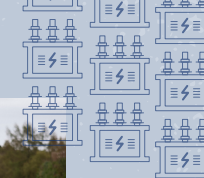


RIIO-T3 Innovation

December 2024





About SSEN Transmission Innovation

Showing leadership through innovation

- Operating the national HVDC Centre, a global centre for technology innovation that has identified and developed a number of groundbreaking innovation projects in support of the energy transition.
- Lowest IIG emissions rate, achieved through continual innovation in assets and operations, in particular the installation of SF₆ free switch gear on our network
- World first (outside China) HVDC technology deployment with the Caithness-Moray-Shetland system
- Setting the standard for terrestrial biodiversity net gain, and now extending that into the marine environment
- Innovative use of AI to enhance community and stakeholder engagement
- A diverse portfolio of innovation projects tackling some of the big system challenges

Innovation as a culture

- Diverse portfolio of 'business as usual' innovation that addresses real-world challenges
- Strategic supply chain partnerships to develop and deploy new technology and ways of working, in particular, our Accelerated Strategic Transmission Investment (ASTI) Charter that seeks to foster greater collaboration with our supply chain partners to pursue better ways of working through challenge and innovation
- Network of collaborations with research institutions, specialist bodies and small companies
- Rigour in measuring value: achieving significant benefit returns in RIIO-T3 exceeding our investment made during RIIO-T2
- An established innovation organisation and governance that gives everyone the opportunity to innovate

Strategic focus on energy system transformation

- Faster – to meet the ambition of clean power by 2030, by accelerating the development and construction of network infrastructure
- Greener – our sustainability strategy pushes the boundaries of best practices in climate, nature and communities
- Safer – we aim to be proactive rather than reactive on safety, finding new ways to design safety from the start
- Smarter – data and digital technology are rich opportunities to innovate to reduce cost and increase performance

Innovation in the RIIO-T3 period

Looking back to learn lessons from the past five years, and looking forward to our ambition for 2030 and beyond, we propose to be:

1. Quick and agile – using a Network Innovation Allowance of £5 million pa. with half of this on our strategic focus 'faster'
2. Value driven – by translating innovation to 'business as usual' with a targeted roll-out mechanism
3. Leading – using partnerships and competitive funding to drive forward technology of the future, in particular offshore and HVDC systems

This proposal places innovation at the heart of delivering a low-carbon energy system that is reliable, safe and efficient, at a pace in line with our national net zero targets.

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About this document

This document outlines Scottish and Southern Electricity Networks Transmission’s strategic approach to innovation and our funding requirements from Ofgem for innovation activities within the upcoming RIIO-T3 price control period. As the energy landscape undergoes rapid transformation, driven by the urgent need for decarbonisation, digitalisation, and the increasing integration of renewable energy sources, our commitment to fostering innovation has never been more critical.

Section 4 details our overarching Innovation Strategy, which aligns with our RIIO-T3 outcomes by employing innovation stimuli and additional funding opportunities to maximise impact. Key areas of exploration during RIIO-T3 will be outlined, including the identification of problems to be addressed, accompanied by a thorough justification of the requested funding levels. We provide a synopsis of our objectives for the Network Innovation Allowance (NIA) and outline the high-level business-as-usual (BaU) innovation activities we plan to pursue in RIIO-T3 using our total expenditure (Totex) allowance. Recognising the importance of exploring high-risk and high-reward innovation activities that extend beyond BaU operations, we seek to access a flexible innovation allowance in RIIO-T3, focusing on pioneering solutions that tackle emerging challenges within the energy networks.

Section 5 describes how we will deliver our strategic focus on collaboration with third-party stakeholders to embrace diverse perspectives and ensure broad-based participation in our innovation efforts. We will address our approach to collaboration with other network companies to ensure collective learning and knowledge dissemination, as well as the measures in place to prevent duplication of efforts. Furthermore, we will emphasise our dedication to integrating successful innovations into our BaU processes, demonstrating our proactive stance in rolling out proven solutions. Our commitment to monitoring and evaluating the expected benefits of these innovative activities is vital to making a meaningful impact on cost reduction across our network. This will also enable us to enhance consumer value through improved outcomes resulting from our initiatives.

We approach RIIO-T3 on the foundation of solid innovation performance in RIIO-T2 (**Section 2**) and our current approach to innovation (**Section 3**).

This document serves as a detailed articulation of our innovation strategy, ensuring that we not only meet but also exceed the expectations set out by Ofgem for the RIIO-T3 price control period. We aim to enhance our capabilities, deliver tangible benefits to consumers and contribute to a more sustainable energy future.

1. Executive Summary

As a leading player in the energy sector, our commitment to innovation is not merely a strategic choice but a necessity as we prepare to face the monumental task of decarbonising the energy system in Great Britain (GB). Our electricity network has experienced exponential growth and is set to expand further during the RIIO-T3 period. This transformation demands robust and resilient infrastructure to accommodate future energy demands and also help achieve ambitious carbon reduction targets. This network transformation aligns with the government's commitment to enhancing energy independence and reducing consumer bills, delivering on the vision for clean power by 2030.

We have developed our strategic approach to innovation for the RIIO-T3 period to act as a catalyst for this transition. This approach underscores the critical need for new methods and collaborative efforts to address the complex challenges that lie ahead. By systematically identifying and prioritising key issues through a robust innovation process and strong governance, we are well-positioned to ensure that our innovation initiatives yield impactful results aligned with our strategic goals.

Recognising that we cannot achieve these objectives in isolation, we are committed to fostering collaborative partnerships across academia, the supply chain, and our wider stakeholder groups across the industry. This collaborative approach will provide us with the insights and resources necessary to maintain a holistic view of innovation that maximises value across the entire energy system.

While we successfully secured £8 million (18/19 prices) of Network Innovation Allowance (NIA) funding during the RIIO-T2 period, this level of support is insufficient given the expansive growth of our network and the urgent need to deliver on national clean power targets. To address the critical challenges of network security and resilience, and to expedite progress toward a net zero network, we are seeking £20.5 million (18/19 prices) in NIA funding in RIIO-T3. This investment is essential for enabling innovative solutions that will safeguard our infrastructure and enhance its ability to meet growing demand.

In conjunction with our funding request, we will continue to engage within the Strategic Innovation Fund (SIF) programme, targeting key challenges and pioneering new technologies vital for the future of our network. This integrated approach will ensure that we not only meet the present demands but also build a sustainable and robust energy network for the future.

While we are actively requesting funding from Ofgem to support transformative innovation projects, we recognise the importance of also investing in our own Business as Usual (BaU) innovation initiatives. Our commitment to resourcing BaU innovation is integral to our approach, as it allows us to explore new methodologies that deliver operational efficiencies and improve service delivery. By targeting these pragmatic, lower-risk innovations, we can complement the more ambitious projects supported by regulatory innovation funding. This dual approach ensures that we are not solely reliant on Ofgem's support, thereby alleviating the burden of risk from consumers. We firmly believe that it is only fair for us to share in the responsibility for innovation, paving the way for a more sustainable energy future while safeguarding the interests of those we serve.

This approach and the support we require from Ofgem will empower us to deliver significant benefits and consumer value, laying the groundwork for a sustainable energy landscape that meets the needs of homes and businesses across GB and achieving a greener, more resilient energy future.

Our strategic approach to innovation in RIIO-T3 is built upon the foundation of our successes in RIIO-T2, and as of this point in time, we have initiated 38 new innovation projects, positioning us to deliver over £190 million of potential benefits by the end of RIIO-T3. This figure is based across our portfolio of NIA, SIF, and BaU funded projects. As we progress, we are focused on accelerating our innovation efforts to promote network growth while maintaining a safe and reliable infrastructure that supports our net zero ambitions.





2. Why we Innovate

At SSEN Transmission, our strategy is “Delivering a Network for Net Zero,” while maintaining a safe, reliable supply of electricity that powers our society and economy. We see increased electrification as central to the global effort to reduce carbon emissions. Within the framework of the RIIO-T3 price control, our objectives focus on three critical ambitions: accelerating the pathway to net zero, ensuring a safe, reliable, and resilient network, and facilitating a fair and sustainable transition. These align closely with the UK Government’s Clean Power Plan 2030, positioning us to play a pivotal role in supporting Scotland’s long-term aim to achieve net zero emissions by 2045 and the UK’s target by 2050.

Central to this transition is the urgent need for modernisation of our power systems, which must evolve to accommodate a significant increase in renewable energy sources. To ensure we remain efficient during these transformational times, we recognise the necessity of innovation to drive meaningful and effective change.

Significant innovation efforts are crucial in bringing new technologies to market in time to achieve national objectives. Current trajectories indicate that while a substantial portion of global CO₂ reductions through 2030 can be addressed using existing technologies, a considerable share of the anticipated reductions by 2050 will rely on innovations that are still in developmental stages. Thus, there is a need to place a high priority on rigorous research and development to unlock these opportunities.

We feel that it is vital to foster a strong culture of innovation across our organisation, encouraging all to engage in creative problem-solving and proactive thinking to address challenges head-on. Our commitment to innovation is driven by its broader societal benefits, including enhanced efficiency, reduced costs, and improved performance. Investing in cutting-edge technologies and innovative methodologies will not only modernise our infrastructure but also foster economic growth and job creation.

This is facilitated by strong collaboration which is vital to this process. We actively seek to innovate via strategic partnerships with industry leaders, academia, and innovators across sectors. By leveraging diverse expertise and collaborative creativity, we aim to develop robust solutions that bolster our infrastructure and propel us towards a sustainable, low-carbon future.

Innovation is not merely an avenue of exploration; it is imperative for us as we navigate the complexities of achieving net zero emissions. It acts as the catalyst for our goals, driving us towards a sustainable and resilient energy landscape that meets the challenges of the future while benefiting society as a whole. Embracing innovative thinking is essential as we work collectively to build the energy infrastructure of tomorrow.

3. Innovation in RIIO-T2

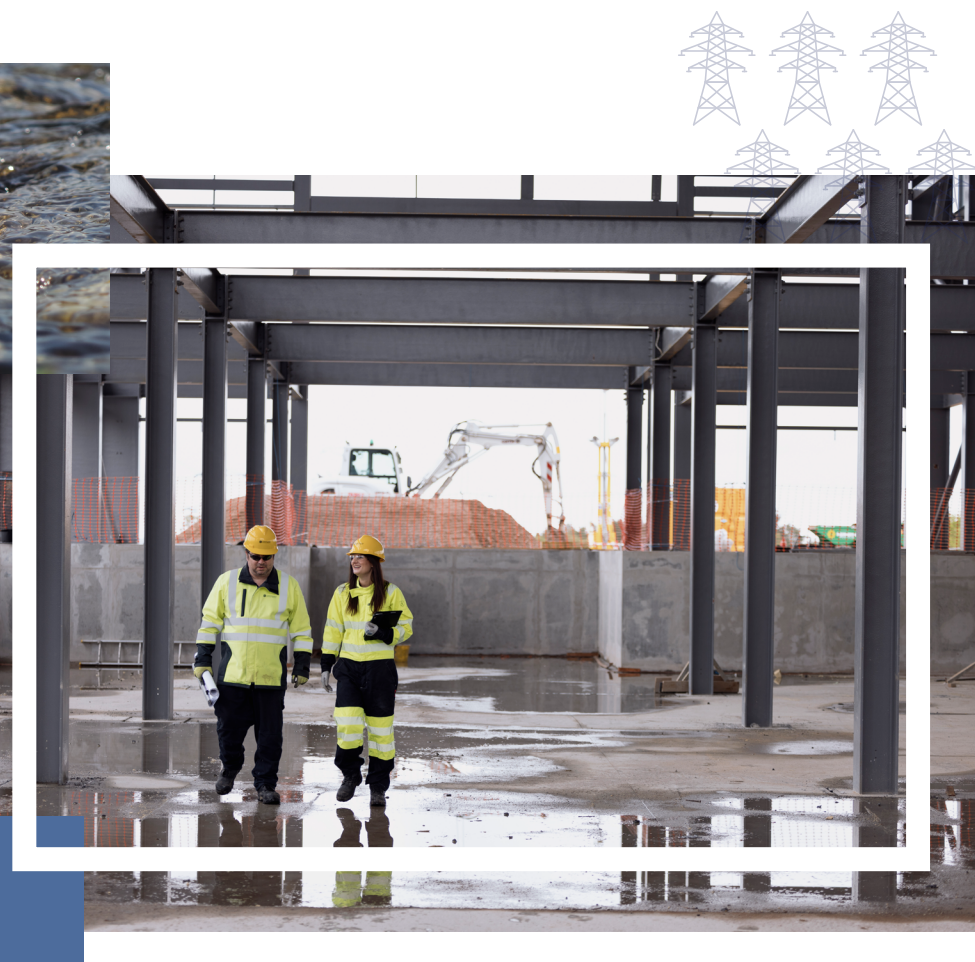
At the beginning of the RIIO-T2 period, our business underwent a significant change to establish itself as an independent business unit, distinct from SSEN and its two distribution businesses. This change prompted the creation of a dedicated innovation function within our business, at which point we outlined our strategic approach to innovation for the upcoming price control period. In collaboration with our stakeholders, we developed a robust innovation framework and identified new strategic themes to underpin this new strategy, which was subsequently published in December 2019.

After establishing our strategic framework, we focused on developing new capabilities to support our goal of leading the sector in innovation during the price control. As a result, we adopted a deliberate approach to create new processes for identifying, developing, and implementing innovation. A key component of this effort was the formation of a specialised innovation team to provide the necessary expertise. Since the start of RIIO-T2 in 2021, we have continued to build upon our capabilities, and to operationalise our vision we delineated three key functions: an Innovation Development and Strategy team, an Innovation Delivery team, and a dedicated support function responsible for all of our regulatory reporting requirements. This has enabled us to approach innovation holistically, integrating strategic insight with practical implementation.

At the core of our innovation framework was the newly established Innovation Governance Board (IGB), comprised of senior leaders from both technical and non-technical areas within our organisation. The IGB plays a pivotal role in governing innovation by approving the technical scope of all projects, ensuring that each opportunity aligns with our strategic objectives and presents a compelling case for our customers and the energy consumer. Their rigorous oversight ensures that projects are thoroughly evaluated to minimise duplication, ensure strategic alignment, deliver consumer value, and establish a clear pathway to success through comprehensive innovation deployment plans.

In this section, we will provide an overview of our innovation activities during the RIIO-T2 period across several funding streams, including the Network Innovation Allowance (NIA), Strategic Innovation Fund (SIF), and Business as Usual (BaU). We will detail the benefits we have identified to date and outline our expectations for future gains as we progress to deploy innovation in the upcoming RIIO-T3 price control period. Furthermore, we will highlight the collaborative efforts made across our innovation portfolio, our approach to project dissemination, the notable innovations we have already deployed and the key insights we have gained from our RIIO-T2 experiences that will inform our strategies moving forward into RIIO-T3.

Throughout RIIO-T2, we have not only demonstrated our capacity for innovative thinking but also our resilience and adaptability in delivering sector-leading initiatives. By prioritising collaboration across functions and emphasising a structured approach to innovation, we have solidified our reputation as leaders in our field — committed to identifying new solutions that can enhance the energy landscape for all stakeholders involved. Consequently, we are poised and eager to continue this momentum into the upcoming RIIO-T3 price control period, with a focus on leveraging our established processes and expert capabilities to further elevate the standard of innovation in the energy sector.



3.1 Our RIIO-T2 Portfolio

Despite being the smaller of the three Transmission Owners (TOs) in GB at the start of RIIO-T2, we have established a strong portfolio of innovation projects that emphasise our commitment to advancing industry standards and practices. Throughout RIIO-T2, we were allocated £8 million of NIA funding, and by this point, we had invested £7.4 million of this allowance into crucial innovation projects. We have achieved significant success through the SIF programme, securing funding for 9 new projects. We have also invested in delivering innovation through BaU funding routes, prioritising solutions that enhance operational efficiencies. Overall, we anticipate that our RIIO-T2 innovation portfolio has the potential to generate upwards of £190 million in benefits by the end of RIIO-T3, demonstrating our substantial contributions to the sector and our dedication to creating value through innovation. The following section will delve deeper into our innovation portfolio during the RIIO-T2 period, highlighting key projects and their contributions to our strategic objectives.

Network Innovation Allowance

The NIA funding mechanism has played a crucial role in fostering innovative solutions to tackle the most pressing challenges in our energy system. In a time where rapid advancements are not just beneficial but essential, the NIA has been instrumental in driving the development of solutions that can significantly modernise our energy infrastructure. Without this innovative funding, our progress would inevitably slow, resulting in an outdated network ill-prepared to meet future demands. This stagnation would not only hinder our transition to a cleaner energy system but also impose a heavier financial burden on energy consumers.

In response to this, we have carefully prioritised innovations that offer tangible benefits for consumers, ultimately striving to lower their energy bills. Through strategic project selection, we have ensured that each investment in innovation is a responsible one, designed to deliver real value during this critical price control period. Our approach goes beyond just funding innovation; we are actively involved in sharing insights from our projects to prevent duplication of efforts and improve overall system effectiveness.

This collaborative spirit lies at the core of our commitment to stakeholders. By engaging with industry partners at events and forums, we not only share our successes and insights but also promote a culture of openness and knowledge-sharing that amplifies the impact of our efforts. Every lesson learned from our projects has the potential to benefit other areas of the energy system, creating a robust network of shared innovation that can drive systemic change. In this way, the NIA serves not only as a funding mechanism but also as a catalyst for a sustainable energy future that prioritises both efficiency and affordability for consumers. This approach can ensure the development of a resilient energy grid that not only meets today's challenges but also anticipates the needs of tomorrow.

Our commitment to investing the £8 million of NIA funding effectively has led to several key projects that supports the transition of the energy system and delivers tangible benefits to consumers.

The Value of the NIA in RIIO-T2 - The NIA regime in RIIO-T2 has been instrumental in delivering value by providing us with the resources necessary to address significant challenges faced in the energy sector. This agile funding mechanism has enabled us to pursue innovative solutions that are pivotal as the energy system transitions and evolves.

Agility in Funding Innovation - The flexibility of the NIA allows us to fund projects that are specifically targeting major challenges being experienced on the electricity transmission system. By adapting our focus as the sector changes, we can ensure that our innovations are relevant and impactful, addressing the critical hurdles in reaching a net zero future.

Eligibility Criteria - The eligibility criteria established for the NIA has been appropriately set, striking a balance between flexibility and specificity. This ensures that the innovations we fund are unique and not duplicated elsewhere in the industry, which helps us concentrate on delivering significant value for the energy consumer.



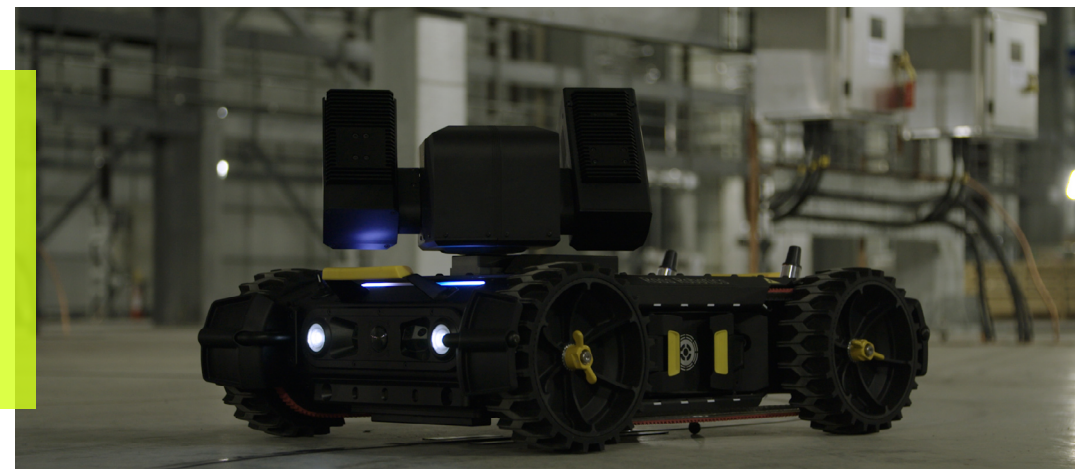
Key Project Examples



Project 1. Pollution Monitoring [NIA_SHET_0042](#)

The objective of this project is to tackle the challenges posed by severe pollution and adverse weather conditions, which often lead to sudden electrical overloads and unplanned power outages in electric utility networks. Currently, there is a lack of pollution measurement data across the infrastructure. To address this, the project will deploy insulator leakage current monitoring sensors to capture and share remote data for assessing the risk of equipment degradation due to pollution. This information will be instrumental in improving the design and maintenance of Overhead Lines (OHLs) in high-risk areas, enabling proactive strategies to minimise faults. The expected benefits include reduced unplanned outages and maintenance costs, resulting in direct savings for consumers. Additionally, it will provide valuable insights for communities to address pollution risks. A cost-benefit analysis will compare the innovative monitoring approach to a scenario without it, focusing on potential savings from outage reduction while considering risks associated with electrical overloads and their causes.

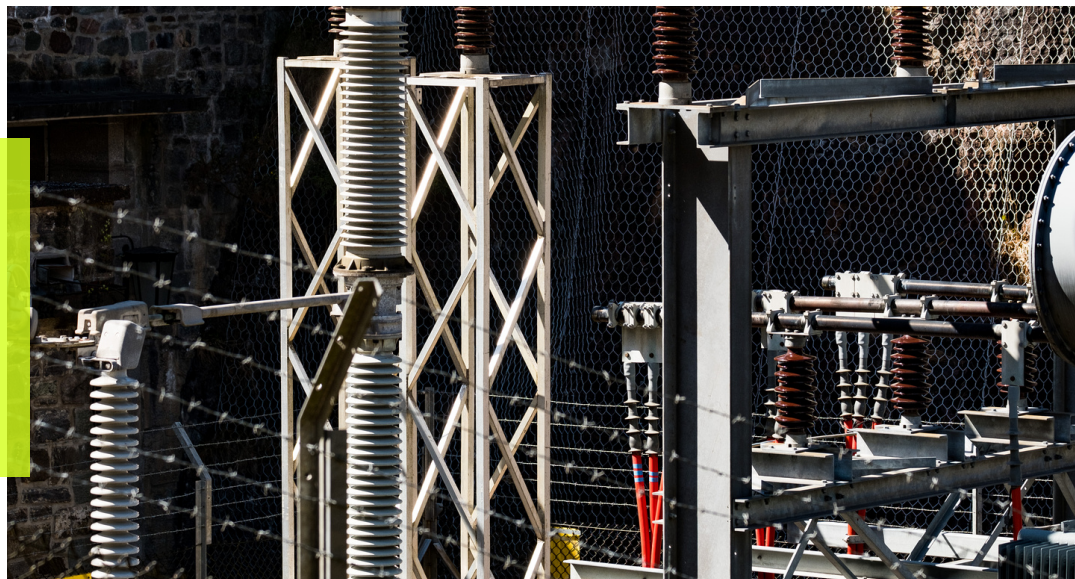
We have recently deployed sensors on a section of our network to gather essential trial data. As we continue to expand our network to support the energy transition, the impact of these outages will become increasingly significant. We were pleased to receive positive and insightful feedback on this trial from our stakeholders through our [social media](#) channels.



Project 2. AIM High [NIA_SHET_0041](#)

This initiative is focused on deploying an autonomous robot in the confined spaces of High Voltage Direct Current (HVDC) valve halls, which are currently off-limits to staff due to hazardous conditions. At present, monitoring is carried out using stationary cameras, which do not offer comprehensive visibility of equipment, particularly gauges and floor-level equipment. This necessitates periodic maintenance, leading to system shutdowns. The AIM High robot will enable continuous monitoring of equipment status and maintenance needs, allowing for early detection of faults without causing unplanned downtime and enabling condition-based maintenance. It is anticipated that this innovation will significantly reduce operational and maintenance costs, resulting in savings for consumers. By monitoring SF₆ gauges, potential leaks can be detected earlier, minimising environmental loss. Initial analysis suggests that a single robot could reduce operational costs by up to 61% by 2072, resulting in an identified benefit of £6.28 million per converter station. As we integrate more renewable energy sources, the number of HVDC valve halls will increase, making this new technology essential for developing smarter maintenance strategies and ensuring our system is as efficient and cost-effective as possible.

We recently engaged the community by inviting local schoolchildren from two primary schools to participate in a competition to name the robot, providing them with a valuable educational experience as they interacted with the robot and had the opportunity to ask questions of our engineers, with the winning name being '[Haggis](#)'. In addition, we shared the progress of our advancements in robotic maintenance technology at a [Utility Week](#) webinar event.

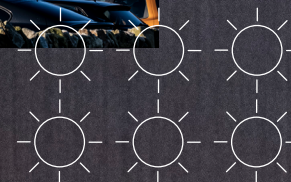


Project 3. Condition Assessment of SF₆ Alternatives (CASA) [NIASHET_0036](#)

Gas Insulated Systems (GIS) in the UK electricity network traditionally rely on pressurised sulphur hexafluoride (SF₆), a gas with a global warming potential 23,500 times greater than CO₂. We are committed to transitioning away from SF₆ towards alternative gases with lower carbon footprints, aligning with its RIIO-T2 objective to reduce greenhouse gas emissions by one-third and supporting government net zero targets. As regulations on SF₆ tighten, it is crucial to explore and adopt suitable alternatives for GIS applications.

Failures in high-value GIS equipment often stem from small manufacturing defects that lead to gas ionisation and partial discharge (PD). Understanding PD characteristics in alternative gas mixtures is vital for ensuring the integrity of GIS. This research project aims to enhance network operators' understanding of these characteristics, allowing them to assess GIS equipment with greater confidence and mitigate failure risks. The project will also enable early failure identification and effective condition monitoring through insights into alternative gas properties.

To date, Cardiff University has delivered five progress reports, presenting valuable findings that informed a technical paper presented at the [CIGRE](#) conference in August 2024. This work not only underscores the importance of adopting greener alternatives but also provides practical strategies for maintaining the reliability and safety of GIS equipment.



Strategic Innovation Fund

The SIF programme plays a vital role , providing a mechanism for companies to explore and develop large-scale, transformational solutions that can help us achieve our net zero ambitions. We have been proactive in participating in the programme, recognising the importance of tackling the bigger challenges that require more significant investment. As we understand our network region will be critical to the success of a net zero energy system, we have prioritised participation in the SIF programme, securing funding of £10.2 million for 9 projects across the Discovery, Alpha, and Beta phases.

Key Project Example

To highlight some of our key successes within the SIF programme, we present below an example of a project that demonstrates how innovative thinking is being used to tackle a significant system challenge.

SIF Project. Network DC [10067854](#)

HVDC Circuit Breakers (DCCBs) are critical for advancing High Voltage Direct Current (HVDC) networks into more complex, flexible systems. The Holistic Network Design (HND) supports the UK Government’s goal of 50 GW of offshore wind by 2030, recommending an integrated onshore and offshore electricity network. A key element of this vision is the increased deployment of HVDC switching stations (DCSSs), which reduce cost and environmental impacts. Notably, a DC switching station at Noss Head (within the Caithness-Moray-Shetland network) is operational, and others are planned around our network, aiming to connect HVDC links and offshore wind farms. Without DCCBs, the growing HVDC network would lack flexibility, leading to higher costs. However, uncertainties remain about DCCBs’ performance, reliability, and cost.

Network DC is a SIF Round 1 project that has progressed from Discovery, through Alpha and is now in the Beta Phase. It will test DCCBs, accelerating their readiness for GB’s HVDC networks. The project will clarify technical, regulatory, and commercial challenges, focusing on a use-case at Peterhead, where DCCBs could enhance capacity for additional power generation.

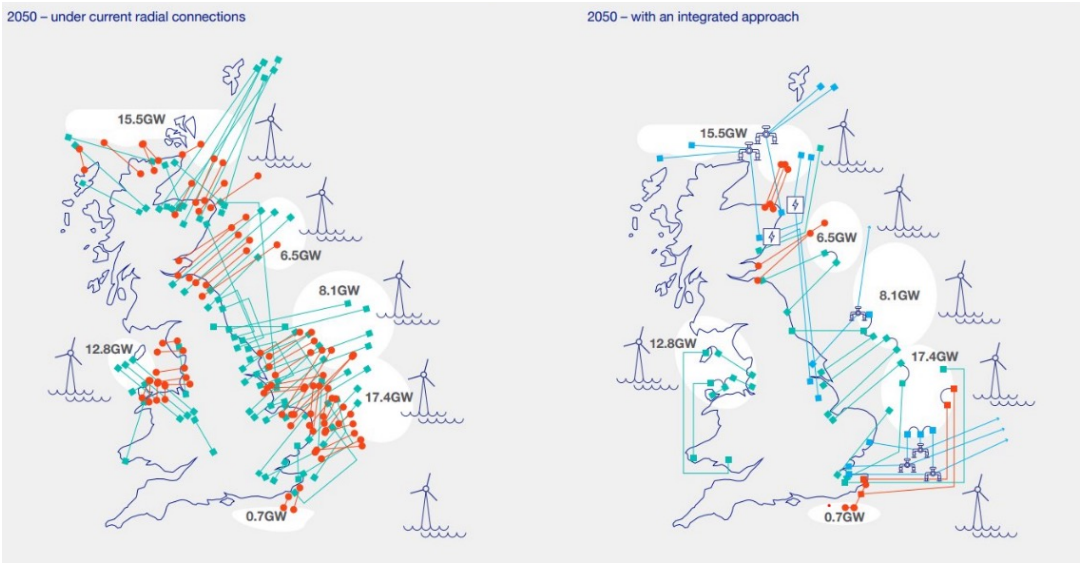
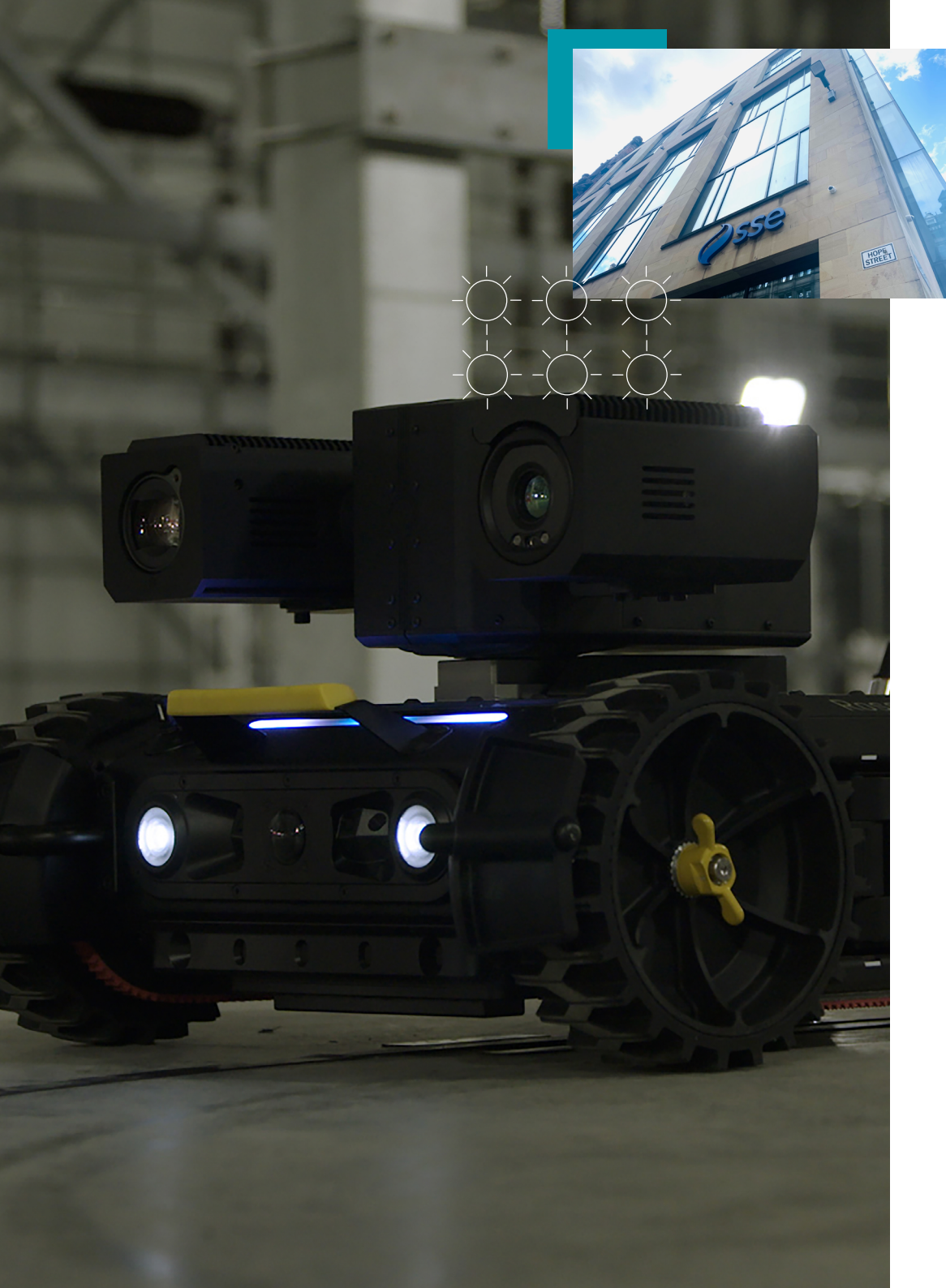


Figure 1 - Network DC Vision illustrating multipurpose interconnectors



Business As Usual (BaU)

We define BaU innovation in one of two ways:

1. Continuous, incremental advancements and adaptations in processes, technologies, or products that occur as part of our organisation's regular operational practices. These innovations are typically characterised by their focus on reducing costs, enhancing efficiency, or improving service delivery without incurring the higher risks or uncertainties associated with disruptive or radical innovation projects. Importantly, this type of innovation is not funded by the regulatory innovation funding stimulus.
2. The process of integrating well-established innovations that have demonstrated tangible benefits and completed rigorous proof-of-concept testing. This approach focuses on solutions with a high level of maturity that can be deployed in operational settings as standard practices. Effective rollouts of these solutions often require adequate training, proper resource allocation, and necessary process adjustments to maximise their value and ensure seamless adoption and scalability across our organisation.

Responsible innovators - we acknowledge that the NIA and SIF funding mechanisms are ultimately provided to us by the energy consumer, and it is our responsibility to prioritise the use of this funding to maximise value for them, as we strive to deliver a safe and reliable network. To achieve this, we have established a rigorous innovation governance process designed to assess every innovation opportunity and determine the most appropriate funding route. This process involves conducting detailed analyses to identify where benefits will accrue, evaluating the technology readiness level (TRL) to gauge the required investment and associated risks, and thoroughly considering the eligibility of innovations under the NIA and SIF governance criteria. For projects that do not align with these criteria, we are committed to advancing them as BaU, ensuring that all innovations are responsibly managed and aligned with our commitment to delivering positive outcomes for consumers.

Key BaU Innovation Examples

To illustrate some of our key successes within our BaU portfolio, we have provided examples of three key projects initiated during the RIIO-T2 period:



BaU Innovation 1: Overhead Line Noise

Last year, we initiated a new research project led by one of our recent graduate engineers. This was prompted by feedback from local communities regarding excessive noise generated by our OHL conductors. Addressing community concerns is vital, so we launched an investigation to determine that the noise resulted from a phenomenon known as corona discharge. This audible sound occurs around high-voltage OHL conductors when the electrical field surrounding the conductor becomes strong enough to ionise the surrounding air, leading to the breakdown of air molecules and the creation of ions. As these ions move rapidly within the electric field, they produce small electrical sparks or discharges, generating sound waves that we perceive as noise.

Our investigation revealed that water droplets resting on our OHL conductors exacerbated the corona effect, particularly given the unique weather conditions frequently experienced in Scotland. We discovered that atmospheric factors, such as mist, fog, and drizzle, significantly influenced noise levels; however, we faced challenges due to a lack of existing research on this relationship. To address this gap, we developed a new laboratory testing setup designed to replicate field conditions.

We explored potential solutions and collaborated with a company called Asset Cool, which produces an innovative conductor coating. Upon application, this coating altered the characteristics of water beading on the conductor, leading to a direct reduction in corona noise. With our findings now well-established, we aim to integrate them into our projects and foster collaboration with other TOs across the UK.

This successful research project, spearheaded by our graduate engineer, underscores our commitment to addressing community concerns and overcoming operational challenges. Notably, our graduate engineer presented these findings at the CIGRE event in Paris in August 2024, highlighting the significance of our work on an international platform.



BaU Innovation 2: SF₆-free 420 kV switchgear

Our recent collaboration with [Hitachi Energy](#) exemplifies our commitment to sustainable energy solutions through impactful business-led innovation. At CIGRE 2024 in Paris, we proudly announced the deployment of the world's first SF₆-free 420 kV air-insulated switchgear circuit breakers at our Connagill substation upgrade project in Sutherland. This groundbreaking initiative strengthens local networks and facilitates the connection of multiple onshore wind farms, showcasing our leadership in adopting environmentally friendly technologies.

The discussions and knowledge exchange at CIGRE highlighted the shared challenges faced by transmission operators globally, reinforcing the importance of collaboration. Engaging with supply chain partners during this event was vital as we explored future opportunities within our Pathway to 2030 investment programme. This strong relationship has positioned us well to deliver over £20 billion in critical grid upgrades across the north of Scotland, highlighting our proactive approach to innovation.

Our collaboration with Hitachi Energy is just the beginning. We are committed to further innovations that align with our ambitious net zero targets and emphasise our role as leaders in sustainable energy solutions. By seeking partnerships that foster pioneering technologies, we are not only enhancing our operational capabilities but also setting a benchmark within the industry.

Our presence at CIGRE 2024, marked by the contributions of our technical experts and recent graduates, underscores our dedication to advancing research and technology for a sustainable future. We are excited to continue on this innovation journey, demonstrating through initiatives like our partnership with Hitachi Energy that together, we are capable of driving the energy transition toward a more sustainable, flexible, and secure energy system.

BaU Innovation 3: TOTEM [NIA_SHET_0035](#)

The TOTEM (Transmission Owner Tools for EMT Modelling) project serves as a great example of how NIA funding can be effectively utilised to deploy innovative technologies into BaU operations. Originally funded through our RIIO-T1 NIA, this collaborative project involving all TOs and the National Energy System Operator (NESO) aimed to develop a large-scale Electromagnetic Transients (EMT) system model and analysis tool. The primary objective was to understand and predict the behaviour of new renewable energy sources before their integration into the GB network, thereby facilitating the offline analysis of potential controller interactions and mitigating risks associated with new technology integration.

Since 2022, the TOTEM tool has demonstrated significant value by:

- 1. Modelling various network scenarios to ensure the safe connection of new renewable assets.
- 2. Enabling the investigation of control interactions and oscillations within the network in an offline environment.
- 3. Recreating network events to understand their causes and develop effective mitigation strategies.

A follow-on project, [TOTEM 2](#), is currently underway to enhance the existing re-dispatch tool by enabling the direct use of Power Factory models and optimising the model to reduce simulation run times. Plans for TOTEM 3 are in place, with the objective of completing this project within the RIIO-T2 period. TOTEM 3 aims to introduce further functionality and tools to the baseline model established in TOTEM, including:

- 1. A more automated modelling process
- 2. Enhanced resolution in the model, such as the representation of Grid Supply Points
- 3. Improved network equivalences for vendors

These enhancements collectively minimise the potential for human error and expedite simulations.

The TOTEM project demonstrates how NIA funding has translated into tangible outcomes for BaU operations. The collaborative nature of this project with the NESO and all three TOs has maximised its value by implementing it as a system-wide solution. With the initiation of the TOTEM 2 and TOTEM 3 projects, we have a compelling illustration of how lessons learned from one NIA project can deepen our understanding of the critical challenges faced by the energy system and foster further innovation. This reinforces the value that the NIA funding mechanism can provide and showcases the significant benefits that collaboration can bring to the successful delivery of innovations into BaU.

Figure 2 below provides an overview of the project timelines of all three TOTEM projects, with the expectation of the fully enhanced solution being rolled out as business as usual before RIIO-T3.

Figure 2 - Evolution of TOTEM

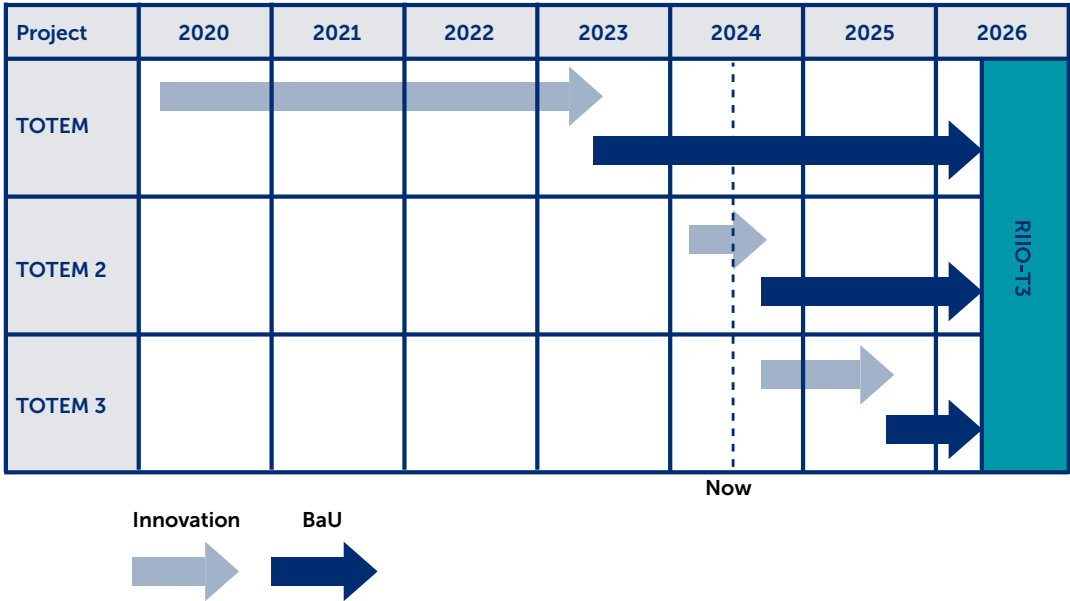


Figure 3 - Our RIIO-T2 NIA Innovation Portfolio

Project	Description	Benefits
CASA	New steps in understanding the underlying physics of partial discharge in the alternative gases to SF ₆	Research-based taking TRL from 3 to 6, potentially leading to a reduction in early life failures and remediation costs by introducing new, knowledge-driven technology solutions
Corrosion Mapping	Numerical weather prediction model using modern meteorological practices as hindcasting	The solution will enhance design principles and improve maintenance efficiencies, leading to a projected network cost reduction of £1.9m by the end of RIIO-T3 and at least £4.9m beyond.
Low Profile 132kV Poles	Create a low-profile design replicating the visual consenting envelope, reliability levels, insulation level, and construction methods associated with wood poles.	The new pole design will enable faster connections with reduced costs and materials for connections above 300m, with initial savings estimated to be £3.2m by the end of RIIO-T3, with further savings of at least £6.6m beyond.
Non-Intrusive Foundation Testing	Development, test and trial of a new method for assessing OHL foundations to achieve a reliable non-intrusive foundation assessment	The project aims to reduce costly foundation assessments for new OHL structures, with estimated savings of at least £243k by the end of RIIO-T3 and significantly higher savings as future upgrades increase
Pole Mounted Switchgear	Exploring an OHL switching solution for teed circuits to deliver faster, more efficient connections managing supply chain resources more effectively	If successful, the project aims to lower construction costs of ground-mounted switching stations, create a reduction of platform and building materials and the associated carbon footprint with an overall quicker connection to the network
Pollution Monitoring	Monitoring OHL and capturing data to assess asset degradation risk from pollutants to inform design and maintenance practices for managing the increasing asset base and predicted increase in future outages	This solution will enable proactive identification of equipment degradation, reducing unplanned outages from 61 to 8 across an asset's lifespan. It is expected to decrease outage costs to the consumer from £732k to £96k for a single case
TOTEM Extension	TOTEM and TOTEM Extension projects developed tools for power system modelling, enabling large-scale power electronics simulation and mitigation strategies for the GB network	The tool was successfully rolled out in RIIO-T2 and developed the UK's first whole system model. Benefits of £300k are expected by the end of RIIO-T3, with a further £1.1m beyond
TOTEM 2	Building on the successes of TOTEM, this project will aim to make further improvements to the tool by way of accelerating the simulation process	As this project is aimed at making improvements to the existing TOTEM tool, a further £91k of benefits are expected by the end of RIIO-T3, with an additional £404k beyond
PSL-FC	This project aims to simulate a future electrical network where fault current spike is marginal but prolonged. The objective is to evaluate how existing P&C products function and respond in such scenarios	If evidence shows P&C products have the potential to respond effectively in a lower-level fault current environment then Synchronous Condenser costs can be avoided at c£200k per installation
Probabilistic Modelling	Develop a probabilistic analysis process for transmission connection studies, delivering a tool to assess connection applications and provide a detailed view of network capacity under uncertain generation and demand	Improved understanding of the probabilistic planning process driving better investment decision-making bringing greater efficiencies in connecting renewable generation and flexibility assets.
Ice Mapping (RIME)	This project developed a new ice accretion model that integrates with existing global Numerical Weather Prediction (NWP) to derive new values for radial ice accretion that improve design practices.	Reducing OHL overdesign, with initial saving by the end of RIIO-T2 of £8m. Integrated into RIIO-T3, this approach projects £30m in savings, with at least £16.5m also expected through ASTI deployment.
OHL Foundation Uplift	Produce learning on improved designs for OHL tower foundations, including a better understanding of the optimal edge profile/roughness, and how this can reduce the materials/space required.	The new foundation design aims to reduce CO ₂ by using less concrete, minimising land disruption, and providing consumer savings of at least £4.7m throughout our future reinforcement schemes.

Autonomous Robot (Aim High)	Install an autonomous robot in an HVDC valve hall to monitor equipment, enabling condition-based maintenance and preventing unplanned downtime.	Successful deployment of autonomous robots, creating a proactive maintenance approach leading to increased reliability of the network with initial lifetime savings of at least £6.2m.
220kV Low Profile Design	A new 220kV low-profile pole design that aims to provide a lower-cost alternative to the existing steel lattice tower design.	It has been determined that the new design can produce a 60% saving in construction costs compared to the existing alternative. Current lifetime savings are calculated to be £34.5m
Digitised Condition Monitoring	Enhancing site inspections by developing a structured, easily repeatable approach to on-site data collection by building a digital visual aid routine via a handheld device	A repeatable framework enables data collection for preventive maintenance, reducing unplanned outages and offering potential savings of up to £10.4m over an asset's lifespan.
Year Ahead Outage Optimiser	Exploring decision support algorithms to enhance efficiency and effectiveness in managing planned outages amid rising renewable integration and grid reinforcement challenges	The optimisation tool is expected to streamline outage planning, yielding £1m in benefits by RIIO-T3 and £6.2m beyond, while enhancing efficiency, stakeholder coordination, and future readiness
HTLS Non-intrusive Inspection	The project explores the use of a guided wave inspection prototype to assess High Temperature Low Sag (HTLS) conductors, aiming to provide a non-invasive method for detecting defects and improving conductor management.	The project aims to reduce outage times, enhance conductor life-cycle management, and minimise replacement costs. Estimated benefits of £280k are expected over the life of the asset.

Figure 4 - Our RIIO-T2 SIF Innovation Portfolio

Project	Description	Benefits
Network DC Circuit Breakers	Providing a pathway for making DCCBs a viable option for specification and implementation in HVDC network development projects in GB.	The project aims to enhance system security and accelerate renewable energy integration, reducing the need for multiple converters and delivering estimated savings in the hundreds of millions.
REVISE	Revisiting the existing methodology for assigning overhead line ratings using high-resolution topographic weather data	The solution aims to increase capacity on existing lines without upgrades, accelerating renewable energy integration and reducing constraint payments, with anticipated benefits in the hundreds of millions.
SYSMET	Creating a pathway to implement measurement-based tools to provide visibility of system strength to enhance operational decision-making	Consistent monitoring of system strength indicators helps network owners address low system strength, ensuring power availability and enabling informed, real-time decisions to mitigate costs and impacts during disturbances.
Blueprint	Identifying key risks and uncertainties for the connection of offshore wind farms into currently constrained areas of the GB network, and devising innovative and collaborative solutions to mitigate these risks	Reducing connection delays boosts investor confidence in new renewable projects, lowers constraint costs, and reduces overall system operation costs.
REACT	The development of a visualisation tool to provide real-time information on network connection requests, helping identify optimal locations for new connections on the network.	The tool can help manage the anticipated surge in network connection requests by allowing developers to assess the impact of their requests and explore alternative solutions, saving both time and resources.
INSIGHT	Creating a real-time alert and control system to monitor and mitigate power network oscillation events, using past insights and advanced modelling to predict and address future occurrences.	Enhance network stability and reliability, improving management of weaker networks and allowing higher levels of renewable generation avoiding alternative, less efficient operations.
SECURE	Exploring the options to develop a Digital Supply Chain Hub that can enhance visibility over sectors of the supply chain, providing real-time insights into supply and demand.	The expected benefits were to deliver rapid results on supply chain dynamics and improve efficiency across capital projects; however, the project's complexity necessitated a deferral due to insufficient time to define requirements.
INCENTIVE	Investigating and demonstrating how offshore wind farms can provide inertia to the onshore networks providing greater stability and system security.	Benefits include reduced stability costs, faster renewable connections, and competitive stability markets. Further development paused due to strategic priorities, with the Offshore Wind Association exploring alternative routes to progress
NIMBUS	Leveraging meteorological data to enhance network planning, modelling, and forecasting, using real-world testing to assess how weather impacts asset resilience and decision-making	Improves asset reliability, proactive planning, and federated data-sharing for better network forecasting; however, project paused to allow input data maturity to advance that can enhance data-driven decision-making across the energy sector

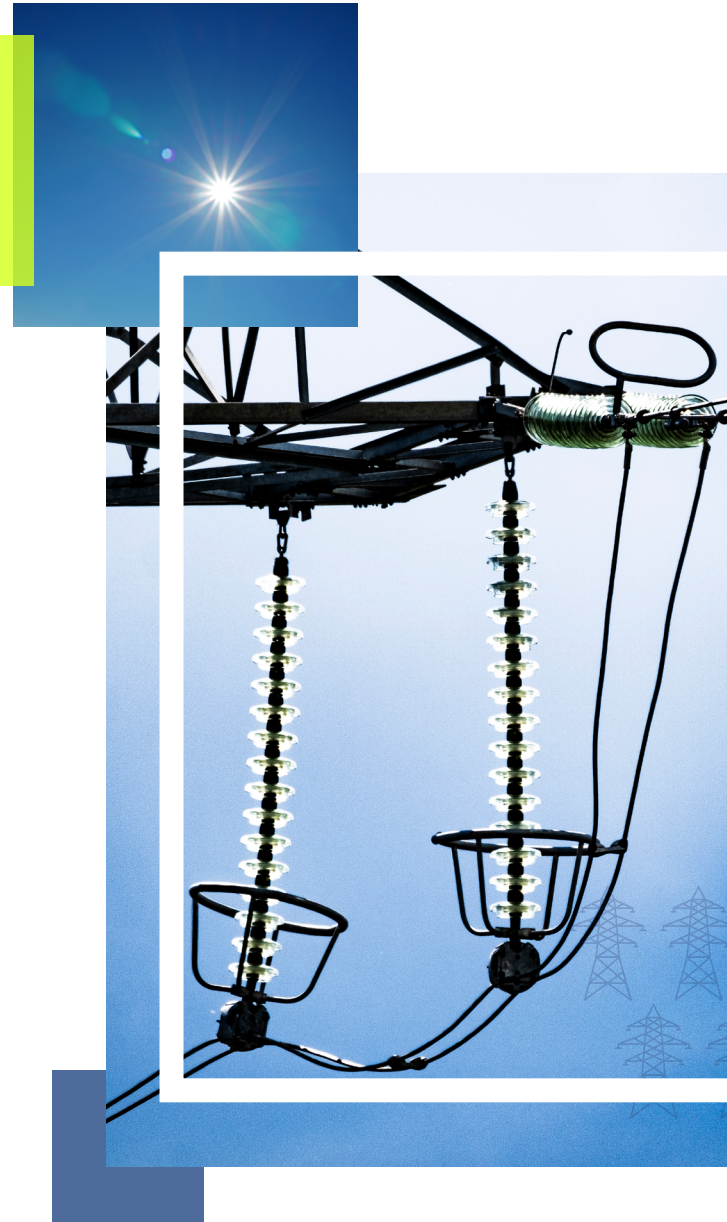


Figure 5 - Our RIIO-T2 BaU Innovation Initiatives

Project	Description	Benefits
Housing Strategy	Taking an innovative approach by partnering with councils to deliver over 1,000 homes, setting a new standard for infrastructure projects that directly support local communities	By addressing housing needs in the north of Scotland, this strategy supports our workforce during project delivery and creates lasting community benefits, providing long-term infrastructure and alleviating local housing challenges
Nodes and Links	An AI-driven platform streamlines contractor tender reviews, automating key checkpoints and enabling rapid, unambiguous decisions that reduce manual oversight	The AI solution improves efficiency by saving significant resource time, proven in offshore trials and is now being scaled across the business for a broader impact
Mobile Substations	We are trialling a mobile substation (132kV to 11kV) to facilitate quicker and reliable connections for customers at existing Hydro Generation sites with space limitations	Enables efficient use of limited space, reduces costs, accelerates project timelines, and ensures continuous supply to generators and customers during substation replacement
Sf ₆ Free 420kV CB	World's first groundbreaking 420kV circuit breaker, free of SF ₆ , to improve environmental performance in high-voltage infrastructure at a major substation in Scotland	Minimising reliance on SF ₆ gas supports renewable integration and accelerates sustainable, low-impact technology adoption—paving the way for a greener energy system to meet future energy needs
Bird Flight Diverters	A trial of a robotic system to install Bird Flight Diverters (BFD) on our overhead lines, addressing bird collisions and enhancing operational safety	Implementing BFDs will significantly reduce bird strikes, protecting wildlife, minimising costly outages, and ensuring a more reliable electrical network while promoting environmental conservation
OHL Noise Impacts	Research methods to mitigate noise from overhead power lines, particularly investigating the impact of low rain rates like mist and fog on noise levels and identify new solutions to mitigate	This research aims to minimise community disturbance from overhead line noise, enhancing living conditions and potentially inspiring global solutions for similar issues in diverse weather conditions
OHL Sag Measurement	The use of an intelligent bolt with embedded measurement technology that allows for real-time remote load measurements on OHL to eliminate manual inspection of ice accumulation on OHL conductors	Reducing the risk of power outages, preventing potential damage to infrastructure, and enhancing overall safety. By providing real-time alerts, the system enables proactive maintenance, minimises repair costs, and improves service reliability
Dynamic Line Rating	A trial of various Dynamic Line Rating (DLR) equipment on our overhead lines to monitor conditions to assess potential capacity increases for integrating more renewable energy	Increase line capacity by optimising existing infrastructure, reducing the need for new transmission lines, and lowering costs for consumers by avoiding unnecessary constraint payments as renewable energy grows on the network
Ice Monitoring	Using meteorological measurement equipment mounted on overhead line (OHL) towers to monitor weather conditions and provide alerts for a high risk of ice buildup on OHL conductors	Reducing the risk of power outages, preventing potential damage to infrastructure, and enhancing overall safety. By providing real-time alerts, the system enables proactive maintenance, minimises repair costs, and improves service reliability
TReNDS	Replace copper wiring with fibre optics to enable streamlined communication, reducing civil costs and delivery time while supporting real-time data and remote control capabilities	Digital substations enhance reliability, enable faster, more accurate data transmission, improve monitoring, and support remote control, reducing maintenance needs and operational complexity
Sumitomo Cable Factory	A collaborative project to build a new subsea cable factory in northern Scotland to support the growth of offshore wind, providing vital infrastructure to connect renewable energy to the system	The innovative approach to overcoming supply chain challenges will enhance local supply chains, create 330 skilled jobs, and bolster energy security, contributing to Scotland's renewable energy goals and economic growth
Bird Nesting Diverters	Utilising laser technology to prevent birds nesting in substations, this innovative project aims to reduce maintenance disruptions, improve equipment reliability, and enhance safety for both wildlife and operational teams	By deterring bird nests, this project minimises maintenance needs, reduces operational risks, and promotes equipment longevity, supporting a safer, more reliable infrastructure for uninterrupted service delivery

Figure 6 - Our Anticipated RIIO-T2 Innovation Benefits

Funding	Investment (£m)	T2 (£m)	T3 (£m)	Beyond T3 (£m)
NIA	7.4	14.2	58.7	150.6
SIF	10.2	0	26.3	1,092.0
BaU	8.9	25.4	73.8	14.7
Total	26.5	39.6	158.8	1,257.3

3.2 Collaboration

In the ever-evolving landscape of energy innovation, collaboration is not just beneficial; it is essential for driving meaningful change and achieving impactful outcomes. Throughout the RIIO-T2 period, we have established a strong track record of developing collaborative innovation projects that leverage diverse expertise from innovators, supply chain partners, and academic institutions. Our systematic approach ensures that we proactively seek out and identify the right partners who can contribute to resolving our key challenges. Like the Open Innovation process, we actively invite solutions from the market, working closely with organisations like Innovate UK through their Knowledge Transfer Network to align innovation efforts with our specific needs. This openness not only promotes inclusivity but also mitigates the risks of pursuing random, non-targeted solutions that can waste valuable time and resources. We recognise the importance of clear external communication regarding our strategic innovation goals and the challenges we face. Active participation at industry events is a method we have adopted allowing us to share our vision and stimulate innovative thinking to foster new partnerships with leading institutions. We recognise that not all challenges can be resolved at this level, so we have developed strategic partnerships with academia, such as Imperial College London, the University of Strathclyde, and the University of the Highlands and Islands. Together, these elements create a robust framework for effective innovation that is both inclusive and forward-thinking, positioning us at the forefront of the energy sector’s transformation.



Key Project Examples

Highlighted below are examples of three collaborative innovation projects that illustrate our joint efforts in innovation.

Project 1: REACT [UKRI10079052](#)

The REACT (Rapid Evaluation Areal Connection Tool) project, funded under the SIF (Round 2), demonstrates our dedication to collaborative innovation in the sector. As the lead partner, we actively collaborated with three Small Medium Sized Enterprises (SMEs) that are crucial to the development of this state-of-the-art, user-friendly digital web-based geographical planning tool. Collaboration is vital in this context as it brings together diverse expertise and perspectives, enabling us to create more robust, effective solutions that address the complex needs of the industry.

The tool offers significant advantages, including:

- Accessibility for a diverse range of customer connection stakeholders
- Compliance with the evolving needs of the User Group
- Facilitation of exploratory discussions among stakeholders during project shaping and scoping
- Multi-vector compatibility, with hydrogen electrolyzers as its initial use case
- Comprehensive support across the entire GB network, backed by all TOs

The proof-of-concept developed during the SIF Alpha Phase is illustrated in Figure 7. A cost-benefit analysis (CBA) has quantified the tool's advantages, projecting significant savings for customers. This project underscores our proactive approach to collaborative efforts in delivering innovative solutions that meet the needs of our stakeholders.

Figure 7 - REACT tool showing offshore wind in Northern Scotland



Project 2: OHL Conductor Sag Measurement [InterBolt](#)

We have successfully used the Open Innovation process, supported by the Knowledge Transfer Network (KTN), to collaborate with the SME, InterBolt, aimed at addressing the challenges posed by extreme weather conditions in the north of Scotland. In winter, temperatures can plummet to -30°C with wind speeds reaching 110 mph, resulting in ice accumulation on overhead lines. This ice increases the sagging of the lines, reducing ground clearance and posing hazards to both infrastructure and personnel.

To tackle this issue, we used the Innovate UK Innovation Exchange programme to identify credible technologies for monitoring overhead conductor lines. InterBolt’s innovative bolt load monitors (Figure 8) were selected from 21 potential solutions. These wireless, battery-powered devices provide real-time, remote monitoring of bolt loads, allowing us to detect ice accumulation without manual inspections. As the load on the bolts increases due to ice weight, real-time data will enable prompt responses to prevent potential outages. The project is set for a live network trial during the 2024/2025 winter season, demonstrating a proactive approach to enhancing network resilience and operational efficiency.

Throughout our innovation programme, we have significantly expanded our network of collaborators across all funding streams. In July 2024 we reported in our [Annual Innovation Summary Report](#) that we have engaged with 34 project partners up until March 2024, and have continued to increase these efforts since then. We are increasingly engaging with SMEs, recognising them as the entrepreneurial backbone of GB, representing over 99% of the business population .

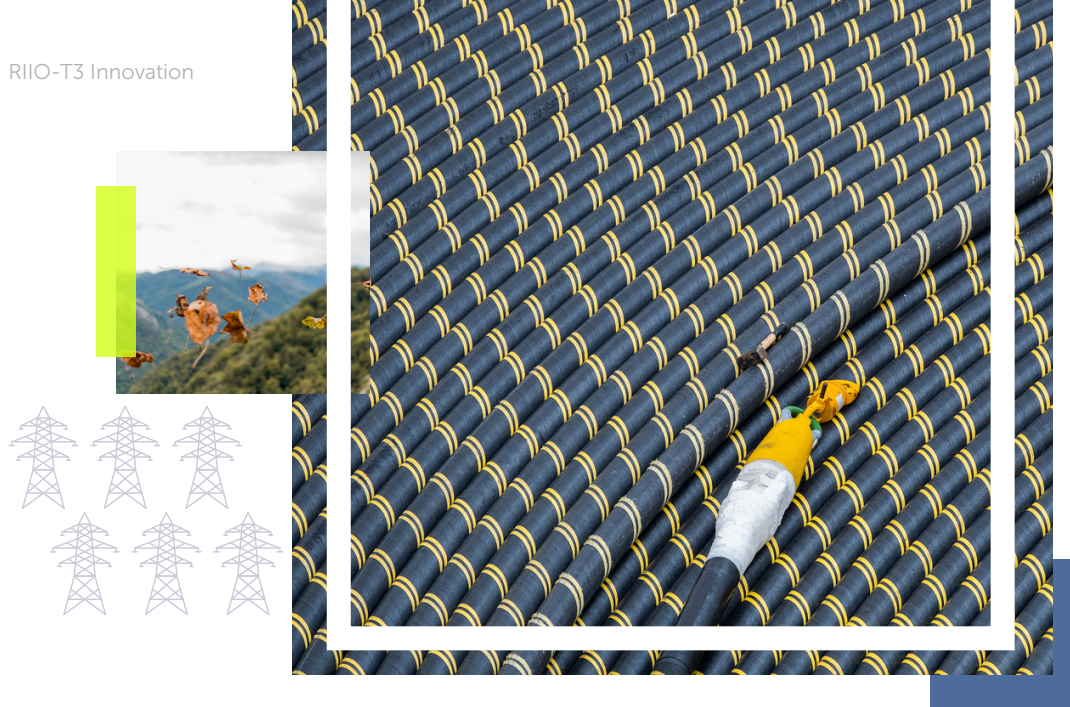
We are taking proactive steps to work closely with our supply chain partners to drive innovation to support the substantial expansion of the infrastructure required across the north of Scotland. Last year, businesses from our supply chain and contractors gathered in Glasgow to pledge their commitment to our [Accelerated Strategic Investment \(ASTI\) Delivery Charter](#), which encompasses all those involved in the ASTI programme. One of the key commitments of this charter is “Relentlessly pursuing better ways of working through challenge and innovation.” Our objective is to collaborate closer in partnership to develop and test new ideas that can be implemented across various ASTI projects, supporting the delivery of the programme’s ambitious goals.

Figure 8 - Interbolt’s Innovative Measurement Fastener



Figure 9 - Collaborative partners in RIIO-T2





3.3 Dissemination

In our dedication to promoting a collaborative and transparent innovation model, we understand that sharing the knowledge gained from our projects is not just a regulatory requirement, but a crucial aspect of accelerating our progress towards achieving net zero goals. By sharing our innovations and the lessons learned, we enable all energy networks to build on each other's advancements, leading to faster and more effective solutions to common challenges. This collective approach not only enhances our individual efforts but also amplifies our overall impact on the energy system transition. Given that a significant portion of the innovation we deliver is funded by regulatory stimulus, we have a responsibility to ensure we invest consumers' money responsibly. Our approach to knowledge dissemination is one way to maximise its value.

By actively bringing awareness and sharing the lessons learned from our projects, we foster a continuous cycle of shared knowledge that promotes collective growth and innovation within the industry. This collaborative spirit not only enhances the capabilities of our peers but also drives operational efficiencies, ultimately leading to reduced costs that benefit consumers. Our belief is simple: the more we share, the more we empower others to learn, innovate, and contribute to achieving net zero targets more quickly and cost-effectively.

To demonstrate our commitment to proactive dissemination, we have undertaken various initiatives aimed at engaging and educating our stakeholders on the valuable insights derived from our innovation projects. Following are some examples of our proactive efforts to share learnings from our innovation projects in RIIO-T2:

1. EnergyX 2024

In June of 2024, [two members](#) of our Innovation team travelled to Newbury Racecourse to take part in the EnergyX 2024, an exhibition and conference focused on bringing experts together from across the Transmission and Distribution industry to discuss the challenges of reaching net zero. Our team took the stage to present our new innovation strategy and to share some of the key learnings from our SIF-funded Network DC project. This was a great opportunity to engage directly with the industry and target the messaging to help bring awareness of our specific challenges, but also how the learnings from this project can be effective in other areas of the sector. To reinforce this messaging, we shared this experience via our company's [LinkedIn](#) page, as a strategic method of spreading the message further.

2. SSEN Transmission Website

We have recently revamped our company's innovation webpage to enhance the communication of key innovation projects with the aim of encouraging greater stakeholder engagement. The updated layout provides easier access to our innovation initiatives and features a dedicated section for prominent innovation reports and strategies. A new [ideas](#) submission form has been introduced to allow innovators to share their concepts directly with us. To promote the updated page, we launched an interactive video showcasing the "before and after" transformation on our [social media](#) platforms. This initiative reflects our dedication to continually improving the effectiveness of our innovation dissemination activities while promoting greater transparency and communication. Alongside other efforts, this initiative is part of our focused approach to elevating the profile of innovation within SSEN Transmission, fostering a strong culture of innovation that encourages collaboration and nurtures creativity.

3. Industry Media

Our Low Profile Earthed Steel Trident Structures (EaSTS) NIA project has recently been a focal point of our dissemination efforts. Connor Duncan, our Senior OHL Engineer, participated in [EnergyX 2023](#), where he sat on a panel of industry experts to introduce the innovative pole design and discuss how SSEN Transmission is leveraging innovative thinking to overcome key challenges on our network. Connor's work has also been featured on various industry [news](#) sites, further expanding the reach of our project learnings.

3.4 Lessons Learned during RIIO-T2

Funding Flexibility: During the RIIO-T2 period, the NIA has played a critical role in the success of our innovation activities. Thanks to this flexible allowance, we have been able to respond swiftly to emerging challenges and opportunities, resulting in a portfolio of projects that really are tackling the challenges that matter the most to our transmission network. The eligibility criteria detailed in the RIIO-2 NIA Governance Document, particularly Requirement 1, which focuses on facilitating the energy system transition, is a broad definition and has encouraged innovative thinking across the many areas of our network activities. It is worth noting, that little opportunity is presented to innovate under the Vulnerable Consumers criteria due to the transmission network's proximity to these types of challenges. We have found that the self-governance approach of the NIA has been effective in contributing to the overall agility of the process.

The accessibility of the NIA in contrast to other funding routes, has been influential in fostering a culture of innovation within our business, it has helped to stimulate innovative thinking and collaboration while giving confidence in the management of our internal innovation resource. It encourages engagement from third-party innovators, leading to a well-rounded portfolio of projects with clear benefit cases that ultimately drive consumer savings.

We strongly support the idea of having a flexible funding mechanism in RIIO-3 that retains the essential features of the RIIO-2 NIA funding approach. However, we acknowledge that there is always room for improvement, and we believe that there needs to be greater alignment across the industry regarding the practice of reporting benefits. In particular, we recognise that innovation is not always a linear process and that not all innovations will lead to financial benefits. Some activities may be research-based and lead to new learnings but are key to stimulating further innovation. Therefore, we suggest that more attention should be given to establishing a benefits framework that considers the different paths that innovation takes to achieve successful outcomes. The methodologies used to achieve this should be consistent across the industry to ensure greater transparency and reporting accuracy.

Five-year structure: The current five-year structure in place for NIA funding drives an approach that prioritises projects which can be completed within the designated price control window. While this structure helps ensure timely delivery, it also creates a risk that higher-value projects may be postponed due to a lack of sufficient time for completion. Additionally, the pressure to maximise the innovation allowance within the set timeframe may force network businesses to prioritise smaller, quicker projects at the expense of more impactful initiatives that could deliver greater long-term benefits.

This situation presents a significant challenge, as postponed projects risk diminishing their potential benefits and missing valuable opportunities. To address these issues, enabling funding to flow seamlessly across price controls could be a beneficial solution. By allowing funds to move between price controls, we can mitigate the risk of higher-value projects being delayed and strengthen the overall innovation process. We fully support the implementation of effective terms that govern this flexibility in funding flow by advocating for the reintroduction of the Carry-Over NIA (CNIA), as it would optimise the delivery of high-impact projects while safeguarding against missed opportunities. Striking a balance between timely delivery and maximising the impact of innovation initiatives is essential for ensuring the long-term success and efficiency of the innovation regime.

Funding levels: To support the UK's ambitious net zero targets, a higher level of NIA funding in RIIO-T3 is essential. The significant growth of our transmission network, driven by the rapid expansion of offshore wind, increased electrification, and the transition to low-carbon energy sources, presents complex challenges. Higher NIA funding will enable us to explore cutting-edge technologies and innovative solutions to enhance grid capacity, manage intermittent renewable generation, and meet urgent decarbonisation deadlines. Maintaining current funding levels would risk limiting innovation at a time when faster, smarter, and greener solutions are critical to ensuring a resilient, efficient energy system. A funding increase aligns with the scale of change required to deliver the energy system transition while protecting consumers from rising costs in the long term.



10% NIA Compulsory Contribution: We recognise the importance of ensuring appropriate financial contributions to NIA projects in RIIO-T3. Given the varying risks, complexities, and potential benefits of each project, we believe it is prudent to assess financial contributions on a case-by-case basis, rather than applying a blanket percentage across the entire portfolio. This approach allows us to tailor our contributions based on the specific risk profile and projected outcomes of each innovation project, ensuring that we balance investment with consumer benefits. We remain committed to contributing fairly to NIA projects and will review each opportunity to ensure alignment with both strategic priorities and regulatory expectations while maximising the value of innovation for the energy transition.

Innovation Rollout: The proposal to implement an innovation rollout mechanism in RIIO-T3, aimed at accelerating the deployment of mature innovation, is viewed as a significant enhancement to the existing innovation regime. Historically, the network innovation funding mechanisms have served to explore new concepts, ultimately resulting in the development of a 'proof of concept.' However, the true value of innovation can only be realised through successful implementation. Within the structure of a regulated price control, incorporating the cost of innovation rollout becomes challenging, given the inherent uncertainty of innovation. Providing additional funding exclusively dedicated to this final stage offers numerous benefits such as faster adoption, reduced risks, improved resource management, and enhanced success rates in driving positive change to achieve our desired outcomes.

This type of mechanism should not be limited solely to projects that have matured through the NIA route but should also encompass strategic large-scale innovations from other sources that have demonstrated a compelling business case and clear benefits in terms of consumer value and progress towards achieving net zero targets. However, we believe that setting specific timeframes for accessing this funding may restrict opportunities for innovative projects. Therefore, we advocate for a flexible and agile process for accessing this funding, akin to the adaptable and responsive design of the NIA. By ensuring that the rollout mechanism maintains a versatile and nimble approach, we can optimise the potential for success and efficiency in deploying innovative solutions that contribute to a sustainable future.

Competitive Funding: The continuation of a competitive funding pot structured around phasing and quality assurance remains an effective way of delivering agile innovation with quality outcomes. Phasing not only fosters flexibility but also facilitates the development of top-tier initiatives. Additionally, the Regulator sending market signals through strategic whole system challenges proves to be effective in driving innovation. However, the annual rotation of challenge statements may hinder longer-term strategic planning, potentially detracting from the overall effectiveness of the funding mechanism. Challenge statements, at times, may seem disconnected from the actual network-specific

challenges, which could impede the alignment of projects with real-system needs. Introducing greater flexibility in the start dates and length of project stages within the SIF framework could yield significant benefits. Currently, conflicts arise when application windows open during the previous phase, leading to challenges in managing resources effectively. Moreover, the demanding partner requirements imposed by the SIF can strain network capabilities, making it difficult to accommodate all partner requests. Finding a balance between flexibility, alignment with challenges, and resource management is essential for optimising the impact and success of innovation projects within the funding framework.





4. How we Innovate

In this section, we aim to provide an overview of our robust, end-to-end innovation process, designed to ensure that every project is carefully planned, developed, and executed. This approach demonstrates our commitment to delivering innovation in a structured and accountable way, ensuring we make efficient use of resources while aligning our efforts with the needs of customers and the broader energy landscape, ultimately maximising the value of each investment.

Our innovation framework focuses on identifying, developing, and implementing novel solutions that support the energy transition and enhance value for our customers. This approach is underpinned by a strong governance structure that ensures transparent decision-making and active stakeholder engagement, ensuring innovations align with both regulatory goals and the long-term needs of the energy system.



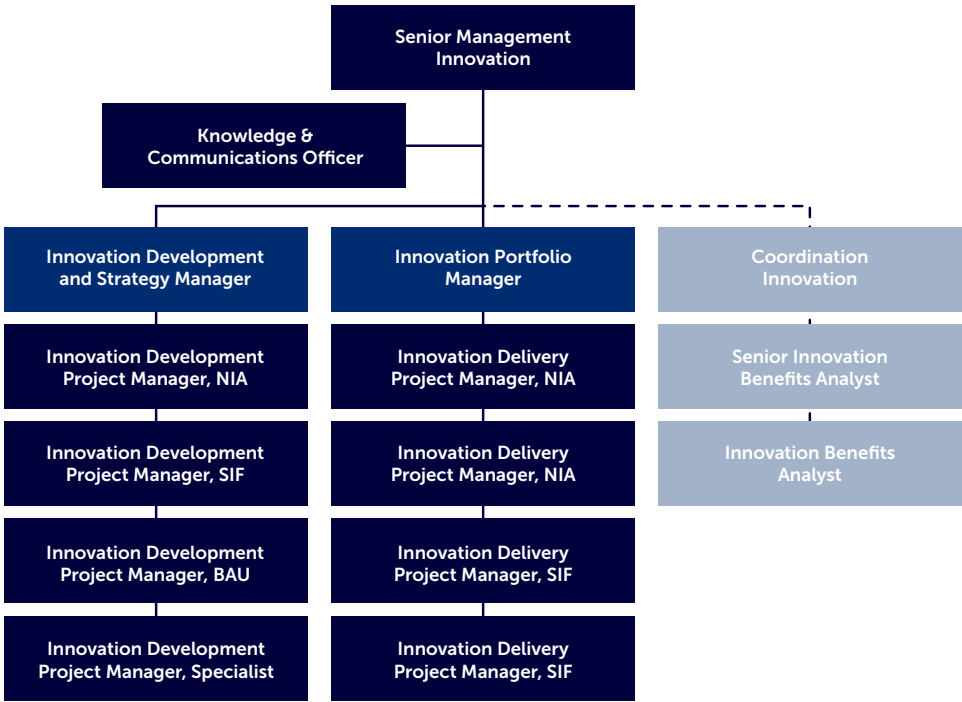
4.1 Innovation Team

Since we transitioned from being part of SSEN’s combined Distribution and Transmission business, we have prioritised innovation as a core central function. This began with establishing a dedicated Innovation team responsible for coordinating innovation delivery across the organisation and providing structure and guidance to help identify new innovative opportunities that align with our strategic objectives.

The team was strategically assembled to ensure a balanced combination of the necessary skill sets and complementary personalities, fostering both high performance and a harmonious working environment. Key roles were established for development and delivery activities, as well as a dedicated support function to ensure a consistent approach to project delivery and all regulatory reporting requirements. The organisational structure of SSEN Transmission’s innovation team, which covers NIA, SIF and BaU innovation activities, is shown in Figure 10. Within the ‘Innovation Development’ strand of the team, there are dedicated project managers who focus on the individual funding streams mentioned above.

In just a few years, we have made significant progress having built a robust portfolio of NIA and SIF projects. These projects are addressing some of the most critical challenges we face on our network, and we have already identified an estimated £99 million in potential benefits by the end of RIIO-T3. Additionally, our SIF programme has achieved over 90% success rate in funding being awarded, with £10.2 million awarded to date. We take pride in our achievements, being one of the newest innovation teams across the energy networks and look forward to building on this success as we move forward into RIIO-T3.

Figure 10 - Organisational Structure of Innovation Team



4.2 Process and Governance

The innovation development team is a dedicated and integral part of the wider innovation team, responsible for supporting the organisation in identifying and developing new ideas that have the potential to drive growth, improvement, and value. This team comprises experienced project managers who are tasked with building project scope and working closely with subject matter experts to fully inform the innovation ideas. Through a rigorous process, a comprehensive understanding of the proposed innovation, including its potential benefits, challenges, and requirements is developed.

4.2.1 Idea Development

Our innovation process begins with ideation, sourced either internally from technical staff or externally from third-party innovators. Innovators must clearly outline the problem they are addressing (Problem Statement), their proposed solution, and the perceived benefits, with a focus on delivering Value for Money to the Consumer. This information is presented at Gate 0 of our structured innovation gate process (Figure 11), which ensures ideas are developed iteratively and build a solid business case. Key steps include identifying cost-effective funding options, forming the project team, and securing a business sponsor to champion the project throughout its lifecycle. Innovation analysts conduct a detailed cost-benefit analysis to assess potential returns on investment.

Collaboration with external stakeholders, such as the Energy Networks Association (ENA) and UKRI, is critical to identifying new opportunities and ensuring our innovations are informed by industry best practices.

Fully developed ideas are reviewed by our Innovation Governance Board (IGB), a senior committee comprising key business leaders. The IGB rigorously evaluates each proposal,

ensuring it aligns with our strategic goals, avoids duplication, and offers real value to both the business and energy consumers. With this robust process in place, we are confident in our ability to drive growth, improvement, and value through innovation.

4.2.2 Project Delivery

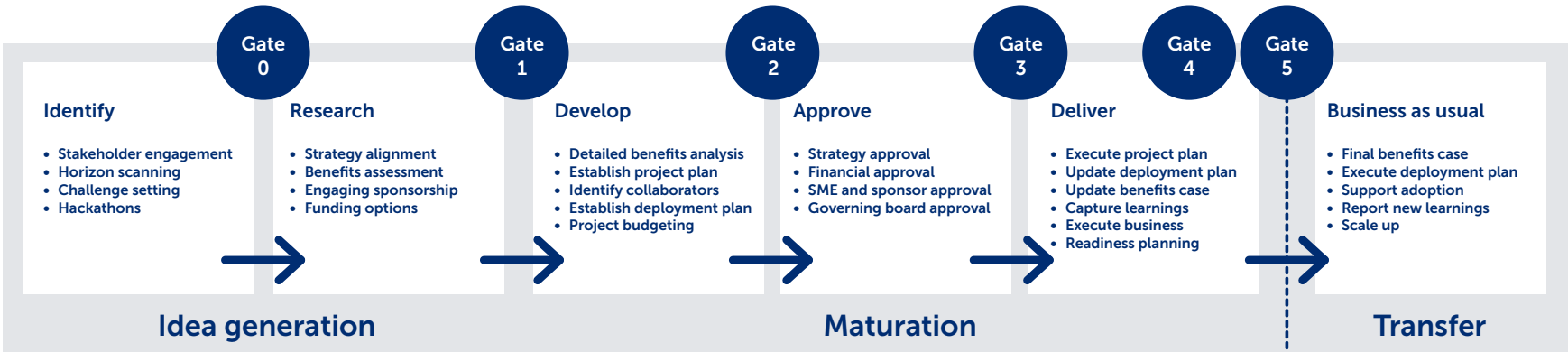
Our innovation delivery team is a dedicated and experienced group of project managers responsible for delivering innovation projects. The team is tasked with managing projects funded by regulatory innovation mechanisms as well as BaU initiatives.

In addition to their project delivery responsibilities, the team is also responsible for reporting regulatory innovation funding mechanism projects in compliance with regulatory requirements.

The delivery project managers are also responsible for maintaining the innovation deployment plans for each of their projects. This involves ensuring that the innovative solutions developed are rolled out into the business in a timely and effective manner, maximising the benefits that can be achieved from the innovation. This requires close collaboration with stakeholders both internally and externally to ensure that the new solutions are fully integrated into our operations and processes on time.

The delivery project managers are responsible for disseminating learnings from their projects, supported by our Knowledge and Communications Officer to internal and external stakeholders, including other network businesses. This involves sharing best practices, lessons learned, and new insights gained through the project, with the aim of potential benefits through deployment across the industry. By doing so, we can accelerate the adoption of new technologies and innovations, driving growth and improvement across the industry. The team's commitment to knowledge sharing and collaboration is critical to our success in delivering innovative solutions that drive real value for our customers and stakeholders.

Figure 11 - Innovation Process



4.2.3 Innovation Deployment

Innovation can only deliver true value when it is rolled out successfully. To achieve this, careful planning and execution are essential from the very beginning of the project. Deployment planning starts at Gate 0 of our innovation process (Figure 11), where we establish the foundation for a successful rollout. For each innovation, we create a tailored deployment plan that evolves throughout the project lifecycle. This proactive approach ensures that we address critical components early on, including:

- **Business Recipient Identification:** We define where the innovation will be deployed, identifying the key business recipient.
- **Stakeholder Engagement:** We identify key stakeholders, internal teams, customers, and partners and outline their roles to build buy-in and facilitate collaboration.
- **Resource Allocation:** Our plan details the necessary financial, people, and technological resources for effective deployment.
- **Implementation Timeline:** A structured timeline helps monitor progress and ensures timely deployment, with milestones that foster accountability.
- **Risk Assessment:** We conduct a comprehensive risk assessment to identify potential challenges and develop mitigation strategies.
- **Feedback and Iteration:** Mechanisms for gathering user input allow us to refine the innovation continuously, enhancing its efficacy and adoption.
- **Metrics for Success:** Clear success metrics enable us to measure impact and inform future deployment strategies.

Currently, the majority of our RIIO-T2 innovation portfolio is in the delivery phase, with several key projects nearing completion. Figure 12 summarises the innovations, funded via the regulatory innovation stimulus that we have deployed or are about to transition into BaU operations, underscoring our commitment to leveraging innovation for sustained growth.



Figure 12 - Deployed Innovation Projects in RIIO-T2

Project	Description	Benefits
TOTEM extension	Build and validate a PSCAD model of the GB transmission network, create TO-specific models, and provide tools and resources for effective model analysis and adoption.	Enhanced technology integration targeted at system reliability and efficiencies with lifetime savings of up to £1.4 million.
Probabilistic Modelling for Connection Studies	Create a probabilistic analysis tool for transmission connection studies to assess generation and demand uncertainty and network capacity.	Developed a probabilistic planning process methodology to allow a more accurate assessment of risks and uncertainties in generation and demand scenarios allowing enhanced decision-making.
Corrosion Mapping	Numerical weather prediction model using modern meteorological practices as hindcasting.	Detailed corrosion models were created alongside new corrosion rate maps to integrate into GIS systems creating £6.8 million of lifetime savings.
Ice Mapping (RIME)	This project developed a new ice accretion model that integrates with existing global Numerical Weather Prediction (NWP) to derive new values for radial ice accretion that improve design practices.	Reducing OHL overdesign, with initial saving by the end of RIIO-T2 of £8m. Integrated into RIIO-T3, this approach projects £30m in savings, with at least £16.5m also expected through ASTI deployment.
Low Profile 132kV Poles	Create a low-profile design replicating the visual consenting envelope, reliability levels, insulation level, and construction methods associated with wood poles and towers above 300m	The new pole design, approved for network use, will debut on the Aberarder windfarm. Provisional analysis has now estimated a £6.2m saving in RIIO-T2 over the alternative L7 and NeSTS tower designs.
Autonomous Robot (Aim High)	Install an autonomous robot in an HVDC valve hall to monitor equipment, enabling condition-based maintenance and preventing unplanned downtime.	Successful deployment of autonomous robots, creating a proactive maintenance approach leading to increased reliability of the network with initial lifetime savings of up to £6.2 million.

4.2.4 Support and Reporting

The innovation team also benefits from the support of the Business Planning Project Management Office (PMO) which plays a critical role in supporting the development and delivery of innovation projects. The PMO is responsible for providing guidance, resources, and expertise to ensure that our project teams are equipped to deliver high-quality projects and support the regulatory reporting process, ensuring that our organisation is compliant with all relevant regulatory requirements.

Additionally, the team has access to Innovation Analysts, who specialise in developing cost-benefit analysis to help stakeholders understand the economic, social and environmental benefits of each innovation project.

The PMO support is a vital asset to the innovation team, providing strategic support, analytical resources, and operational expertise to ensure that our innovation projects are delivered successfully. By providing a robust process for governing and supporting the development and delivery of innovative projects, we can maximise output and drive real value for our customers, stakeholders and the energy consumer.

In addition, the innovation team has a dedicated Knowledge and Communications Officer responsible for all written materials related to our innovation projects, working closely with project managers and the wider SSEN-T communications team to disseminate progress and learnings both internally and externally. This includes coordinating all industry event engagements, including the annual Energy Innovation Summit, which provides a platform for sharing knowledge, showcasing our innovation projects and networking to identify collaboration opportunities with innovative SMEs.





5. Innovation in RIIO-T3

As we approach the RIIO-T3 price control period, we acknowledge a crucial opportunity to redefine the future of electricity transmission in GB through ambitious innovation. Our commitment is to spearhead the transformation of our transmission network, with a refreshed strategic approach to innovation during RIIO-T3 that reflects our preparedness to address the complexities of the future energy landscape.

Our refreshed [Innovation Strategy](#) builds upon the learnings achieved in RIIO-T2 and is firmly grounded in delivering exceptional value for energy consumers, ensuring that each innovation we implement translates into tangible benefits. Central to our approach is the establishment of new innovation Challenge Groups, which will serve as a creative and collaborative forum to explore and address the significant challenges we face. This structured methodology ensures that our efforts yield real value and make a meaningful difference in our journey towards a sustainable energy future.

Our RIIO-T3 innovation plan is enduring and deliberately focused on key areas that matter most, encompassing short and long-term time horizons. This strategic approach empowers us to solve pressing problems in the short term, while simultaneously preparing for a more agile and adaptable future. We are particularly championing large-scale transformational innovations that will redefine industry standards rather than solely focusing on making incremental improvements to existing systems.

To support our expansion, our innovation capabilities must be properly aligned. We currently have a team of experts with a deep understanding of industry trends and best practices, equipping them to identify, develop, and implement innovative solutions effectively. Complementing this expertise is our skilled Innovation Analysts, mentioned in the last section, who specialise in conducting rigorous cost-benefit analyses to ensure a consistent and structured methodology for identifying and quantifying the benefits of innovation. However, given the scale of growth that our network will experience, it is crucial that we enhance our innovation resources in RIIO-T3 to ensure we possess the capabilities necessary to deliver exceptional value and meet the demand for sector-leading innovation.

We are committed to fostering new partnerships across academia, industry, and the supply chain. By uniting diverse perspectives and expertise, we aim to co-create pioneering solutions that address the complexities of modern energy demands. Our vision for innovation in RIIO-T3 is to provide everyone with the opportunity to innovate and take action to make a difference, ultimately leading the electricity transmission system into a new era that resonates well with the needs of consumers and communities alike.



5.1 RIIO-T3 Innovation Strategy

We felt it was vital for us to take a fresh look at our strategic approach to innovation, as our last innovation strategy was published during RIIO-T1 in 2019. With the wide range of challenges anticipated ahead, we adopted a stakeholder-led approach to formulate an updated Innovation Strategy. This strategy was launched in March 2024 and has been designed to ensure clear alignment with the overarching strategic goals of our business in facilitating the transition to a low-carbon economy. Unlike our 2019 strategy, which focused solely on a singular price control period, the new approach takes a more expansive view. It outlines strategic objectives across three distinct time horizons, aiming to accomplish specific milestones by 2026, 2030, and beyond. Embracing this comprehensive strategy enables us to address immediate challenges, cultivate a pipeline of opportunities to tackle near-term obstacles, and establish a robust framework for identifying critical threats and opportunities on the horizon.

The strategy has been created and shaped by our stakeholders using horizon scanning and engagement at every level to ensure that it aligns with the business goals and values. Our strategic purpose is to deliver a reliable and resilient network safer, smarter, greener, and faster. Consequently, we have based our primary focus on these four strategically important areas.

Figure 13 - Our Innovation Strategy at a Glance

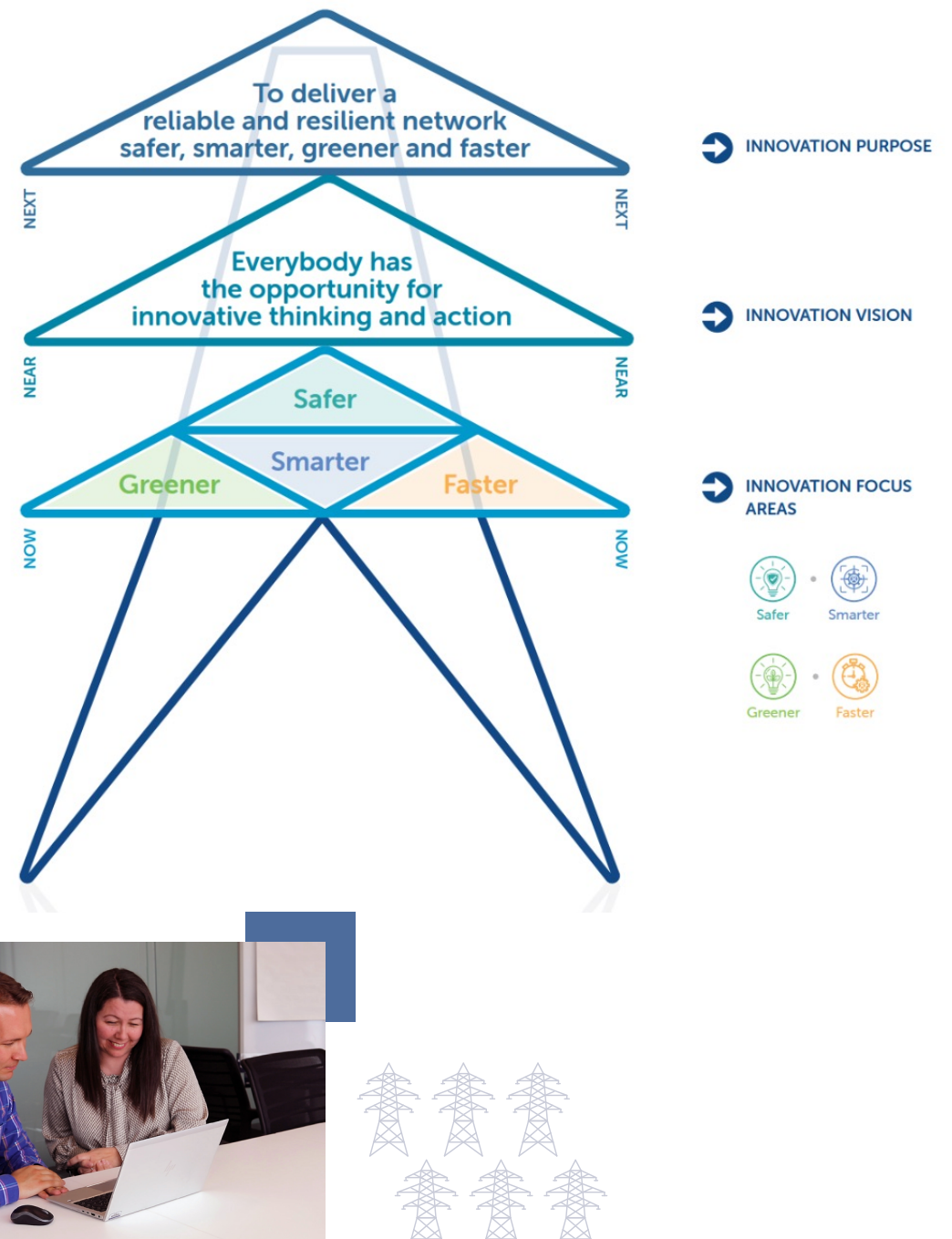


Figure 14 - Innovation Strategy - Focus Areas



Safer

Using innovation to push to be safer than we are today. We will focus on the security of the network, reducing physical hazards, promoting safe behaviours, and do so by designing out risk and designing in safety from the start.



Greener

Applying the test of sustainability to everything we do. We will use innovation to quantify and communicate our contribution to net zero, reducing environmental harm throughout the lifecycle of our assets.



Smarter

Becoming future ready by learning and adapting to maximise our assets. We will apply logic, data, and the right skills and experience to increase functionality and actively seek new ways of working and collaboration to improve efficiency.



Faster

Keeping pace, increasing productivity, and minimising delays through flexibility, agility, and empowerment. We will apply new tools and assets, focus on the output to remove barriers and champion efficient ways of working.

5.1.1 New Horizons

Our new Innovation Strategy is structured around three horizons: now, near, and next. The 'Now' refers to the present and the next two years. The 'Near' encompasses a timeframe of two to five years, while the 'Next' extends from five to ten years and beyond. Drawing from our RIIO-T2 innovation portfolio, we have identified that many of our projects are addressing challenges in the 'Now' and 'Near'. However, we have identified a gap in the 'Next' space. In the upcoming RIIO-T3 period, we plan to cultivate more innovative thinking in this area through horizon scanning and research efforts to effectively recognise potential emerging threats and opportunities.

Now: In the 'Now' horizon we plan to expedite the identification of quick win solutions. Our horizon scanning programme will be utilised to scout for emerging opportunities that can yield new solutions to increase our pace. As outlined in our innovation strategy, we plan to prioritise innovations that can help enhance the efficiency of our network operations. Specifically, we aim to allocate 60% of our innovation portfolio to the 'Now', with a key emphasis on solutions within our 'Faster' focus area. Leveraging tools such as Open Innovation, in collaboration with partners like the Knowledge Transfer Network (KTN), we will identify challenges through our Innovation Challenge groups. These groups have been established as a collaborative forum for technical experts from across our business to brainstorm the key network challenges to identify innovation opportunities. We have established four challenge groups, each representing one of the four focus areas within our innovation strategy. Funding innovation within the 'now' horizon will be sourced from either BaU sources, like our Totex allowances or from a flexible allowance, where we assess the opportunity to align with mandated eligibility requirements. With priority in this area, we aim to maximise the opportunity to grow our innovation benefits realisation within the RIIO-T3 price control period.

Near: Within the 'near' time horizon, we will persist in developing innovation opportunities aimed at enhancing the Technology Readiness Level (TRL). These innovations are classified in the near term due to the need for concept maturation, with benefits not expected in the short term. The NIA and SIF funding mechanisms in RIIO-T2 have been instrumental in funding such innovations and going forward in RIIO-T3, we plan to utilise both the flexible funding allowance and competitive funding to sustain the delivery of these types of innovation.

Next: With many of our network challenges being in the short to medium term, we have prioritised innovations here in RIIO-T2. However, because of our new Innovation Strategy, which involved thorough industry landscape research, we have recognised the importance of enhancing our awareness of the future landscape. Through our horizon scanning programme, we will allocate resources toward understanding emerging threats and opportunities that can lay the groundwork for a sustainable future. Insights gained from this programme will enrich our Innovation Challenge Groups strategy, ensuring that our approach to innovation is continuously informed and upgraded by these insights.



5.2 RIIO-T3 Funding Requirements

In our response to Ofgem's Sector Specific Methodology Consultation (SSMC), we expressed strong support for maintaining a flexible funding allowance in RIIO-T3. This allowance enables a swift and agile approach to delivering network innovation while fostering an innovation culture within our business. We recognise the importance of the NIA eligibility criteria under RIIO-T2, particularly Requirement 1, which focuses on solutions facilitating the energy system transition. We believe this framework appropriately encourages innovation that addresses network-specific challenges, and we fully support Ofgem's decision to retain it.

The comprehensive design of the eligibility requirements within RIIO-T2 NIA effectively prevents the funding of BaU projects. We advocate for Ofgem to maintain this stringent standard to ensure that innovation projects target pressing issues stemming from the energy transition, remain innovative, prioritise consumer benefits, and avoid unnecessary duplication. We also appreciate Ofgem's inclusion of 'Sustainability' and 'Network Resilience' as additional focal categories, given their critical importance. Furthermore, we endorse the decision to conduct the SIF Discovery project under the NIA, which will form part of our funding requirements for RIIO-T3.

To accelerate innovation under such a regime, we are seeking £20.5 million (at 2018/2019 prices) in NIA funding. This funding will allow us to explore higher-risk projects beyond business as usual that have the potential to transform our transmission network, achieve our net zero targets, and provide long-term value to consumers.

To align with our Business Plan Data Tables (BPDT), all references in this document moving forward will be in 2023/2024 prices. Therefore, our NIA funding requirement will be £25.5 million.

Our request for this funding has been carefully estimated through a detailed analysis that evaluated five potential funding scenarios. This analysis aimed to ensure the chosen amount would support our innovation commitments across our four focus areas while ensuring that we deliver efficient and quality outcomes.

Scenario 1 – Maintain RIIO-T2 Funding (£10.6 million): This scenario proposed keeping the NIA funding level the same as in RIIO-T2. While this would have been straightforward, it would not allow for real growth in our innovation capacity or ambitions, failing to support the required development for our innovation strategy. Therefore, we did not pursue this option.

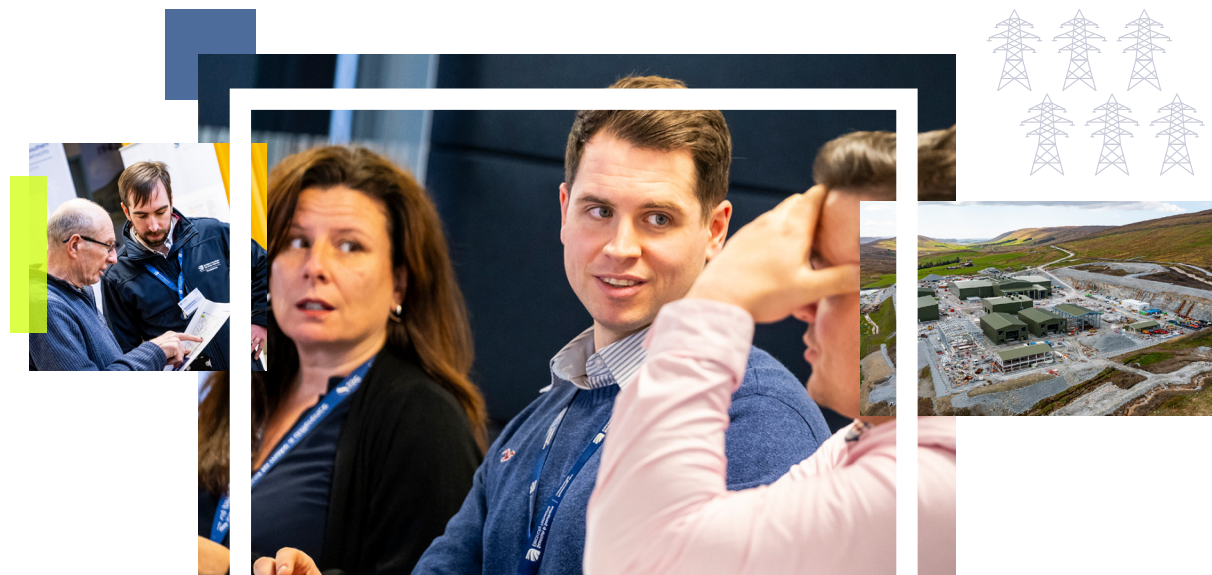
Scenario 2 – Business Revenue (£30.7 million): This scenario aligned with the overall business revenue growth, considering a compound annual growth rate (CAGR) of 16%. While this is a reasonable reflection of business growth, it was deemed more than required for delivering our innovation strategy in RIIO-T3.

Scenario 3 – Exponential Growth (£32.5 million): Based on a compound annual growth rate (CAGR) of 32%, this reflects the rapid expansion of our innovation portfolio during the early stages of RIIO-T2. However, this surge in growth was primarily due to the initial establishment of our innovation team and processes. With the team now fully developed and our capabilities matured, we do not anticipate a similar growth rate in RIIO-T3. Therefore, this scenario was not selected.

Scenario 4 – Accelerated Innovation Development (£33 million): This scenario assumed that innovations could be developed 30% faster, increasing throughput. However, we determined that reducing development time could significantly compromise the quality and depth of innovations, so this scenario was also not pursued.

Scenario 5 – Deliver Commitments with Manageable Scale (£25.5 million): Finally, we calculated this scenario based on our proven capabilities to fully utilise funding and maximise its value. Our internal processes and governance ensure that we select high-quality, strategic projects - a careful approach that takes time but promotes strong outcomes. This method reflects our reputation for delivering impactful projects, as demonstrated during RIIO-T2. We analysed the rate at which we developed RIIO-T2 projects against our established processes and balanced this against our ambition, resulting in a well-considered funding request. Additionally, it reflects our commitment to conducting more discovery-type projects, enabling us to adopt a more strategic approach in prioritising opportunities that are well-positioned to progress to the later stages of the SIF programme. We anticipate a need to increase our resources to support this work and have outlined these requirements in Section 6 of this document. This scenario is considered the most suitable and forms the basis of our request.

After careful consideration, **Scenario 5** was selected, resulting in a funding request of £25.5 million, which offers the right balance of ambition, manageability, and innovation impact to support our strategic goals for RIIO-T3.



5.2.1 RIIO-T3 Priority Areas

Throughout the development of our Innovation Strategy, we actively engaged with key internal and external stakeholders to gather their insights on where to focus the majority of our NIA spending. Their input was instrumental in helping us prioritise each focus area. Based on this feedback, we have carefully allocated the funding request across the four focus areas of our strategy, ensuring that the distribution reflects their relative importance in achieving our strategic innovation goals:

- **£5.1 million for Safer**
- **£5.1 million for Smarter**
- **£2.55 million for Greener**
- **£12.75 million for Faster**

Each of these areas includes five priority innovation areas that have been identified based on current and emerging challenges, as well as opportunities for substantial impact. Below is an overview of how we intend to prioritise NIA funding to explore innovations within each focus area.

Safer – £5.1 million

Ensuring the safety of our workforce, the public, and the network is paramount. We will focus on five priority areas:

1. **Asset Condition Monitoring:** We will develop advanced monitoring technologies to improve real-time detection of faults or deterioration, preventing incidents and reducing maintenance costs.
2. **Physical Network Security:** Innovations in surveillance, perimeter control, and sensor technologies will enhance the security of our physical infrastructure.
3. **Cyber Security:** With increasing digitalisation, we will explore new methods to safeguard the network from cyber threats through advanced encryption, intrusion detection, and AI-driven security solutions.
4. **Climate Change Impact Mitigation:** We will innovate around new protective measures, such as storm-proofing infrastructure and flood resilience technologies, to enhance the network's resilience to extreme weather events.
5. **Autonomy (AI and Robotics):** We plan to develop robotic inspection systems and AI-driven operational tools to reduce human risk during high-voltage maintenance and improve fault detection.

Smarter – £5.1 million

Improving system intelligence and performance is essential to support the energy transition. Our key areas for innovation include:

1. **Talent Recruitment and Retention:** We will collaborate with academia on key research topics that can allow us to access cutting-edge knowledge that leads to recruiting new talent into the industry.
2. **System Performance:** We will seek to explore new ways to improve real-time system performance, reducing outages and improving operational efficiency.
3. **Asset Data Acquisition and Analytics:** We will invest in advanced data collection and analytics tools, including smart sensors and IoT devices, to improve asset management and extend asset life.
4. **Future Control Room Capabilities:** Developing a future-ready, digitally enhanced control room will be key to managing more complex, dynamic grid operations, incorporating technologies like AI, automation, and machine learning.
5. **System Stability:** We will explore innovations such as synthetic inertia and fast-response technologies to stabilise the grid amidst the increasing penetration of intermittent renewable energy.

Greener – £2.55 million

Supporting the decarbonisation of the network is critical to achieving our net zero ambitions. Our focus areas are:

1. **SF₆ Condition Monitoring:** We will explore technologies to monitor, reduce, and replace SF₆ emissions, with the goal of significantly reducing our environmental impact.
2. **Construction Efficiencies:** We aim to improve construction methods and materials to lower the carbon footprint associated with new infrastructure builds.
3. **Circular Economy Initiatives:** We will pilot projects to research the reuse, recycling, and material recovery throughout the lifecycle of our assets, reducing waste and conserving resources.
4. **Community Green Initiatives:** We will explore innovation projects that focus on enhancing the environmental sustainability of our transmission network, with an emphasis on reducing carbon emissions and supporting the wider energy system transition.
5. **Environmental Impact Mitigation:** We will focus on innovative approaches to reduce the environmental footprint of our transmission network. This could include developing new technologies and processes to minimise habitat disruption during infrastructure projects.

Faster – £12.75 million

With the UK's ambitious net zero targets in mind, the majority of our NIA funding will be allocated to the **Faster** focus area. This is essential for enabling us to build the transmission network at the speed necessary to support the integration of vast amounts of offshore and renewable energy generation. The five priority areas are:

1. **Supply Chain Efficiencies:** We will explore innovations to digitise and optimise our supply chain, improving logistics, lead times, and reducing delays in material procurement and delivery.
2. **Asset Utilisation Efficiencies:** We will innovate to maximise the capacity and efficiency of existing assets, such as technologies focused on similar outcomes like our DLR project, allowing for higher utilisation without extensive new builds.
3. **Land Acquisition and Consenting:** We will explore new digital tools, to streamline land acquisition processes and reduce consenting lead times for infrastructure projects.
4. **Design Efficiencies:** Through innovations in modular design, prefabrication, and digital twin technology, we will aim to tackle project timelines, improve design precision, and accelerate the deployment of key assets.
5. **Construction Efficiencies:** We will continue to innovate in construction methods to accelerate the construction of new transmission infrastructure while reducing costs and environmental impact.

Our innovation strategy for RIIO-T3 focuses on addressing the most pressing challenges and opportunities for transforming the GB energy landscape. By allocating the NIA funding across these four strategic areas - Safer, Smarter, Greener, and Faster - we aim to deliver high-risk, high-reward innovations that go beyond BaU and provide long-term benefits for consumers, the environment, and the network. These projects will help us meet the increasing demand for renewable energy integration, improve network resilience and performance, and ultimately accelerate the energy system transition our path toward achieving GB net zero targets.



5.3 Competitive Funding

Our commitment to large-scale, high-impact innovation is reflected in our proactive engagement with the SIF programme during RIIO-T2, where we successfully secured funding for a number of projects. One notable example is the Network DC project, which aims to de-risk the implementation of the first DC circuit breaker in GB, a key technology for facilitating the integration of offshore wind power. Building on this success, our strategy for RIIO-T3 is to continue leveraging the SIF to deliver experimental development and demonstration projects that align with national energy priorities.

Key Innovation Priorities for RIIO-T3

1. **Expanding Connections from Dispersed Locations**
To accommodate the rapid increase in offshore wind generation, we will look to explore innovative solutions for connecting power from more geographically dispersed locations. This includes developing modular and scalable technologies, an area of interest is technologies like dynamic cable systems and advanced offshore substations that have the potential to support the integration of new generation sites efficiently.
2. **System Stability with Low-Inertia Power Sources**
With the rise of intermittent renewable energy, maintaining system stability is a critical challenge. Through SIF, we see an opportunity to explore our work on inertia compensation technologies, including fast-response energy storage systems and synthetic inertia solutions that mimic the stabilising effects of conventional power plants, ensuring grid stability in a low-carbon future scenario.
3. **Accelerating Delivery to Meet Net Zero Targets**
To meet the ambitious net zero timelines, we must deliver infrastructure faster. We will seek to pursue innovations in technologies like digital twin and prefabricated transmission infrastructure, allowing us to streamline the planning and construction phases, reducing lead times and accelerating the deployment of critical assets.
4. **Reducing the Cost of Energy and Delivering Better Value for Customers**
Ensuring affordable energy for consumers remains a priority. We see the opportunity to leverage SIF funding to pilot cost-effective energy balancing technologies which will enable us to maximise the efficiency of existing assets, reducing operational costs and consumer energy bills.
5. **Long-Term Impact**
The benefit of having access to funding through the SIF programme offers a real opportunity for us to deliver significant long-term benefits that include improved network flexibility, faster integration of renewable energy, and enhanced grid reliability. By focusing on these priority areas, we are confident that our approach will support the large-scale integration of offshore energy and help the GB achieve its net-zero goals while delivering better value for consumers.

5.4 BaU Innovation

As part of our commitment to continuous improvement, we recognise the critical role of BaU innovation in driving efficiency, reducing costs, and ensuring the transition to a low-carbon energy system. BaU innovation is central to our strategic objectives, and we are committed to ensuring that our operations not only align with regulatory incentives and requirements under the RIIO price control framework but also go beyond to deliver real value to shareholders, consumers, and the wider energy system.

In RIIO-T3, we plan to build on the successes of RIIO-T2 by scaling proven innovations and continuing to explore new avenues for cost-effective, efficient, and sustainable network operations. Here is a high-level overview of some of the BaU innovation activities we will look to explore during RIIO-T3:

Deployment of RIIO-T2 Innovations

We are committed to scaling innovations previously explored and tested under the NIA, SIF. For example, the use of robotic monitoring technology in our HVDC Valve Halls developed under NIA funding will be fully integrated into our asset management system, enabling enhanced predictive analytics and real-time performance monitoring, reducing operational costs, and improving service reliability.

Deployment of Dynamic Line Rating (DLR)

In RIIO-T3, we plan to scale the deployment of the first network-wide Dynamic Line Rating (DLR) system. Supporting the Smarter focus area of our strategy, DLR is a cutting-edge technology that was successfully tested under RIIO-T2. This system enables real-time monitoring and adjustment of the capacity of transmission lines based on environmental conditions, such as temperature and wind speed. By optimising the power flow across the network, DLR increases the capacity of existing transmission infrastructure without the need for costly upgrades or new builds.

Scaling up DLR across our network will significantly enhance grid flexibility, allowing us to accommodate higher volumes of renewable energy and support the government's Clean Power 2030 plan. By dynamically adjusting line ratings, we can maximise the use of existing assets, reduce congestion, and minimise curtailment of renewable generation, all while ensuring the continued security and reliability of the network.

This innovation aligns with our commitment to decarbonisation, as it facilitates the integration of additional clean energy sources without the immediate need for substantial new infrastructure investment. The full-scale deployment of DLR in RIIO-T3 will play a critical role in meeting the UK's 2030 renewable energy targets, enabling a faster transition to net zero while delivering long-term cost savings for consumers.

Circular Economy Initiatives for Sustainable Network Operations

In RIIO-T3, we will seek to explore circular economy principles across our operations to drive sustainability and resource efficiency that support the greener focus area of our strategy. As we expand our network, we will focus on circular design and asset reuse, exploring innovative ways to extend asset lifespans and repurpose decommissioned components. This includes piloting projects that enable the reuse of key materials like transformers and conductors, reducing the need for new raw materials.

We will also look to explore how innovation can strengthen our Sustainable Procurement Code, working closely with suppliers to source recycled and low-carbon materials, ensuring a responsible and ethical supply chain.

Improving Network Resilience with AI and Machine Learning

Leveraging the advancements in AI and machine learning we will seek to explore the use of this technology to support initiatives like real-time monitoring systems to identify faults and optimise asset performance to proactively manage risks. Our aim is to use these types of innovations to help reduce maintenance costs and improve overall network resilience.

Data-Driven Efficiency in Operations and Maintenance

A focus in RIIO-T3 will be the expanded use of data analytics to improve our asset management and maintenance strategies. By integrating data from smart sensors and condition-monitoring systems across our network, we will look to understand more how we can optimise our maintenance schedules, reducing the need for reactive maintenance and improving operational efficiency. This will result in long-term cost savings that benefit consumers.

Commitment to BaU Innovation

Innovation is a crucial driver of efficiency and performance improvement. While we acknowledge the value of the NIA in exploring innovative solutions to address key challenges in the energy transition, we are also dedicated to self-funding a portion of our innovation initiatives using our Totex allowance. This approach allows us to continuously enhance our operations, driving efficiency and cost savings. By taking ownership of our operational improvements, we aim to achieve the best possible outcomes for consumers and the environment, independent of solely relying on regulatory innovation incentives. Our BaU innovation plan for RIIO-T3 aims to take a balanced approach to self-funding innovation, focusing on deploying and scaling proven technologies, driving operational efficiencies, and contributing to the decarbonisation of the energy system. By integrating these initiatives into our business operations, we can deliver tangible benefits for consumers in terms of cost savings, improved service reliability, and progress toward the wider net zero goals.

5.5 Proposal for an Innovation Rollout Mechanism

We propose the introduction of a reopener mechanism specifically designed to support the rollout and deployment of innovative solutions that have already been proven but carry additional risks when scaled or implemented. The mechanism would allow network companies to request additional funding in the event that the successful deployment of innovation into BaU proves more costly or complex than anticipated.

The primary issue this mechanism addresses is the risk of deploying proven innovations onto the network, which can carry significant uncertainty. While innovation funding under the NIA currently supports the development and testing of new solutions, it stops short of covering the subsequent rollout into BaU operations, where implementation can face unforeseen challenges, increased costs, or regulatory disincentives. Without a clear pathway for additional funding to support the full deployment of innovations, there is a real risk that proven innovations may not be rolled out across the network, limiting the overall value these innovations can deliver to consumers. This risk is particularly pronounced in large-scale energy system transition projects, where the consumer benefits of innovation outweigh the immediate benefits to the network operator.

By introducing a reopener mechanism, we can remove this disincentive and encourage the widespread adoption of innovation, leading to greater consumer benefits and faster progress towards net zero objectives. The rollout of innovative solutions must be seen as a shared risk, with funding structures that fairly allocate the risks and rewards between the network operator and consumers.

5.5.1 Materiality of Issues

The materiality of the issue is significant. During RIIO-T3 many proven innovations - especially those addressing the energy transition - possess the risk of being under-deployed due to the risks involved in rolling them out at scale. This is particularly true for innovations developed under RIIO-T2 that, while successful in small-scale trials, could face significant deployment barriers when considered for large, multi-asset projects. Without the support of a suitable rollout mechanism, these innovations may likely remain in a "trial phase," and networks will not fully realise their potential benefits to the wider system.

5.5.2 Frequency and probability of the issue over the price control period

The frequency and probability of this issue occurring during the RIIO-T3 price control period is high. As the energy system undergoes a transition towards net zero, the complexity of integrating new, innovative solutions into large infrastructure projects will increase. Many of these projects will require innovative approaches to deliver efficiency, sustainability, and resilience. Therefore, without an appropriate rollout mechanism, the likelihood of delays, cost overruns, or non-deployment of innovations is considerable. This is compounded by the fact that regulatory output delivery incentives (ODIs) can create disincentives to deploy innovative solutions, fearing delays or cost implications that might impact delivery timelines.

5.5.3 Value for Money and Efficient Delivery

On balance, this proposed reopener mechanism would deliver value for money by ensuring that proven innovations are deployed and integrated into BaU operations, which will drive cost reductions and efficiency gains for both consumers and networks in the long term. By removing the financial risks and disincentives, the mechanism enables greater innovation uptake, which can enhance the resilience of the transmission network and contribute towards meeting net zero targets more quickly and effectively.

This mechanism is essential for ensuring that the innovation process does not stall after the proof-of-concept phase, thereby maximising the consumer benefit from innovations developed at the network level. Without it, the risk is that innovations that could revolutionise energy system performance and cost-efficiency remain underutilised, ultimately leading to higher long-term costs for consumers as the potential for innovation-led efficiencies is not realised.

This approach ensures that the network company is incentivised to deploy innovative solutions responsibly, while also protecting their ability to finance the efficient delivery of projects, as the additional risks associated with scaling proven innovations are shared with the regulatory framework. Additionally, we are looking to seek an agile funding mechanism for projects with lower materiality - those innovations, for example, that have been proven elsewhere but require additional funding to be deployed onto our network, and we look forward to continued engagement with Ofgem on this potential opportunity.





6. Delivering our RIIO-T3 Innovation Plan

To meet the increased funding requirements of £25.5 million in RIIO-T3, we are committed to implementing a robust innovation strategy that fosters collaboration, drives efficiency, and enhances the value delivered to our customers. The following outlines our approach to achieving these goals in line with Ofgem's business plan guidance.

6.1 Resourcing Requirements

To successfully deliver innovation in RIIO-T3, we plan to expand our team resources from 15 FTEs to 21 FTEs by the end of the period. This growth will focus on enhancing our capabilities through the recruitment of critical roles across our development and delivery teams.

6.2 Challenge Groups

We have recently launched four innovation challenge groups aligned with our four strategic focus areas: Safer, Smarter, Greener, and Faster. These groups are integral to a proactive approach in identifying and addressing the significant challenges involved in developing our network. Through these challenge groups, we aim to gain critical insights into priority areas, allowing us to allocate resources strategically and maximise impact.

The purpose of the challenge groups is multi-faceted, targeting key aspects that enhance our innovation framework:

- 1. Collaboration:** These groups bring together diverse expertise from across our business to tackle complex challenges collaboratively, fostering knowledge-sharing and team synergy.
- 2. Duplication Prevention:** As our organisation grows, the challenge groups help prevent redundancy, reduce siloed efforts, and identify overlapping areas, improving efficiency and focus.
- 3. Proactive Strategy:** By prioritising key challenges within a structured framework, our approach shifts from reactive to proactive, allowing us to strategically address key challenges as they arise.
- 4. Culture Building:** Operating continuously, these groups encourage new participants over time, strengthening our innovation culture and increasing the visibility of ongoing initiatives across the organisation.
- 5. Sub-Groups for Targeted Solutions:** As specific challenges emerge, dedicated sub-groups allow subject matter experts to focus on developing specialised, impactful solutions.

By implementing these challenge groups, we are ensuring that our innovation efforts align directly with strategic goals and deliver meaningful advancements in the network's ability to support net zero objectives.



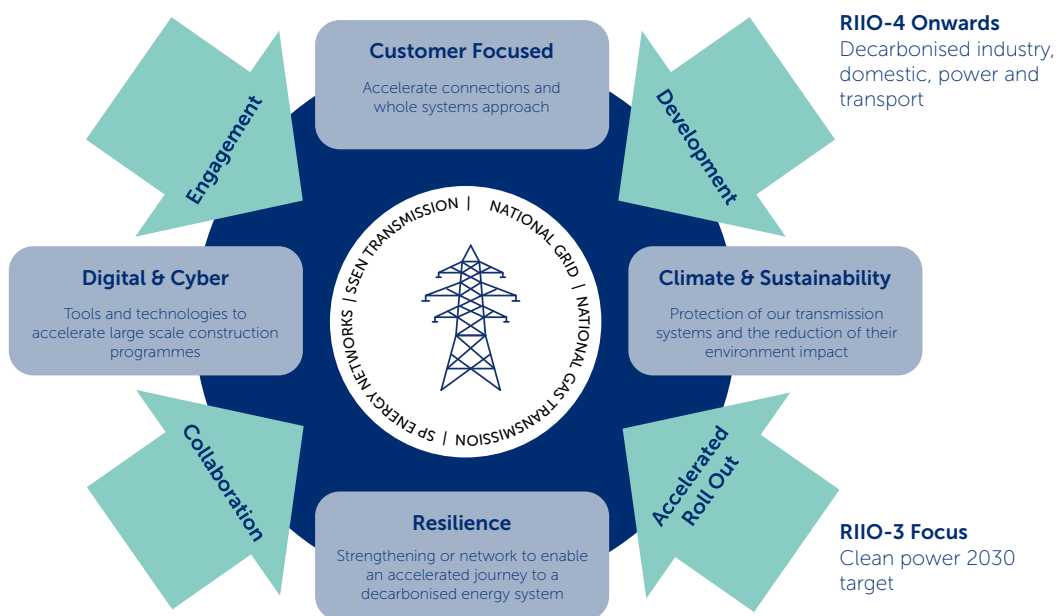
6.3 Collaboration

By fostering proactive, strategic partnerships, we aim to ensure that innovations benefit not only our network but the broader energy system. Through the ENA's Innovation Strategy Group (ISG), we will deepen our engagement with other network operators, facilitating knowledge exchange, sharing best practices, and aligning efforts on common industry challenges. These collaborative efforts will help minimise duplication of work across the sector, enabling more efficient use of resources and fostering a "fast-following" approach where proven innovations can be rapidly deployed across networks, accelerating the pace of implementation and delivering benefits to consumers faster.

We are focused on strengthening collaboration between the three electricity transmission networks to accelerate innovation in addressing shared challenges. This partnership will be central to our approach, enabling a unified effort to deliver solutions more efficiently. In addition, we are looking to enhance cross-industry collaboration, as shown by our recent joint initiative with electricity and gas transmission businesses. Together, we have established shared priorities, including digitalisation, decarbonisation, and system resilience; as illustrated in Figure 15.

Figure 15 - Transmission Networks Collaboration Model

Our UK Transmission networks working together



In addition to our network-to-network collaboration, we are actively engaging with our supply chain partners. A prime example of this commitment is demonstrated through our ASTI Charter (Figure 16), where we aim to create a unified community across our supply chain. A key focus of the charter is "relentlessly pursuing better ways of working through challenge and innovation," which formalises our proactive efforts to tap into the expertise of our key suppliers. By keeping them well-informed about our challenges, we encourage them to propose innovative solutions. This collaboration strengthens the innovation ecosystem, positioning our supply chain as a crucial partner in co-developing and implementing cutting-edge solutions.

Figure 16 - ASTI Charter



Furthermore, our Open Innovation Process continues to invite third-party innovators to address challenges identified by our internal Challenge Groups. Collaboration with organisations like the KTN and Scottish Enterprise further amplifies our innovation capability, pooling industry expertise and ensuring that ideas generated from various sources are developed into practical solutions. This approach not only drives innovation within our business but also contributes to the development of scalable system-wide solutions.

6.4 Deploying Innovation in RIIO-T3

Several innovation projects currently in delivery will be transitioned into BaU operations during RIIO-T3. We will proactively scale up successful innovations from RIIO-T2 using dedicated resource, to ensure we maximise opportunity. By effectively deploying these innovations, we will be supporting the enhancement of our infrastructure's capacity and resilience, facilitating the integration of more renewable sources into the grid. This not only accelerates our progress towards achieving RIIO-T3 commitments but also plays a critical role in driving the transition to a sustainable energy future, ultimately benefiting consumers and supporting national decarbonisation efforts.

6.5 Portfolio Approach to Innovation

Innovation, by its nature, involves a mix of projects with varying timelines, risk levels, and benefit types. While some projects may yield quicker results, others may require longer time horizons to mature and deliver their full value. In this context, the true success of innovation lies not in the immediate outcomes of individual projects but in the combined effect of an entire programme working in concert to drive transformational change. In RIIO-T3, our innovation strategy has been purposefully designed with this portfolio approach in mind. By balancing our efforts across different funding streams - NIA, SIF, and BaU - we can address both immediate operational needs and longer-term strategic challenges. Some projects may be high-risk, research-focused initiatives that take time to realise benefits, while others might be lower-risk innovations that deliver near-term efficiency gains. This diversified approach allows us to continuously generate value while also laying the groundwork for future breakthroughs.

The portfolio approach is critical for several reasons:

- **Diversity of Outcomes:** Not all innovations will lead to immediate or direct benefits. Some, particularly research-based NIA projects, serve to develop foundational knowledge or test new technologies that will be pivotal for future solutions. While these projects might not provide immediate consumer benefits, they are essential for informing and enabling later-stage innovations that do.
- **Risk Mitigation:** By distributing our innovation activities across multiple projects, the portfolio approach mitigates the inherent risk of innovation. If one project does not deliver the anticipated outcome, the overall programme can still succeed through the cumulative gains of other projects.
- **Long-Term Value Creation:** The most impactful innovations often take time to deliver value, particularly in an industry like energy, where asset lifecycles can span decades. Projects aimed at improving the resilience, sustainability, or efficiency of network infrastructure may not realise their full benefits until many years into the future. The portfolio approach ensures that we are continually investing in both near-term gains and long-term value creation.

- **Integrated Benefits:** Projects in different funding streams often complement each other. Insights gained from NIA research can directly inform BaU innovations, while SIF-funded collaborations can accelerate the deployment of new technologies tested through NIA. Therefore, evaluating innovation success purely on a project-by-project basis would fail to capture these integrated benefits and the overall strategic value of the programme.

This is why we have built three time horizons - 'Now', 'Near', and 'Next' - into our RIIO-T3 innovation strategy. This ensures that we can balance the portfolio to deliver benefits across various timescales, rather than being overly reliant on short-term gains or overly focused on longer-term initiatives.



6.6 RIIO-T3 Innovation Benefits

It is well-recognised that innovation is not a straightforward process, and the benefits are not always immediate. Projects funded through the NIA and SIF often focus on high-risk, high-reward research that explores new technologies, methodologies, and solutions critical for long-term system transformation. These initiatives lay the groundwork for future innovation and are crucial for tackling complex challenges that may not have an immediate BaU solution.

While BaU projects can deliver quicker, more tangible benefits, they are typically focused on near-term improvements to existing operations. In contrast, NIA and SIF are designed to support transformative innovation - testing early-stage technologies and addressing challenges where there is a high level of uncertainty. These projects can eventually lead to breakthroughs that fundamentally reshape the network and deliver larger-scale benefits for consumers in the long term. Therefore, despite the longer time horizon to realise benefits, NIA and SIF remain essential tools for driving significant advancements that would not be possible within the confines of BaU innovation.

The benefits from many of these projects may not be seen until the end of the next price control period, or even further into the future. Additionally, some of the benefits from innovations we implement today may only be fully realised over the entire life of the asset - potentially spanning 45 years or more. As a result, it is challenging to assign a single figure to the total benefits that the RIIO-T3 innovation programme will deliver.

However, we can provide a projected benefits figure based on our current understanding and historical performance. Given that the majority of our innovation efforts in RIIO-T3 will be targeted at energy system transition challenges, a large part of these activities will be funded via the NIA. Therefore, it is more realistic to project benefits that will materialise by the end of RIIO-T4 and beyond allowing research-focused projects to fully mature while still ensuring measurable value to consumers.

In RIIO-T3, we aim to build on the successes of the RIIO-T2 innovation portfolio by expanding further our range of innovation projects and aligning this with our refreshed Innovation Strategy to deliver greater value to energy consumers. Importantly, innovation ideas are not developed with a specific funding route in mind. Our innovation gate process evaluates the technology maturity (Technology Readiness Level, or TRL) and delivery risk of each idea. At this early stage, we assess the potential financial and non-financial benefits - some opportunities may be clear, while less mature ideas may need further proof of concept to identify where their benefits lie. With this evaluation, we can better determine the most appropriate funding route for each project, ensuring a balanced and strategic approach to innovation.

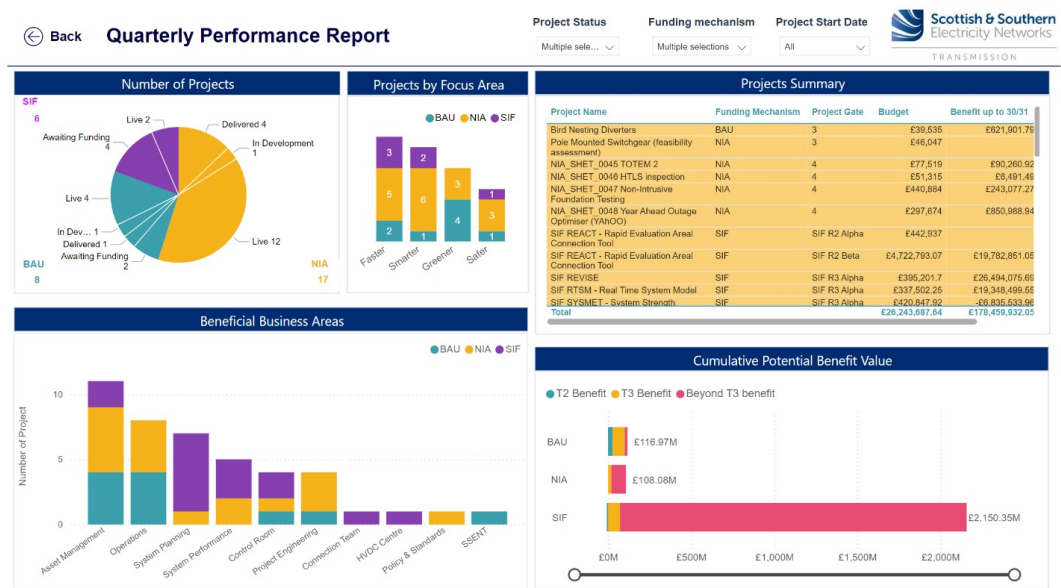
For the RIIO-T3 period, we are requesting an innovation allowance of £25.5 million under the NIA. Given the proportional increase in this allowance and our success in driving value throughout our RIIO-T2 innovation activities, we anticipate a significant increase in consumer benefits through this mechanism. Based on our track record in RIIO-T2, we anticipate a potential return of £61 million of benefits in RIIO-T3, with a further £190 million by RIIO-T4 from our NIA portfolio alone. We will continue to build our SIF and BaU portfolios, ensuring a balanced approach to driving innovation across all funding streams. Rigorous measurement of value remains central to our approach, enabling us to achieve significant benefit returns in RIIO-T3 that exceed the investments made during RIIO-T2, further reinforcing the impact and efficiency of our innovation strategy.



6.7 Monitoring Benefits

To effectively monitor the benefits of our innovation efforts in RIIO-T3, we will utilise our new Innoverse reporting system (Figure 17). Developed by our expert innovation analysts, Innoverse is a Power BI tool designed to track project progress and benefit realisation comprehensively. By establishing a single source of truth, Innoverse enables accurate regulatory reporting and enhances our ability to evaluate the impact of our innovation initiatives. In addition, Innoverse will ensure that we can deliver accurate regulatory reporting, including the consistent data required for our annual submission of the Innovation Measurements Framework (IMF), supporting transparency and alignment with regulatory requirements throughout the RIIO-T3 period.

Figure 17 - Our 'Innoverse' Reporting System



6.8 Project Duplication

Our internal governance process is built around a rigorous Gate process, which meticulously ensures quality outcomes at each stage. A key component of this process is a mandated checkpoint requiring our development team to conduct a thorough investigation of all innovation ideas to identify opportunities for fast following. We aim to improve this investigation by the rollout of our innovation horizon scanning programme, allowing us to quickly respond to ideas with solutions that are already deployed. Additionally, this approach helps minimise duplication by compelling us to understand existing technologies. We will also leverage insights from the ENA's Innovation Strategy Group (ISG), where network peers actively challenge new ideas and identify areas of commonality and potential overlap. This collaborative strategy establishes a robust system designed to limit project duplication, maximising the effectiveness of our innovation efforts.

6.9 Project Dissemination

To strengthen our dissemination activities in RIIO-T3, we will build upon the foundations established by our dedicated Knowledge and Communication Officer. Additional strategies will include hosting workshops and webinars to share project learnings and outcomes with other networks, conducting case studies highlighting successful innovations, and enhancing our online knowledge-sharing platform for stakeholders. By actively disseminating our findings, we aim to ensure that consumers and industry peers benefit from our innovations, thereby maximising the value derived from our investment in innovation.



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