Innovation Strategy

Contents

Executive Summary

SP Energy Networks has a key part to play in enabling Net Zero; from connecting new renewable energy sources to our network and enabling them, to supplying the growing demand across our licence area and beyond. In addition, we work with the National Energy System Operator (NESO), maintaining the stability of the transmission network in increasingly challenging generation/demand scenarios.

Innovation is fundamental to achieving Net Zero and we have laid out in this Annex what we have achieved in RIIO-T2 as well as the innovation activity that requires innovation stimulus under the Network Innovation Allowance (NIA) mechanism in RIIO-T3. In addition, we have outlined the 'BaU Innovation' activity proposed in RIIO-T3, which is detailed across the wider Business Plan.

Our RIIO-T3 Ambition

Our stakeholders have told us we should utilise innovation to deliver on our business plan ambition and to address key challenges. We know we must increase activity in RIIO-T3 across both our Totex and stimuli-funded innovation if we are to deliver the Net Zero transition at pace and at the lowest cost for customers, whilst minimising climate impacts and ensuring the security and reliability of our network.

Through listening to our internal and external stakeholders and carrying out a prioritisation process considering the key challenges that require innovation, we have proposed £22.45m as our RIIO-T3 Network Innovation Allowance (NIA); a 34% increase compared to our RIIO-T2 NIA funding request.

In addition, we are also investing over £380m in RIIO-T3 into innovative activities via our Totex allowance. Finally, we will continue to actively participate in the Strategic Innovation Fund (SIF) challenges, building upon our strong track record of collaboration and successful delivery through this funding mechanism in RIIO-T2.

Our RIIO-T3 Innovation Areas of Focus

We have distilled our RIIO-T3 innovation activities into four Areas of Focus (AoF):

- **Ready**. We will focus on innovation activities that prepare us for, and accelerate the pace to, achieving a low-carbon energy system which is affordable for the consumer.

- **Resilient**. We will focus on innovation which seeks to deliver a network which is both secure and adaptive, protected against holistic threats to disruption.

- **Reliable.** We will focus on innovation which provides our customers with a high quality of service across all interactions and engagements, tailored to customer's needs and challenges.

- **Responsible.** We will focus on innovation which will drive efficiency across our services in order to minimise the cost of Net Zero to our consumers and network users.

Each of these areas of focus targets one of the 4 x RIIO-3 Outcomes. (Figure 5 in Section 02, below, shows the RIIO-3 Outcome that each AoF seeks to pursue). The specific activities we plan to deliver across both Totex and stimuli-funded innovation can be found in Section 2 of this document, including the specific problems we aim to solve and their associated cost and expected benefits.

Our RIIO-T2 Track Record

During RIIO-T2, we have managed an innovation-stimulus portfolio of 32 projects. In addition, we have worked to deploy innovation using Totex; through rolling out previously proven projects and implementing innovative methods to improve efficiency and adopt technologies. In summary:

- Our £13.5m NIA RIIO-T2 allowance has resulted in a portfolio projected to deliver significant benefits if deployed into SPEN business as usual (BaU). These include reducing the risk of cyber incidents from our Cyber-SAFEN and Cyber-RIAST projects and reducing the restoration time after blackouts from our HiL Simulator project.

- Our SIF awarded funding of £20.3m has allowed us to progress high risk projects which, if rolled-out, will deliver significant benefits (c. £700m) over their lifetime, and potential benefits of over £3bn across the same period if rolled out at a national scale - £2.2bn of which being associated with our Flexible Railway Energy Hubs project (see section 1.2.1).

- Our Totex funded projects are also projected to deliver significant benefits to our network and consumers. Our deployment of synchronous and hybrid synchronous compensators is projected to deliver £20-30m in net customer benefits by the end of RIIO-T3, providing a boundary uplift of up to 280MW on the transmission network boundary B6 (see section 1.2.2).

Our Focus on Stakeholder Engagement & Collaboration

Engagement with our stakeholders has been critical to developing and delivering our innovation strategy. We have undertaken widespread engagement with diverse groups, ranging from innovators, academia and research bodies to other licensed networks, industry bodies and local and national government. Our partnerships with the Energy Networks Association (ENA) and Energy Innovation Centre (EIC) have been pertinent to us understanding and tackling industry-wide challenges as well as collaborating and sharing knowledge with our counterparts across the country.

Equally, as innovation is inherently underpinned by the organisation's strategic challenges, we are in constant engagement with our colleagues from around the business to identify opportunities for innovation. Paired with feedback and challenge from our Independent Net Zero Advisory Council (INZAC), the outputs of this engagement (detailed in Section 2.1.3) were key to developing our RIIO-T3 strategy.

In RIIO-T3, we will expand the involvement of diverse, pertinent stakeholders in our innovation space, aiming to harness the expertise and resources of external organisations to drive our strategy forward. This includes strengthening our existing relationships with key

stakeholders and establishing new relationships with emerging grid user groups, such as data centres.

Annex Structure

To demonstrate what we have achieved during RIIO-T2, provide further detail to support the Innovation Strategy presented in our main Business Plan document, and finally outline the underpinning governance and processes to achieving our strategy, we have organised this Annex in three sections:

01   Our RIIO-T2 Journey

- Our journey through RIIO-T2 across NIA, SIF and our Totex allowance, including case studies, projects and benefits
- Our plan for the remaining 18 months of the RIIO-T2 period

02   Our RIIO-T3 Innovation Strategy

- How we engaged with our stakeholders to create the strategy
- Demonstrating what influences and practices we used to define our innovation outlook and what conclusions we drew from this process
- Presenting what we have chosen to focus on because of this process and what work we have undertaken in RIIO-T2 to develop a strong foundation for RIIO-T3
- Detailing what activities we have identified in each area of focus and the rationale as to why NIA is necessary in realising the activity potential

03   How we Deliver, Report & Deploy Innovation

- How we work through the innovation project life cycle, including how we roll-out innovation into our business and how we disseminate our learnings (including insights from halted projects)
- How we plan to enhance our existing processes for RIIO-T3

Linking our Innovation Annex with Ofgem's Business Plan Guidance

We have carefully reviewed Ofgem's Business Plan Guidance for RIIO-3, and ensured we address all requirements related to Innovation. A table can be found in Appendix C which links each minimum requirement in the guidance to a section in this document.

1.   Our RIIO-T2 Journey

To provide confidence and ensure credibility in our RIIO-T3 (henceforth noted as "T3") strategy, in this section we explore the current need for innovation to address key sector challenges, what we have delivered during RIIO-T2 (henceforth noted as "T2"), and our remaining priorities for the period.

1.1.   We Understand the Need for Innovation

Great Britain's transmission network needs to undergo unprecedented expansion, as our economy electrifies to deliver energy security and Net Zero. With the increasing shift towards electrification of transport, heating and industrial processes, a significant amount of additional grid capacity is required. With the perspective of an average peak winter demand of 5GW, we anticipate that 42GW of generation capacity is scheduled to be added to the SP Transmission (SPT) network during T3.

To deliver this expansion in time, we need to significantly reduce the current end-to-end build time for transmission infrastructure. The Electricity Network Commissioner's report and subsequent publication of the Transmission Acceleration Action Plan (TAAP)[1] noted that the current process for building transmission infrastructure takes 12-14 years, whilst identifying a need to reduce this to 7 years.

There is uncertainty in how the transition will occur, which translates into challenges in managing the energy system as we see changes to the location of electricity generation, increased electricity demand, a decline in natural gas demand and a role for hydrogen to support decarbonisation. Key challenges include:

1. Scaling Up Infrastructure Development: To meet the demands of the net-zero transition, a significant increase in the volume and pace of new and upgraded electricity infrastructure is necessary. Innovation will be crucial in finding faster, more efficient ways to design, approve, and build these projects. We also need to ensure we leverage new technologies that allows us to maximise existing capacity while reducing or delaying the need of conventional reinforcement.

2. Strategic and Coordinated Planning: Developing and implementing strategic network plans, such as the Strategic Spatial Energy Plan (SSEP) and Centralised Strategic Network Plan (CSNP)[2], will involve innovative approaches to planning and coordination, working with the NESO. This will include integrating new technologies and data analytics to optimise the placement and timing of infrastructure investments while balancing regional needs.

3. Addressing Supply Chain Challenges: With global supply chain constraints affecting infrastructure projects, innovation will be needed to mitigate these challenges. This might involve new procurement strategies and engagement models with suppliers to secure necessary resources and capabilities. This also includes exploring how we can reduce

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[1] Transmission Acceleration Action Plan: Government response to the Electricity Networks Commissioner's report on accelerating electricity transmission network build (publishing.service.gov.uk)

[2] Decision on the framework for the Future System Operator's Centralised Strategic Network Plan | Ofgem

carbon emissions related to our supply chain, aligned with our sustainability commitments.

4. Enhancing System Resilience and Security: As the energy system evolves, the network must remain resilient to physical, financial, and cyber risks. Innovation in areas such as cybersecurity, asset management, and climate adaptation will be essential to ensure the network can withstand these threats while maintaining a reliable electricity supply.

5. Balancing Cost Efficiency with Future-Proofing: Achieving Net Zero goals while keeping costs low for consumers requires innovative investment strategies. This includes exploring ways to "future-proof" the network by investing ahead of demand and incorporating flexibility into the infrastructure to accommodate future technological advancements and changes in energy demand.

1.2. Our Track Record

In our T2 strategy we set out our commitment to deliver an innovation portfolio that was balanced across four technical clusters, as per Figure 1.
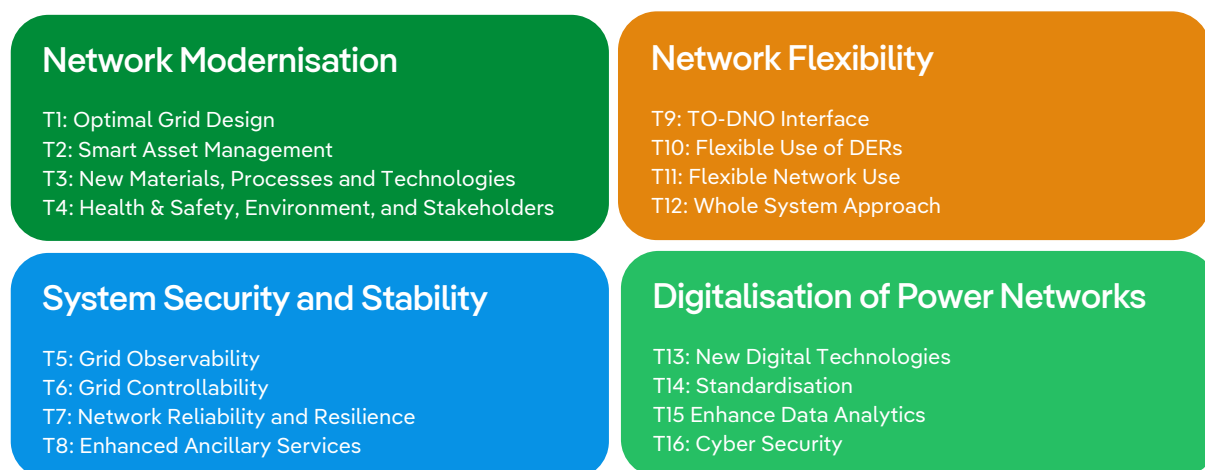
Network Modernisation

T1: Optimal Grid Design
T2: Smart Asset Management
T3: New Materials, Processes and Technologies
T4: Health & Safety, Environment, and Stakeholders

Network Flexibility

T9: TO-DNO Interface
T10: Flexible Use of DERs
T11: Flexible Network Use
T12: Whole System Approach

System Security and Stability

T5: Grid Observability
T6: Grid Controllability
T7: Network Reliability and Resilience
T8: Enhanced Ancillary Services

Digitalisation of Power Networks

T13: New Digital Technologies
T14: Standardisation
T15 Enhance Data Analytics
T16: Cyber Security

Figure 1. T2 Innovation Strategy comprised of 4 clusters and 16 themes

In this section, we showcase the activities and benefits we have delivered through our innovation work in T2, including key learnings which have informed our future strategy. Our innovation portfolio includes projects using both our Totex funding, as well as those funded using innovation stimuli through our Network Innovation Allowance (NIA) and secured through the Strategic Innovation Fund (SIF).

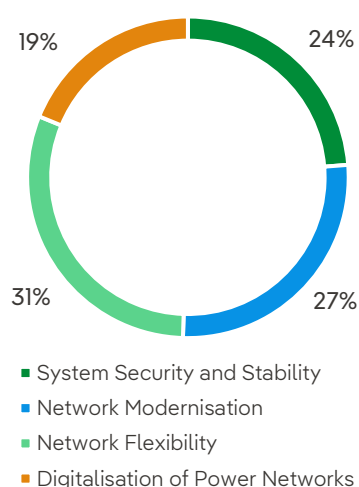### 1.2.1. RIIO-T2 stimulus funded innovation delivery

We have a dedicated innovation team who secure and leverage innovation stimulus funding to develop and prove high-risk and/or longer-term innovation through the NIA and SIF.

During T2, we are working to deliver a highly ambitious portfolio comprising 32 projects split between the NIA and SIF funding mechanisms. In addition, we have supported a further 8 NIA projects and 4 SIF projects led by other Licence Network Operators (LNOs). In Table 1, we show how many NIA and SIF projects we have started or completed, alongside our planned projects for NIA until the end of RIIO-2 and a SIF project forecast based on past performance.

Funding source	Status	Number of projects	Investment allowance (£m)
NIA	In flight/closed	15	9.2
	Planned	6	4.3
SIF	In flight/closed	17	20.3
	Forecast	15	-

Table 1. Overview of T2 innovation portfolio

T2 NIA + SIF Innovation Funding Profile

- 24%
- 27%
- 31%
- 19%

- System Security and Stability
- Network Modernisation
- Network Flexibility
- Digitalisation of Power Networks

As illustrated in Figure 2, our existing portfolio of in-flight and planned NIA and SIF projects show that we have a strong balance across our T2 clusters This demonstrates how we have delivered against our T2 strategy, increasing our Network Flexibility spend as we adopt a whole system approach and interact more with DNOs and DSOs., while setting us up for success for delivery in T3.

In Table 2 below, we have highlighted the outcomes of projects being delivered under each T2 cluster and how they are contributing to accelerating decarbonisation and enhancing digitalisation whilst maintaining a secure, reliable, efficient, and sustainable network for future generations.

Figure 2. T2 NIA + SIF Funding Profile

Cluster	Project examples and outcomes
Network modernisation	As part of this cluster, our **BIM project** will lead to biodiversity and land use emission considerations to improve environmental outcomes and better compliance with regulations and Net Zero greenhouse gas (GHG) ambitions. The **SF6 Retrofill project** will ensure the grid of tomorrow minimises the harmful effect of greenhouse gases on the environment. Together, these projects ensure we meet our Net Zero goals responsibly, minimising costs and maximising benefits for our network users.
System Security & Stability	**Automated system restoration procedures** based on real-time data and predictive algorithms, ensuring a swift and efficient response during power outages. **Advanced modelling of converter-dominated power networks** will allow us to understand the impact as the makeup of our network changes with power electronic devices. **Project Synthesis** will research the viability of a range of technologies to act as network frequency response services across various timescales increasing the quality of service provided.
Network Flexibility	The **Flexible Railway Hubs project** will demonstrate the flexibility that can be provided by the single largest energy user, Network Rail. Projects enabling **data sharing for flexibility** use cases are crucial for

	reducing network stress and optimising investment strategies. By integrating these innovative approaches, we aim to create a transmission network that is not only cost-effective but also robust enough to meet the demands of a low-cost transition to Net Zero by 2035.
Digitalisation of Power Networks	We will deliver **Predict4Resiliance** which will provide better customer service through adverse weather events that affect the network, getting customers restored quicker. We will link various energy vectors through **advanced digitalisation and data sharing** to improve collaboration and enhance cross-sector communication and coordination. **Cyber security** focused projects such as Cyber-SAFEN will enhance our ability to monitor and maintain network integrity and protect against increasing cyber threats. The projects delivered through this cluster will fortify our network's resilience, ensuring it can withstand the changing physical and cyber environment while accommodating changes to the network.

Table 2: Outcomes from T2 Clusters

NIA projects

We anticipate utilising 98% of our T2 NIA allowance of £13.5m through both in-flight projects and new projects yet to be initiated in the remaining 18 months, making use of Carry-over Network Innovation Allowance (CNIA) where required.

Some key NIA projects, learnings and outcomes from our T2 portfolio include:

HiL Simulator (NIA_SPEN_11098)

In partnership with GE, this project seeks to deliver a Glasgow-based operational training simulator and associated training for all TO and DSO control engineers to improve practical skills and knowledge related to real time power system Electricity System Restoration Services (ESRS) operation.

The (main) simulator scenario(s) "Restoration" will deal with a coordinated system restoration after a blackout of the implemented Electricity System Restoration Zones. The goal is to bring the system back to a safe state with no violations of operational criteria. If deployed, this training simulator would help to minimise restoration times in the event of a blackout, leading to significant socio-economic benefits.

Landslide Protection Asset (NIA_SPEN_0075)

Landslides or landslips are a relatively rare event, but their impact can be catastrophic. In the recent past Scotland has experienced landslides which have caused serious impact to road and rail infrastructure.

This project is studying the vulnerability of the transmission network to damage from landslips, landslides and prove the use of a landslide protection system. The key benefit is to reduce the likelihood of damage to our Overhead Line assets and therefore reducing outages and supply interruptions, with estimated benefits of £1m per avoided incident.

Cyber security for active and flexible energy networks (NIA_SPEN_0064)

A report published by the International Energy Agency (IEA) shows that utility companies were the target of over 1,100 cyber-attacks per week, on average in 2022. This is highly likely to have significantly increased in 2023-2024.

Cyber-SAFEN will demonstrate an integrated cyber defence (ICD) platform to provide a foundation on which to build essential cyber safe and resilient functions for electricity network PAC, WAMS and SCADA systems against advanced cyber-attacks.

It focuses on combining an intrusion detection system (IDS) with an intrusion response system (IRS) powered by advanced AI and machine learning technologies to build a dual defence system against advanced cyber threats. The key benefits realised by undertaking this project include:

- Reduced risk of outages and damage caused by cyber attacks
- Enable increased digitalisation and automation across the network
- Builds a secure and resilient platform on which to rollout further applications

We have a pipeline of new projects to utilise our remaining T2 NIA allowance. A few examples of topics of focus in this programme of activity include:

- Stability assessment of converter-dominated power networks using hybrid EMT (PSCAD) and RMS models (Power Factory) in the frequency domain, alongside developing a tool for business-as-usual (BaU) applications. Additionally, we will automate the assessment of EMT and RMS models to enhance efficiency and explore potential data-sharing use cases to improve collaboration and data utilisation.

- Trialling GE's Device and Asset Management solution, which promises automated system restoration capabilities and enhanced device management through advanced data and digital solutions.

- Further integrating Building Information Modelling (BIM) with costing tools, AR/VR-enabled designs, and site scanning to revolutionise our design and construction processes.

SIF projects

We recognise the value and strategic importance of the SIF and have worked collaboratively with UKRI to support this mechanism as it developed over the last four years (with our participation starting in SIF Round 1 in 2021).

SIF Stage/Project	SIF funding awarded (£m)	Applications submitted	Applications funded
SIF Discovery and Alpha projects	2.66	18	14
Beta - Predict4Resiliance	4.52		
Beta - BLADE	4.85	4	3
Beta - Flexible Railway Hubs	8.26		
Total	**20.29**	**22**	**17**

Table 3. SIF Applications and Funding Awarded

Our submissions have aligned both with SIF challenges and with the ambitions set out in the T2 business plan. For example, our Fast Flex project under the Whole System challenge is supporting our aim to maintain system stability, whilst Predict4Resilience and En-twin-E align with the goals of our T2 Digitalisation Strategy.

Our engagement with SIF in T2 has been successful, with 77% of applications being approved, and effective dissemination of their learnings resulting in subsequent NIA and SIF applications. BaU roll-out of some our SIF Beta projects is projected to commence in T3.

Some key SIF projects, learnings and anticipated outcomes include the following:

Predict4Resilience (Beta, Round 1 – 2023)

Part of our Round 1 SIF project portfolio, Predict4Resilience is a £5 million innovation project that uses AI technology to predict the impact extreme weather may have on our network. Whenever there is a bad weather event on the horizon, we begin to plan and mobilise our engineers to ensure customer disruptions are kept to a minimum. With Predict4Resilience, we can now go even further. By using AI and historic weather and fault data we will be able to get our teams to the relevant locations ahead of the bad weather hitting to prevent or minimise damage to the network.

P4R will support the control room engineers to proactively respond up to 7 days in advance, which will enhance operational management, decision making and preparedness in advance of an extreme weather event.

The project is expected to be rolled out in 2026 and is estimated to deliver £3.9m in net benefits over T3, including direct social benefits to consumers, reduction in costs from support following storms, and carbon and air quality benefits.

Blade (Beta – Round 2, 2024)

Black Start Demonstrator from Offshore Wind (BLADE) is a £5m SIF Round 2 Beta project that will bring electricity system restoration from offshore wind to commercial reality by building the necessary cross-industry understanding between the onshore transmission network owners, transmission system operators, offshore wind farm (OWF) operators, and technology suppliers.

This project looks to build on the knowledge acquired from previous innovation projects that considered network restoration and stability, such as Distributed Restart and INCENTIVE.

The Beta phase will create industry-wide understanding on the technical requirements for windfarms to provide restoration, the technology specifications that will enable OWFs to meet those requirements, the cost of those technology specifications, and the potential revenue achievable by providing restoration services. This in turn will give clarity to all parties and allow NESO to evolve the restoration market.

This will provide benefits by avoiding the cost of building new energy restoration infrastructure, which would be required to meet the ESRS requirement of restoring 60% of the network within 24 hours of an outage. If rolled out across GB, the net present lifetime benefit is forecast to range between £0.92bn - £1.62bn depending on the option selected.

Flexible Railway Energy Hubs (Beta Round 2 – 2024)

Flexible Railway Energy Hubs, a groundbreaking innovation in partnership with Network Rail, aims to convert the largest electricity demand into a source of flexibility. Hubs utilised our NIA allowance for development and directly submitted to the SIF Beta Round 2, aligning with our T3 submission where flexibility is required by Ofgem to be a consideration for strategic planning.

An Energy Hub is a modular microgrid solution that integrates batteries and local renewable energy with the rail traction network. By transforming the railway into a flexible electricity consumer, the project generates benefits to the electricity network and consumers by reducing wind curtailment expenses via flexibility services and reducing engineering disturbances.

By leveraging investment and de-risking, it anticipates substantial benefits of up to £2.2 billion by 2045. The 5-year project is designed to capture staged outcomes and has secured formal commitments from both SPT and Network Rail for successful rollout, which is expected to commence in 2030.

A Holistic Hydrogen Approach to Heavy Duty Transport - H2H (Round 1 Alpha - 2022)

H2H is an example within SIF where the learnings from initial concept changed to inform the direction of future phases. Our Discovery project assessed three solutions to make rail electricity demand more flexible: Full Electrification, Discrete Electrification with Battery Trains and Hydrogen-Electric. Of the solutions assessed, Green Hydrogen offered the clearest route to provide flexibility benefits for TSOs, DSOs and hence reduce costs for consumers. H2H Alpha quantified the network benefits of flexible operation for hydrogen in rail and identified that broadening the scope to cover all hydrogen transport uses provides far greater benefits.

Our Beta project was submitted with the scope of demonstrating solutions essential for a reliable and cost-effective roll-out of grid-connected hydrogen production using electrolysis, which is required to decarbonise the heavy transport sector. Although this was not awarded Beta funding, the project disseminated learnings and brought together the team that later developed the Flexible Railway Hubs project that was awarded Beta funding in 2024.

We are proud of our achievements during this regulatory period, where we have demonstrated the development and ongoing delivery of an ambitious and diversified portfolio of stimulus-funded innovation.

1.2.2. RIIO-T2 BaU innovation delivery

Our BaU innovation activities during T2 have focused on using Totex to roll out proven innovation (previously funded through NIA and NIC) and to fund new initiatives that carry a lower risk to our business and therefore do not require innovation stimuli.

We are committed to ensuring that Totex funding is used alongside NIA and SIF to fund certain activities that should not require to be incentivised, particularly operational and maintenance projects with the potential to deliver cost efficiencies.

For deployment of previously proven innovation, we follow a rigorous approach to ensure projects led by us and those delivered by other networks are rolled into BaU where appropriate (details on this process are provided in Section 3).

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We delivered a wide range of innovation projects during T2 using our Totex funding, several examples of which are highlighted below:

Roll out of synchronous and hybrid synchronous compensators

This follows on from our Phoenix NIC project and includes the installation of two Hybrid Synchronous Compensators (H-SC) at Eccles 400kV, in combination with Real Time Thermal Rating (RTTR) systems to provide boundary capacity and system strength, expected to be completed in 2026.

This will deliver over £20-29m in net customer benefits by the end of T3, providing a boundary uplift of up to 280MW on the transmission network boundary B6 (a SPEN Transmission and National Grid Electricity Transmission boundary) ahead of the closure of Torness nuclear power station. The project will also provide additional system strength, enabling further connection of renewable generation on the system. These learnings have also contributed to 5 x H-SC projects announced by NESO.

Wide Area Monitoring (WAM) technology

The **VISOR project** (concluded in 2018) successfully delivered the first integrated GB WAMS to gather, collate, visualise, and analyse time synchronised measurements in real-time, whereby each transmission owner has visibility of measurements within their network and the system operator has visibility of all measurements. This was then further built through the **MIGRATE project** (concluded in 2022) which sought to use this WAMs technology to measure the "Rate of Change of Frequency (RoCoF)" as a proxy for the system stability, understanding the impact of increased low-carbon technology (LCT) generation on the resilience of the UK network. Our WAMs have since been integrated to the Operational Control Centre (OCC) during the T2 period as part of the BaU adoption.

Since the successful project delivery in 2018, the VISOR project (utilising Wide Area Monitoring technology) has provided further benefit in detecting Sub-Synchronous Oscillations (including resonance and interactions). There have been a number of system events which have required investigation by the NESO – the technology deployed through the VISOR project has been unique in supporting these investigations, by identifying the participants on the GB network and preventing wider impact.

Building Information Modelling (BIM)

The BIM Initiative detailed in our T2 Submission set out to take forward the successful application of building information modelling from gas transmission network NIA projects. Our ambition was to improve SPEN's data framework by implementing BIM Level 2, including full 3D modelling of SPEN's assets.

During T2, we have been developing 6 projects that will be piloting the BIM Framework, which would allow SPEN to successfully comply with UK's 2016 mandate to implement BIM Level 2 in all Government commissioned contracts above £2m and bring in £0.66m in benefits by the end of T2. As part of this rollout, SPEN has made investment and learning in:

- Improved quality across all aspects of the project planning lifecycle from design to delivery.

- Reduction in time, effort, and cost of changes throughout project life cycle resulting in cost efficiency for customers and reduced variation from original designs.

- Improved project implementation by seamless data sharing with design engineers co-ordinating and making changes within one environment, improving customer satisfaction.

- The integration to our portfolio and project management system for construction units, data integration for sustainability, 3D models of SPT assets, digital twin workflows, and supplying digital data to field workers.

One pilot project has been delivered successfully, with 5 in-flight. The pilots will inform how the BaU processes need to change and transform to adopt and embed BIM.

1.2.3. Benefits from our RIIO-T2 portfolio

We measure benefits from all our innovation projects as part of our innovation process, which is laid out in Section 3. This approach allows us to understand if a project should be transitioned to business as usual by justifying the benefit that adopting the innovation would have to the business and consumers. In addition, we capture benefits and learnings from projects at a lower technology readiness level, to help us determine whether we should continue to invest in an idea, and to support our dissemination process.

In summary, during T2 we have delivered substantial benefits, both financial and wider system benefits and learnings which have informed our T3 strategy and evidence how we are delivering towards our innovation ambition.

- The roll out of BaU innovation is forecast to result in the order of £20m to £30m in net benefits across T2 and T3, with the highest proportion associated with the roll out of synchronous and hybrid synchronous compensators.

- Our SIF Beta demonstrators, if successfully rolled-out across GB, have a forecast net present lifetime benefit of over £3bn, based on their submission CBA's. This includes £2.2bn estimated lifetime benefits from our Flexible Railway Energy Hubs project, through the reduction of wind curtailment expenses via flexibility services and a reduction of engineering disturbances. These benefits will be monitored through delivery and rollout and show the importance of this funding source for large scale projects with significant long-term impacts.

- Our NIA funding has enabled us to carry out research and development activities that are crucial to inform our future network enhancement decisions and trial lower technology readiness level solutions that can lead to larger scale deployment in the future. Of our current NIA portfolio, we estimate that significant benefits can be realised if deployed. Benefits include reducing the risk of cyber incidents from our Cyber-SAFEN and Cyber-RIAST projects and reducing restoration times in the event of a blackout from our HiL Simulator project. As part of our project governance, we will review our benefit estimates as projects reach completion, as well as exploring the potential for national deployment.

Beyond financial benefits, our innovation projects have delivered other important benefits which, though not included in a typical cost-benefit analysis, are still delivering significant value in the form of increased understanding of problems and barriers, reduced risk across our network, increased resilience to climate change impacts and more.

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As an example, our Truly Sustainable Substations project will significantly increase our understanding of the environmental impacts associated with developing and operating substations, providing opportunities to improve substation design to minimise whole-life carbon emissions, incorporating circular economy practices and nature-based solutions.

As the energy system transition progresses, a reliable electricity system will become even more essential as our society becomes ever more reliant on electricity for essential services including heating and transport. Transformer failures resulting in outages will have even greater consequences than currently. As another example, our DynaLoad Project looks to characterise the long-term mechanical endurance of transformer insulation under heavy dynamic loading conditions to better protect against transformer failures. The learnings from this project have the potential to improve transformer reliability and availability through informing improved requirements specifications and maintenance procedures.

1.3.   Our priorities for the remainder of RIIO-T2

Our strategic approach for the remainder of the T2 period is designed to ensure delivery of our in-flight and planned innovation projects, whilst undertaking additional activity to get ourselves set up for success in T3.

We have set the following key objectives and actions:

Objective	Actions
Successfully deliver our T2 NIA portfolio and continue active participation in the SIF challenges	We will efficiently wrap up our T2 NIA projects, ensuring that each initiative meets its objectives and delivers its expected benefits. We anticipate utilising 98% of our total request of £13.5 million, making use of CNIA where required.
	We will also ensure successful delivery of our existing SIF projects funded through Rounds 1, 2 and 3, and continue to actively participate in future competition Rounds. By the end of T2, we aim to secure an additional 15 SIF projects across Ofgem's challenge areas, focusing on initiatives that can drive benefits aligned to our business and stakeholder priorities.
	All learnings and insights gained from these projects will be disseminated in our annual innovation report and on the Energy Networks Association (ENA) Smarter Networks portal to ensure that the knowledge is shared and can be utilised to drive further innovation and improvements across the industry.
Review portfolio of projects completed in T2, and document lessons learned	Upon advice from our Independent Net Zero Advisory Council (INZAC), we plan to undertake a holistic review of all innovation projects completed in T2 to understand and reflect on lessons learned, particularly from those that have not or are not planned to transition to BaU.
	While we already undertake this type of analysis at the project level, this deep dive review will aggregate learnings from across our entire portfolio to establish common themes and areas for improvement. We will use these outputs to 'de-risk' future activities and processes, informing prioritisation and acceleration of specific projects in the T3 period.
	As part of this, we plan to improve on our recording of projects we have decided against proceeding with. In the remaining months of T2, we will develop a log of projects which have been previously reviewed and not met the necessary conditions to proceed (see Section 3 for more detail on our innovation process). This will enable us to increase our pace in identifying unnecessary duplication. In the beginning of T3 we plan to share this log across the business to ensure our

	colleagues can check against previously discarded projects and seek similarities with new proposals.
Enhanced stakeholder engagement to mobilise our T3 innovation plan	In section 2.1, we outline the range of stakeholders with whom we regularly engage. We understand that this list of stakeholders and partnerships needs to continuously evolve and expand as we adapt to the changing energy landscape.

As we prepare for T3, we plan to solidify our relationships with key organisations we have identified as playing a crucial role in shaping energy networks and markets in the next 5-10 years. This will include grid users such as developers, BESS, data centres, renewables, and relevant parties within hydrogen industry.

As an example, the central innovation team will present at the bi-annual developer SPT forum to solicit feedback on our T3 innovation plans.

Once we publish our T3 Innovation Strategy, we plan to establish a series of working groups with organisations and innovators across the supply chain over the course of 2025. Our objective is to develop our activities into tangible work packages, ready for T3 deployment. We also intend to use this mechanism to enrich delivery of our ongoing projects and support with the ideation processes for innovation delivery in the remainder of T2. |
| Further developing our team to set us for success ahead of RIIO-3 | The challenges that the sector faces cannot be addressed without innovative approaches and technologies. We don't just need to innovate, but to increase the pace at which we do it, staying ahead of an ever-changing landscape.

Our ambition for innovation during T3 has increased significantly from the previous regulatory period, and we know that to achieve this, we will also need to increase our capability and capacity as a team.

In addition to the portfolio review, we'll also implement an in-depth gap analysis of the skills and capacity that need to be addressed ahead of the T3 period.

Additionally, we will explore internal structure options to better support and align with our business areas, potentially specialising team members in specific topics. |

Table 4: Priorities for remainder of T2

2. Our RIIO-T3 Innovation Strategy

2.1. Stakeholder Engagement to Shape our Strategy

2.1.1. Who we engaged

Stakeholder engagement is integral to the development and delivery of innovation. As transmission operator for Central and Southern Scotland, our business and its operations impacts a large, diverse group of stakeholders. Throughout T2, the central innovation team, named the Future Networks team within SPEN, has worked alongside the central stakeholder engagement team to deliver a comprehensive engagement programme to inform the development of the T3 Innovation Strategy.

Meanwhile, as innovation is inherently underpinned by wider business operations, extensive internal engagement was carried out to understand our organisation's state-of-play and challenges to allow us to identify opportunities for innovation (see Figure 3).
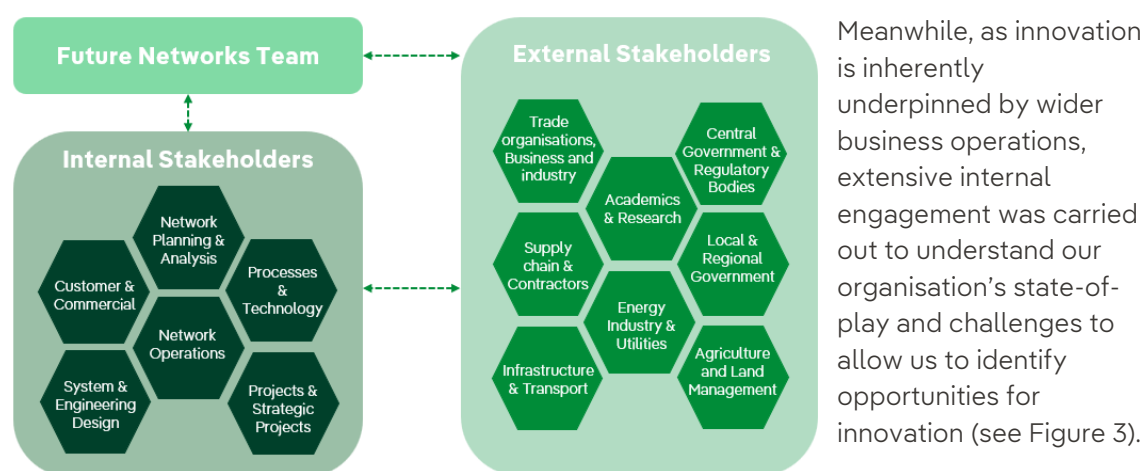
Figure 3: Our stakeholders

Therefore, our Future Networks team engages both directly with external stakeholders, whilst also engaging with internal stakeholders who carry out their own external engagement activities.

2.1.2. How we engaged

	Purpose	Engagement Lead	Methods	Key Stakeholders
Horizon Scanning	• Identify and anticipate emerging trends, challenges and opportunities	• Future Networks Team	• Industry Forums • Research (direct and external)	• ENA, EIC, PNDC, UKRI, Academia, Research Centres, Think Tanks
External Engagement	• Understand stakeholder challenges and the need for innovation • Generate innovation ideas • Develop ideas into projects & solutions • Disseminate learnings from projects	• Future Networks Team • Business Leads (SMEs) • Central and Reginal Stakeholder Mgrs	• Wide range of methods (incl. surveys, working groups, LA workshops, annual innovation events)	• Academia, Central and Regional Gov, Supply Chain, Consultancies, DNOs, TOs, NESO, Connections, Industry Innovators etc
Internal Engagement	• Gather inputs on innovation needs from business leads – based on their external stakeholder engagement and business challenges	• Future Networks Team	• Bilaterals • Company-wide engagement events	• Business Leads (SMEs) • Central and Regional Engagement Mgrs

Figure 4: Engagement Mechanisms

We utilised three different mechanisms to undertake stakeholder engagement to shape our Innovation Strategy, as per Figure 4. Horizon scanning carried out through surveys, research and participation in forums and events enabled us to identify emerging trends and opportunities for innovation, whilst internal and external engagement led to an understanding of challenges and needs from both stakeholders and our business.

Internal engagement

Ongoing internal engagement with subject-matter experts and senior management across our business enables us to maintain our understanding of challenges. From the outset of our engagement programme, we mapped the internal stakeholders to our innovation strategy. We then:

1. Assessed what challenges each area is facing; and/or
2. Identified any innovation ideas they are exploring for T3.

Where internal stakeholders presented their challenges, we held further workshops with relevant teams to collaborate and co-develop activities; where stakeholders presented the opportunities they wished to pursue under innovation, we then collaborated to map the proposed activities to our Innovation themes. We then undertook a gap analysis to ensure the planned activities were proportionate to the trends and external stakeholders' expectations. In the development of the strategy, we held prioritisation tasks with over 30 business leads to identify our businesses' priorities for innovation. In addition, our INZAC members provided feedback and challenge in the development of our strategy over a range of sessions.

External engagement

Simultaneously, we engaged with organisations across the industry and all the way along the value chain.

Licensed operators

We routinely engage with other transmission networks as well as with other licensed networks through our participation on ENA and Energy Innovation Centre (EIC) forums and regular events. Some of these include ENA Innovation Managers Working Group, the ENA Annual Basecamp, EIC Calls for Partners and EIC Calls for Innovation. More recently, we have also been holding monthly meetings with National Grid Electricity Transmission (NGET), Scottish and Southern Electricity Networks Transmission (SSEN Transmission) and National Gas to explore the potential for collaboration in T3 (see more details on collaboration in section 3.1.2).

Regional bodies

We maintain strong regional relationships with Local Authorities (LAs) and other regional bodies we serve. Our colleagues in Whole Systems engage with the relevant bodies on regional Local Area Energy Plans (LAEPs) and Regional Energy Masterplans at least quarterly and participate with the Edinburgh Climate Forum and Sustainable Glasgow Forum. Additionally, the Future Networks team maintain a frequent liaison with Whole Systems teams to ensure we are informed on current disposition and challenges. Where transmission activity specifically impacts a Local Authority, a point of contact is set up within SP Transmission.

Academia and Research

We also engaged with a breadth of academia, including Edinburgh University, St Andrews, Heriot Watt, Glasgow University, and the University of Strathclyde. As critical infrastructure operators, we also maintain strong engagement with the Centre for Digital Built Britain, National Cyber-Physical Infrastructure (NCPI), and the Data Analytics Facility for National Infrastructure (DAFNI) through our flagship projects, such as ENSIGN and Predict4Resilience.

Wider Industry including Small and Medium Enterprises (SMEs)

Equally, partnerships with the ENA and EIC allowed us to collaborate with the wider industry. The primary purpose of the EIC is to attract new innovators into the sector, continuously enhance their experience, and accelerate innovation to efficiently and cost-effectively meet the challenges and needs of utility businesses. This has led to the development of a Transmission Collaboration Panel with the two other electricity transmission operators in the UK where we have developed three workstreams looking at innovation specifically for SF6 alternatives, Net Zero substations and consumer vulnerability. More details on how we collaborated with wider industry can be found in Section 3.1.2.

2.1.3. How this has influenced our RIIO-T3 innovation strategy

From the outset of developing our T3 Innovation Strategy, we sought to answer the following questions through engagement with our internal and external stakeholders:

1. What are the **key challenges** facing the industry where innovation is required?

2. What **level of ambition** is required to address these challenges considering the new landscape?

3. Which **priority areas** do stakeholders expect us to be focusing our innovation efforts on and what's changed for T3?

4. How can we improve **collaboration and engagement** between networks and third parties to deliver innovation in T3?

5. What changes do stakeholders believe we need to make to our **innovation processes** to ensure we are set up for success in T3?

In Appendix A, we provide a summary list of engagement events which have contributed to the development of the T3 Innovation Strategy. The feedback from this engagement has influenced our plans in the following key areas:

	Stakeholder feedback	Impact on our T3 innovation strategy
Innovation focus areas	In Ofgem's Sector Specific Methodology Decision (SSMD), the regulator outlays four outcomes for RIIO-3.	Upon review of Ofgem's SSMD, we distilled our innovation strategy into 4 areas of focus aligned to Ofgem's RIIO-3 outcomes.
	Our engagement with both NGET and SSEN Transmission identified the other transmission operators also developed their innovation strategy to focus on Ofgem's RIIO-3 outcomes.	This was then ratified through further internal engagement that told us this also supported the business direction, in addition to the other UK transmission operators' ambitions, to ensure industry-wide collaboration in achieving these outcomes.

Innovation ambition	In a survey with external stakeholders, there was consensus that SPEN should be ambitious with its innovation programme.	We plan to ramp up our innovation delivery to meet challenges and respond to increasing stakeholder needs, whilst understanding the limits on deliverability. We want to ensure that our proposed plan is ambitious and achievable.
	Through bilateral engagement with core internal stakeholders, it is evident that there are a range of challenges which require innovation, as reiterated by externals. However, our ambition is limited to the deliverability of the plan. Our current resourcing constraints, in addition to industry-wide supply chain bottlenecks, place restraints on our ambition to innovate. Through direct surveys with internal stakeholders, we have identified the core priorities we need to address:	Our innovation's ambition is therefore high but targeted, with an increase of 34% spend compared to T2.
		We have ensured our planned activities match our business and stakeholder's priorities, and we will aim to deliver projects to first address our core priorities in order to align with the feedback provided.
	1. Extreme environment conditions impact assessment	
	2. Sustainable and resilient supply chain	
	3. Adaptive protection systems supporting growing uptake of LCTs	
	4. New sustainable assets and construction materials – market research and trials	
	5. ███████████ cyber security ███████████	
Innovation funding	Through our internal engagement, it is clear our business aims to deliver an ambitious plan, aligned to the deliverability of our workforce and supply chain. Our business leads are committed to deploying suitable innovation projects into BAU and continuing to actively participate in the SIF.	We are increasing our innovation investments for NIA to £22.45m with an additional BaU Innovation investment of over £380m woven into our Totex baseline. This funding level is reflective of our desire to meet our business and stakeholder's ambitions, whilst balancing deliverability constraints. We will continue to contribute 10% of funding.
Collaboration	Innovate UK research showed that there is a need for organisations across the industry to work collaboratively to drive the required change, and that strengthened relationships and open environments are a key step to achieving this.	We will embed new points of third party and business collaboration to further generate ideas, share learnings and improve project delivery. This will include:
	Regarding third parties, engagement with Innovators suggests they want to see us be more approachable and more open to new ideas.	• Strengthening our existing relationships with core stakeholders. Part of this is already in progress through monthly meetings with other transmission operators (see Section 3.1.2)
	Our INZAC have also previously identified potential gaps in	• Further formalising our internal engagement processes to

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	commitments to collaborate with other transmission operators. Stakeholders highlighted the importance of involving relevant people at an early stage in innovation projects. For instance, involving the people to whom a particular 'innovation' is addressed can accelerate the feasibility assessment or business case of a project, leading to time and cost gains.	maintain our understanding of opportunities to collaboration and areas of innovation, further embedding innovation culture within our organisation • Leveraging our existing network within Iberdrola to create wider opportunities for collaboration with third parties.
Innovation processes	Through direct engagement with EIC Innovators, we learned that they want more streamlined processes, faster implementation of innovation into BaU, in particular more consistency across networks in the process of moving from idea submission to BaU. They want the pace of engagement and decision making to be quickened. Only 26% of innovators agreed that energy companies have improved their procurement process to accommodate smaller companies. UKRI research on innovation culture also suggested that we need flexible and efficient processes to facilitate effective collaboration.	We have begun the process of reviewing our processes against the ISO 56000 series, a best practice framework for innovation management. We will continue to adjust our innovation governance tools and process to reflect stakeholder feedback on best practice and to set ourselves up for success in T3. This includes enhancing our processes for transition to BaU and rollout. We will also enhance the way we engage with our Innovators through utilising our partnership with EIC.

Table 5: Engagement feedback and impact on strategy

As a result of our comprehensive engagement, we have co-developed our T3 innovation strategy alongside our stakeholders to ensure we deliver a robust plan, strategically aligned to our wider business goals.

2.2. RIIO-T3 Innovation Strategy

This section looks ahead and focuses on our innovation strategy, focus areas and delivery plans for T3.

Our starting point for developing a strategy to support these missions was to listen to our stakeholders through internal and external engagement and research, followed by evaluating our current performance in T2 to assess how we have delivered against our current goals and plans as set out in Section 1. We also took into consideration the four key outcomes outlined by Ofgem in the T3 Sector Specific Methodology, that consumers and network users expect network companies to deliver through RIIO-3.

We reviewed the above against our T2 innovation strategy clusters and supporting themes (see Figure 1), the ENA Innovation Themes and the priority activities from our internal and external stakeholders to develop a clear framework for where we should focus our innovation efforts in T3. This framework includes four goals we aim to achieve during this regulatory period and four areas of focus under which our T3 funding and efforts will be structured.

Our RIIO-T3 Innovation Goals

Delivery of our T3 ambition will require us to leverage and enhance our innovation processes, governance and frameworks, focusing on the areas that will drive value and efficiency. We are committed to continuous improvement and with this objective in mind we have identified four strategic goals for our T3 innovation strategy:

1. Optimise our delivery	To use innovation to deliver transformational change to the pace and scale of delivery required of transmission projects in order to facilitate the UK's Net Zero ambition whilst also minimising our internal carbon emissions. We will drive efficiency in project design & delivery, with the aim of reducing project costs and accelerating construction timelines.
2. Accelerate connections	To use innovation to create the network capacity that will reduce the time to connect, through both process and technology innovation. In addition, we will explore novel approaches to facilitate connections which mitigate the need for infrastructure upgrades.
3. Develop emerging technologies and processes	To support a focused incubator for early-stage solutions which are aligned to SPT innovation priorities; additionally, we will identify and support emerging market players, whilst continuing to leverage cross-sector relationships. To ensure our processes and governance support this and are aligned with best practice, we will also improve our Innovation Management System to more closely align with the principles ISO 56000.
4. Foster collaboration	To broaden the range of stakeholders who are actively engaged in our innovation space, as we seek to leverage the expertise and resources from external organisations to deliver our plan. In addition, we will develop simplified proposal templates and submission processes tailored to small-medium enterprises (SMEs), reducing administrative burden and encouraging participation. We will work towards future-proofing our approach to engagement and support emerging network customers.

Table 6: T3 Innovation Strategic Goals

Our RIIO-T3 Innovation Areas of Focus

As a result of stakeholder engagement and consideration of the Ofgem RIIO-3 Outcomes, we have derived four outcome-orientated focus areas for our innovation activity, each of which addresses one of the RIIO-3 Outcomes. These are presented in Figure 5, below.

The NIA and BAU innovation activities proposed in this section have been structured against these four areas of focus, replacing our T2 innovation technical clusters. To ensure continuity, the underlying themes in our T2 innovation strategy have been mapped against these four areas of focus, however we believe that replacing our T2 innovation clusters with this new structure will allow us to better evidence how innovation is contributing to RIIO-3 objectives.

This continuity has also been validated with internal stakeholders and the INZAC, agreeing that the themes we explored in T2 continue to be relevant as we look ahead to the next regulatory period.

Ofgem RIIO-3 Outcome	Area of Focus (AoF)
Infrastructure fit for a low-cost transition to Net Zero: Network companies must facilitate a low-cost, environmentally sustainable, low carbon energy system that enables the transition to Net Zero, with infrastructure built at pace;	**Ready**- Preparing us for, and accelerating the pace to, achieving a low-carbon energy system which is affordable for the consumer
Secure and resilient supplies: Network companies must deliver a safe, secure and resilient network that is efficient, data rich and responsive to change. Consumers should have access to gas and electricity supplies that are resilient to physical, financial, climate and cyber shocks;	**Resilient** - Delivering a network which is both secure and adaptive, protected against holistic threats to disruption
High quality of service from regulated firms: Network companies must deliver a high quality and reliable service to all consumers and network users, including those who are in vulnerable situations;	**Reliable** - Providing our customers with a high quality of service which are tailored to customer's needs & challenges
System efficiency and long-term value for money: Network companies must deliver an efficient cost of service, minimise the costs to consumers of system transformation and ensure consumers and network users get a fair deal	**Responsible** - Driving efficiency across our services to minimise the cost of Net Zero to our consumers & network users

Figure 5: Alignment of Areas of Focus with RIIO-3 Outcomes

Additionally, in line with the Sector Specific Methodology Decision published by Ofgem, we support the continuation of the Strategic Innovation Fund as complementary to our flexible allowance to fund more ambitious and high-budget innovation projects which are relevant and aligned with strategic challenges. During T3 we will continue to submit and deliver projects through this competitive mechanism, following our success in T2 as outlined in section 1.2.1.

The following sections outline:

- Our NIA funding request and proposed activities, including problems we aim to solve, potential solutions and benefits.
- Our BAU innovation activities and associated investment and expected benefits.

2.3. RIIO-T3 NIA Strategy & Activities

We will use our NIA to fund projects that are higher risk and smaller scale, including those that address whole system issues and require wider collaboration. These types of projects, if successful, can deliver longer term benefits, including benefits that go beyond our network and can therefore carry a level of risk that we are not prepared to take on as part of BaU funding. Our BaU-funded innovation will be used to roll out proven innovation and deliver projects with lower risk and/or shorter-term benefits, such as the automation of connection processes, technology-enabled inspections, and the roll out of SF6-free switchgear. The 'Inception' stage of our 'Innovation Process' includes an evaluation of whether a given innovation project ought to be funded by stimuli funding or our Totex budget, and why.

In particular, we aim to use our innovation stimuli funding to:

- Advance research and development (lower TRL) projects focused on addressing energy system transition challenges.

- Accelerate the adoption of large scale disruptive transformative innovation aimed to deliver long term benefits

- Enable whole system approaches

- Empower our consumers and address consumer vulnerability

We have developed a balanced portfolio of activities which addresses the needs of our stakeholders and industry challenges. We intend to continue using the NIA (and SIF) funding mechanisms, building upon on our work and learning in T2.

2.3.1.   RIIO-T3 NIA funding request

T3 NIA Funding Request Profile
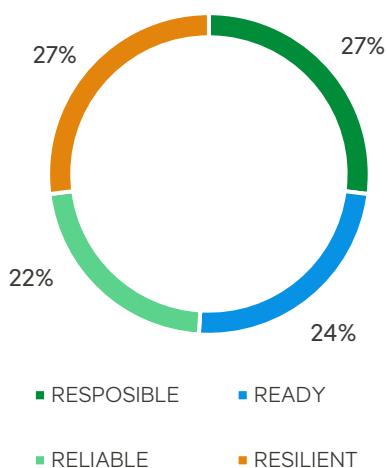
Figure 6: T3 NIA Funding Request

We have requested a total of £22.45m for T3 NIA projects. This is a 34% increase in NIA funding from T2 (after considering inflation), which reflects both the increasing need for investment in innovation and our commitment to meeting this need. This request is for the full length of T3 with SP Transmission continuing its commitment to fund 10% as a compulsory contribution. Our T3 funding request is balanced across the 4 areas of focus we have defined as part of T3 innovation strategy, as per Figure 6. The following sections provide details on how we plan to make use of our NIA over the next regulatory period.

We have defined T3 innovation activities under each of these four areas. Our cost estimates were derived from innovation stimulus projects completed in the T2 period by all TOs, with factors applied to account for anticipated efficiencies from collaboration potential and from multiple activities contributing to a common area of focus.

All of the proposed T3 NIA activities that are presented in the sections that follow are explained in more detail in Appendix B, in which icons are provided to indicate which of the NIA eligibility criteria each activity satisfies.

In the coming months we will continue to refine these activities and scope projects under each, ensuring that they satisfy the NIA eligibility criteria and engaging relevant third parties and networks as required. Tables detailing each proposed T3 NIA activity can be found in Appendix B, including descriptions of the problem, allowance required, proposed NIA criteria and potential solutions.

2.3.2. Ready (£5.32m NIA Funding)

We must be Ready to play our part in enabling a low carbon energy system; this ranges from supporting LCT connections, getting the most from our infrastructure and looking at new technologies and processes where we can directly decarbonise our network. The transmission network is a critical infrastructure that should be fit to achieve the low-cost transition to Net Zero, and our innovation strategy targets the core developments required to achieve this.

We have six activities under our Ready area of focus in our T3 plans, aligning seamlessly with our overarching goal of enabling a low carbon energy system. **We are requesting £5.32m allowance to deliver activities in these areas**. The nature of projects defined under these activities will include market engagements, desktop studies, software and hardware procurement, and developments and live trials.

Overall, these activities will work towards:

- Enhancing our complex network performance analysis capability

- Enabling the use of more sustainable assets

- Demonstrating better utilisation of existing assets

- Evaluating additional opportunities for ancillary services

The six activities we have shortlisted are shown in Table 7 below:

Activity	Expected benefits	Planned collaboration
A1 – Enhanced transmission performance by HVDC links control and deploying Flexible Alternating Current Transmission Systems (FACTS A2 – Harmonic mapping and AI-based impedance loci calculation for quicker Low Carbon Technology (LCT) connection decisions A3 – Enhanced system performance assessment tools (hardware and software) development and deployment A4 – Smarter Overhead Line (OHL) routing design and wayleaves streamlining A5 – Review emerging markets for low carbon technologies to support a holistic approach to achieving Net Zero greenhouse gas targets A6 – OHL temperature and progressive fault monitoring using integrated and distributed sensors	• Faster connection of LCTs • Improved transmission network performance • Defer or discard conventional reinforcement • Faster decision making on harmonic assessment of LCT connections • Allowing better utilisation of existing OHLs • Better availability of assets • Improved OHL routing, reducing costs and delays	National Grid Transmission, SSEN Transmission, Distribution Network Operators (DNOs), power electronics and HVDC manufacturers, standards bodies, Selected SMEs and Academia

Table 7: NIA Ready activities and expected benefits

Activities enabling data sharing and advanced modelling of converter-dominated power networks are crucial for system performance studies and planning to inform the optimisation of investment strategies. By integrating these innovative approaches, we aim to create a

transmission network that is not only cost-effective but also robust enough to meet the demands of a low-cost transition to Net Zero by 2035.

We also plan to enhance our design approaches from system study to final network design by developing new platforms and tools to better understand system performance, support quicker decision-making processes and inform our investment strategies. We intend to better inform our network planning stages on how they can include power electronic technologies to design our transmission network more cost effectively, following on from learnings generated by our Phoenix project (T1 NIC).

In addition, whilst we recognise that SPEN's Net Zero target is set for being achieved in 2035, we seek to lead the industry and work with our supply chain to meet this. The pace of activity needed to meet our Net Zero target is intense and innovation is a vital part of this mission, especially given the associated requirement for imminent commencement of construction to meet the forecasted demand. In our 'RIIO-T3 Environmental Action Plan' we have set out a commitment to implement cost-effective sustainable materials and solutions in our construction programmes. This is supported by our stakeholders, who have highlighted how critical it is to consider construction materials and our supply chain if we are to meet our 2035 target. We plan to demonstrate innovative ways that we can deliver a commercially sustainable transmission network, through market research and trials.

2.3.3. Resilient (£6.15m NIA Funding)

We must be Resilient in the face of a rapidly changing environment. Our transmission network must evolve in order to withstand various challenges, including severe weather events and the impacts of climate change. In addition, it must be protected from an increased cyber security threat, while at the same time ensuring it is adaptable and able to accommodate a diverse and decentralised energy mix. Innovation is essential to address this.

We have defined five activities aligned to our Resilient area of focus to ensure our Transmission network remains stable and reliable amidst evolving challenges. **We are requesting £6.15m NIA allowance to carry out these activities**. This will allow us to use data and processes to protect our network in addition to trialling new materials and technology which may bring additional benefit.

We look to build upon this learning in T3 by innovating towards:

- Enhancing our long-term network planning capability

- Using advanced technologies for inspection and maintenance

- Introducing more data analytics and data management tools

- Enhancing our cyber security capability

We aim to utilise the growing digital footprint at our substations and across our networks to trial more advanced substation & asset inspection using new sources (such as robotics) to assess asset health, including more in-depth data analytics and improvements using LIDAR data. This will support the delivery of one of the key themes on our 'RIIO-T3 Digitalisation Strategy', enabling us to optimise the management of our network and assets. Furthermore, we recognise that short term solutions need to be developed to support network resiliency, better long-term planning of our infrastructure and network connectivity.

We also aim to anticipate network issues by both deploying new technologies which provide an enhanced capacity and capability to monitor our network condition, harnessing both existing data and models, as well as evaluating new platforms. Moreover, we would seek to assess the health of new materials being deployed. We seek to find agile ways to monitor the durability and longevity of these materials when deployed in different environments to ensure that they continue to be fit-for-purpose without compromising the network's integrity or necessitating premature replacement.

Additionally, in recent years threat actors are attempting to disrupt processes and controls or conduct reconnaissance and as a result, Operators of Essential Supply (OES) such as energy networks need to take action. There is opportunity for innovation to support this by derisking opportunities that require research, testing and demonstration before deployment. We propose to examine a series of topics which will reduce our attack surface, identify threats faster and enable us to express OT threat to our supply chain.

We therefore need to increase our efforts in defending our network against cyber-attacks, complementing the significant investment being made via Totex to improve our cyber security posture both in T2 and planned for T3. The five activities we have shortlisted are shown in Table 8 below:

Activity	Expected benefits	Planned collaboration
A7 - Advanced inspection & surveillance using robotics and analytics A8 - Data Analytics & AI supported long term network planning A9 - Enhanced operation safety deploying digital technologies A10 - Sustainable project delivery and construction (carbon management) A11 - Enhancing OT Cyber Security ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮	• Better availability of assets allowing faster connection of LCTs • Enhanced network resilience to changes in demand and generation • Optimised use of workforce • Improved data accuracy and data sharing • Reducing the carbon associated with critical infrastructure • Enhanced network resilience against cyber attacks ▮▮▮ ▮▮▮▮▮▮▮▮▮ • Reduction in carbon emissions across our network and supply chain	National Grid Transmission, SSEN Transmission, Distribution Network Operators (DNOs) and potentially Various Catapult Centres, Academia

Table 8: NIA Resilient activities and expected benefits

2.3.4. Reliable (£5.02m NIA Funding)

We must be Reliable for our customers; this applies to all of our customers and to each service we provide, whilst recognising that customers' needs will vary across the business. We recognise that with significant challenges in the path to Net Zero, we must maintain the quality of services to our customers. We know that we must play our role in maintaining continuity and security of supply even in the face of increased demand stemming from the energy transition of heat and transport.

Global warming has also introduced more extreme weather conditions that may impact asset health, their performance or even cause wide area outages. We need to ensure we provide a good quality of service to our customers in a consistent manner, providing a reliable service even through extreme events. We aim to investigate these impacts in detail, exploring

adaptive protection technologies that can help improve the reliability of service of the transmission network. **We are therefore requesting £5.02m in NIA allowance to fund these activities.**

We will build on our learnings from our FITNESS project (T1 NIC) to explore adaptive protection systems to support the growing uptake of Low Carbon Technologies (LCTs).

Many stakeholders emphasised the need for a reliable and secure network that can withstand storms and prevent power cuts, ensuring consistent supply, especially in rural and remote areas. Our stakeholders have also remarked that we need to go beyond Building Information Modelling (BIM) and look to implement an integrated business management system that allows for a common data environment and real-time analytics.

To support our goals in relation to Reliable, we have developed our activities to achieve the following:

- Improving our response and quality of service during extreme events

- Upscaling digital and AI tools for outage planning

- Advancing our knowledge in protecting dynamic networks

- Increasing our use of analytics & monitoring applied to advanced predictive maintenance

To achieve this, our innovation strategy is planned to ensure we can explore, test and demonstrate new methods that can help us improve condition assessment and availability of our assets. Specifically, in T3, we have developed 5 activities to support this goal as provided in Table 9 below.

Activity	Expected benefits	Planned collaboration
A12 - Procedure, specification and architecture design for predictive maintenance using effective monitoring - OHL and substation A13 - Feasibility study and functional specification for coordinated multi TOs and DNOs flexibility A14 - Adaptive protection system supporting growing uptake of LCTs A15 – Geomagnetically-induced currents impact on transmission assets and mitigation plans A16 - Disaster management and response tools assessments	• Improved asset availability and overall reliability of grid • More adaptable protection arrangement allowing further integration of Low Carbon Technologies LCTs • Reducing the cost of protection systems in substations • Allow market competition by participation of wider range of manufacturers • De-risking wide area network outage or black out • Improved network design for extreme conditions resulting in improved continuity of supply	National Grid Transmission, SSEN Transmission, Distribution Network Operators (DNOs) and potentially Various Catapult Centres, Academia

Table 9: NIA Reliable activities and expected benefits

2.3.5. Responsible (£5.95m NIA Funding)

We must be Responsible in our network investment, working to minimise costs and maximise benefits for our network users whilst ensuring we meet our Net Zero goals responsibly. We recognise that our customers increasingly rely on electricity as their main source of energy

therefore maintaining the quality of our services and continuity of supply at minimum cost is one of our core targets.

Electrification of heat and transport will put more stress on the network and will trigger significant network reinforcement which is usually costly and time consuming to implement; consequently, we intend to explore services which will potentially reduce the level of traditional investment we may otherwise need for transmission networks. For example, we intend to explore how we can practically use and implement the demand response from customers e.g. large cluster of EVs connected to distribution networks as an ancillary service for balancing mechanism and reducing the thermal and voltage stress on transmission networks. In addition, we aim to explore opportunities to improve connection offer processes by deploying more analytics, automations, and AI tools to help us reduce the time required for connection application assessments with better data accuracy.

Our supply chain and procurement strategy also have an impact on the final cost and lead time of products. In line with our ongoing procurement commitments to ensure technical compliance at the minimum cost, we aim to explore further procurement criteria in sustainability and the cyber security domain that can be practically added to the process. Also, to tackle supply chain challenges, we will further engage with the market, identify trusted databases, and develop a practical approach to support our ongoing procurement strategy in achieving the best value for our customers.

We recognise that, with collaboration and effective data sharing among stakeholders - including our customers, we can optimise decision making processes in a whole energy system. However, we need to further explore data sensitivity and its impact on various stakeholders to achieve balanced and secure data sharing practices. **For our Responsible area of focus we are requesting £5.95m in NIA funding.** We will aim to achieve the following:

- Optimise an evolving supply chain

- Improve secure data access with customers & supply chain

- Improve connection assessments using analytics and AI

- Look into further value for customers' demand responses

We have developed the activities in Table 10 below to meet these objectives:

Activity	Expected benefits	Planned collaboration
A17 - Ancillary services from heat and transport A18 - Understanding the cost for supply chain Resilience A19 - Automated outage planning tool using analytics and AI A20 – AI-generated connection offers A21 - Ancillary services and integration A22 - Data sharing protocols and standards	• Improved network reliability and security of supply by customers' (demand and generation) responses • New infrastructure for customer participation in capacity market and enhanced frequency response • Faster connection application assessment processes • Enhanced data accuracy and data sharing standards among energy industry players and customers	Aggregators, manufacturers, National Grid Transmission, SSEN Transmission, Distribution Network Operators (DNOs) and potentially Various Catapult Centres, selected SMEs and Academia

	• Improved outage planning processes and better network reliability assessments

Table 10: NIA Responsible activities and expected benefits

2.3.6. NIA funding request evolution

To show how our funding has evolved from RIIO-2 to RIIO-3, we will refer to our T2 Strategy in which we structured our funding request under 4 clusters as Figure 7. For the purposes of comparison, we can organise our T3 funding request around these 4 clusters to show how the overall increase has been distributed across these areas.

T2 NIA Funding Request Profile

- System Security and Stability
- Network Modernisation
- Network Flexibility
- Digitalisation of Power Networks

T3 NIA Funding Request Profile

- System Security and Stability
- Network Modernisation
- Network Flexibility
- Digitalisation of Power Networks
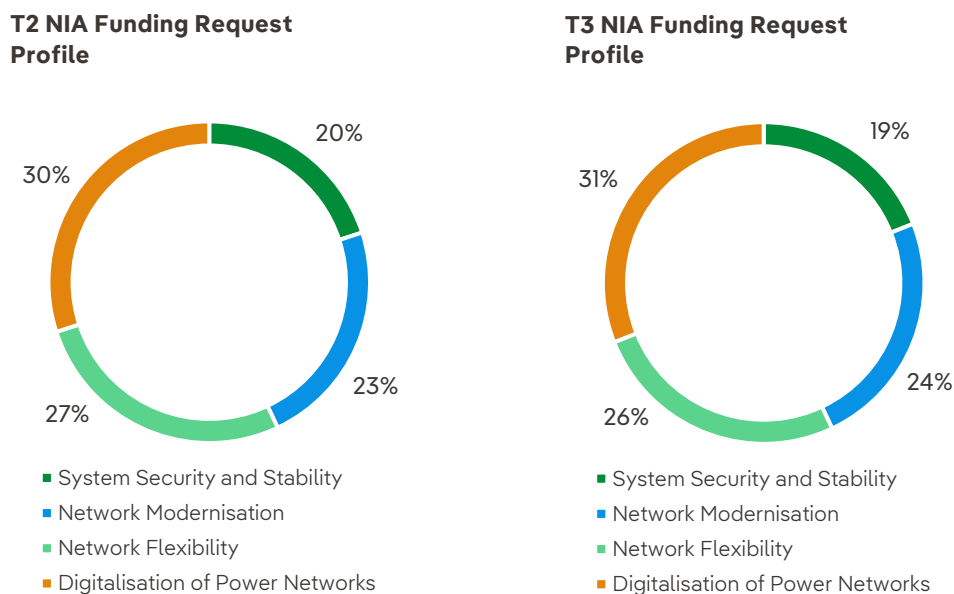
Figure 7: T2 and T3 NIA funding request comparison

As shown, the balance of innovation (when mapped to the T2 cluster) has been broadly maintained across the portfolio. Furthermore, all clusters have seen an increase in funding request, between 24-41% increase, with an overall increase of 34% after taking account of inflation.

2.4. RIIO-T3 BaU-funded Innovation

Alongside our NIA innovation activities, we are also constantly investing in innovation using our Totex allowance to improve our operations, help us reach Net Zero more quickly and ultimately reduce the cost to customers. These projects usually fall into one of two categories:

- Innovation led by SPEN Transmission or other transmission network, previously funded through stimuli and now being deployed as BaU using Totex
- Innovation projects funded through Totex to deploy innovative approaches, methods or technologies not previously funded through innovation stimuli

In Table 12 below we outline a summary of the BaU innovation activities that we will deliver using T3 Totex funding, their estimated cost and where they are referenced across our Business Plan documents. **The total estimated investment associated with these activities**

exceeds £380m, which reflects our commitment to innovation and our strong belief that innovation should be central to how our business operates day-to-day.

Business Area	Activities	Cost (£m)	Business Plan Reference
Engineering Design & Standards	• HTLS conductor (roll out of SPT T1 NIA) • SF6-free switchgear • RePower project (roll out of Distributed Restart – T1 SPT/NESO)	███	Load Related Activity – Baseline Projects. Network Asset Management Strategy.
Operational Technology	• Protocol migration • Removal of 3rd-party-owned Ethernet Access Direct • Transmission PowerOn Functionality • Network enhancements		Operational Technology Business Plan Annex
Cyber Security	███████████████		Cyber Resilience Business Plan
Business Transformation	• Customer-led connections – Automation of contract creation • Procurement process automation • Digital field technology – Easy on-site asset identification • Technology-enabled inspections		Digitalisation Strategy & Action Plan
Sustainability	• Low carbon construction materials • Carbon emission offsetting • Biodiversity net gain		Environmental Action Plan.
Data Intelligence	• Open Data Portal • Data governance – Informatica platform • Data Sharing Infrastructure (DSI) Project • Data Platform – Reporting and analytics		Data & Digitalisation Annex
Total		495.6	

Table 11: T3 Totex Innovation Activities

There are other recently proven innovative technologies, such as hybrid synchronous compensators and digital substations, the roll-out of which is very much part of our T3 ambition, but which do not feature in our baseline T3 Totex funding request. These activities are explicitly referred to in the Load Related Activity section of our submission, under non-baseline projects.

We currently lack sufficient data to reliably quantify the costs associated with these non-baseline roll-out activities - hence our decision to submit a nil return in BPDT 9.10. We therefore recommend that a re-opener mechanism is required in T3, similar to the Innovation Rollout Mechanism (IRM) which was available during T1. This would allow us to remain agile in our innovation delivery and deployment, ensuring that changes such as unexpected advancements in the technology readiness of certain concepts and cost uncertainties are accounted for and don't impede the rollout of solutions and realisation of benefits.

3. How we Deliver, Report & Deploy Innovation

3.1. Our Innovation Process

SP Energy Networks has a well-established innovation process which has evolved throughout T2, based on industry research, to align with the Energy Networks Innovation Process (ENIP). This process applies to all our innovation projects.

The objectives of our innovation governance and innovation process are:

- To carefully triage and curate ideas into concepts.
- To ensure concepts are proven or disproven through project delivery; and
- To embed and communicate learnings from project delivery.

To fulfil these objectives, our innovation process spans 6 phases, as per Figure 8.
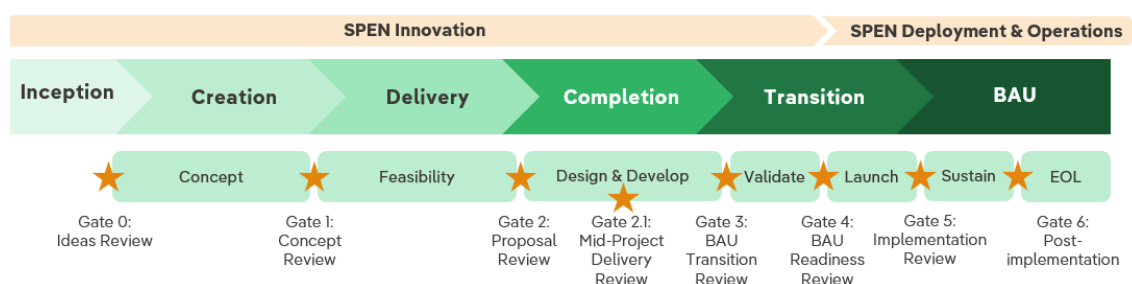
Figure 8 - Summary of our Innovation Process

Inception

Inception can originate from a range of sources, including the Future Networks team itself, wider SPEN business units, external innovators, academic partners or from a call for ideas by the business, EIC, ENA or more. **Extensive engagement takes place surrounding any project origination to ensure potential activities are aligned to business goals** and strategic ambition (see Section 2.1.3 for further detail on how stakeholders have influenced our T3 plan).

Every project must have a business sponsor before progressing beyond the inception phase. Where an idea is 'pulled into' the business, for example as a response to a call for ideas, there is inherent business alignment and sponsorship, however when an idea is 'pushed to' the business, typically further work is required to identify a business sponsor.

Each project goes through a detailed approval process before progressing. Firstly, assess whether the innovation project can be funded through Totex (as BaU Innovation) and if not, why not. For projects which we plan to deliver via stimulus funding, we assess their eligibility against the NIA or SIF criteria, as required.

We have a **comprehensive approach to manage the risk of duplication**, built on the following five key elements: collaboration with other network operators, leveraging existing project outcomes, thorough review of relevant projects, adaptation of proven technologies, and focus on novel aspects. This is enacted through our relationships with other License Network Operators and desktop analysis of project data available on the ENA portal undertaken during the ideation phase. We also share proposed projects at the ENA Electricity Innovation

Managers forum, ahead of project submission, to validate and cross check for any duplication. This process is further bolstered through the EIC Partnership which triages third party ideas.

Where research has identified similar previous projects, we work to make sure that any value we deliver is additive and does not overlap with existing learnings. We collaborate and conduct thorough reviews of project outcomes and lessons learned to identify unique aspects that can be built upon, adapting and extending previous work to new challenges. This approach enables us to transfer learning. Where insufficient additional value can be identified to justify the associated further investment required, the activity is halted.

Once we have identified a project as meeting NIA/SIF criteria, all projects are then assessed and ranked according to our internal score criteria as set out in Figure 9 below:

Alignment to Strategy and Importance	End User & Strategic Benefits	Scalability	Synergies and Core Competencies	Technical Feasibility	Cost Benefit Analysis (CBA) for integration to BaU
Degree of alignment with the innovation strategy and important of the project to the company	The degree to which the project offers greater benefits to the end user, offers discrete benefits from other projects, offers strategic benefits to the company	Scale of potential roll out, ease of roll out, likelihood of completed project leading to furthers	Ability to leverage synergies with existing systems and working practices and availability of required resources (skills, capability & experience)	Degree of technical feasibility and size of technical gap	Degree of definition of cost benefit analysis and positive cost benefit analysis

Figure 9 – Innovation Projects Score Criteria

We use the Score Card criteria to ensure alignment to strategy and to assess how potential benefits stack up against estimated costs. To proceed, each project must reach a minimum threshold in all criteria and score highly in 3 categories in order to be presented for further interrogation. This process also enables projects to be prioritised based on their scoring.

Creation

Following a successful scoring, significant stakeholder engagement takes place before any presentation of project proposals to the necessary governance groups, such as the Innovation Board (IB)[3] to affirm the project concept, scope and sponsorship.

Teams who will be impacted by (and benefit from) the project and whose support is required for delivery are consulted and **a sponsor is appointed** who:

- is of an appropriate level within the organisation to support the project delivery; and
- who will own the outputs (and BaU implementation)

The Future Networks team also **assign resource to support the project sponsor** throughout the project lifecycle. An overview of the responsibilities of the relevant internal parties across the lifetime of the project is shown in Figure 10 below.

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[3] *The IB consists of senior management across SPEN, and is responsible for approval, transition into BaU and overall oversight of performance of the innovation project portfolio.*
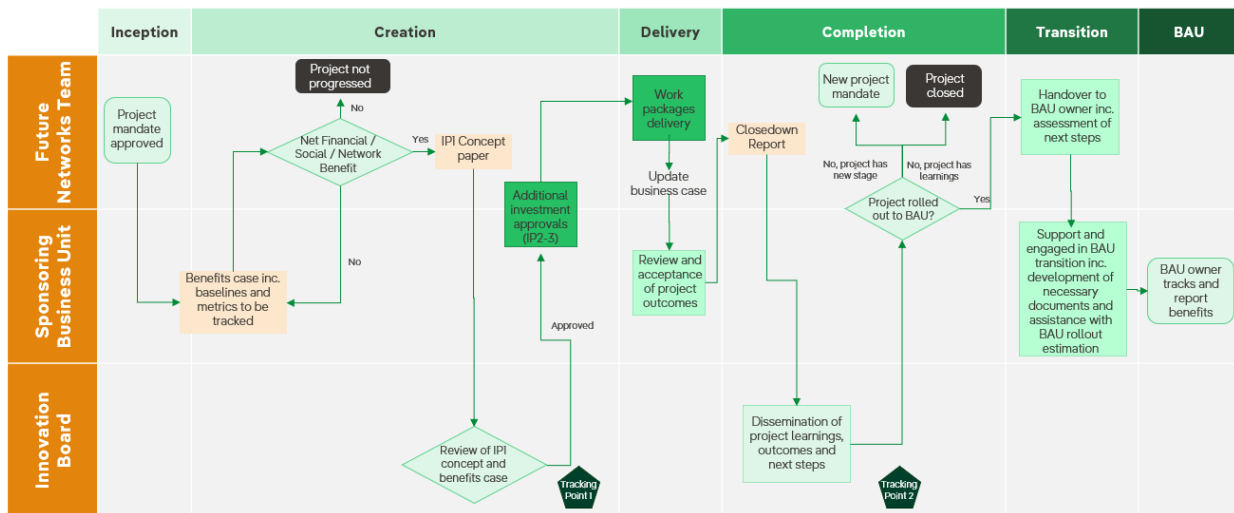
Figure 10: Innovation process – roles and responsibilities

Delivery

To ensure successful project delivery, we **follow a stage-gate process over the project phases.** These gates ensure that the project is progressing in a timely manner, to budget and to the standards expected by the relevant stakeholders. The project's success criteria are defined during the creation stage and are confirmed by the Future Networks team, BaU Sponsor and Innovation Board. Through this process, **risks are actively managed**, and sufficient gates are built in to allow for proceed, hold or stop the project if necessary.

All stimulus-funded projects are reported on a quarterly basis to the IB. This provides an overview of the progress and costs, with key risks and any outstanding cases highlights. The impacts and mitigations, as well as the owner of risks, are also captured in relevant risk registers.

Phase	Gate No.	Gate Name	Objective	Description	Owner
Inception	0	Ideas	To ensure only projects with potential to deliver benefits are taken forward, and that mitigation measures are available for identified risks	Review of project ideas, Score Card, CBA & Business Case, alignment to strategy, Resource & Budget	• Future Networks team
	1	Concept Review			
Creation	2	Proposal Review			• Innovation Board
Delivery	2.1	Mid-Project Delivery Review	To ensure projects are being delivered to time, budget and quality, and that any newly identified issues are mitigated for.	Monthly Innovation Board Project review to assess viability. Allows time for decision to proceed, hold or stop.	• Future Networks team • Innovation Board
	3	BAU Transition	To assess success of project and identify grounds for BAU rollout	Gate to review project ideas, Score Card, CBA & Business Case, Resource & Budget and Business Impact Assessment	• Future Networks team • BAU Sponsor
Completion	4	BAU Readiness			
Transition	5	Implementation	To assess roadmap, budget, process, resources and governance for successful rollout, and finalise benefits tracking and reporting for BAU	Gate to review Project Adoption and benefit	• BAU Sponsor
BAU	6	Post-Implementation			

Figure 11 Summary of gate process over the project lifetime

Completion, Transition & BaU

To be considered for BaU transition, **each project must meet the project success criteria** set out at the creation stage. Within the transition gate process, the BaU sponsor and impacted teams will also review **the roadmap to BaU implementation and updated benefits case of rollout**. Not every project will be immediately transitioned to BaU, for example if the project

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has a new stage or if learnings indicate that BaU rollout would not drive net benefits. The gate process considers the following aspects of the project:
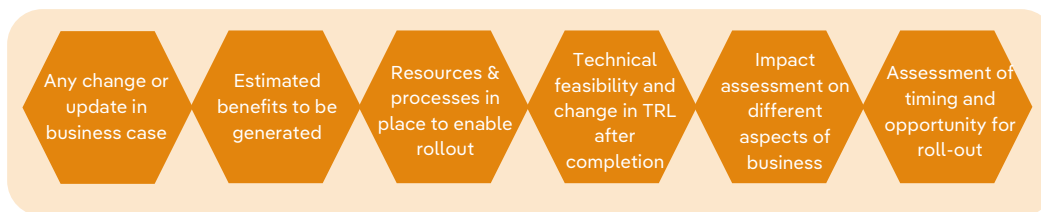

Figure 12: BaU Roll out Considerations

This gate process ensures **the BaU sponsor is best informed to make the necessary decision surrounding BaU rollout** and includes:

Confirmation of BaU owner

As a project progresses, it may evolve to impact wider business areas. Throughout the gate processes, it is reviewed to ensure the right parties are involved. **The decision to rollout to BaU ultimately resides with the Sponsor.**

Realisation of benefits

Review of projected benefits (from trial and roll-out) against those estimated at outset.

Financial approval

Depending on the level of risk involved in the roll-out of the project, external funding may be requested to avoid significant impact on allowances; where possible innovation roll out will be funded through Totex allowance.

Vulnerable Customers

Prior to approving future rollouts, we will consider the potential impacts on customers in vulnerable situations and, where necessary, develop a plan for mitigating those impacts.

Training and knowledge dissemination

Throughout the project, we provide frequent updates to both internal teams and external stakeholders. This keeps everyone informed about progress, challenges, and emerging insights. Internally, we maintain team briefings **and have established an informal network of departmental focal points** to ensure that innovation insights are shared throughout our company. **We also recognise the importance of industry-wide collaboration in driving sector progress** and participate in industry events and forums to share our project learnings and engage in valuable knowledge exchange with our peers. We also utilise the ENA Smarter Networks Portal, to upload project reports and key learnings, making them accessible to a broad audience of industry professionals.

We produce closedown reports which capture critical learnings, outcomes, and recommendations for future work or potential adoption into business-as-usual practices. This ensures that the value of each project – including lessons learned - extends beyond its immediate scope, informing future initiatives and operational improvements.

Standards and specifications

In order to facilitate BaU adoption, we ensure relevant resources are developed (or updated) to take into account the new solutions. This could include newly created or updated policies, standards, best practice guides and/or specifications.

Additionally, **the Future Networks team carries out an annual review of projects completed by other networks which we may want to deploy in our network** and engages with the relevant business areas to select which ones we will want to develop a business case for and assess our readiness for roll out. We also engage with the network that developed the solution to unpack any potential lessons learned that could support the deployment.

3.1.1. Benefits management and reporting

Our innovation process includes benefit tracking and reporting activities at each stage of the project lifecycle, from creation to BaU.

CREATION	DELIVERY	COMPLETION	TRANSITION	BAU
• Business unit approves benefits case, including baseline and metrics to be tracked, these are summarised on statement of planned benefits. • Initial CBA developed • **Tracking point 1:** Innovation Board reviews planned benefits and outcomes	• Statement of planned benefits and CBA are updated based on project delivery. • Project progress is included in annual innovation report and Innovation Measurement Framework	• Quantitative and qualitative benefits included in project closedown report, CBA is updated. • **Tracking point 2:** Innovation Board reviews planned benefits and outcomes against actuals.	• Year on year benefits tracking projection is created and included in project roll-out roadmap for future tracking and reporting of benefits.	• BaU owner tracks and reports on benefits. • Future Networks Team collates benefits for inclusion in Innovation Measurement Framework.

Figure 13: Benefits management through innovation process

When a project is created, a statement of planned benefits is developed. This includes an initial benefits estimation, a risk assessment, relevant assumptions, and a timeline for when these can be tested. This document is reviewed and updated as the project is delivered.

A cost-benefit analysis is also developed alongside the statement where appropriate, however not all projects will be at a stage to carry out this assessment, in which case the benefits are described qualitatively. **We understand that evidencing value for money to consumers is key to justifying the investment we are making in innovation, however it is also important to point out that value can be delivered in many forms.**

Beyond financial benefits, projects can contribute to our increased understanding of how new technologies can be applied, removing barriers to innovation, improving our environment, helping to achieve national Net Zero targets, increasing the safety of our operations, improving the resilience of our network and much more. **We aim to capture the many ways in which our innovation projects benefit our network, consumers, society, and the environment** through our project reporting available in the ENA portal, which also feeds into our dissemination activities.

Our benefit tracking activities shown in Figure 13 allow for the stage gate process to be implemented smoothly, providing an up-to-date view of estimated benefits and business case ahead of gate decisions. For example, at the end of a project the CBA process is repeated based on learnings throughout delivery. If the outcome of this process shows that estimated benefits do not provide a business case or societal benefit and/or the risk score remains high, the project may be referred for further work or stopped all together.

As a network, we report on innovation metrics and benefits through the Innovation Measurement Framework (IMF). During T2, we have started reporting through this framework and have also actively engaged with sector-wide efforts to improve benefits reporting for

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innovation, particularly working with the EIC on an enhanced reporting framework for NIA projects, and with the ENA on improvements to the IMF. For the next regulatory period, we will continue to improve our benefits reporting process, in alignment with sector endeavours in this space.

3.1.2. Collaboration and third-party involvement

Collaboration is a key enabler and success factor for innovation projects, ensuring that ideas and learnings are shared, duplication is avoided, and that proven innovation is deployed successfully across the sector.

We participate in several cross-sector forums that provide opportunities for collaboration and encourage third party participation, including the ENA Innovation Managers Working Group, the ENA Annual Basecamp, EIC Calls for Partners, EIC Calls for Innovation, SIF Calls for Ideas and our strategic partnership with Energy Systems Catapult (more details on how we engage with wider industry can be found in Section 2.1.1). We have also demonstrated how this engagement can lead to project partnerships which can deliver significant benefits; during T2 we have developed 19 projects which partner with other networks with a total value of over £10m, across both SIF and NIA.

We have also engaged with NGET, SSEN and National Gas through monthly meetings in recent months to explore the potential for collaboration in T3. Through this engagement, we have identified 4 common areas in which our networks are planning NIA activity, shown in Figure 14. We commit to continuing to explore the scope for transmission owner (TO) collaboration in these areas during T3. We will do this by continuing these monthly meetings with the aim to develop a coordinated collaboration strategy, which avoids duplication and ensures learnings are shared.
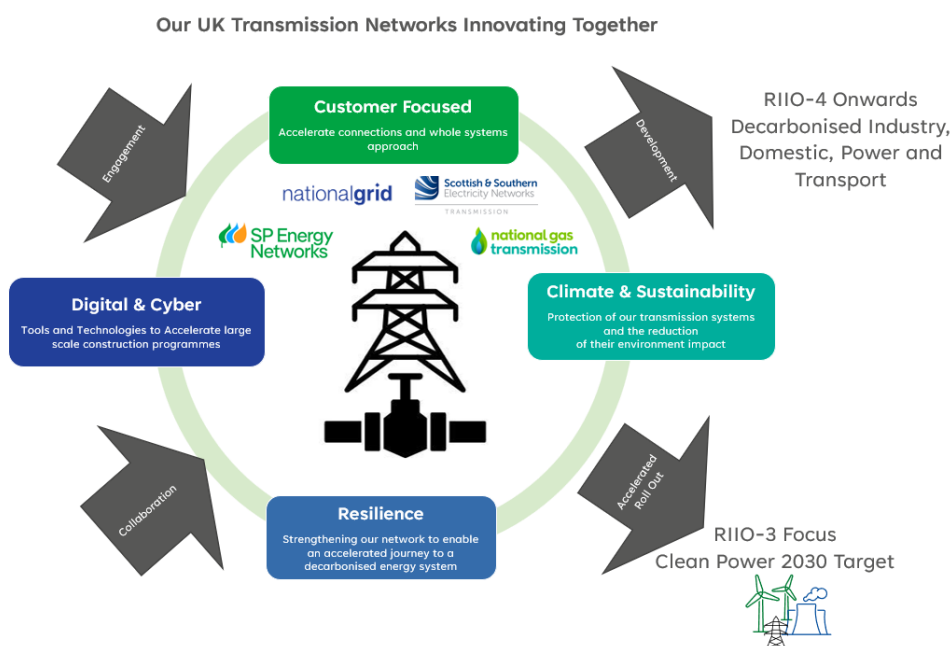

Figure 14: Collaboration with other Transmission Networks

We have also worked to increase third party involvement in our projects, with 72% of our current T2 NIA portfolio including third party collaboration, and 100% of our SIF projects. Through the EIC's "Innovation Gateway" initiative, we publish our existing challenges and welcome solutions and thoughts from Innovators, in particular from SMEs. This online portal serves as a single point of entry for SMEs looking to collaborate with us. Through this platform, we regularly publish our innovation challenges and invite creative solutions from the SME community. Direct engagement is made through quarterly "Innovation Pitch Days." These events give SMEs the opportunity to present their solutions directly to our leadership and technical teams. The most promising pitches are fast-tracked for further development and potential implementation.

Furthermore, the ENA held their latest Basecamp in January 2024. We submitted 4 challenges to the session and received around 80 proposals to review. These were then shortlisted into 12 proposals, for which we attended the pitching sessions across June/July of this year. We will continue to work with these SMEs and attend future ENA Basecamps.

We are continuously looking for ways to attract third parties, including SMEs. In the following section we outline the steps we are planning to take to improve our engagement and lead to increased collaboration and partnerships with this group.

3.2. Key enhancements for RIIO-T3

It is imperative our business continues to improve in how we deliver. Through T1 and T2 we have invested considerable effort in developing our innovation management system with our innovation partners. As we prepare for T3, we are looking to further improve our processes through alignment with best practices. Our initial review has identified what we consider to be opportunities to enhance our existing process.

Process	Proposed Improvement
New engagement mechanisms	We will expand the involvement of diverse stakeholders in our innovation space, aiming to harness the expertise and resources of external organisations to drive our strategy forward. This includes formalising our existing relationships with key stakeholders into strategic partnerships. For the remainder of T2, **we will progress on laying the foundations of these partnerships in order to ensure we are best positioned to foster collaboration and innovation**. This will include core organisations which are key to our strategic priorities as a network.
	Similarly, **we will continue to formalise our internal engagement by making our internal priorities survey a 6-monthly recurring engagement event**. This will allow us to remain constantly aware of our colleagues' challenges, priorities and ideas for innovation.
	As part of the Iberdrola group, we will leverage learnings from our wider organisation to expand our opportunities for engagement and wider learning. Our parent company has a long-standing initiative named PERSEO committed to startups and innovation. The PERSEO programme currently has over 7,500 start-ups in its eco-system, and maintains an Open Innovation Tool, where it launches 10 annual challenges which are responded to by over 500 proposals each year. We will leverage this to enhance our call to ideas processes and create wider opportunities for engagement with third parties and SMEs.
	Regarding our engagement specifically with SMEs, we will coordinate the following through our partnership with the EIC:

	• Clearly communicate our strategy to EIC's SME pool to help them understand us better. • Broadcasting key successes which resonate with the stakeholder group and showcase this positive network. • Help us understand the stakeholder group better through mechanisms such as surveys/engagement days/pitch coaching events. • Pre-triage suggested ideas from SMEs using an agreed process and then bring to TO/DNO members for review.
Improving our benefits reporting and tracking	The sector has made significant progress in the last regulatory period to improve the way we collectively track and report on benefits, particularly through the development of the Innovation Measurement Framework in partnership with ENA and other networks. We plan to continue to improve this process and to engage with other networks and stakeholders. Internally, **we will work to implement a central repository for benefits reporting that also includes our Totex funded projects that are being rolled out into the business**. This will allow more visibility and easier aggregation of estimated and realised benefits from these projects, which are currently managed and tracked by each business unit. We are also looking for ways to better track and aggregate wider system and societal benefits, as well as benefits from projects with a lower Technology Readiness Level. We believe these projects are delivering valuable benefits, however, current sector reporting only requires financial and other monetised benefits to be reported. **We will work with other networks to find new ways to show how these projects are delivering towards our innovation objectives**, including for projects that don't progress to business as usual.
Improving overall governance and standards (aligning with ISO 56000)	ISO 56000 series is considered a best practice framework for innovation management. It provides a set of guidelines and standards designed to assist organisations to systematically manage innovation and improve their innovation capabilities. **We will review the standards included in detail, to assess their applicability to an electricity transmission business and develop a roadmap for implementation** as appropriate. Standards include: • a framework and processes to support the implementation of an innovation management system. • how to leverage partnerships and intellectual property management. • how to gather and use strategic intelligence to foster innovation, and • a methodology for evaluating the effectiveness and maturity of an organisation's innovation management system. Adopting these processes could lead to more systematic innovation. We will work to identify how we can best use these standards to improve our current processes and address any gaps compared to best practice, whilst reducing unnecessary burden during implementation. In addition to this, with the aims of improving our mechanisms to 'fail fast', **we aim to share and maintain a log of discarded retired ideas or projects (as detailed in Section 1.2.4) across the business**. This will ensure that our colleagues from around the organisation are able to self-serve and investigate if we have reviewed and discarded potential projects which are similar to new proposals under review.

Table 12: Key enhancements for T3

Appendix A: Summary of Stakeholder Engagement Events

Event(s) Name	Type of engagement	Method	Date	Description / Objectives	Stakeholders
Innovator Insights Survey Report 2022: Outputs and Action Plan	Horizon Scanning	Survey	Mar-22	Survey undertaken by EIC to understand Innovators perspective on innovation landscape	SMEs, Innovators
Innovator Insights Survey Report 2024: Outputs and Action Plan	Horizon Scanning	Survey	Sep-24	Survey undertaken by EIC to understand Innovators perspective on innovation landscape	SMEs, Innovators
New Infrastructure Stakeholder Engagement Survey 2022/2023	Horizon Scanning	Survey	Apr-23	Survey undertaken to understand our stakeholder's satisfaction with new infrastructure projects and areas for improvement	Stakeholders impacted by new transmission projects, i.e. local residents, communities and landowners
UKRI Innovation Culture Report	Horizon Scanning	Research	Jan-24	Research commissioned by UKRI in collaboration with Ofgem to identify challenges faced by individual organisations and wider industry from enhancing innovation culture	UKRI, Ofgem
ENA Basecamp Event	Horizon Scanning	Conference	Mar-24	Engagement with academia and SMEs on focus areas for innovation to identify future projects.	SMEs, Academia, Innovators
New Infrastructure Stakeholder Engagement Survey 2023/2024	Horizon Scanning	Survey	Apr-24	Survey undertaken to understand our stakeholder's satisfaction with new infrastructure projects and areas for improvement	Stakeholders impacted by new transmission projects, i.e. local residents, communities and landowners
ENA Innovation Strategy	Horizon Scanning	Research	Apr-24	A roadmap developed by the ENA to help enable collaboration and shape the energy sector's efforts towards the Net Zero transition	ENA
Sustainable Glasgow Forum	External Engagement	Working Group	6-weekly (2018 – ongoing)	A partnership which is dedicated to delivering a sustainable Glasgow together, meeting every 6 weeks,	Clyde Gateway, Glasgow Caledonian University, Glasgow Chamber of Commerce, Glasgow City Council, Glasgow Convention Bureau, NHS Greater Glasgow and Clyde, Scottish Enterprise, Scottish Government, Skills Development Scotland, Strathclyde Partnership for Transport, Transport Scotland, University of Glasgow, University of Strathclyde, Wheatley Group
Edinburgh Climate Forum	External Engagement	Working Group	Quarterly (Sep-21 – ongoing)	Working group meetings every quarter with the objective to conduct knowledge sharing on climate impact	Arup, Agilico, Changeworks, Edinburgh Airport, Edinburgh Napier University, Edinburgh Science, Edinburgh Trams, ITPEnergised, Natwest Group, NHS Lothian, Robertson

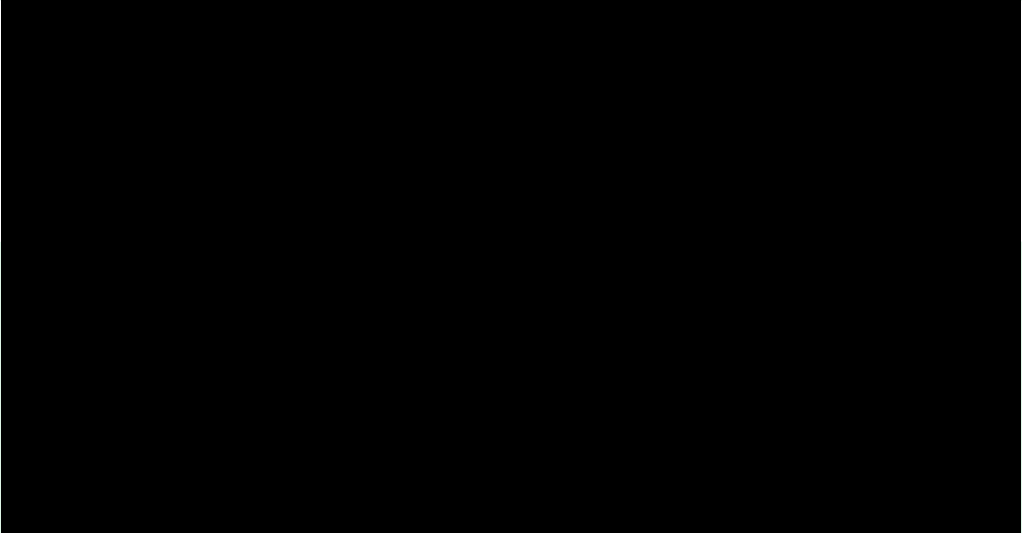|					
				reduction strategies, participate in benchmarking studies and share successes and challenges	Group, Scottish Parliament, University of Edinburgh, Vattenfall, Warmworks
Net Zero Knowledge Community	External Engagement	Working Group	Quarterly (Sep-22 – ongoing)	To provide information and support for all stakeholders in facilitating the UK and Scottish Governments' Net Zero targets	SSEN, SGN, Strathclyde University, St Andrews university, Edinburgh university, EON, Cala Homes, Fife Council, City of Edinburgh Council, East Ayrshire Council
Open Innovation Event	External Engagement	Workshop	2023	Workshop organised by Future Networks team with academia and SMEs to identify future project proposals.	Siemens, GE, Arup, CGI, Ricardo, University of Strathclyde, Leeds University, Newcastle University, DNV, Cardiff University, Juice Immersive, Energy Systems Catapult and Network Rail
Project ENSIGN	External Engagement	Working Groups and knowledge sharing events	Bi-monthly (Mar-23-ongoing)	ENSIGN aims to create a digital representation of the networks, including infrastructure, asset data and real time data streams. The working group meet every 2 months to share knowledge, learnings and updates with wider stakeholders and gain feedback / insight into challenges.	UKRI, University of Strathclyde, Heriott Watt University, University of St Andrews, University of Liverpool, DAFNI, National Grid, Arup, DESNZ, NGESO, ODI
Project Phoenix	External Engagement	Knowledge sharing event	Jul-23	Knowledge dissemination event from Project Phoenix, looking at the barriers and challenges associated with the roll-out of Hybrid Synchronous Compensators.	Hitachi Energy, National Grid ESO, University of Strathclyde, Technical University of Denmark (DTU)
Energy Innovation Summit	External Engagement	Conference	Nov-23	Project dissemination (Predict4Resilience, LV Engine, Angle DC, Hubs, D-Suite, Synergy and Project PACE), project partner engagement, idea generation	PLP, DNV, Lucy Electric, Ricardo, SPM, CEE/Morgan Ash, XR Company, ANRA Technology
SPT Connections Summit	External Engagement	Conference	Dec-23 (bi-annual event)	Event to address customer challenges, provide updates on the network and reinforcement works, and receive customer feedback	150+ customers looking to connect or have connected to our Transmission network
SPT Stakeholder Priorities Survey	External Engagement	Survey	Mar-24	To gain understanding of SPT's stakeholder's priorities areas for us to deliver and relevant timeframes	Local Authorities, Community Councils, Contractors and Connected Customers, DNOs/iDNOs, Suppliers, Academia, Charities, Consultancy and Engineering
Utility Week Live	External Engagement	Conference	May-24	Dissemination of innovation portfolio and engagement with organisations to identify future innovation projects.	SMEs, Academia, Innovators
INZAC Innovation Buddy Group	Internal Engagement	Working Group	Jul-24 Sep-24	Our Independent Net Zero Advisory Council's specialised Innovation-focused group forum to provide feedback on strategy progress	INZAC
Ofgem RIIO-3 Innovation Working Group	External Engagement	Working Group	Bi-weekly (Aug 24 – Oct 24)	To provide input on a range of policy areas, including: innovation deployment, how to improve reporting on deployment, reputational incentive design, and the case and design for financial incentive, adjustments to Strategic Innovation Fund	Ofgem, NGET, SSEN Transmission

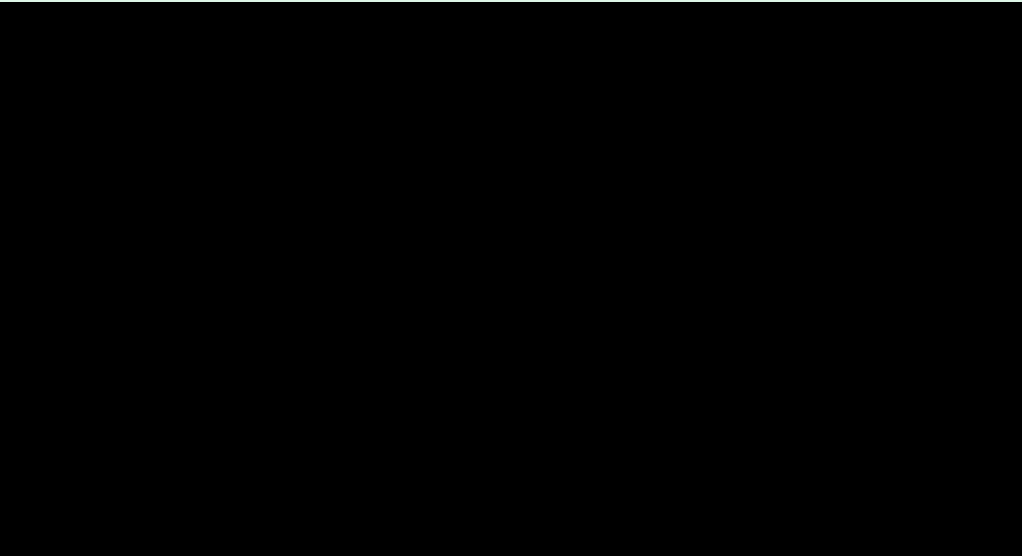# Appendix B: Detailed NIA Activities

READY

⊞ Facilitate energy transition

◯ Benefit vulnerable consumers

Activity title	A1 - Enhanced transmission performance by HVDC links control and deploying FACTS
Allowance requested Problem	£0.46m
Solution to be explored	

Activity title	A2 - Harmonic mapping and AI based impedance loci calculation for quicker LCT connection decisions
Allowance requested Problem	£0.37m
Solution to be explored	

Activity title	A3 - Enhanced system performance assessment tools (hardware and software) development and deployment
Allowance requested	£0.58m

Problem	
Solution to be explored	

Activity title	**A4 - Smarter Overhead Line (OHL) routing design and wayleaves streamlining**
Allowance requested	£0.63m
Problem	
Solution to be explored	

Activity title	**A5 - Review emerging markets for low carbon technologies to support a holistic approach to achieving Net Zero greenhouse gas targets**
Allowance requested	£1.24m
Problem	
Solution to be explored	

Activity title	A6 - Overhead Line (OHL) temperature and progressive fault monitoring using integrated and distributed sensors
Allowance requested	£2.04m
Problem	
Solution to be explored	

RESILIENT

Activity title	A7 - Advanced inspection & surveillance using robotics and analytics
Allowance requested	£2.22m
Problem	
Solution to be explored	

Activity title	A8 - Data Analytics & AI supported long term network planning
Allowance requested	£0.71m
Problem	

Solution to be explored	
	██

Activity title	A9 - Enhanced operation safety deploying digital technologies
Allowance requested	£0.56m
Problem	███
Solution to be explored	

Activity title	A10 - Sustainable project delivery and construction (carbon management)
Allowance requested	£0.67m
Problem	███
Solution to be explored	

Activity title	A11 - ████████ Cyber Security ████████
Allowance requested	£2m
Problem	███

Solution to be explored	

RELIABLE

Activity title	A12 - Procedure, specification and architecture design for predictive maintenance using effective monitoring - OHL and substation
Allowance requested	£1.65m
Problem	
Solution to be explored	

Activity title	A13 - Feasibility study and functional specification for coordinated multi TOs and DNOs flexibility
Allowance requested	£0.27m
Problem	
Solution to be explored	

Activity title	A14 - Adaptive protection system supporting growing uptake of LCTs
Allowance requested	£1.94m
Problem	

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Solution to be explored

Activity title	A15 - Geomagnetically induced currents and lightening impact on transmission assets and mitigation plans
Allowance requested	£0.53m

Problem

Solution to be explored

Activity title	A16 - Disaster management and response tools assessments
Allowance requested	£0.63m

Problem

Solution to be explored

RESPONSIBLE

Activity title	A17 - Ancillary services from heat and transport
Allowance requested	£0.60m

Problem	
Solution to be explored	

Activity title	A18 - Understanding the cost for supply chain resilience
Allowance requested	£0.22m
Problem	
Solution to be explored	

Activity title	A19 - Automated outage planning tool using analytics and AI
Allowance requested	£0.60m
Problem	
Solution to be explored	

Activity title	A20 – AI-generated connection offers
Allowance requested	£2.21m
Problem	

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Solution to be explored	

Activity title	A21 - Ancillary services and integration
Allowance requested	£0.89m
Problem	
Solution to be explored	

Activity title	A22 - Data sharing protocols and standards
Allowance requested	£1.44m
Problem	
Solution to be explored	

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Appendix C: Linking with Ofgem's Business Plan Guidance

The table below highlights how this document links with Ofgem's Business Plan guidance released in September 2024.

Business Plan Guidance Section	Location in Innovation Annex
3.9	A high-level overview of our Innovation Strategy, including an overview of the BaU innovation we plan to undertake, and a summary of our planned utilisation of Network Innovation Allowance (NIA) can be found in our RIIO-T3 Business Plan Narrative, Section 3.3 – Continuing to Innovate.
3.11	Planned areas of BaU innovation can be found in section 2.4. Plans for third party involvement are described in section 3.1.2, whilst the steps to ensure previously proven innovation is deployed into BaU is laid out in section 3.1. How we will measure benefits from BaU innovation can be found in section 3.1.1.
3.13	Key areas of focus for NIA spending, including details of individual planned projects, how activities will be delivered, how we will ensure they meet NIA criteria, anticipated benefits and our funding request can be found in section 2.3, with more details provided on NIA activities in Appendix B. We have made a comparison of our funding request to RIIO-2 in section 2.3.6.

Details on our process to avoid duplication of projects, roll out innovation into BaU and disseminate learnings can be found in section 3.1, we have also provided evidence that we are already rolling out proven innovation in section 2.4. Our plans to collaborate with other networks and increase third party involvement are detailed in section 3.1.2. We have also proposed potential collaborators for each of our RIIO-T3 areas of focus for NIA in sections 2.3.2, 2.3.3, 2.3.4 and 2.3.5. Finally, in section 2.3 we explain why the proposed NIA activities can't be funded by Totex. |
| 3.15 | Our contribution towards our RIIO-3 flexible allowance can be found in section 2.3.1. We also set our views on other mechanisms to support allowance funding, such as reopeners in section 2.4. |