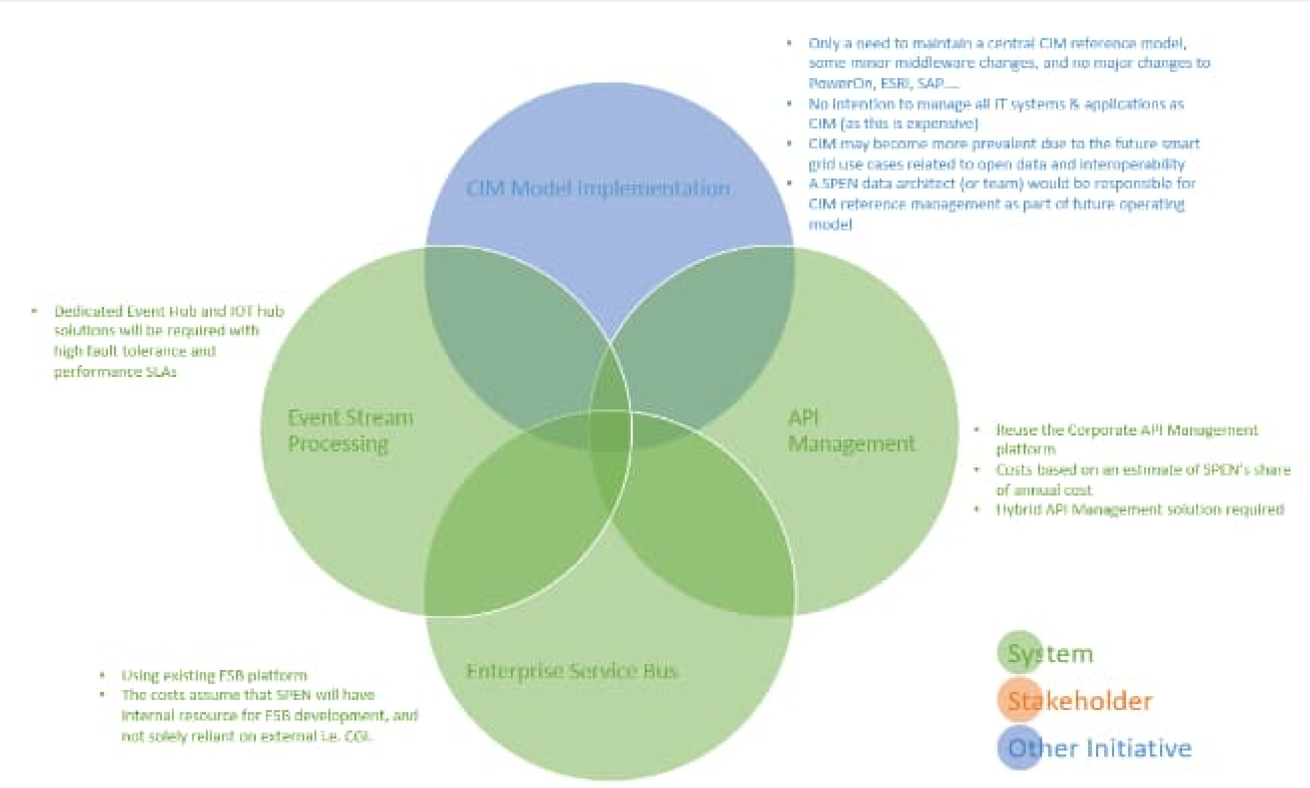


Figure 156 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Data & Systems Integration Initiative and breaks down those from other initiatives, Systems and Stakeholders.

8.3.10 Risks & Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Lack of internal skillset for integration development.	Required skills analysed and called out early in project planning.	Low	Tools not used to full potential.
2	Cyber security policies do not approve use of streaming technologies for OT data. (OT/IT)	Work closely with Cyber / IT security early in project to evaluate tools and address any concerns early.	Medium	Would prevent delivery of real-time use cases.
3	Integration tooling is not scaled effectively for the demand level.	During implementation, work closely with business SMEs to understand estimated volumes of calls (no. requests and data volumes) and ensure environment is scaled appropriately.	Medium	Tooling could fail resulting in delayed responses to requests.
4	We cannot execute good decisions because we lack clarity on the measures that matter and the skills to use data well which will limit our ability to take action to improve stakeholder outcomes.	Clear Pre-Ed2 comms about the need for change and the journey will set expectations about the options to build skills via role relevant training will be critical	Medium	Failure to equip our people with the skills and knowledge to interact with data will mean that we can't prioritise the actions we need to take to make the greatest difference
5	Mistrust of data quality means few people will fully use data to make a difference. This mistrust stems from limited visibility of data, quality assurance measures and the absence of clear routes to resolution on potential data quality issues.	• Validation of data with owners • ML Enabled scans for anomalies/ volatility • Introduction of clear routes to escalate issues will provide more transparency on data quality • Proactive publication of data catalogues will also go some way to assuring users on data accessibility, quality and exposing any relevant health warnings	Low	Data is likely to be used (in the absence of alternatives) but the maximum value return won't be achieved
6	It's hard to make connections through data because of siloed projects which build out ad hoc data sets which means that there is no coherent data view for analytics	• Establish a community of practice drawn from all relevant areas (voluntary basis) which is afforded formal recognition to consult on role change and learning pathways and support the development and adoption of principles and policies for data use, as well as community events • Introduce a baseline level of education on data, principles, and practices	High	There are no common data practices nor learning options nor standardised approaches to enable reuse of solutions

7	The technologies in the architectures described in this document are largely new to SP and therefore significant training will be required by the company on the new process and ways of working	• Role relevant training, assets, and playbooks to mitigate issues due to poor practices • Data principles and policies for good decisions • Delivery partners who guide and limit our exposure to risk through past experience	Medium	Time & cost – this may increase time to train and deploy and suboptimal performance of solutions
8	If data is downloaded to a non-corporate device, or, used incorrectly by a malicious user, there is a risk that the organisation may fail to meet GDPR compliance	• Cyber policy and protocols will mitigate risk to solutions from malicious external attacks • Policies and associated controls (overseen by Committee and Exec sponsor) will limit exposure internally and via approved users/ devices • Protections to mask or otherwise obfuscate or anonymise any data deemed to be higher risk will be considered by committee in line with the policies to be developed	Low	Failure to comply with GDPR and DPA regulations

Table 168 Data and Systems Integration Risks and Proposed Mitigations

8.4 Data Governance and Mastery

8.4.1 Overview

As the volume and classes of our data continues to grow exponentially, it is imperative that we industrialise our methods for accommodating an elastic landscape of data creation, curation, and management. We must also ensure that it is easy for stakeholders to understand what data exists and how to access it.

We are clear that good data practices are as much about ensuring everyone has an interest and a role to play in supporting better data management as it is about landing the tools to make that achievable at scale. That is why we have proposed a dual programme of activity to support the technology and the business change to achieve this goal.

8.4.2 Projects

8.4.2.1. Data Governance

Deloitte highlight 5 signs that an organisation should consider an industrialised approach for MDM:

- Unclear Picture of Data – Data is lying across disparate locations, systems, applications, and other sources so it can never present a complete picture
- Finding Data Turning Troublesome – There are no inter-domain associations between departments to know which data is the right data when working on problems which cut across domain areas of expertise
- Dipping Customer Satisfaction – Customer dissatisfaction can be a consequence of inconsistent, incomplete, low-quality data that can result in bad reviews and reputational damage as workaround will never provide the same seamless experience

- Increasing Unstructured Data – Unstructured data doesn't have an already defined schema or data model. It can be textual or non-textual but can be a cause of concern as it can lead to huge ambiguities if its data that is routinely used for reporting and tables are being spun up on the fly that really need to be more tightly controlled (note: this does not mean there is not a valid place for unstructured data)
- Suffering Business Intelligence – Incorrect or incomplete data undermines the validity of analysis and reduce the likelihood of data driven decision making and ultimately value realisation

Whilst the statements above may be true to varying extents across different parts of any business, it is clear that to scale the levels of data maturity set out in this strategy, it will be necessary to adopt more industrialised methods for data management. Increasingly the value of meta data (data about data) can be exploited to manage data more effectively. The tools for master data management and metadata management have converged and master data management is more associated with the process of linking all the critical data into a common reference point while metadata management is the process of administrating the data that describes other data which is a useful feature to enable that.

In addition to establishing common forms and definitions as well as sources for data, and making them more discoverable and more accessible, there is a need to introduce a systematic method for assuring data quality. IBM describe Data Quality Management (DQM) as, "the pipeline process that checks the data for required values, valid data types, and valid codes. To apply data quality management to the data loaded into the system, you configure data quality management rules (or DQM rules)." In reality neither MDM/Meta Data Management nor DQM are supported through technology solutions alone but human sampling, repeatable data cleanse activity, which is done manually, and time-consuming discrete data labelling and classification activities are unnecessary and undesirable in an age when the tools are available to assist humans in doing this at scale. To complement the people changes set out in Data Mastery, the Governance solutions proposed will be established with a key principle of supporting people to understand what data we have and make good decisions about how to look after it and how to use it well.

In recent years, there has been a convergence in solutions for DQM, MDM and Meta Data Management and our initial work shall focus on discovery on the requirement we have for tooling to enable effective management across the data lifecycle given our data landscape.

Current Position	Change Drivers
• There is currently no active technology used to systematically catalogue data assets, to create, read and use meta data nor industrialised model and technology solution for data quality management. • Workshops with staff suggest there are perceptions of data quality issues which are not easy to evidence and pockets of practice to review and address data quality issues which do not extend to all data types that are likely to be a priority.	• To treat data as an asset, it should be catalogued, discoverable, and proactively quality assured so that stakeholders can make use of it with confidence to achieve value targets. • The pace and scale of technology change and the requirement for data to be available at the point of need for operational and analytical purposes throughout the broader business strategy and programme for Digitalisation will necessitate an industrialised solution for this. • There are technology solutions available which address 3 needs effectively (MDM, MetaDM, DQM). • The market and regulation require that organisations exercise care and effective management of data; and it is fast becoming a brand making/ breaking key point of trust for consumers and businesses to look after data well. • The risks of poor data management or use could lead to operational issues and negative impacts for stakeholders in an increasingly data driven, agile organisation and the use of non-industrialised practices will not scale to support the emerging service offering and operating model.

Table 169 Data Governance Current Position and Change Drivers

Key Outcomes

- Data is more discoverable, trustworthy, and accessible for more people to support delivery of stakeholder value as a result of solutions (both business and technology) which are used to actively look after data
- Data is managed more effectively to uphold our commitments as a data custodian and data processor.

8.4.2.2. Data Mastery

Deloitte define Data Mastery as knowing how to use data to secure business outcomes, being able to transform data and insights into actions because the necessary infrastructure, governance, and operations are in place; and knowing how to leverage external data and enhance insights to deliver benefits. In tandem with the technology solutions for MDM/ DQM/ Meta Data Management above, the following changes are necessary on the business side to ensure that the processes, skills, and accountabilities exist to wield these solutions in real terms for effective results.

Current Position	Change Drivers
There are pockets of responsibility for data but no SPEN nor enterprise**-wide** data stewards and data owners with accountability and responsibility for data management and quality.	• The increasing importance of data as mission critical for our business. • Increasing expectations from stakeholders on good data practices. • Legislation and regulations coming into force which increasingly place the obligation upon the organisation to ensure 'doing data right' is systematic and reinforced at the individual level. • The Data Best Practice Guidance which is raising the bar for data practice across industry.

Table 170 Data Mastery Current Position and Change Drivers

Solution

We will introduce a new virtual data governance organisation with representation across all business areas. This will support colleagues across each business area to oversee data quality, data governance, engage actively to deliver master data management, and coalesce upon our data and information strategy with accountability for the business architecture and processes. We will introduce a roadmap for SPEN domain data for which a virtual data governance organisation will be responsible for coordinating / doing related activities; and a relevant SPEN executive will be accountable. A new committee structure will have responsibility for implementation of the strategy led by the virtual team. Equivalent responsibilities for the technology architecture and services will run in concert on the IT side with the Committee structure providing a connection point for collaboration and alignment for cross functional teams.

New conceptual, logical, and physical data maps will be created and managed centrally, with versions subject to approval at Committee level in a controlled fashion. People making changes that result in additions, removals and updates to data points/ models - that will impact our underlying data model - will use a new data governance process which ensures they capture meaningful changes to key data items to provide visibility to the virtual data governance team. This information will be communicated via automated procedures to the user community so that they can evaluate any upstream and downstream impacts with support from the virtual data governance team.

The paradigm shift for our industry, advances in sensors and our ability to capture and process large volumes of various types of data, means that plenty of new data streams will be coming online and will be used in new ways. This means we must provide the business architecture through the virtual data governance team to ensure we plug such data, models, and mechanisms into the network data ecosystem with ease not just technically but also from a governance perspective. Our processes will ensure that as part of our Governance process, new projects that will create or update data and will be required to open up that data through an approved pattern for connection (e.g. microservice, ESB or API in a common format) so that new data being created will be tagged (for classification and mapping) and accessible so that it can be leveraged by the user community for operational or analytical purposes. Data ownership must also be assigned at this stage.

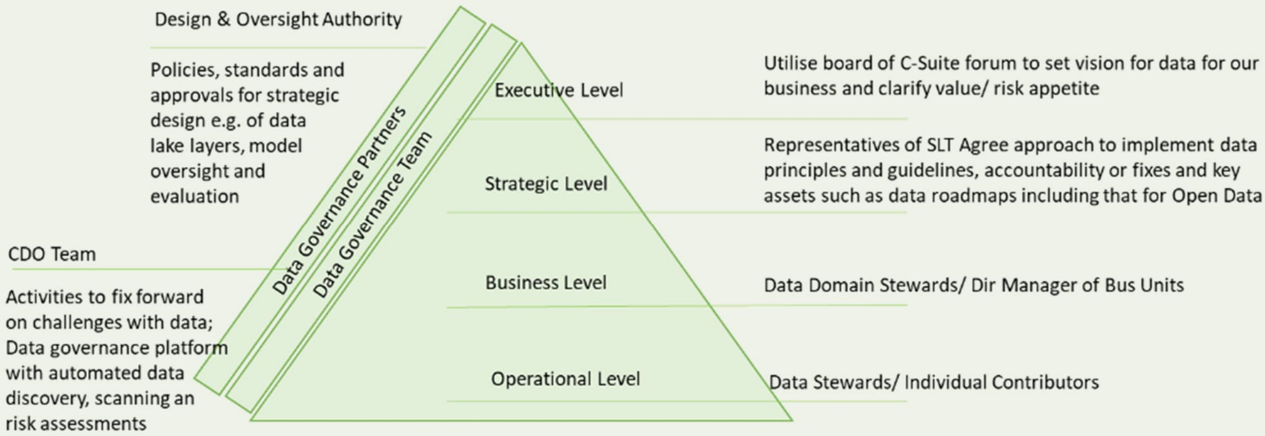


Figure 157 Illustrative Example of a Potential Data Governance and Risk Structure

An additional area of focus for our committees will be oversight of models (within the scope of Analytics, Digital Twin and AI Decisioning) including their risk/ reward evaluations and consideration of the potential for ‘explainability’. Explainability will be important, as it ensures we can playback the state of the inputs and the algorithms at the point at which a recommendation was generated through machine learning to study the drivers for its outcome. This has proven to be a key area of focus in other regulated industries where machine learning has been deployed at scale for offer recommendations or to execute actions directly to assure the business that we are doing the right thing with data. This is because it is important that model owners are aware of the degree of autonomy exercised by a machine learning model, the associated risks and the drivers that have influence over an outcome. This is a continuous requirement as models based upon machine learning can drift overtime to deliver different outcomes from when initially built.

The committees will have the power to delegate actions and responsibilities to individual data owners, stewards, and others. A set of data principles will guide our people in responsible data use. An associated framework will guide our people to the appropriate business and technology architecture, complemented by guidance on best practice and policy standards.

We will establish a regular forum to review feedback from stakeholders and operate mechanisms to publish and respond to feedback on our roadmap for data both internally and externally. We will continue to play a key role in industry fora shaping the agenda on data and developing industry standards and models to shape the collective response to the Energy Data Taskforce recommendations from the “Strategy for a Modern Digitalised Energy System” report with the virtual data governance team bringing together the vision and roadmap for each initiative and how these relate to one another logically and physically. We currently chair the DDSG, sit on the Coordination, Energy Data Request Tool, and National Energy System Map subgroups and have representation on both active Icebreaker One groups.

The expectation is that central resource from SPEN will coordinate /execute activities for the broader SPEN business and leverage a combination of Data Governance and Networks domain expertise; and tap into the central Hub when additional advice or capacity is required for a given activity.

Our preferred model for data governance can be seen below:

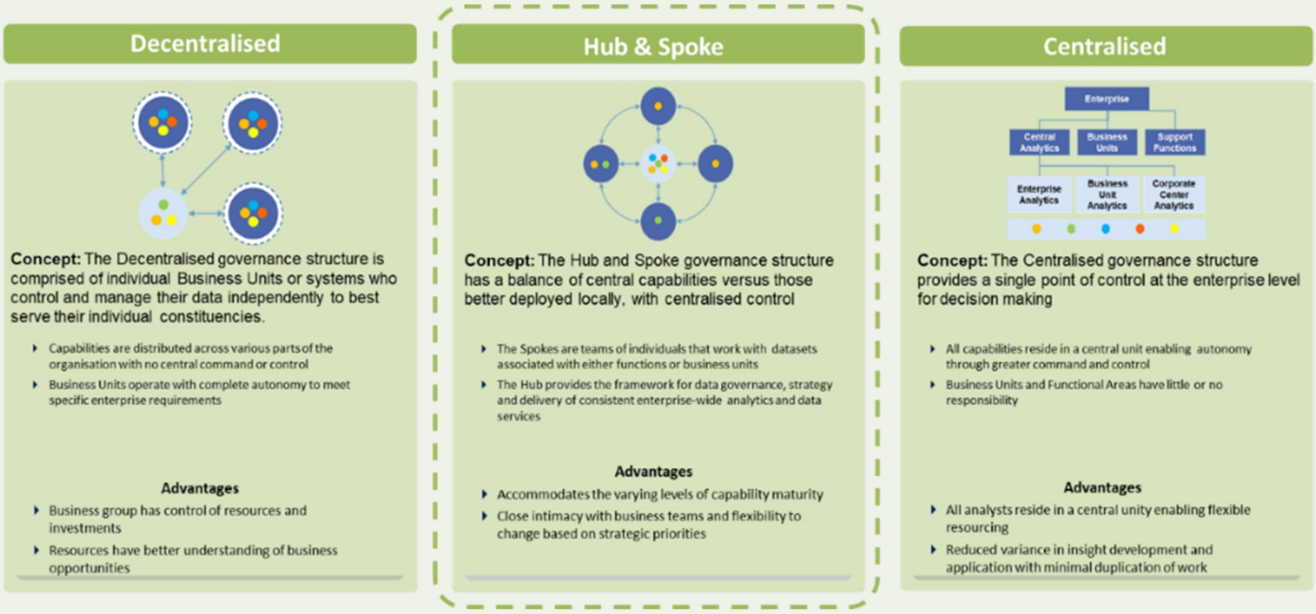


Figure 158 Our Preferred Model for Data Governance

Key Outcomes

- Increased awareness of what data exists and its quality status
- Improved understanding of good data practices and awareness of data capabilities / art of the possible
- More joined up thinking within the organisation and through to external industry groups that we liaise with
- Greater ease of managing industrially our data including opportunities for and execution of our presumed open data
- Greater visibility of data quality issues, early warning signals on emerging issues and clear accountability for resolution to improve stakeholder outcomes and boost trust in data

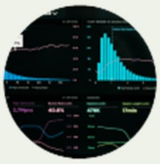
8.4.3 Persona Spotlights

SPOTLIGHT: HEAD OF DATA

What is the benefit for me?
Vast improvement in flow of data from RTS network as well as capability to expose more data externally.

How will I feel the impact of digitalisation?
Data strategy; emerging trends and us cases; Increased focus on data governance and data quality; New training requirements for data team on integration platforms.

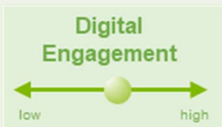
SPOTLIGHT: REPORTING / ASSET MANAGEMENT



What is the benefit for me?
Improved visibility of asset data at a more granular level.

How will I feel the impact of digitalisation?
Increased focus on data governance due to availability of more asset data.

SPOTLIGHT: DOMESTIC CUSTOMER



What is the benefit for me?
Improvements in customer service driven by single view of our customers.

How will I feel the impact of digitalisation?
Data and systems integration improvements will underpin our single view of the customer aims.

SPOTLIGHT: FIELD TEAMS

What is the benefit for me?

Making site work safer and more productive for me

How will I feel the impact of digitalisation?

- Guided risk and safety assessment to ensure that line outages have occurred
- Intelligent supply chain that proactively manages the delivery of materials and consumables for my team
- Augmented reality/virtual reality walkthrough of complex construction tasks/integration
- Automated job status reporting and time writing.

SPOTLIGHT: COMMERCIAL CUSTOMER

What is the benefit for me?

Improvements in customer service driven by single view of our customers.

How will I feel the impact of digitalisation?

Data and systems integration improvements will underpin our single view of the customer aims.

SPOTLIGHT: CUSTOMER SERVICE TEAM

What is the benefit for me?

Access to reliable data that is up to date

How will I feel the impact of digitalisation?

Complaints: Resolved within timescales by single point of contact, serious complaints with highly available and massive parallel Processing data.

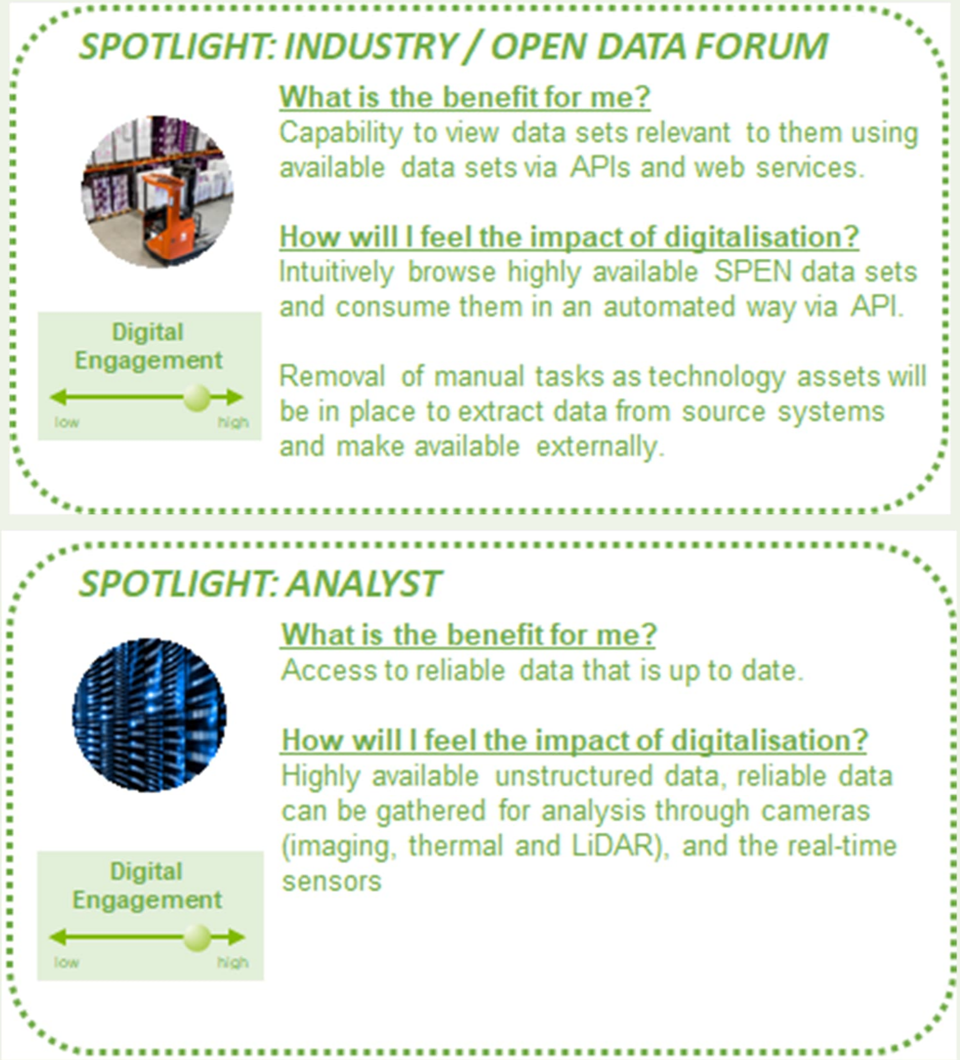


Figure 159 Persona Spotlight Benefits and Impacts

8.4.4 Delivery Approach and Timeline

Approach	Initiatives
Data Governance and Mastery	Data Governance and Mastery

Table 171 Data Governance and Mastery Approach ad Initiatives

		Y1	Y2	Y3	Y4	Y5
Workstream	2022/3	2023/4	2024/5	2025/6	2026/7	2027/8
Data Mastery			Data Mastery Enabled			

Figure 160 Project Schedule and Key Milestones

8.4.5 Resources

Skill Profile	Purpose
Data Stewardship	Interpret data legislation, devise data policy and support implementation of governance through practice supporting ensuring standards are clearly set and expectations met; providing guidance to business and technology teams on data use including ethical standards and methods; translating business strategy into data management strategies with domain specificity, determining official sources of data, supporting data definitions and quality assurance/ investigation activity; managing accesses and provisioning and supporting data owners and data users as domain subject matter experts on data; supporting the development and management of business and technical meta data and identifying critical data items; defining standards for meta data and supporting tools for application, controls and compliance. Note data stewardship is a skill but there may be dedicated staff whose primary field of expertise and focus is data stewardship.
Data Ownership	Data owners are individuals who make decisions such as who has the right to access and edit data and how it's used. Owners may not work with their data every day or even be hands on with that data but are responsible for overseeing and protecting a data domain for the business. Note this is expected to be an accountability that someone fulfils as part of their existing role.
Data Translation	Providing a bridge between business priorities and data opportunities, supporting efforts on definition of taxonomies and evaluation of data issues to determine materiality, and identifying options/solutions for resolution. Data translation is a key skill for anyone working at an intersection point between business need and data solutions whether business or data skilled this will enable cross functional teams to work more effectively together and solutions more likely to deliver the desired impact due to better fit to an opportunity.
Data Analysis	Supporting effort on definitions and delivering services for reporting and insight to support activities associated with data mastery and governance.
Data Engineering	Two types: i. Feature Engineering involving sourcing and preparing data in support of investigations ii. Data Engineering to produce robust, reusable data flow solutions at scale for which align to the enterprise-wide model in approved definitions and formats
Data Platform Engineering	Responsible for scaling high performing data solutions (operational, analytical, decisioning) platforms; accountable for delivery of technical architecture to support principle and designs from data architecture; Builds, delivers and maintains platforms and services in line with the approved models and solutions.
Data Architecture	Defines the principles, process and technology framework for data to support business use with ease; Key point of authority to present options and recommendation into Committee structure to assure the integrity of our data solutions and support business uses via an extendable, plug and play architecture; Liaison to platform engineering to ensure technology infrastructure supports business priorities; Liaison to virtual data governance team to ensure high standards and consistent application of policies and patterns and responsible for the templates used to create maps and dictionaries

Table 172 Data Governance and Mastery Skill Profiles

8.4.6 Costs

It is assumed that support costs for solutions will be included in IT overhead costs from the enterprise on enduring basis. A provisional budget has been recommended for the business and technology change associated with introducing Data Governance & Mastery. The basis of this cost estimation includes end-to-end scoping & design, building & deployment, and ongoing operations/user licenses.

For Data Governance, a retainer for data governance expertise and a % overhead applied to each initiative to support the implementation of data governance and quality assurance for each initiative. This approach forms the initial stage of costing, but it will be necessary to align longer term on the right enduring model for the overhead and support mechanisms. This will be decided in due course.

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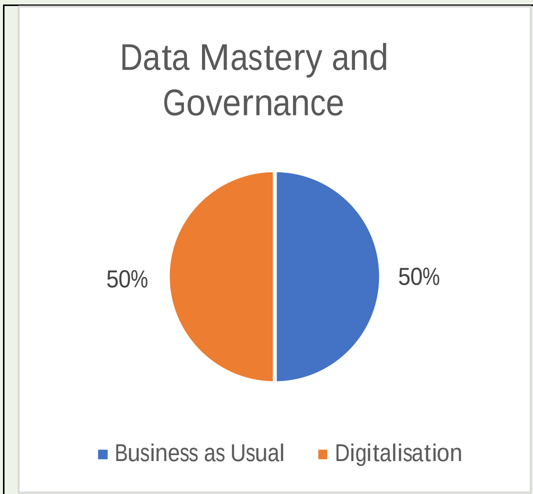
<td rowspan="2">
</td>
<td>BAU Rationale:
Data is a key enabler for our planned activities. We will develop the mechanisms to manage and govern datasets as required by the DBP Guidance. Our BAU investment in this initiative represents the minimum possible to comply with the guidance. However, our ambition is to go further than this as explained in our digitalisation rationale below.</td>
</tr>
<tr>
<td>Digitalisation Rationale:
Our ambition is to transform our organisation to become data driven and where the value of data as an asset is recognised. To do this, we will invest in solutions that will facilitate “data omnipresence” fully aligned with our organisational hierarchy. Data will become the key driver for every decision and enable us to continually monitor and re-optimise our activities.</td>
</tr>
</table>

8.4.7 Performance Metrics

Project	Measures of Success
Data Governance	• Industrialised solutions for the definitions and coordination of key data items (MDM) are in place • Industrialised solutions for the scanning and reporting of data quality assurance are in place • Active meta data management is enabled
Data Mastery	• Business processes are established for the ownership and execution of data governance supported by the technology solutions above

Table 173 Data Governance and Mastery Measures of Success Per Project

8.4.8 Risks & Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Lack of internal skillset for data management.	Recruitment/ training enabled through change enablement Programme and additional support available through central resource in Hub	Low	Tools not used to full potential
2	Scale of data mapping, definitions, quality resolution is unknown	A cross functional team of business and IT people leverage state of the art solutions to scan data coupled with domain expertise should help to prioritise the most important data to begin with; the use of overhead rather than absolute cost will therefore let us take a prioritised and proportionate approach to adding our data into the solutions and scale iteratively based upon the learnings	Medium	Cost, effort, or time would significantly exceed estimations

Table 174 Data Governance and Mastery Risks and Proposed Mitigations

9. Enablers

The success of our digitalisation journey will be contingent on having a strong foundation of supporting IT software, hardware, interfaces, and data upon which to build our new solutions. The maintenance, upgrade and evolutionary change to our existing solutions will enable SPEN to cope with the expected increase in volume of activity and to equip our workforce with the digital tools they need to operate efficiently. Our existing IT and data estate is the platform upon which we will build the solutions to digitally transform our business.

9.1 Application Product Upgrades

9.1.1 Overview

As we implement targeted digitalisation initiatives, we must ensure that the surrounding ecosystem of applications used in our day-to-day operations can facilitate these changes and that we have the appropriate resilience and cyber security provisions in place to ensure the continued operation of our platforms. This will include keeping our systems fully supportable, patched, and cyber secure. This section focuses on applications used in delivering our services but not covered by targeted projects.

To support our overarching digitalisation agenda, some of our current suite of applications will require upgrading, while some must be completely replaced, and others will be incorporated into or integrated with our core systems.

9.1.2 Context

Our RIIO-ED1 digitisation activities are principally focused on our customers' requirements for a secure and resilient energy supply, minimising costs and protecting the vulnerable. During this period, we have created the foundations for our digital transformation with some key deliverables shown below:

- Consolidated our core digital platforms through our NAMS project.
- Published our first Digitalisation Strategy and Action Plan which has subsequently been reviewed and updated in 2020 and 2021 taking account of customer and stakeholder feedback.
- Established a new Centre of Excellence and IT Digital Hub to incubate the capabilities needed for digital transformation within our organisation.
- Delivered a programme of continuous improvement and innovation projects.

During RIIO-ED1, we have also incorporated new additions to our suite of applications to support delivery on our plan and commitments. The primary funding mechanisms used to extend our IT application suite were through our non-operational IT and telecoms allowance and by productionising outcomes from our Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) projects.

9.1.3 Non-Operational IT and Telecoms Allowance

During the RIIO-ED1 price control period, SPEN received a £49.87m non-operational IT allowance which has been invested to lay groundwork and deliver value to our customers, stakeholders, network, and the wider economy in areas including:

- Customer satisfaction and connections process improvements
- Vulnerable customer support and social obligations
- Safety, reliability, and availability of the network
- Environmental protection and climate change mitigation
- Flexibility services and wider DSO operation

Network Innovation Competition (NIC) and Network Innovation Allowance (NIA)

SPEN has actively sought out innovative approaches to improve the capabilities and performance of our network, with projects funded through Ofgem's Electricity Network Innovation Competition (NIC) and Electricity Network Innovation Allowance (NIA).

The ambition with each innovation project is the eventual transition and/or adoption of learnings into Business as Usual, delivering financial benefits to the customers and licensee. This has been achieved with multiple innovation projects, supported by our robust project governance process. Transitioning these projects into business-as-usual necessitates replacements or upgrades to several IT solutions in parallel to engineering and network solutions.

9.1.4 Current State

During RIIO-ED1 extensive work has been carried out mapping our current portfolio of applications to inform our long-term IT investment strategy. The figures below are visualisations of this mapping exercise that was carried out in Enterprise Architect.

The below figure shows the full SPEN application Portfolio, including two Kanban boards: one for application support lifecycle, and one for future investment.

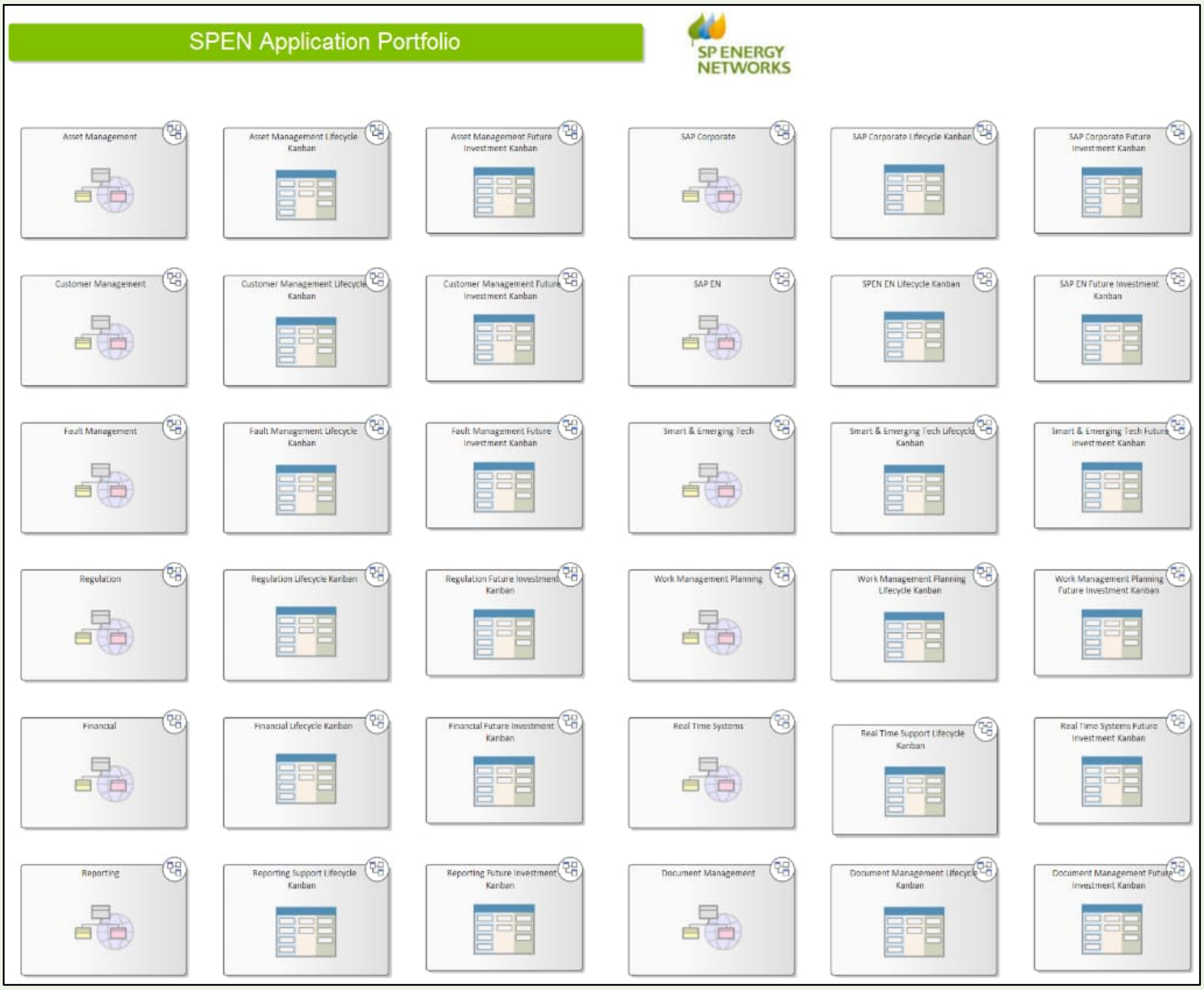


Figure 161 SPEN Application Portfolio Landing Page in Enterprise Architect

The figure below shows an example of the applications which fall under the ‘Real Time Systems’ category. This layout is available for each application. Each individual application is tagged with approximately 30 metadata points to capture information such as: business criticality, whether the systems contain sensitive data, if there is any health and safety impact, when the system went live, when the system is due to be upgraded/replaced, number of users and the support status of the application.

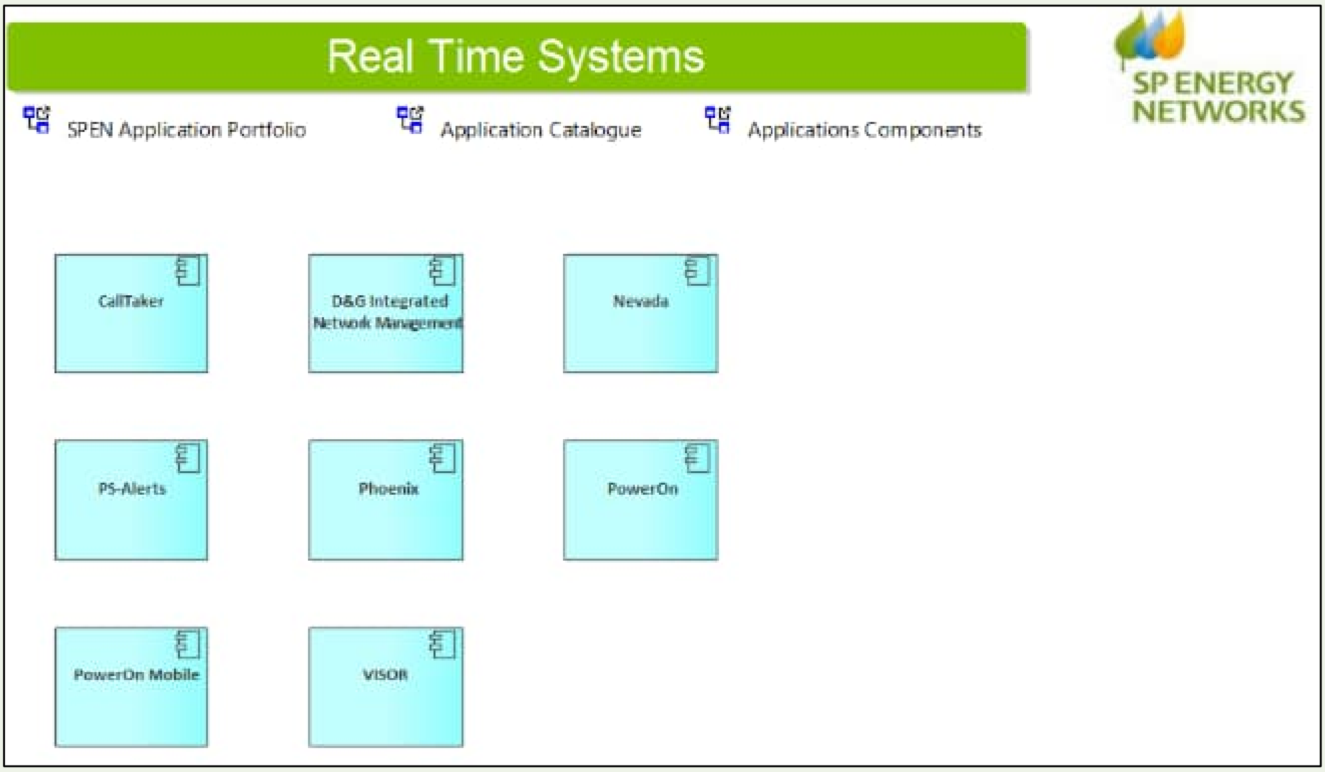


Figure 162 Real Time Systems Applications

The figure below shows an example of the Future Investment Kanban board for the ‘Real Time Systems’ Applications. These applications are split into 3 investment categories: ‘As is’, ‘Replace’ and ‘Upgrade’. These categories, aligned with the ‘upgrade/replace date’ metadata tag, create a visual representation of where investment will be required.

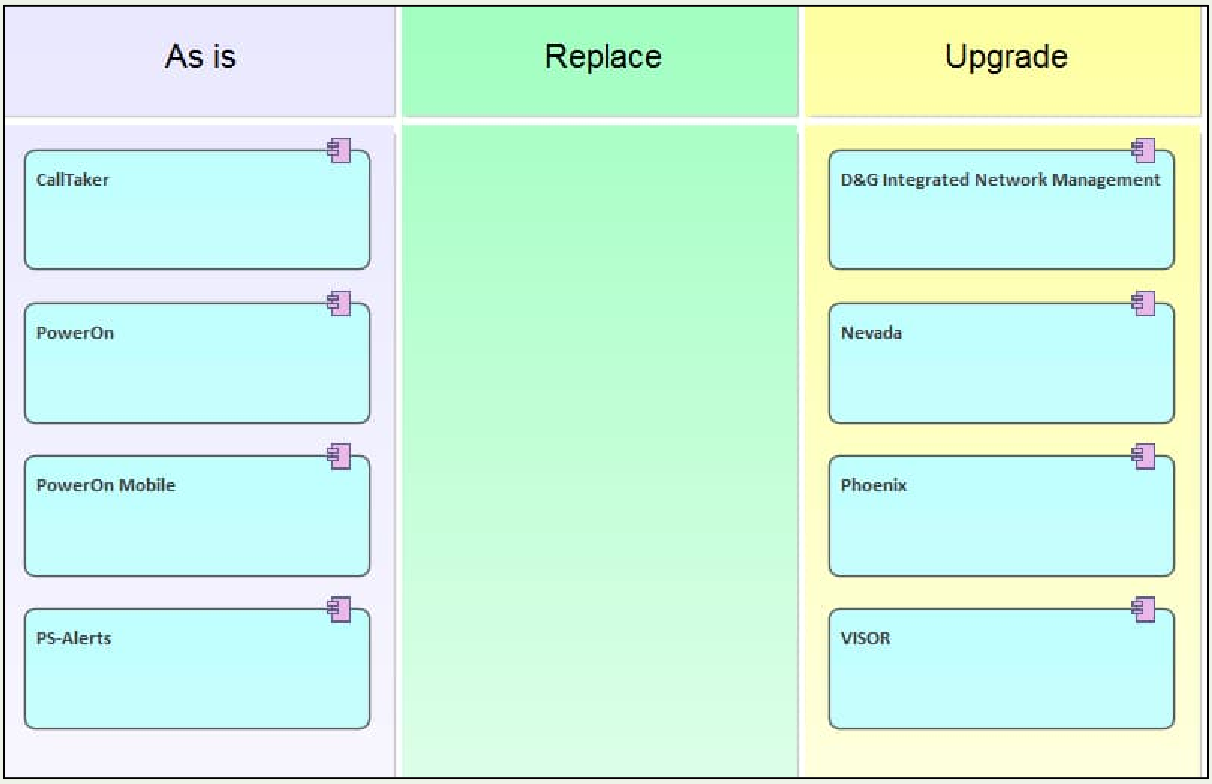


Figure 163 Real Time Systems Future Investment Kanban

Our current suite of applications can be categorised as shown in the table below:

Application Category	Description
Asset Management	Applications used to store and access information on SPEN electrical assets
Customer Management	Applications used to provide services to and manage relationships with our customers
Document Management	Applications used for document storage e.g., technical drawings, permits and agreements etc
Fault Management	Non-OT applications used to manage faults
Financial	Financial systems other than our corporate SAP financial systems, used to track costs
Real Time Systems	OT systems such as Power On which support network fault management
Regulation	Applications such as Meter Point Registration System (MPRS) that carry out regulatory license obligations
Reporting	Tools used for productivity and regulatory reporting
Smart & Emerging Tech	Applications supporting new digital technologies
Work Management Planning	Resource planning tools

Table 175 Application Category Descriptions

All applications covered in this section will have one of two actions planned for them which are as follows:

- Replace – There is a business use case for the application's functionality, but the current tool will be replaced by a different one or incorporated within the scope of a tool with wider functionality

- Upgrade – There is a business use case for the application's functionality and the current version will be upgraded to a newer iteration of the same application. This may be triggered by upgrades to existing infrastructure.

Below is a table detailing the number of systems requiring replacement or upgrade in each application category. A full list of systems is detailed in Appendix 10.2.

Application Category	Replace	Upgrade	Total
Asset Management	6	7	13
Customer Management	4	2	6
Document Management	21	0	21
Fault Management	5	1	6
Financial	2	0	2
Real Time Systems	0	4	4
Regulation	5	7	12
Reporting	2	4	6
Smart & Emerging Tech	0	9	9
Work Management Planning	1	0	1
Grand Total	**46**	**34**	**80**

Table 176 Systems Requiring Replacement or Upgrade in each Application Category

9.1.5 Costs

The costs for this initiative have been based on a detailed review of our existing systems, made possible by the level of work carried out within Enterprise Architecture to map our current portfolio of applications.

We have reviewed the ages and condition of our systems to understand which will require to be upgraded or replaced. For example, twelve of our regulatory systems have been identified as requiring either a replacement or upgrade within this time-period, including our Meter Point Registration System (MPRS) which will be upgraded.

We can also identify systems, such as our Address Data Quality Management (ADQM) system, which will need upgraded during this period. This system is critical in integrating with other systems in our portfolio such as MPRS and our existing CRM system Athos, therefore its upgrade is crucial to our new CRM system. The CRM system will also integrate and be highly dependent on the replacement of our current document management system, Sharepoint, which will be replaced by a new solution.

We have calculated the effort required to upgrade or replace each system and applied a weighting factor. An example of this is the SharePoint, where, due to migration of existing data and integration between the proposed CRM and our existing corporate systems, a heavier weighting was applied to the cost estimates based on the higher effort factor.

Costs have been included to cover a number of Efficiency Measures such as Robotic Process Automation (RPA) and Process Mining. These measures will assist with the longevity of our current portfolio of systems and ensure they are fit to sit alongside our future applications.

9.1.6 Assumptions and Dependencies

Figure 164 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of the Application Product Upgrades Initiative and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
List of applications requiring upgrade or replacement remains unchanged
Current versions of applications to be upgraded are still supported
The devices and infrastructure available can run the future suite of applications
Efficiency measurements will be incrementally implemented as we refresh and maintain the estate, this may include evolutive maintenance measures such as using RPA and process mining

Table 177 Application Product Upgrades Assumptions

9.1.7 Performance Metrics

Performance will be measured primarily through the number of applications that have had successful delivery of a replacement or upgrade.

9.1.8 Risks and Mitigations

5	Risk	Mitigating Actions	Likelihood	Impact
1	Applications cannot be upgraded as they are no longer supported or due to technology obsolescence.	IT and the business will maintain an inventory of applications and interfaces in Enterprise Architect with information on technology obsolescence so there is clarity on deadlines for upgrades, replacement, or retirement of solutions	High	High
2	Costs underestimated due to uncertainty around scope of upgrade or replacement	Costs have been estimated based on historical values and our understanding of current market solutions. In the event or cost overruns, priority will be given to business-critical changes	High	High

Table 178 Application Product Upgrades Risks, Mitigations, and Impact

9.2 Infrastructure Upgrades

9.2.1 Overview

Our business applications run on a combination of on-premise and cloud-hosted environments. For our on-premise devices, we need to invest to ensure these continue to support our business needs including security and resilience. This section outlines the funding required to upgrade and maintain support for the devices and IT infrastructure used in delivering our services.

9.2.2 Context

The items included in the scope of the SPEN IT infrastructure and device upgrades are:

- Desktop hardware – including laptops
- Mobile devices – ruggedised laptops and tablets
- Networking and communications hardware
- Servers hosting SPEN Distribution applications

9.2.3 Current state

Below is current breakdown of the device types in use across the SPEN business

Device Type	Device Class	Count
Computer - Laptop	Standard	2421
Computer - Desktop	Standard	413
Computer - Laptop	Rugged	972
Total		**3806**

Table 179 Infrastructure Upgrades Device Types Used Across the SPEN Business

These devices are replaced on a rolling schedule within a year of their warranty end date. This is effectively a 4-year replacement cycle. Device replacements scheduled are outlined below in red.

Class	Device Type	Warranty	Device Count	Replacement 1	Replacement 2
Standard	Computer - Laptop	Pre-2021	423	2021/22	2025/26
Standard	Computer - Desktop	Pre-2021	338	2021/22	2025/26
Rugged	Computer - Laptop	Pre-2021	755	2021/22	2025/26
Standard	Computer - Laptop	2021/22	327	2022/23	2026/27
Standard	Computer - Desktop	2021/22	67	2022/23	2026/27
Rugged	Computer - Laptop	2021/22	8	2022/23	2026/27
Standard	Computer - Laptop	2022/23	410	2023/24	2027/28
Standard	Computer - Desktop	2022/23	0	2023/24	2027/28
Rugged	Computer - Laptop	2022/23	0	2023/24	2027/28
Standard	Computer - Laptop	2023/24	719	2024/25	2028/29
Standard	Computer - Desktop	2023/24	8	2024/25	2028/29
Rugged	Computer - Laptop	2023/24	138	2024/25	2028/29
Standard	Computer - Laptop	2024/25	538	2025/26	2029/30
Standard	Computer - Desktop	2024/25	0	2025/26	2029/30
Rugged	Computer - Laptop	2024/25	71	2025/26	2029/30
Standard	Computer - Laptop	2025/26	4	2026/27	2030/31
Standard	Computer - Desktop	2025/26	0	2026/27	2030/31
Rugged	Computer - Laptop	2025/26	0	2026/27	2030/31
Total			**3806**		

Table 180 Device Replacement Schedule

The device replacement breakdown is outlined below. This includes:

- An additional column to indicate devices for a headcount increase of 427, mostly field workers (226)
- Laptop replacements incorporating a 10% replacement with premium devices – higher specification devices which will be able to run tasks and systems requiring higher computing/processing power e.g., design work

Note: The number of replacements is greater than the total number of existing devices because our 4-year warranty cycle means some devices will be replaced twice in the period.

Year	Device	Replacement	Additional	Total
2023/24	Standard Laptop	369	35	404
2023/24	Premium Laptop	41	-	41
2023/24	Standard Desktop	0	6	6
2023/24	Rugged Laptop/Pad	0	46	46
2024/25	Standard Laptop	648	35	683
2024/25	Premium Laptop	72	-	72
2024/25	Standard Desktop	8	6	14
2024/25	Rugged Laptop/Pad	138	46	184
2025/26	Standard Laptop	865	35	900
2025/26	Premium Laptop	97	-	97
2025/26	Standard Desktop	338	6	344
2025/26	Rugged Laptop/Pad	826	46	872
2026/27	Standard Laptop	298	35	333
2026/27	Premium Laptop	34	-	34
2026/27	Standard Desktop	67	6	73

2026/27	Rugged Laptop/Pad	8	46	54
2027/28	Standard Laptop	404	35	439
2027/28	Premium Laptop	41	-	41
2027/28	Standard Desktop	6	6	12
2027/28	Rugged Laptop/Pad	46	46	92
	Total	**4306**	**435**	**4741**

Table 181 Device Replacement Breakdown

Network and Communications Hardware

Upgrade of networking and communications infrastructure at SPEN Distribution offices and primary substations. Upgrades will be to enable increased networking bandwidth at offices and Wi-Fi enablement of 10% of primary substations

9.2.4 Assumptions and Dependencies

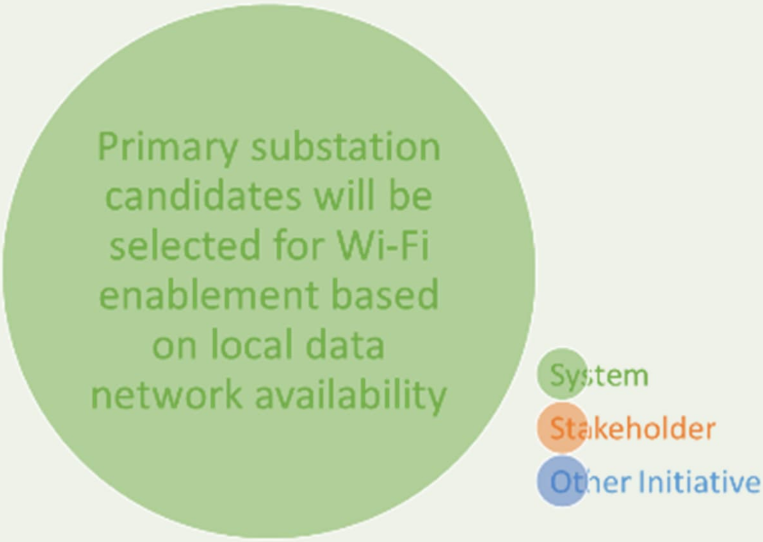


Figure 165 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of Infrastructure Upgrades and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Licensing for server upgrades will be on a like for like basis
Devices will be replaced in relation to warranty cycle as opposed to specific projects or application upgrades
There is projected to be an increase in device count of ~427 spread across device types
10% of annual laptop replacements will be the higher specification units
Server upgrades are aligned with application lifecycles
Costs are for on-premise infrastructure
Server upgrade costs are for physical servers
All SPEN Distribution office locations will require a step upgrade in network bandwidth

Table 182 Infrastructure Upgrade Assumptions

9.2.5 Performance Metrics

Performance will be measured primarily through the percentage of infrastructure that have had successful delivery of a replacement or upgrade.

9.2.6 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Device costs are based on 2021 prices and are therefore subject to fluctuation	Costs have been estimated based on framework agreements and tend to trend downwards	High	Low
2	New applications and technologies e.g., big data, AI, cloud will require further infrastructure investment beyond what is currently planned	Detailed scoping of device and infrastructure requirements will be carried out in advance of deployment and solution will be optimised to prioritise enablement of business-critical applications and infrastructure	Medium	Medium
3	Primary Substations do not have the 4G signal required for Wi-Fi enablement	Conduct up front analysis of substation 4G signal	Medium	Medium
4	Greater than anticipated increase in headcount	Headcount number is current best estimate, if actual is higher, costs will have to be re-prioritised e.g., fewer substations with Wi-Fi enablement	Low	Medium

Table 183 Infrastructure Upgrade Risks, Mitigations, and Impact

9.3 Document Management Systems

9.3.1 Overview

Throughout the lifecycle of any asset, project, stakeholder interaction or customer journey, digital records in the form of documents are created and need to be managed. Data is synchronised with the key “systems of record” for the relevant information but supporting material also needs to be recorded and linked. This project presents the strategy for the management of documentation associated with our activities across our Document Management System (DMS) platforms. Note that the Document Management entry in Section 9.1 refers explicitly to the upgrade of our existing Microsoft Sharepoint solution which is required to maintain support for that platform and is separate from the development of the integrated DMS solution described here.

Our strategy is to deploy the appropriate document management system for the specific use case. So, content to be used as part of a BIM project (see Section 4.1) will require a BIM Common Data Environment (CDE) and this is different to the requirements for the management of content returned from field devices (e.g. video or field returns that are associated with our assets), which in turn is different for the management of content for projects such as this document. This section describes the integration of solutions required to enable this entire content base to be integrated and made available whilst also ensuring the content is appropriately managed.

The management of the content of our document management systems requires consideration of:

- Information classification and data protection requirements including GDPR
- Disaster recovery and business continuity provisions
- Access governance
- Cyber security
- Lifecycle management and retention policies
- Consideration of open data requirements

9.3.2 Current state

Current Position	Change Drivers
We have multiple document management systems used inconsistently and limited capability to sort and extract information from our document repositories.	Our digital records need to be fully aligned with our assets, customers, and stakeholders to enable informed decisions to be taken. The volume of data captured is expected to increase as changes to the network, customer connections and wider stakeholder interactions increase, and it will become more critical that data within our document management systems is easily accessible. Auditable processes for compliance with privacy, security, legal, regulatory rules are required.

Table 184 Document Management Systems Current Position and Change Drivers

Solution

We will review our approach to document management across our operations and consolidate into a defined set of solutions, appropriate to the documentation to be stored.

Rules and processes will be developed that define:

- Documentation to be stored
- Document storage location
- Backup and recovery
- Information classification and any associated regulations
- Access rights and retention, archival and deletion policies
- Workflow to ensure documents are correctly managed

We will evaluate the potential document management solutions including those that we already use (IBM FileNet, Microsoft Sharepoint, Autodesk BIM360, Autodesk Vault, internally developed DocT, internally developed DIMS) to select the most appropriate solution(s) for the relevant documentation sets.

Solutions selected will be integrated with our core systems of record where appropriate and will fully implement our document management rules and workflow processes. Documents will be appropriately tagged and indexed to enable ease of searching and discovery and metadata descriptors will be defined.

We will investigate the use of automated tools to extract information from documents held in the document management system, enabling better visibility and integration with relevant data in other systems.

Key Outcomes

- Improved productivity and reduced time lost from poor document management
- Information fully linked across key systems and available at the point of need
- Ease of access to information held in our document management systems

9.3.3 Delivery Approach and Timeline

Approach	Initiatives
Agile	Document Management System Suite

Figure 166 Document Management Delivery Approach

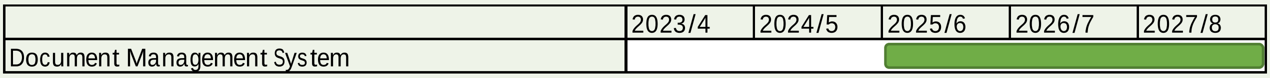


Figure 167 Document Management System Timeline

9.3.4 Assumptions and Dependencies

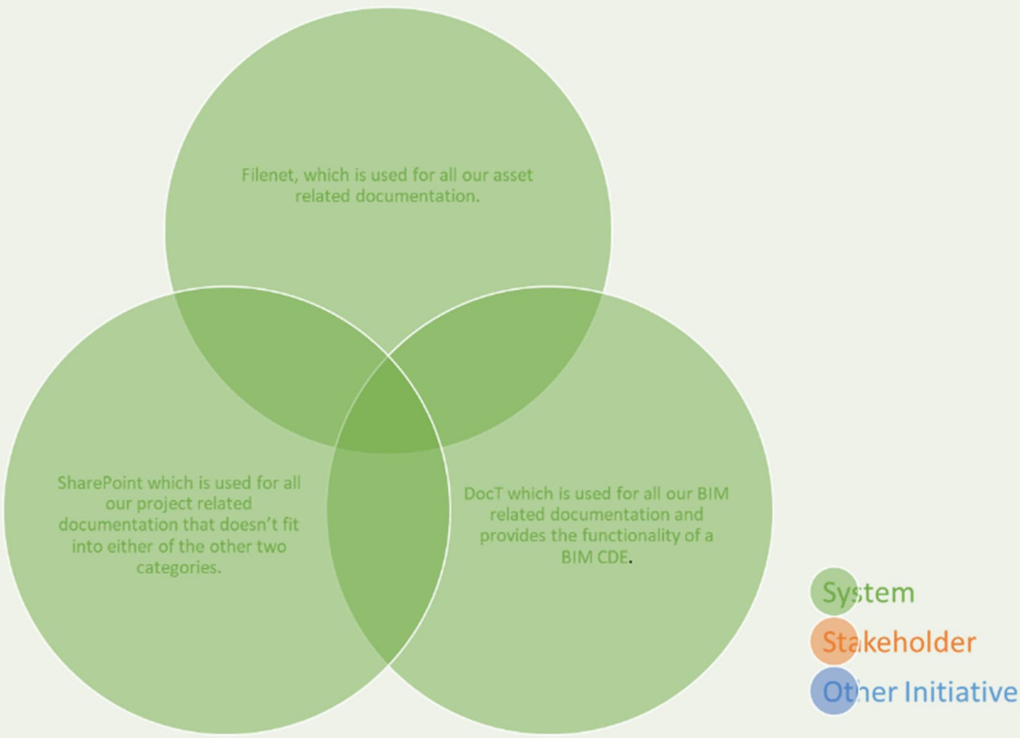


Figure 168 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of Document Management Systems and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Existing corporate suite compatibility

Table 185 Document Management System Assumptions

9.3.5 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Existing platforms and services require extensive integration with existing systems which can be costly and time consuming to deliver	Develop using API standards that can be re-used by multiple applications, reducing cost and speed of delivery	Medium	Low
2	Costs underestimated due to uncertainty around scope of upgrade or replacement	Costs have been estimated based on historical values and our understanding of current market solutions. In the event or cost overruns, priority will be given to business-critical changes	High	High

Table 186 Document Management Systems Risks, Mitigation, and Impact

9.4 Regulatory and Key Systems Enhancements

Our regulatory and key systems are those that we are required to provide by our licence, regulatory or legal obligations, and which enable retail electricity market operation based on our network.

Investment in our regulatory and key systems ensures SPEN adhere to their licence obligations by providing a Meter Point Registration System that is fully compliant with the Common Distribution Charging Methodology, as well as ensuring Durabill, Locus, DF Web and Address Data Quality Management (ADQM) (which holds our Priority Service Register) are maintained and updated with regulatory changes when indicated by Ofgem.

Changes to our regulatory and key systems take place continually. For example, during ED1 we have implemented changes required to enhance our PSR, implement Faster Switching, comply with new GDPR obligations and transition towards half-hourly settlement for non-half-hourly customers. This initiative represents the continuing investment in our regulatory and key systems to maintain compliance and respond to changes to legal and regulatory obligations.

Current Position	Change Drivers
SPEN are compliant of our licence obligations by providing a Meter Point Registration System and are fully compliant with the Common Distribution Charging Methodology. SPEN provides a PSR register.	Regulatory changes must be made in our key systems within the timescales indicated by the Ofgem. For example, the Mandatory Half Hourly Settlements that are expected in 2024, which may also require an interface to corporate SAP system or digital data solution to supply CT ratios needed in this change Increase in PSR Registrations due to ageing population. The traditional view of vulnerability is evolving in line with the changing energy landscape and vulnerability reaches far wider than the standard industry needs codes. There are opportunities to share data (recognising the requirements to respect the privacy of our customers' data) and improve our

	PSR information. Therefore, we are increasing the coverage of our PSR. The Significant Code Review may require changes to our Regulatory and Key Systems but until understood they have not been included.

Table 187 Regulatory and Key Systems Enhancements Current Position and Change Drivers

Solution

SPEN adhere to their licenses obligations by providing and maintaining a Meter Point Registration System as well as Durabill, Locus, DF Web and Address Data Quality Management ADQM.

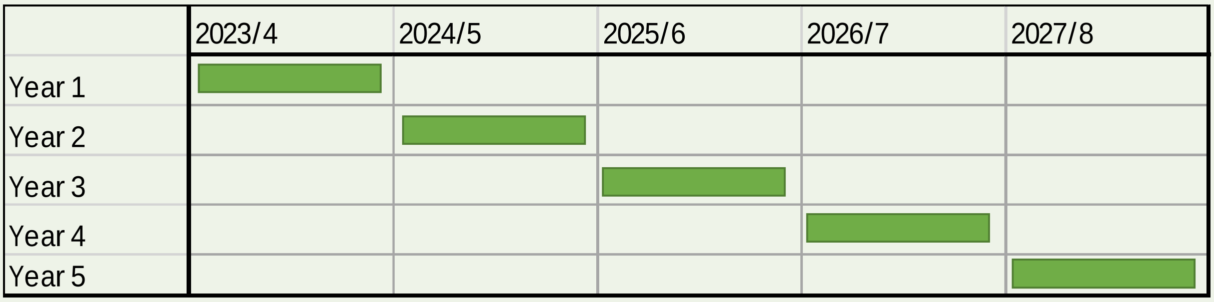
Key Outcomes

- SPEN adhere to license obligations
- SPEN can respond quickly and effectively to industry regulatory changes outlined by Ofgem
- DUoS invoices are calculated and billed correctly, and VAT and Interest rates are accultured correctly
- Unmetered Supply Inventories are processed, and invoices created
- Protection extended to cover more vulnerable customers

9.4.1 Delivery Approach and Timeline

Approach	Initiatives
Waterfall	Regulatory

Figure 169 Document Management Delivery Approach



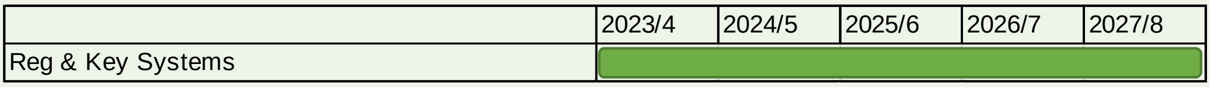


Figure 170 Regulatory and Key Systems Timeline

9.4.2 Assumptions and Dependencies

Figure 171 Dependencies by Type

The diagram above illustrates the Dependencies required for the implementation of Regulatory & Key Systems and breaks down those from other initiatives, Systems and Stakeholders. The table below lists all assumptions that have been made.

Assumptions
Mandatory changes to key systems cannot be assumed however based on previous regulatory changes are expected
Significant Code Review will result in changes to Key and Regulatory Systems

Table 188 Regulatory and Key Systems Enhancement Assumptions

9.4.3 Risks and Mitigations

ID	Risk	Mitigating Actions	Likelihood	Impact
1	Existing platforms and services may require integration with existing systems which can be costly and time consuming to deliver	Develop using API standards that can be re-used by multiple applications, reducing cost and speed of delivery	Medium	Low
2	Costs underestimated due to uncertainty around scope of scope of changes or upgrades needed by SCR impact.	Costs have been estimated based on historical values and our understanding of current market solutions. Costs will be reviewed once SCR changes are confirmed, and a re-opener considered if appropriate	High	High

Table 189 Regulation and Key Systems, Mitigation, and Impact

9.5 RIIO-3 Preparation

9.5.1 Overview

The SPEN Digitalisation Strategy sets out our ambitions for the period 2023 – 2028, however during this period we need to start planning in anticipation of RIIO-3, collating our ideas and proposals and putting forward a new plan. This initiative describes the requirements, strategy, costs, and timelines needed to pull together our RIIO-3 proposal.

9.5.2 Method

Throughout the RIIO-2 period we will continue to update and publish our DSAP online, highlighting our progress and the new initiatives we are working on, seeking feedback from our customers and stakeholders to ensure our development plans are in alignment with their needs and wants. This feedback will be used as the basis for our RIIO-3 plan, together with a process of idea collation, solution proposals and research.

The diagram below demonstrates the continuous iterative and interactive cycle which we will adopt to create our RIIO-3 plan.

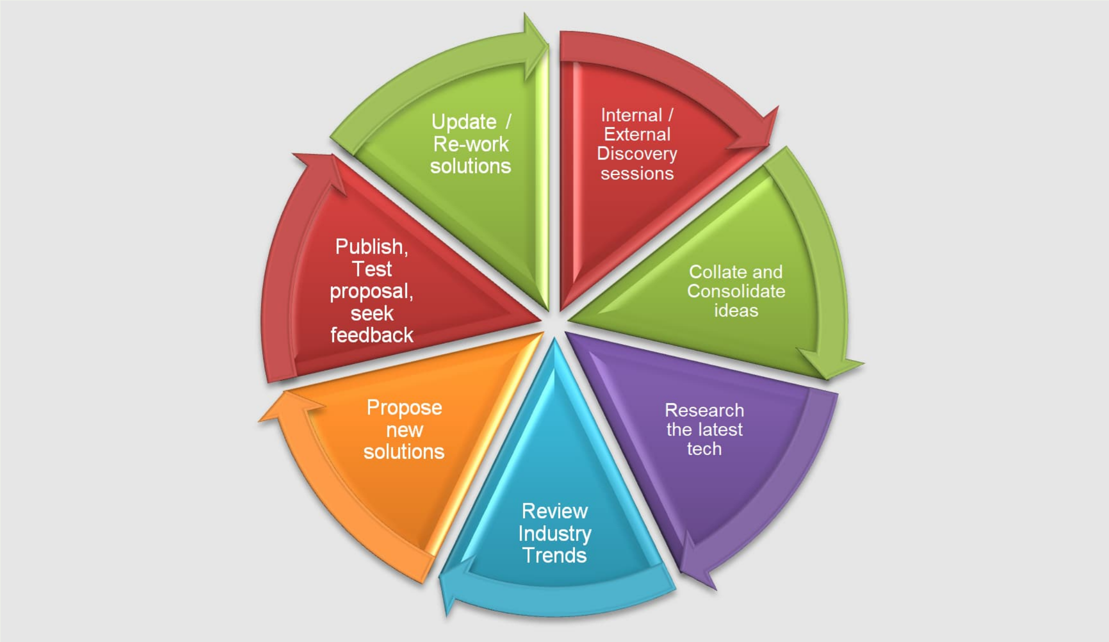


Figure 172 RIIO-3 Preparation Cycle

During this process we will perform an extensive assurance exercise to assess benefits, benchmark costs and ensure we are focusing on the right investments and utilising the right technologies.

9.5.3 Delivery Approach and Timeline

We anticipate a shift towards agile ways of working as a default. We will establish a RIIO-3 team, to work in an agile and collaborative way to compile the plan during RIIO-2.

Approach	Initiatives
Agile	RIIO-3 Preparation

Figure 173 RIIO-ED3 Delivery Approach

	2023/4	2024/5	2025/6	2026/7	2027/8
ED3 Preparation					

Figure 174 RIIO-3 Preparation Timeline

10. Appendices

10.1 Customer Engagement

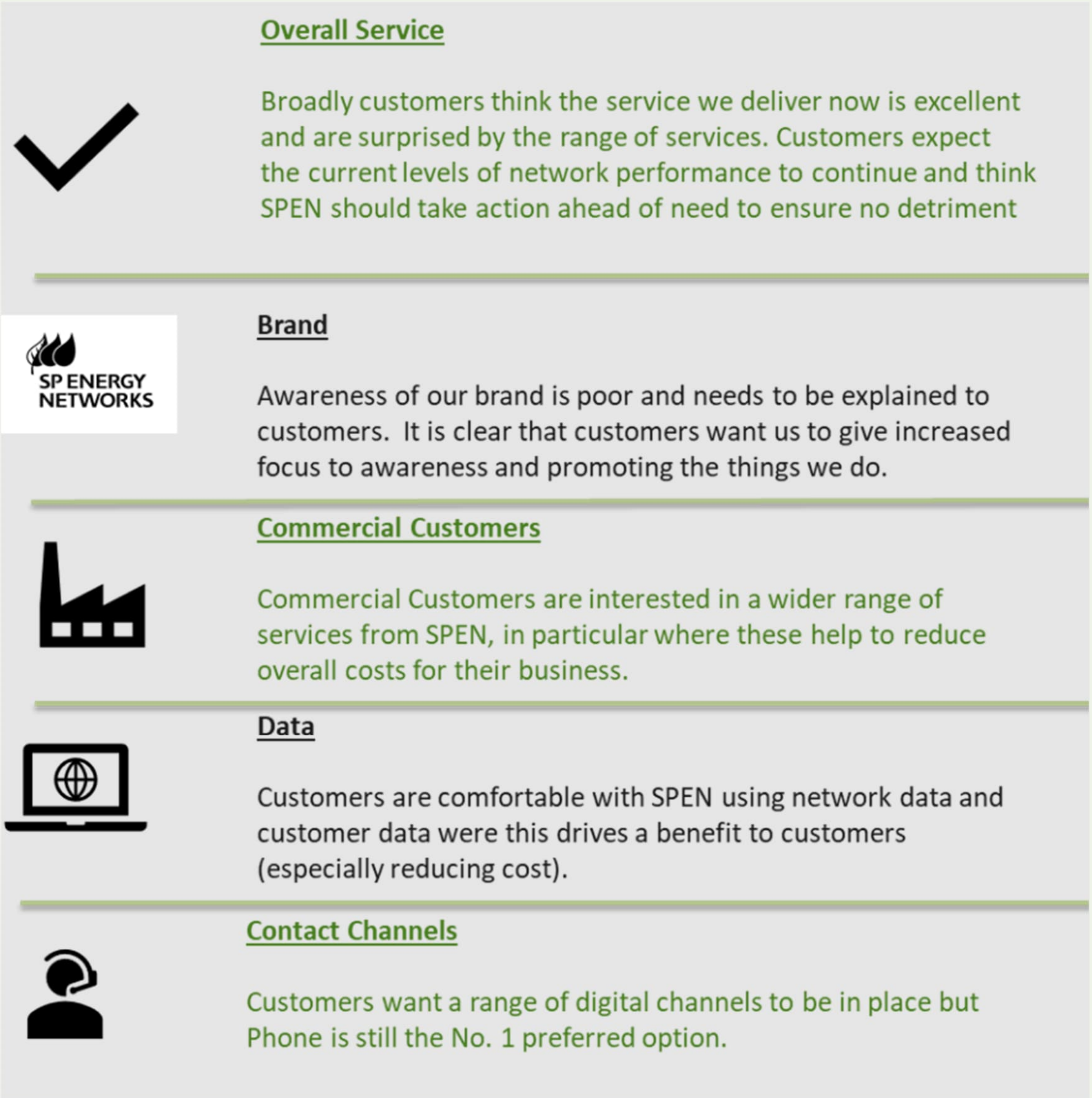


Figure 175 Appendix 1: Customer Engagement Methods pt. 1

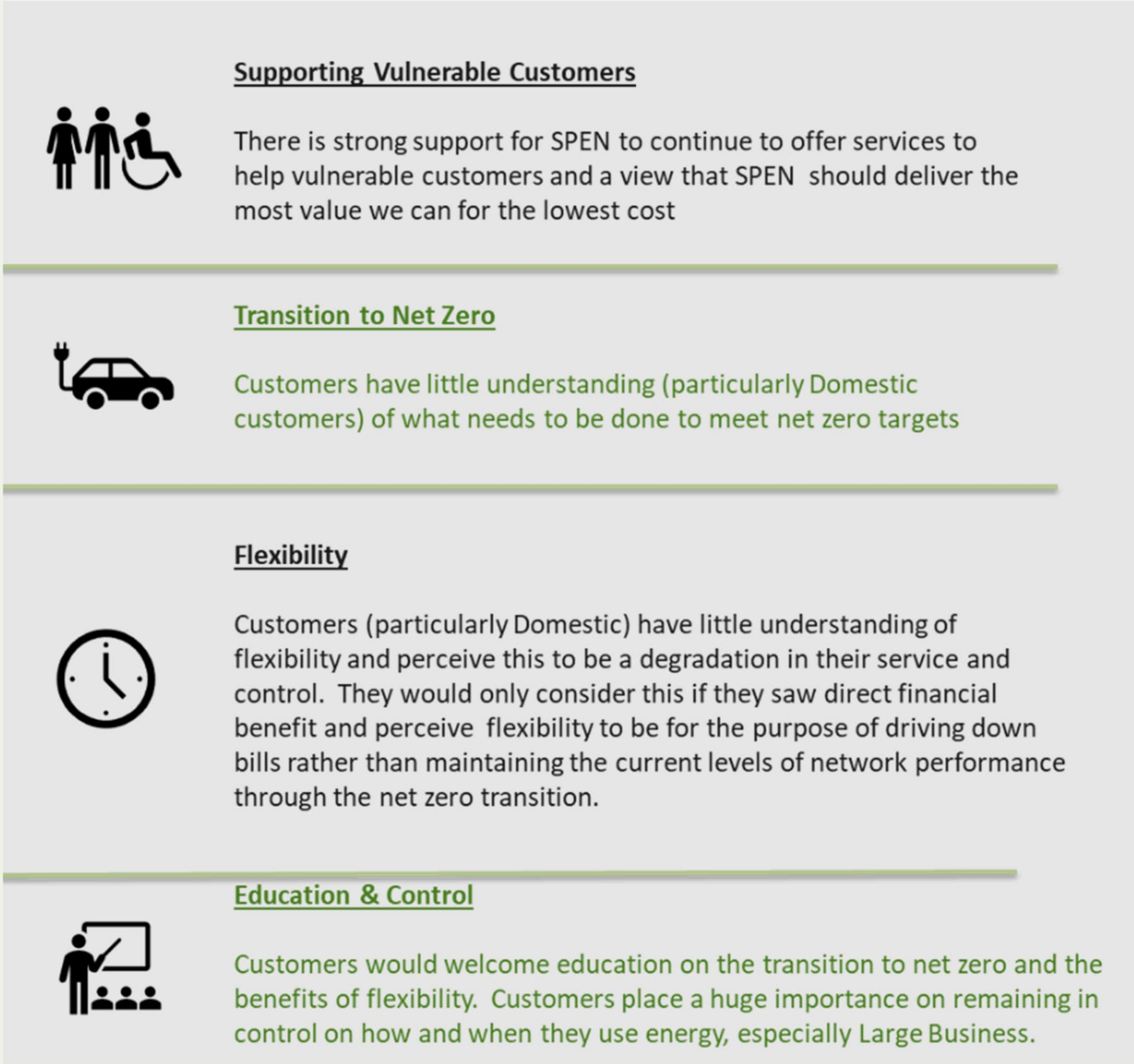


Figure 176 Appendix 1: Customer Engagement Methods pt. 2

10.2 Application Product Upgrades - System List

Application Category	Replace	Upgrade
Asset Management	AssetSync	AutoDesk
	DIRT	FITNESS
	MUC	GIS ESRI
	Quality Checker	ROAMES VWAM
	SAMS	UMV
	Transformer Loadings	Utility Portal - NIU
		Win Debut
Customer Management	SPEN Availability Tracker	iHub
	SPEN Connections Tracker	SPEN Self-Service Portal
	Task Logger	
	UMS Database	

Document Management	Sharepoint (20 sites)	
	SPT-DocuSign	
Fault Management	Angle-DC	Goddess
	Apollo	
	DOP	
	OPD South	
	OPD South Administrator	
Financial	Civil Invoice Tracker	
	Forecast / Income Tracker	
Real Time Systems		D&G Integrated Network Management
		Nevada
		Phoenix
		VISOR
Regulation	BO-Ecoes	@Risk
	BO-MPRS	ADQM
	Debt Manager	CBRM
	DIMS	DFWEB
	TSS	DTN Gateway
		DURABILL
		MPRS
Reporting	OHL NP&R	BO/BW
	Project Wise	Enterprise Architect
		Prolaborate
		Stata
Smart & Emerging Tech		ARC
		ConnectMore
		Energy IP
		Flexible Networks
		LV Engine
		Mathcad
		Migrate
		Navi
		SDIF
Work Management Planning	Process Assurance	

Table 190 Appendix 2: Application Product Upgrades - System List

10.3 Glossary

Agile	Agile Software Development refers to the project management approach of developing increments of software in frequent iterations based on evolving requirements.
Athos	Current CRM system used by SP Energy Networks
Benchmarking	The process used to compare a company's performance (e.g., its costs) to that of best practice or to average levels within the sector
Bilateral Contracts	Two sided contracts which contain terms of reference to both parties involved and to which they are bound
Blacklining	Changes to mapping features directly edited into the core GIS platform with no QA/QC or authorisation process
Capex	Capital Expenditure - Expenditure on investment in long-lived network assets, such as underground cables, overhead electricity lines and substations.
Carbon Footprint	Total amount of greenhouse gas emission caused directly and indirectly by a business or activity.
Carbon Price	A carbon price is a term for a value applied to each unit of carbon emissions. A carbon price can be set by differing methods, such as by the social cost of carbon.
Condition based risk management (CBRM)	A software solution commonly used by distribution licensees to calculate and monitor the risk of distribution network assets.
Data Lake	A centralised repository that allows storage of all structured and unstructured data at any scale.
Decarbonisation	The process to reduce the amount of carbon dioxide (CO2) and other greenhouse gas emissions by introducing new low carbon alternatives and technologies. Much of the decarbonisation strategy is based on switching carbon energy vectors (e.g., petrol and diesel for transport, and natural gas and oil for heating) to electricity, and then using renewable generation to provide zero carbon electricity.
Decentralisation	This reflects the extent to which generation is sited closer to demand consumption (or is even undertaken by consumers themselves) via the use of smaller-scale technologies such as solar PV and local energy storage. A less decentralised system would be characterised by fewer, larger-scale generators sited further from where the electricity is ultimately consumed (demand); a more decentralised system would be characterised by more, smaller-scale generators sited closer to demand.
Depreciation	Depreciation is a measure of the consumption, use or wearing out of an asset over the period of its economic life.
Digital Twin	A digital twin is virtual representation of a physical object or process that simulates relevant aspects of behaviour to enable forecasting, scenario modelling and optimisation.
Digitalisation	the use of digital technologies to change an organisation's operating model and provide new revenue or equivalent value-creating opportunities; it is the process of moving to a digital business/organisation.
Digitalised	Elements of an organisation's operating model that have been through Digitalisation.

Distributed Generation	Any generation which is connected directly to the local distribution network, as opposed to the transmission network, as well as combined heat and power schemes of any scale. The electricity generated by such schemes is typically used in the local system rather than being transported across the UK.
Fuel Poverty	A fuel poor household is defined as one that needs to spend 10% or more of their household income on all fuel use in order to maintain a satisfactory heating regime.
Opex	Operating Expenditure - Expenditure on operating and maintaining the network, e.g., fault repair, tree cutting, inspection and maintenance, engineering, and business support costs.
Persona	Fictional characters, which are created based upon research in order to represent the different user types that might use a service, product, site, or brand in a similar way.
Products and Services	Anything that a party can offer to a market for attention, acquisition, use or consumption that could satisfy a need or want.
Public Interest	The welfare or well-being of the general public and society
Redlining	Changes to mapping features captured using mark-up tools into the core GIS platform. Redlined changes are QA/QC checked and authorised prior to becoming part of the base data
Re-openers	A mechanism used by Ofgem to alter or re-set the revenue allowances (or the parameters that give rise to revenue allowances) under a price control before the next scheduled price control review.
RIIO-ED2	Means the distribution network price control period which runs from 1st April 2023 to 31st March 2028. Before this period starts, we will agree with Ofgem the outputs we will deliver during this period, and the funding, incentives, and penalties for delivering those outputs.
Scrum	Scrum is the most widely used framework under the Agile umbrella. Scrum is an iterative software model that follows a set of predefined roles, responsibilities, and meetings. In Scrum, iterations are called sprints and are assigned a fixed length—sprints typically last one to two weeks but can last as long a month.
Scrum Master	The Scrum Master is often viewed as the coach for the team. He or she organises meetings, resolves roadblocks and issues, and works with the product owner to make sure the product backlog is up to date. The Scrum Master does not have any authority over team members, however, he or she does have authority over the process. A Scrum Master may complete formal training to become a certified Scrum Master, but this is not required.
Smart grid	A Smart grid is an electricity network that can intelligently integrate the actions of all the users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic, and secure electricity supplies.
Smart metering	Advanced gas and electricity metering technology that offers customers more information about, and control over, their energy use (such as providing information on total energy consumption in terms of value, not only volume), and/or allows automated and remote measurement.
Sprint	A sprint is a fixed-length iteration during which one user story or product backlog item (PBI) is transformed into a potentially shippable deliverable. Each sprint is assigned a set amount of time to be accomplished, which could be anywhere from one week to one month, but typically lasts two weeks.

Stakeholder	Stakeholders are those parties that are affected by, or represent those affected by, decisions made by network companies and Ofgem. As well as consumers, this would for example include Government and environmental groups, academia, expert groups etc.
Substation	A building or outdoor compound which contains one or more transformers and switchgear protection. The primary purpose of a substation is to change the network power flow from one voltage level to another. In a primary substation the highest voltage is EHV (primary substations are typically 33kV/11kV); in a secondary substation the highest voltage is HV (primary substations are typically 11kV/LV).
Supply chain	Refers to all the actors involved in the delivery of electricity and gas to the final consumers - from electricity generators and gas shippers, through to electricity and gas suppliers.
Totex	Total Expenditure – (Capex + Opex)
Uncertainty mechanisms	Uncertainty mechanisms allow changes to the base revenue during the price control period to reflect significant cost changes that are expected to be outside the company’s control. Examples include revenue triggers and volume drivers.
Waterfall	The waterfall model is a breakdown of project activities into linear sequential phases, where each phase depends on the deliverables of the previous one and corresponds to a specialisation of tasks. In software development, it tends to be among the less iterative and flexible approaches, as progress flows in largely one direction ("downwards" like a waterfall) through the phases of conception, initiation, analysis, design, construction, testing, deployment, and maintenance.

Table 191 Glossary

10.4 List of Abbreviations

2D	Two dimensional
3D	Three dimensional
5G	Fifth generation technology standard for broadband cellular networks
ADF	Azure Data Factory
ADFS	Active Directory Federation Service
ADMD	After Diversity Maximum Demand
ADQM	Address Data Quality Management
AI	Artificial Intelligence
ANM	Active Network Management
AR	Augmented Reality
ASHP	Air Source Heat Pump
API	Application Programming Interface (a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service)
ASR	Automatic Speech Recognition
AWS	Amazon Web Services
BaU	Business as Usual
BEIS	Department for Business, Energy & Industrial Strategy (now Department for Energy, Security & Net Zero – see **DESNZ**)
BIM	Building Information Modelling
BO	Business Objects
BW	Business Warehouse
C&P	Commercial & Performance (Team)
CBA	Cost/Benefit Analysis
CAGR	Compound Annual Growth Rate
CC	The Competition Commission
CCS	Carbon Capture and Storage
CBRM	Condition Based Risk Management
CDBB	Centre for Digital Built Britain
CDCM	Common Distribution Charging Methodology
CDLS	Cloud Data Lake Storage
CDM	Canonical Data Model
CDO	Chief Data Officer
CGI	Computer Generated Imagery
CHP	Combined Heat and Power. The simultaneous generation of usable heat and power (usually electricity) in a single process, thereby leading to reductions in the amount of wasted heat
CERT	Carbon Emissions Reduction Target

CIM	Common Information Model
CI / CML	Customer Interruptions / Customer Minutes Lost
CIO	Chief Information Officer
CMA	Competition and Markets Authority
CMZ	Constraint Management Zone
CNI	Critical National Infrastructure
CO_2	Carbon Dioxide
CoE	Centre of Excellence
CoP	Code of Practice
C-SAT	Customer Satisfaction
CRM	Customer Relationship Management
DAG	Data Assurance Guidance
DDSG	Data and Digitalisation Steering Group
DECC	Department of Energy & Climate Change. Became a part of BEIS in July 2016
DEFRA	Department of Environment, Food and Rural Affairs
DEM	Digital Elevation Model
DER	Distributed Energy Resources
DESNZ	Department for Energy, Security and Net Zero
DFES	Distribution Future Energy Scenarios
DG	Distributed Generation
DMS	Document Management System
DNO	Distribution Network Operator
DOM	Document Object Model
DPA	Data Protection Act
DQM	Data Quality Management
DSAP	Digitalisation Strategy & Action Plan
DSO	Distribution System Operator
DW	Data Warehouse
EA	Enterprise Architect (product by Sparx Systems)
E2E	End-to-End
ED1	Electricity Distribution price control 1 (2015-2023)
ED2	Electricity Distribution price control 2 (2023-2028)
EDCM	Extra High Voltage Distribution Charging Methodology
EDiT	Energy Digitalisation Taskforce (successor to EDTF)
EDTF	Energy Data Task Force
EHV	Extra High Voltage (33kV & above)
ENA	Energy Networks Association
ENZP	Engineering Net Zero Platform

ESB	Enterprise Service Bus
ESO	Electricity System Operator
ESRI	Environmental Systems Research Institute
ETL	Extract Transform Load
EV	Electric Vehicle
FSPs	Flexibility Service Providers
FTE	Full-time equivalent (employees)
FWMS	Field Work Management System
GDPR	General Data Protection Regulation
GIS	Geographical Information System
GPS	Geographical Positioning System
GSHP	Ground Source Heat Pump
HDFS	Hadoop Distributed File System
H&S	Health & Safety
HSE	The Health & Safety Executive
HV	High Voltage (voltages between 1kV and 20kV)
ICE	Incentive on Connections Engagement
ICP	Independent Connections Provider
IDC	International Data Corporation
IDNO	Independent Distribution Network Operator
ID&V	Identity and Verification
IEC	International Electrotechnical Commission
INM	Integrated Network Model
IoT	Internet of Things
IPRs	Intellectual Property Rights
IT	Information Technology
IVR	Interactive Voice Response
KPI	Key Performance Indicators
LCT	Low Carbon Technology
LiDAR	Light Detection and Ranging
LV	Low Voltage (all voltages up to and including 1kV)
MDM	Master Data Management
MEDA	Modernising Energy Data Access
ML	Machine Learning
MPP	Massive Parallel Processing
MPRS	Meter Point Registration System
MVP	Minimum Viable Product
NAMS	Networks Asset Management System
NAVI	Network Analyse & View

NCEWS	New Connections Early Warning System
NDTp	National Digital Twin programme
NDVI	Normalised Difference Vegetation Index
NESM	National Energy System Map
NGET	National Grid Electricity Transmission
NIA	Network Innovation Allowance
NIC	Network Innovation Competition
NMS	Network Management Systems
NP&R	Network Planning & Regulation (Team)
NRSWA	New Roads and Street Works Act
NVDI	Normalised Difference Vegetation Index
OFGEM	Office of Gas and Electricity Markets
OT	Operational Technology
P.A.	Per Annum
PaaS	Platform as a Service
PbD	Privacy by Design
PBI	Product Backlog Item
PCT	Project Change Triangle
PoC	Proof of Concept
PSR	Priority Service Register
PV	Photovoltaic
QA	Quality Assurance
QbD	Quality by Design
QR Code	Quick Response Code
R&D	Research & Development
RAdAR	Register of Adopted Asset Requests
RAID (log)	Risks Assumptions, Issues & Dependencies
RFID tag	Radio Frequency Identification (a type of tracking system that uses smart barcodes in order to identify items)
RIIO	Revenue = Incentives + Innovation + Outputs
ROI	Return on Investment
RPA	Robotic Process Automation
RPI	Retail Price Index
RRP	Regulatory Reporting Pack - The price control review information submitted annually to Ofgem under standard licence condition 52 in accordance with (and in the form and content prescribed by) the price control review reporting rules.
RSS Feed	Really Simple Syndication (web feed that allows users and applications to access updates to websites in a standardised, computer-readable format)
RTS	Real Time Systems

SaaS	Software as a Service
SAP	**S**ystems, **A**pplications, and **P**roducts in Data Processing
SAP PM	Plant Maintenance module in **SAP**
SAP PPM	Project Portfolio Management module in **SAP**
SAP RE	Real Estate module in **SAP**
SbD	Security by Design
SCADA	Supervisory Control and Data Acquisition
SCSS	Supply Chain Sustainability School
SDIF	Smart Data Integration Fabric
SEAL	Scalable Enterprise Analytics Lifecycle
SGAM	Smart Grid Architecture Model
SGO	Smart Grid Operations (Team)
SLA	Service Level Agreement
SMART	Specific Measurable Achievable Realistic Timely
SME	Subject Matter Expert
SMS (Message)	Short Message Service (Text)
SPD	ScottishPower Distribution
SPEN	ScottishPower Energy Networks
SPM	ScottishPower Manweb
SPT	ScottishPower Transmission
SQL	Structured Query Language
SSMD	Sector Specific Methodology Determination
SSO	Single Sign-on
UAV	Unmanned Aerial Vehicle
UML	Unified Modelling Language
UMV	Utility Map Viewer
VMS	Vegetation Management System
VR	Virtual Reality
VWAM	Virtual World Asset Model
WBS	Work Breakdown Structure
WPA	Work Programme Administrator

Table 192 Abbreviations


SP ENERGY
NETWORKS