citizens advice

May 2026

From Innovation to Impact

Evaluating RIIO-1 Energy Network Projects

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Executive summary

This review of network innovation builds on Citizens Advice's earlier report, *Making Innovation Count*. That report examined the transparency of innovation projects under the Network Innovation Allowance (NIA) and Strategic Innovation Fund (SIF) in RIIO-2. It found that the tracking of project outcomes could be improved.[1] We have similar concerns about projects funded through the NIA and the Network Innovation Competition (NIC) in RIIO-1. Like their successors in RIIO-2, these projects are ultimately paid for by consumers through their energy bills, making it essential to understand the value they deliver, and yet visibility over their outcomes remains limited.

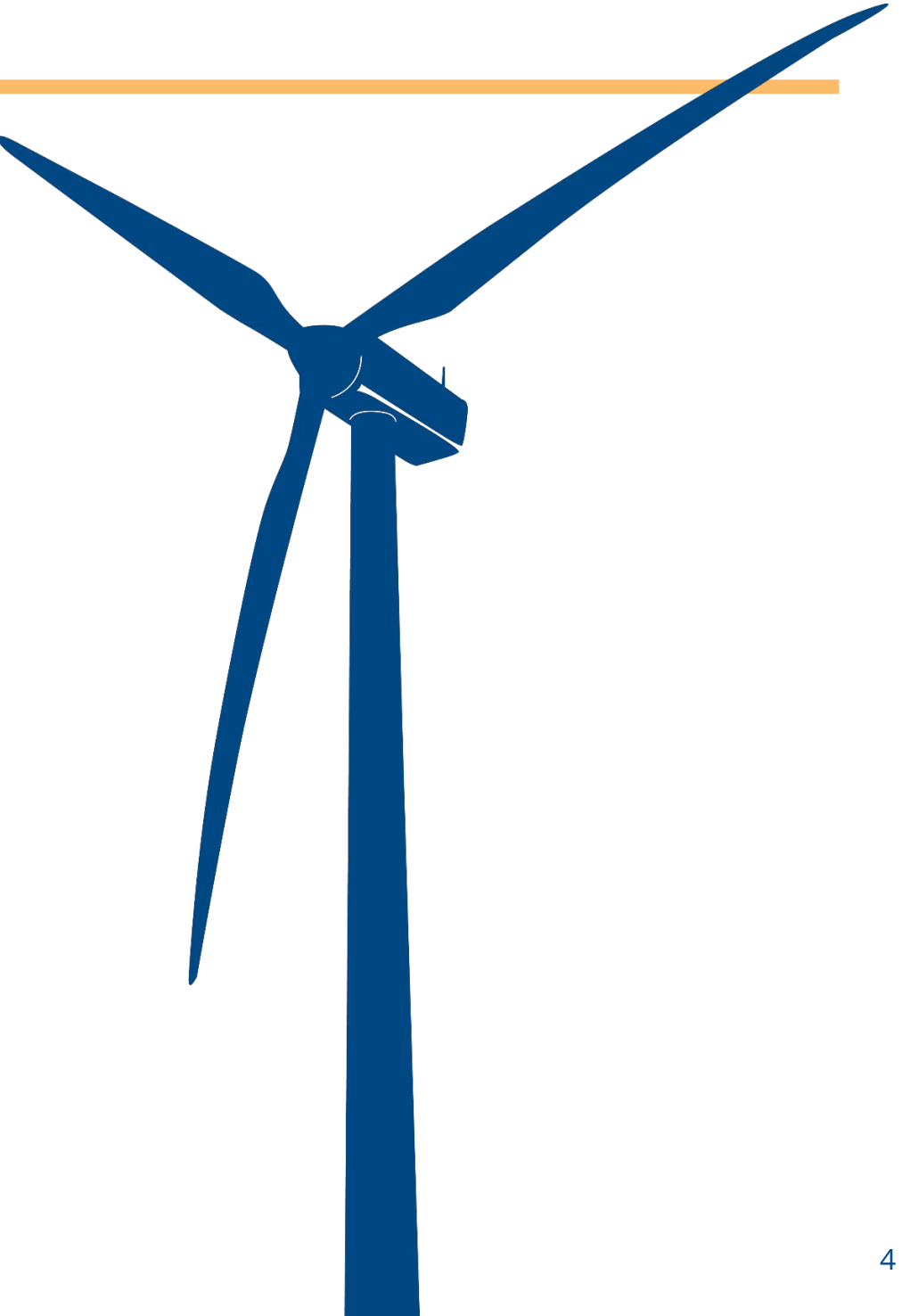
While innovation "outcomes" are often defined in terms of deployment and scaling across networks, this report recognises the need for a broader perspective to fully capture the value of innovation activity. Innovation is not a linear process but involves multiple stages of development, learning, and iteration. As such, projects can generate valuable insights and benefits even if they do not directly lead to deployment. Therefore, this report adopts a broader approach by assessing the different outcomes projects delivered such as improvements to assets, contributions to policy development, the generation of new knowledge, and better consumer outcomes to capture the full value of innovation activity.

However, while adopting this broader perspective, the importance of delivering tangible value to consumers remains central to innovation activity. Supporting the transition of innovation projects into Business as Usual (BAU) should therefore be a key aim of the innovation funding frameworks, as this is the main ways consumers, who ultimately fund these activities, see the real benefits from these projects. The proportion of projects that progress to BAU is therefore an important indicator of the effectiveness of innovation frameworks. That said, not all projects will, or should, reach BAU. A portfolio in which all projects are successfully deployed may indicate insufficient risk-taking and limited ambition to develop more transformative solutions. However, it would be expected that a proportion of innovation projects move into BAU and deliver clear and measurable benefits to consumers. We do not prescribe what this proportion should be at this stage; rather, the appropriate level should be determined through further analysis, drawing on past experiences, and through engagement and continued discussion with stakeholders.

This analysis focuses on innovation projects completed during RIIO-1, which covered the period 2013 - 2023. This provides a complete dataset that enables a comprehensive assessment of innovation outcomes. In contrast, RIIO-2 continues until 2028, and many innovation projects are not yet complete, so a full dataset is not yet available for robust analysis. While recognising that RIIO-1 differs from RIIO-2 and RIIO-3 and these subsequent frameworks introduced a stronger focus on consumer outcomes and clearer strategic direction, RIIO-1 remains a valuable baseline. Examining what happened under RIIO-1 provides a benchmark for assessing whether these subsequent reforms have shaped the innovation portfolio. And the experience of RIIO-1 continues to offer valuable insights, highlighting areas for improvement, helping to inform future governance updates and the design of subsequent frameworks.

Our findings

Overall, this report finds that the RIIO-1 innovation framework was heavily skewed towards technical, asset-focused projects, with limited emphasis on consumer outcomes and engagement. This partly reflects the nature of transmission sectors (both gas and electricity) and the Electricity System Operator (ESO), which have limited direct interaction with consumers. It also reflects the design of the NIA and NIC funding mechanisms in RIIO-1, which were largely focused on incentivising technical and asset based innovation. Innovation activity further showed weak scaling across networks, limited building on previous projects, and gaps in data quality and transparency. While RIIO-2 and RIIO-3 introduce some improvements, including a stronger focus on consumers, it is too early to assess their impact due to incomplete data. This report provides a foundation for future work to assess whether these changes lead to meaningful shifts in the innovation portfolio and its outcomes. It also sets out recommendations for network companies and Ofgem to improve transparency and encourage innovation projects that are more clearly focused on delivering benefits for consumers.



Our approach

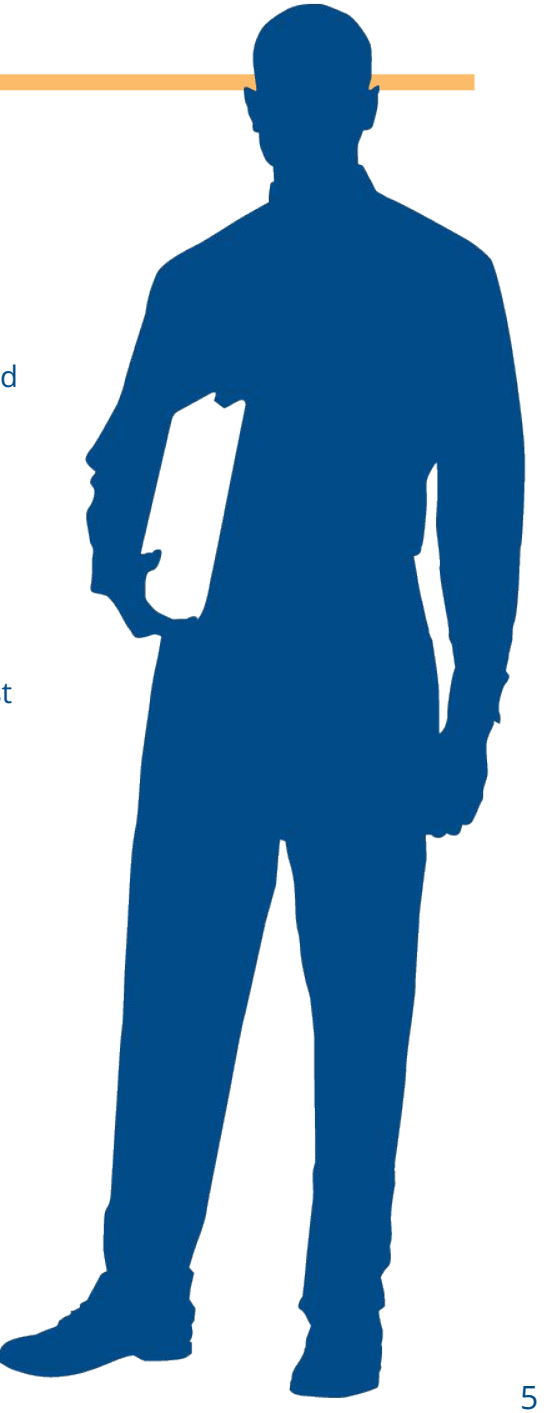
For this study, we randomly selected 306 innovation projects funded through the NIA and NIC under RIIO-1. All selected projects were recorded as completed in the Smarter Networks Portal. The sample covered projects across Electricity Transmission (ET), Gas Transmission (GT), Electricity Distribution (ED), Gas Distribution (GD), and the ESO (now known as NESO). In addition, all completed NIC projects were included in this analysis. Network companies were given the option to substitute up to five NIA projects where the initial sample did not sufficiently capture their most significant or high-value innovation activity. We also asked companies to provide further information on these selected projects, including their nature and outcomes.

Our analysis examined the problems these projects were designed to address and the outcomes they delivered, with a particular focus on the wider value of innovation. This included the development of new ideas, contributions to policy thinking, improvements in consumer outcomes, and broader system benefits, rather than solely direct rollout. It also assessed whether projects engaged consumers, built on previous innovation, and were adopted across different network licence areas.

Specifically, we assessed:

- What each project was trying to achieve
- What outcomes the projects delivered
- How consumers were involved in the projects
- Whether projects were adopted across licence areas
- Whether projects were built on, or informed by, previous innovation work

This gives a clearer picture of not just what was funded but also what innovation funding under RIIO-1 actually delivered.



Key findings from our sample

The innovation portfolio was dominated by technical, asset-focused innovation: innovation under RIIO-1 was heavily concentrated on physical infrastructure and system optimisation. Around 77% of projects focused on hardware and software improvements. Consumer-facing innovation was limited, with 7% of projects explicitly targeting customer or social outcomes. This imbalance reflected the design of the RIIO-1 framework, which prioritised technical performance, such as efficiency and reliability, over direct consumer outcomes. In both NIA and NIC governance documents, "net financial benefits" were primarily interpreted as reducing network costs through asset and system improvements. Combined with the high level of autonomy given to network operators and limited strategic direction, this contributed to a strong bias towards asset-based innovation.

Innovation patterns were consistent across electricity and gas sectors: despite structural differences between gas and electricity networks—across distribution (GD, ED), transmission (GT, ET), and the Electricity System Operator (ESO)—a common pattern emerged. Innovation was predominantly focused on technical, asset-based improvements, rather than direct customer impact.

Innovation was largely exploratory and focused on system improvement: the most common outcome was the establishment of new knowledge and research insights (31%), while only 22% of projects reached Technology Readiness Level (TRL) 7 or above, indicating limited progression to deployable maturity. This suggested that innovation under RIIO-1 was predominantly focused on early-stage exploration. The next most common outcomes were system improvement and integration (23%), and operational process improvements (19%). These findings further suggest that much of the innovation activity under RIIO-1 was focused on improving network performance and operational efficiency.

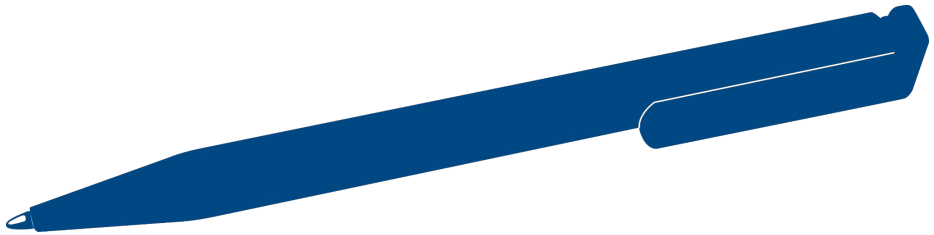
A gap existed between technological readiness and deployment: 5% of innovation projects were technologically ready but were not ultimately deployed. This highlighted that technical success in the innovation project alone did not guarantee transition into BAU. We recognised that progression was influenced by a range of factors, including economic viability, changing business priorities, regulatory considerations, and challenges in integrating new solutions into existing network operations. It also reflected limitations in the RIIO-1 framework, where support for scaling successful innovation was relatively weak. In particular, the Innovation Roll-out Mechanism (IRM), which was intended to facilitate deployment, was rarely used due to its complexity and administrative burden. As a result, it did not provide a strong incentive or effective pathway for network operators to roll out successful projects.

Consumer focus was limited in both design and delivery: under RIIO-1, consumer benefits were generally treated as indirect outcomes rather than core objectives. There was no explicit requirement to support vulnerable consumers, in contrast to RIIO-2. Although both NIA and NIC required projects to deliver "net financial benefits," this was primarily interpreted as reducing network costs, with the expectation that savings would flow through to consumers indirectly. This approach placed limited emphasis on demonstrating direct or measurable consumer outcomes. This lack of focus was also reflected in project delivery. Even among the 7% of projects identified by network companies as being focused on customer, social, or engagement, 38% did not involve consumers at any stage of the innovation process, indicating that engagement was not consistently embedded in project design or development.

Innovation projects demonstrated limited evidence of both scaling and cumulative development: a large majority of projects (79%) were not scaled beyond their original network area, indicating limited cross-network adoption. This reflected the asset-heavy nature of the portfolio, as infrastructure-based solutions were often more difficult to replicate across different networks due to variations in system design, operational context, and local conditions. There was also limited evidence of cumulative innovation. Across the portfolio, only 33% of projects were built on previous innovation, particularly under the NIA. In contrast, NIC projects showed stronger continuity, with 66% building on prior work. This difference reflected the design and purpose of the two funding mechanisms. NIA funding tended to support smaller, early-stage, and more exploratory projects, which were often standalone in nature. By contrast, NIC projects were larger and more resource-intensive, typically requiring a stronger evidence base and therefore more likely to build on prior work.

Technology Readiness Levels (TRLs) were an incomplete measure of deployment readiness: this measurement provided only a partial view of deployment readiness. A high TRL did not necessarily translate into deployability within complex, regulated energy systems. Critical factors such as system integration, regulatory alignment, and operational compatibility were not captured by TRLs, limiting their effectiveness as a standalone indicator of whether a project was ready for implementation.

Tracking and post-project follow-up remained limited and inconsistent: there was no consistent requirement to monitor deployment, assess long-term outcomes, or quantify realised consumer benefits. Data inconsistencies, including issues with the Smarter Networks Portal, further reduced transparency and made it difficult to assess the full impact of innovation funding. In addition, there was little evidence of systematic follow-up on projects that reached deployment readiness but were not implemented, limiting understanding of the barriers to deployment and opportunities for learning.



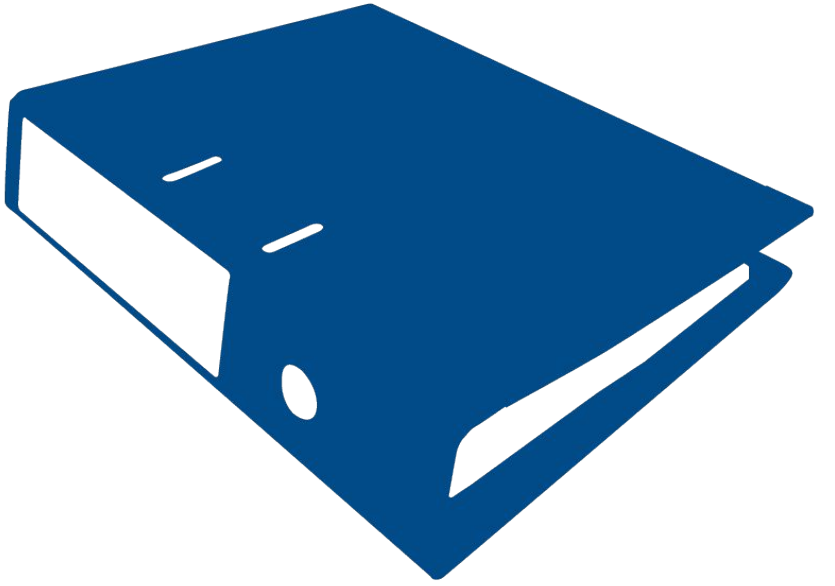
Key Recommendations

Based on the findings of this review, the following recommendations are proposed to strengthen the effectiveness of innovation funding and ensure that innovation delivers greater benefits for consumers.

Recommendations for Ofgem:

1 Ofgem should introduce mandatory consumer engagement requirements for NIA projects that are consumer-relevant, meaning projects with a direct impact on consumers, such as changes to services or overall customer experience. For example, this could include projects involving new service delivery models or technologies that affect how consumers interact with energy networks, where engagement might involve user testing, co-design, or targeted consultation. Engaging consumers early and throughout the innovation process, including at the design stage, would help ensure projects reflect real consumer needs and deliver meaningful outcomes. We recognise that this approach has already been strengthened under RIIO-3 through the SIF, which introduced an eligibility requirement for projects to consider the needs of end users and demonstrate how these stakeholders have been, or will be, meaningfully engaged in the development and adoption of the innovation.[2] Extending similar expectations to NIA projects would improve consistency across funding mechanisms and increase the likelihood of delivering consumer-focused innovation.

2 Ofgem should take a more proactive role in shaping the direction of innovation and determining which projects are implemented, with a stronger focus on prioritising those that deliver clear consumer benefits. This should include ensuring that a defined share of innovation funding goes to projects that provide direct value to consumers and that a certain proportion of projects deliver clear benefits to consumers or wider society. We recognise that progress has been made through the introduction of innovation challenges under the SIF in RIIO-2 and the establishment of the Energy Networks Innovation Taskforce in RIIO-3, both of which provide clearer strategic direction. Expanding on this, Ofgem should take a more active role in determining which successful innovation projects are taken forward into implementation. Ofgem should also take steps to more actively guide and shape NIA projects, ensuring they are better aligned with consumer needs and wider system priorities. For instance, innovation allowances should be contingent on network companies' track record in successfully implementing projects—especially their ability to transition projects into BAU and deliver measurable consumer outcomes. This approach would help rebalance innovation activity towards delivering tangible consumer outcomes alongside technical advancement.



3 Ofgem should work with DESNZ to provide clearer long-term direction on the future energy system, including market design and emerging technologies such as hydrogen. This includes setting out clear guidance on how markets will operate, aligning regulatory decisions with government long-term plans, and defining clear pathways for developing and adopting new technologies. Greater clarity also helps network companies and investors understand where innovation is needed and how new solutions fit within the future system. Reducing uncertainty around future rules will drive investment and increase the likelihood that successful innovations progress and are more widely adopted.

4 Ofgem should explore introducing a multi-dimensional readiness framework for projects reaching TRL 7 and above, going beyond technological readiness to include system integration, regulatory, and market readiness. In practice, Ofgem can work with Innovate UK and network industry stakeholders to design a standardised framework. This should require projects at TRL 7+ to undergo a structured readiness assessment against clear criteria across multiple dimensions, supported by robust evidence. Such a framework would enable a more comprehensive and transparent assessment of deployability and help identify implementation barriers at an earlier stage.

5 Ofgem should strengthen post-project tracking and oversight by strengthening the existing reporting requirements (such as Regulatory Reporting Packs) and introducing proportionate follow-up reviews to better understand projects' real-world impact after completion. This could be achieved by a light touch updates at set intervals after projects has closed, for example, two years after the close-down report, covering areas such as real-world use, adoption by other networks and whether the expected benefits have been realised. Making this data publicly available would improve transparency and enable scrutiny by stakeholders, including Citizens Advice and Innovate UK. While tracking has improved since RIIO-2, particularly through the introduction of the SIF and its staged approach (Discovery, Alpha and Beta), further improvements could be made across both SIF and NIA projects. In particular, Ofgem should require network companies to clearly identify any preceding or related projects in registration reports and explicitly set out how those earlier projects have contributed to the current project's design and development, enabling more effective tracking of knowledge sharing and cumulative innovation.

6 Ofgem should introduce a simple mechanism to track the adoption of innovation projects that move into BAU. This could include a shared register, managed by Ofgem or a third party, where network companies record when innovation developed by another network is also moved into BAU within their own network. This would improve transparency without placing additional reporting burdens on the original project owner.

7 Ofgem should collaborate with network companies to assess stalled and non-deployed projects, particularly those under RIIO-1 and RIIO-2, including NIA projects, to better understand and address barriers to progression and deployment. This should involve a structured review process requiring network companies to provide clear explanations for lack of progression, including technical, commercial and regulatory barriers, supported by a multi-dimensional readiness framework. Ofgem should then analyse these findings across the portfolio to identify common challenges and systemic issues, and publish a report setting out key barriers alongside recommendations for both industry and the regulator, helping to inform improvements to future innovation funding mechanisms. We recognise that Ofgem and Innovate UK have taken steps to address these challenges in RIIO-3, particularly through the introduction of Innovation Delivery Groups within the SIF to support the transition of developed solutions into BAU.[3] This recommendation ensures that lessons from earlier schemes are systematically captured and used to strengthen delivery and deployment outcomes in the future.

8 Ofgem should give greater consideration to past performance when allocating innovation funding to incentivise network companies to move projects into BAU. Past performances should not be judged solely on whether a project reaches BAU as innovation involves risk and uncertainty. Therefore, it should be assessed more broadly including factors like knowledge sharing, quality reporting and quality of delivery. We recognise that this approach has already been embedded in RIIO-3, where networks are required to justify funding requests through evidence of positive delivery outcomes in their business plans. To ensure this approach is effective, Ofgem should focus on improving the consistency, quality, and accessibility of data used to assess performance across networks, particularly in relation to progression to BAU, delivery of consumer benefits, and cross-network adoption. This will require better data and more consistent, robust data collection to ensure that performance can be accurately assessed. Ofgem's work on re-designing the Innovation Measurement Framework (IMF) in RIIO-3 is positive step to improve the capture of outcomes and impacts. With stronger data in place, networks that demonstrate strong performance in taking projects forward and delivering tangible outcomes would receive enhanced funding flexibility or additional allowances, while weaker performance would trigger greater scrutiny or reduced funding. Strengthening this link would create clearer incentives for network companies to focus not only on delivering projects, but on ensuring that innovation leads to real-world impact.

Recommendations for Networks:

1 Network companies should ensure that innovation project data is captured, maintained, and updated consistently over time. This includes tracking deployment status, cross-network adoption, and realised benefits to improve transparency and support sector-wide learning, while making sure the data is accurate, complete and consistent. Companies must assign clear internal responsibility for maintaining and updating project data, ensuring that information continues to be updated after project completion to reflect changes in status, including scaling or discontinuation. Project data should also be retained for a defined period to enable longer-term tracking and evaluation of outcomes.

2 Network companies should work collaboratively with the Energy Networks Association (ENA) and Future Energy Networks (FEN) to improve the Smarter Networks Portal. We recognise that the portal is managed by ENA and is currently being revamped, which provides a valuable opportunity to address existing limitations. We also note that, for gas network innovation projects from 1 January 2025 onwards, information is hosted through FEN's separate portal. These portals should evolve beyond a central storage system for project reports into a comprehensive, publicly accessible platform that enables users to track innovation activity across the sector. It should provide clear, up-to-date information on project status, funding, and outcomes, allowing users to see what projects are being developed, in which areas, how they deliver value, and which previous innovation projects they build on. Consumer representatives and Ofgem should also be involved in the redesign to ensure the portal is user-friendly and meets the needs of a wide range of users.

3 Network companies should ensure that all innovation projects funded through energy bills are reported on transparently, including whether they have been taken forward and, if not, the reasons why. Annual innovation reports must provide a comprehensive and balanced account of project outcomes, covering both successful and unsuccessful projects. In particular, companies need to clearly explain what happened to projects that were not progressed, the barriers encountered, and the lessons learned. This will improve transparency, strengthen accountability, and support more effective learning across the sector.

4 Network companies should place greater emphasis on progressing innovation projects into BAU. While recognising that not all projects, particularly early stage or research-focused initiatives, will have a clear pathway to BAU from the outset, projects at a more advanced stage of development (i.e. higher TRL level) should be designed with a clear pathway to BAU from the outset, including a defined use case, expected benefits and conditions for progression. At an appropriate stage, projects should be assessed to determine whether the innovation can be integrated into existing systems or would require significant infrastructure changes, helping identify barriers early and improve decision-making. Companies should strengthen the business case alongside technical development and engage internal stakeholders early in the process to ensure alignment and buy-in. Together, this would help ensure that innovation activity is more consistently translated into tangible outcomes.

Context and Rationale for Innovation Funding

Innovation plays a critical role in enabling energy networks to respond to evolving system needs, deliver efficient and reliable services. Under the RIIO-1 framework, Ofgem supported innovation through dedicated funding mechanisms, including the NIA, the NIC and the Innovation Rollout Mechanism (IRM). These mechanisms were designed to encourage network companies to test new, higher-risk ideas beyond business-as-usual activities and support their wider rollout. The overall aim was to deliver long-term benefits for both the energy system and consumers.

Definition of Innovation under RIIO-1

In RIIO-1, Ofgem did not provide a single, simple definition of "innovation." Instead, it defined innovation through the criteria used to decide which projects were eligible for innovation funding. According to the RIIO-1 Electricity Network Innovation Allowance Governance Document, a project was considered innovative if it met the following conditions:

- the project must involve something new or unproven in Great Britain. If the idea or technology has already been tested outside Great Britain, the network company must clearly explain why it needs to be trialled again in the GB context. This can include using new equipment, applying existing equipment in a new way, introducing a new operational practice linked to the transmission or distribution system, or testing a new commercial arrangement.[4]

- the project must go beyond normal business-as-usual activity and have an unproven business case. The level of risk must justify carrying out a limited Research, Development, or Demonstration project to test whether the idea works in practice.[5]

- the project must not duplicate other innovation projects that are already registered, ongoing, or completed under previous schemes, such as Innovation Funding Incentive and Low Carbon Networks Fund projects already registered, being carried out, or completed by the Network Licensee or any other Network Licensee.[6]

Together, these criteria show that Ofgem defined innovation in RIIO-1 as a new, high-risk activity that is not part of routine operations and that has the potential to deliver future benefits if successfully demonstrated.

Innovation as a Core Element of the RIIO Framework

Ofgem designed the RIIO (Revenue = Incentives + Innovation + Outputs) price control framework with innovation as a key part of its approach. The second "I" shows Ofgem's aim to encourage network companies to go beyond normal day-to-day activities and try new ideas, technologies, and ways of working that can improve efficiency, make networks more reliable, and deliver better value for consumers.[7]

To make this happen, the RIIO framework includes special funding to support innovation. These funding mechanisms help network companies carry out projects that involve risk and uncertainty and would not normally proceed without additional support. In the RIIO-1, they include the NIA for smaller research and development projects, the NIC for larger and more complex projects, and the IRM, which was created to help proven innovations be used more widely (and was later stopped in RIIO-2 because it was rarely used).[8]

RIIO-1 was the first period of the RIIO framework and set out how this support for innovation would work. It ran from 2013 to 2021 for gas distribution, electricity transmission and gas transmission networks, and from 2015 to 2023 for electricity distribution networks. During RIIO-1, these funding mechanisms played an important role in helping network companies test new ideas and making innovation part of normal network operations.

Why Ofgem judged that Innovation Funding was Needed

Innovation funding is essential to enable network companies to deliver long-term value and respond to evolving energy system needs. Innovation typically requires significant upfront investment and involves a high degree of uncertainty, with no guarantee of immediate or direct financial returns.[9] As a result, many high-risk, high-reward projects would not proceed under normal business or regulatory conditions.

This challenge is reinforced by the nature of network companies as natural monopolies. With limited competitive pressure, they face weaker incentives to invest in uncertain or experimental solutions. Instead, they are more likely to rely on proven, traditional approaches. While these approaches may be more cost-effective in the short term, they may be less efficient, more costly over time, or insufficient to meet future system demands.

Dedicated innovation funding mechanisms are therefore considered necessary by Ofgem within the current regulatory framework to test new ideas and explore alternative approaches that might not otherwise be attempted.

RIIO-1 Innovation Mechanisms

To help network companies deliver long-term value to customers and respond to changing system needs, Ofgem introduced a range of funding mechanisms to support innovation and the rollout of projects under RIIO-1. These mechanisms were created to encourage network companies to test new ideas, develop new technologies, and try different ways of working that go beyond normal day-to-day operations and into wider deployment where appropriate.

Funding Mechanisms	Purpose of the Funding Scheme	How Funding Is Allocated	Eligibility for Funding	Total Funding Available
NIA	The NIA supports small-scale research, development, and demonstration projects. It can fund different types of innovation, including commercial, technological, and operational improvements, helping network companies test new ideas and ways of working.[10]	The NIA is set at the start of each price control period and reflects the quality of a company's innovation strategy.[11]	The NIA is only available to network licensees and is provided as part of their price control settlement.[12]	The amount of funding provided ranges from 0.5% to 1% of the licensee's annual allowable revenue, depending on the strength and development of their innovation strategy.[13]
NIC	The NIC supported large and complex innovation projects. It funded various types of innovation, including commercial, operational, and technical projects, as long as they had the potential to deliver environmental benefits and positive customer outcomes.[14]	Funding for the NIC was awarded through an annual competitive selection process.[15] Technology Readiness Level (TRL) 1 – 3 (Research activities) and 9 (proven activities) were not eligible for funding from the NIC.[16]	The NIC was open to both RIIO and non-RIIO network licensees and allowed them to lead bids for innovation funding.[17]	For electricity networks, £30 million per year was provided under RIIO-T1 until March 2021, followed by £40 million per year under RIIO-ED1 until the end of that period.[18] For gas networks, up to £20 million per year was made available under the RIIO-T1 and RIIO-GD1 price controls.[19]
IRM	IRM was designed to support the rollout of proven innovations into normal business practice.[20]	IRM applications are assessed by Ofgem against clear criteria. Projects must deliver environmental benefits, provide long-term value for money, and not generate commercial returns for the network company during the remaining price control period. The IRM is not used to fund routine business activities.[21]	IRM is open to network companies only.[22]	There are two application windows available within the RIIO-1 period, and all applications are assessed through a formal evaluation process.[23]

Outcomes of Innovation Projects

The "outcomes" of innovation projects are often unclear and difficult to track. Deployment is usually seen as a key outcome of innovation projects. The *Playbook for Network Innovation*, commissioned by Innovate UK, states that the ultimate goal of innovation is for new solutions to be "implemented in practice and used widely across the network".[24] However, evidence from our previous report, *Making Innovation Count*, showed that deployment is not well monitored and that information available through the Smarter Networks Portal is limited.[25] As a result, there is no clear or consistent picture of what happens to innovation projects once they are completed.

This work argues that the outcomes of innovation should be understood more broadly than deployment alone. Engagement with network companies and industry representatives suggests that focusing solely on deployment is insufficient, as innovation is rarely a linear process. Network companies have highlighted that only in limited cases does a single innovation project lead directly to deployment. More commonly, deployment emerges through an iterative process, where learning from multiple projects gradually leads to implementation. As a result, innovation projects—particularly under the NIA—do not always result in immediate deployment, but they can still generate valuable insights, deepen understanding of system challenges, and support future innovation.

However, while deployment should not be the sole measure of success, it remains critically important. Deployment is the primary way consumers, who are the main contributors to innovation funding, see tangible benefits from these investments. Ensuring that learning and insights are effectively translated into real-world implementation, where appropriate, is therefore essential to maximise the value of innovation for consumers.

For this research, we adopted a wider outcomes-based approach to capture the full range of potential impacts. Outcomes were therefore categorised as follows:

- **System Improvement and Integration (hardware-focused):** Projects that upgrade, enhance, or integrate new technologies into the physical network.
- **Operational Process Improvement (software and data-focused):** Digital tools or data-driven processes that improve organisational operations.
- **Customer and Social Benefit Delivery:** Projects that provide direct benefits to customers or wider society.
- **Policy Impact and Standards Change:** Projects that influence policy, regulation, technical standards, or internal procedures.
- **Generation of New Knowledge and Research Insights:** Projects that create learning and evidence to support future innovation.
- **Projects Not Taken Forward:** Projects where the solution was not found to be workable, practical, economically viable, or effective and therefore were not progressed further.
- **Project Achieved Deployment Readiness but Not Deployed:** Projects where the solution was technically viable and reached a deployable stage but was not ultimately implemented due to external or organisation barriers.

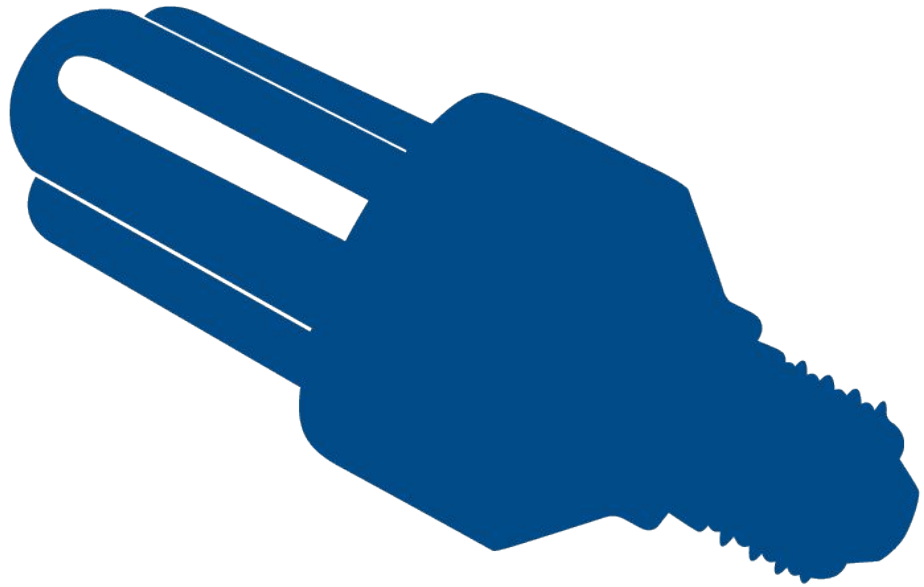
This broader definition of outcomes will provide a more accurate and meaningful assessment of innovation funding by capturing the full range of impacts delivered by innovation projects. This reflects the diverse ways innovation projects can contribute to the energy network system such as creating new knowledge, even where they were ultimately not rolled out.

Importance of this research

Innovation across the energy network sector is wide-ranging and complex, covering many technologies, approaches, and stages of development. However, there is still limited visibility of how many projects are successfully deployed, what outcomes they achieve, or how their impact extends beyond individual network companies. Existing reporting (like the annual innovation summary report by the ENA) does not capture the full range of innovation activity or results. As a result, it is difficult to assess the overall value and effectiveness of innovation funding. Ofgem, and even more so the public, does not have full visibility into what happens to projects once funding ends.

This research addresses these gaps by providing an evidence-based overview of the innovation landscape across the energy network sector. It examines the nature of innovation projects, the outcomes they have achieved, whether and how customers were involved, whether projects were implemented beyond a single network's licensed area, and whether they built on previous innovation activity. This approach moves beyond simple project descriptions to identify patterns and wider system impacts.

Overall, this research provides a more complete and meaningful view of innovation in the energy network sector. It can support regulators, network companies, and other stakeholders to make better decisions through improved transparency, clearer identification of what works well, and better targeting of future innovation funding towards areas that deliver the greatest benefits for consumers and the wider energy system.



Methodology

This review assessed a representative sample of completed RIIO-1 NIC and NIA projects to ensure robust and unbiased findings. Only projects recorded as "Complete" in the Smarter Networks Portal were eligible for inclusion.*

Projects from the RIIO-2 period were excluded because a number of RIIO-2 innovation projects are still ongoing, and the available dataset would be incomplete and unable to reflect the full scope of innovation funding and outcomes. Including partial RIIO-2 data risked introducing bias. To avoid this, network companies were asked to complete a structured questionnaire for the selected RIIO-1 projects only.

Projects were randomly selected from the population of completed RIIO-1 projects. Network companies were permitted to replace up to five NIA projects where the initial selection did not adequately reflect their key achievements or high-value innovation activity. In one case, National Gas Transmission was approved to replace seven projects, where the original random selection largely consisted of activities concerned participation fees in industry research groups such as the European Pipeline Research Group and Pipeline Research International across multiple years, rather than projects involving substantive innovation delivery.

Each company reviewed at least 10 projects, with companies holding larger innovation portfolios reviewing up to 36 projects to ensure proportional representation. In addition, guidance was provided to network operators to support their understanding of each category and to assist them in completing the survey.

All completed RIIO-1 NIC projects were included in the assessment, alongside a statistically representative sample of RIIO-1 NIA projects.

The final sample comprised 306 projects, providing a 95% confidence level with a 5% margin of error.

Projects were categorised using a common framework based on project outcomes, nature of activity, links to previous projects, customer participation, and evidence of scaled deployment (as set out in more detail above). The review was based on data provided by network operators through completed questionnaires and information available on the Smarter Networks Portal. Companies were required to submit brief supporting evidence for each categorisation, in line with the issued guidance, to ensure consistency and transparency across the review.

A draft report was shared with network companies to enable them to review the findings, provide feedback, and respond to any issues or observations identified in the analysis.

*Using the Smarter Networks Portal, we identified a total of 1,196 completed innovation projects delivered during the RIIO-1 period, of which 1,174 were funded through the NIA and 22 through the NIC. However, network operators reported a total of 29 completed NIC-funded projects. This discrepancy suggests that the Smarter Networks Portal may not fully reflect the complete or up-to-date status of innovation projects. For example, projects such as *Fitness*, *Visor*, *Phoenix, Angle-DC, LV Engine and Fusion* were excluded from our selection because they were listed as "Live" on the portal, while other projects, such as *Charge*, could not be identified on the portal at all.

Analysis and Findings

Overall Findings

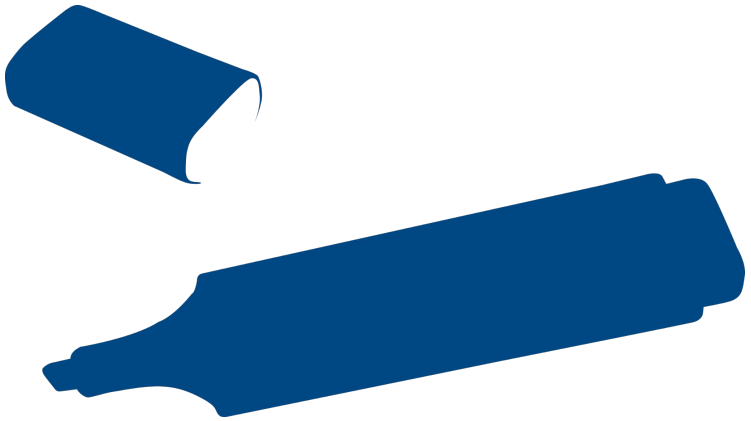
This section examines the outcomes and characteristics of innovation projects funded under the NIA and the NIC. Based on a review of 306 projects across Electricity Transmission, Gas Transmission, Electricity Distribution, Gas Distribution, and the Electricity System Operator, the analysis provides an assessment of how innovation funding is utilised, the types of outcomes delivered, and the extent to which projects progress towards implementation and wider impact.

Focus of innovation

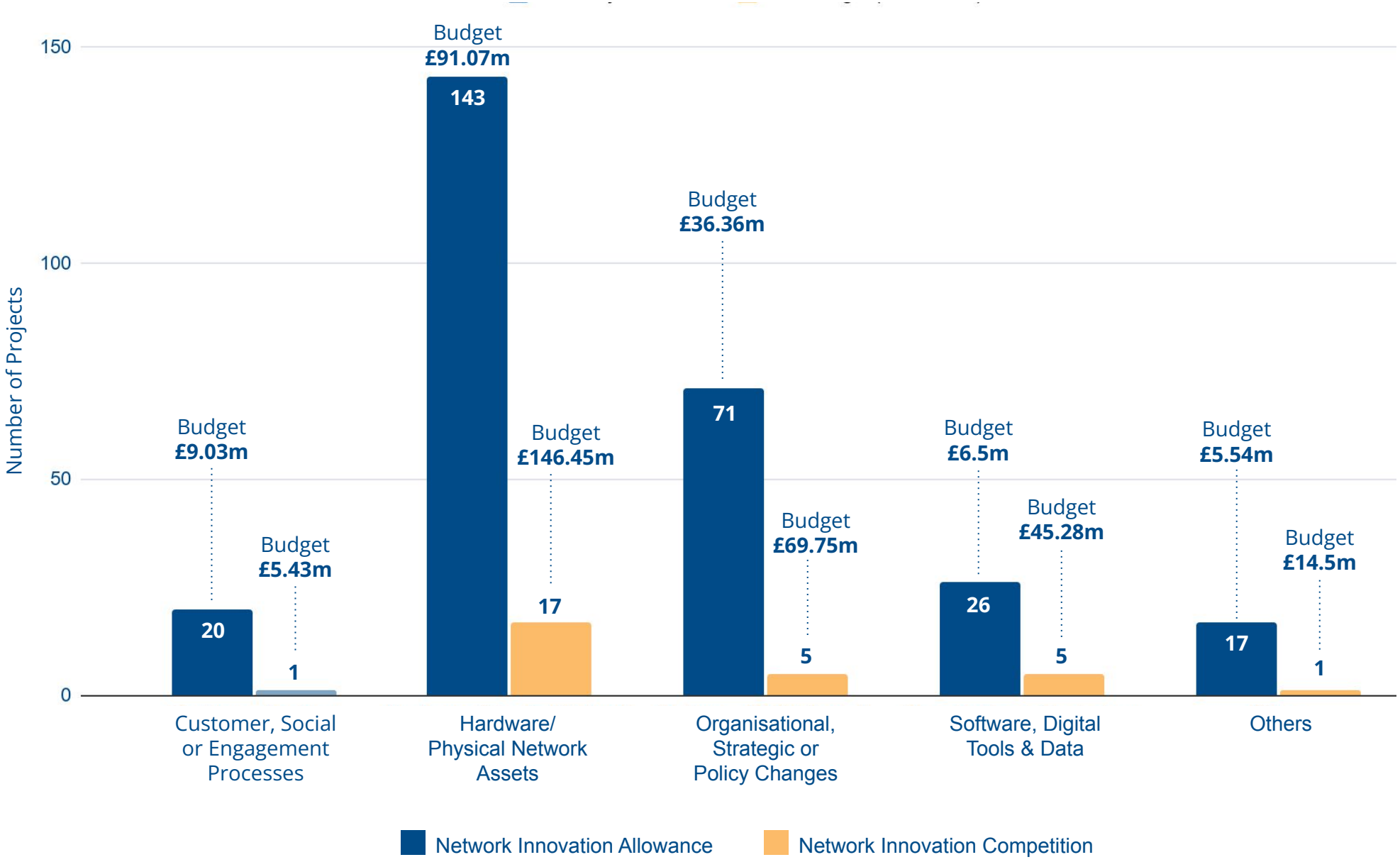
The majority of innovation projects were funded through the NIA, accounting for 277 projects (91%) with a total registered budget of £148.5 million. In contrast, the NIC funded a much smaller number of projects—29 (9%)—but with a significantly higher combined registered budget of £281.4 million.[27] This indicates that NIA supports a larger number of smaller, incremental projects, while NIC funding was concentrated on fewer, higher-value and larger-scale initiatives.

Across the portfolio, innovation was strongly focused on physical infrastructure, with over half of projects (52%) targeting hardware. Software and digital innovation also played an important, though secondary, role (25%), while customer-focused innovation remained relatively limited (7%). This asset-heavy pattern was consistent across both funding streams. For NIA projects, 52% focused on hardware and 26% on software, while for NIC projects, the figures are 59% and 17% respectively. In contrast, projects focused on customer, social, or engagement processes were less common and were more likely to be funded through NIA (7%) than NIC (3%).

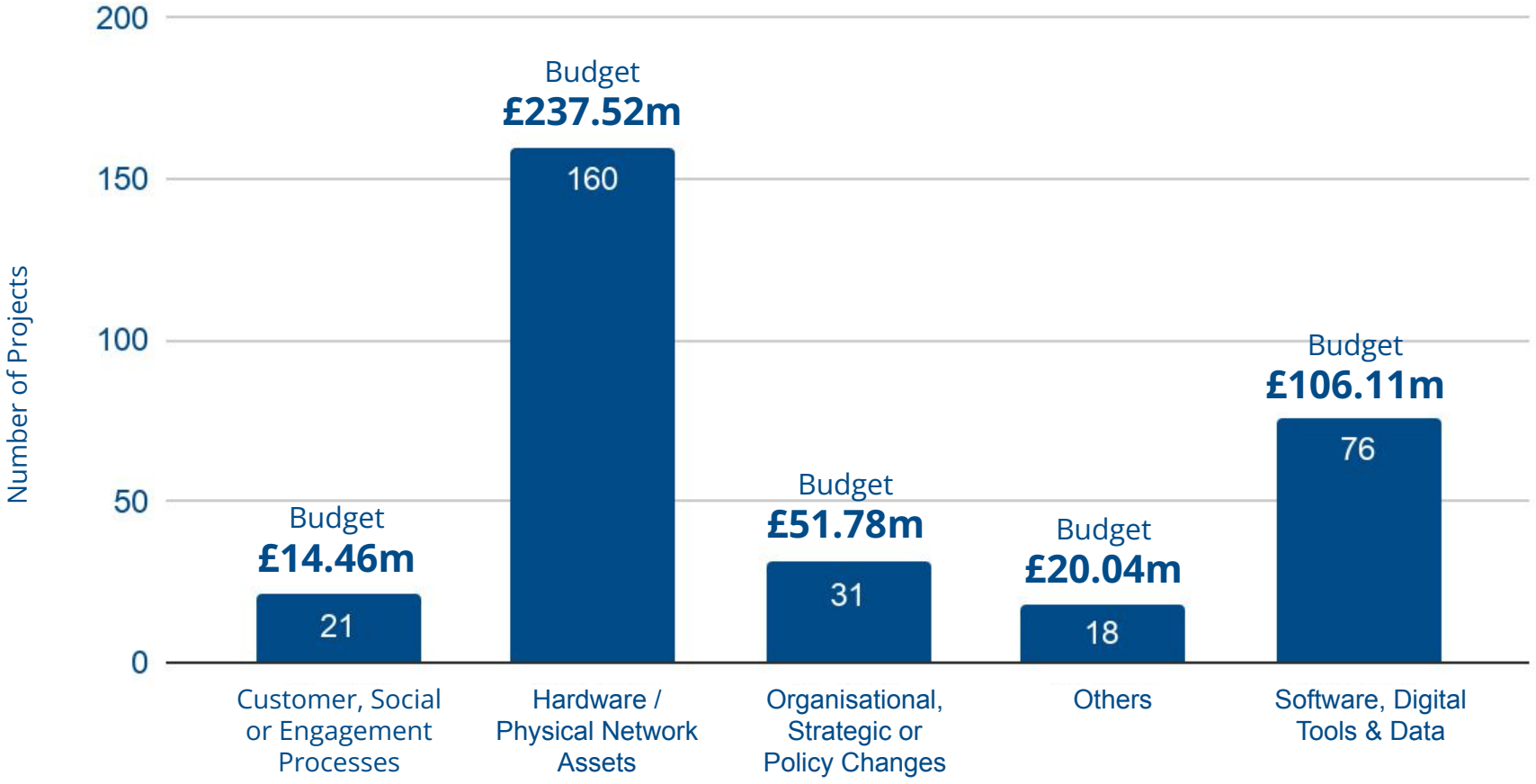
This asset-heavy pattern largely reflects the absence of a clear consumer-focused direction in Ofgem's design of the NIA and NIC under RIIO-1. During this period, innovation was primarily defined in system and engineering terms, with a strong emphasis on improving network efficiency and technical performance. As a result, there was limited emphasis on innovation aimed directly at consumer outcomes, such as affordability and support for vulnerable customers in RIIO-1. This meant that consumer benefits were often treated as secondary outcomes of technical innovation, rather than as key drivers shaping the design and delivery of projects. This strong focus on assets has driven the changes introduced in RIIO-2, which provide clearer direction for innovation to have a stronger consumer focus. The RIIO-2 Sector Specific Methodology reformed NIA funding to place greater focus on supporting vulnerable customers, alongside the introduction of SIF challenges such as "supporting a just energy transition."[28]



Innovation Project Focus and Registered Budget



Innovation Portfolio Total Budget Allocation



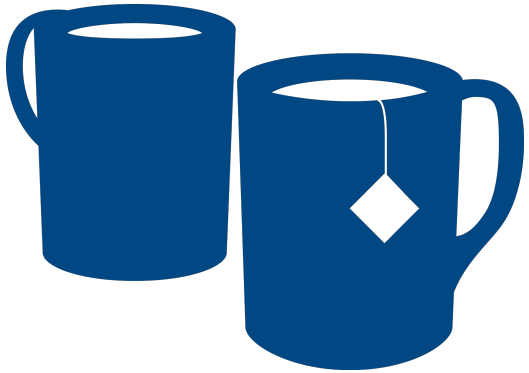
Project Outcomes

Across both funding streams, outcomes followed a similar pattern. Overall, the most common outcome was the generation of new knowledge and research insights (31%), which reflects limited progression to the highest levels (i.e. TRL 7 and above) of technological maturity. With the exception of four projects that did not report TRL data, one project that was halted, and two that showed no change, all projects demonstrated some level of progression in their TRL. The extent of improvement varied: for example, the *Assessment and Creation of Novel PE Pipe Repair Systems* project advanced from TRL 2 to TRL 8, while the *Deep Excavation Load Analysis* project progressed more modestly from TRL 2 to TRL 3. However, only 68 projects (22%) reached TRL 7 or above after completing innovation activities, indicating that the majority of projects remain at earlier, exploratory stages.

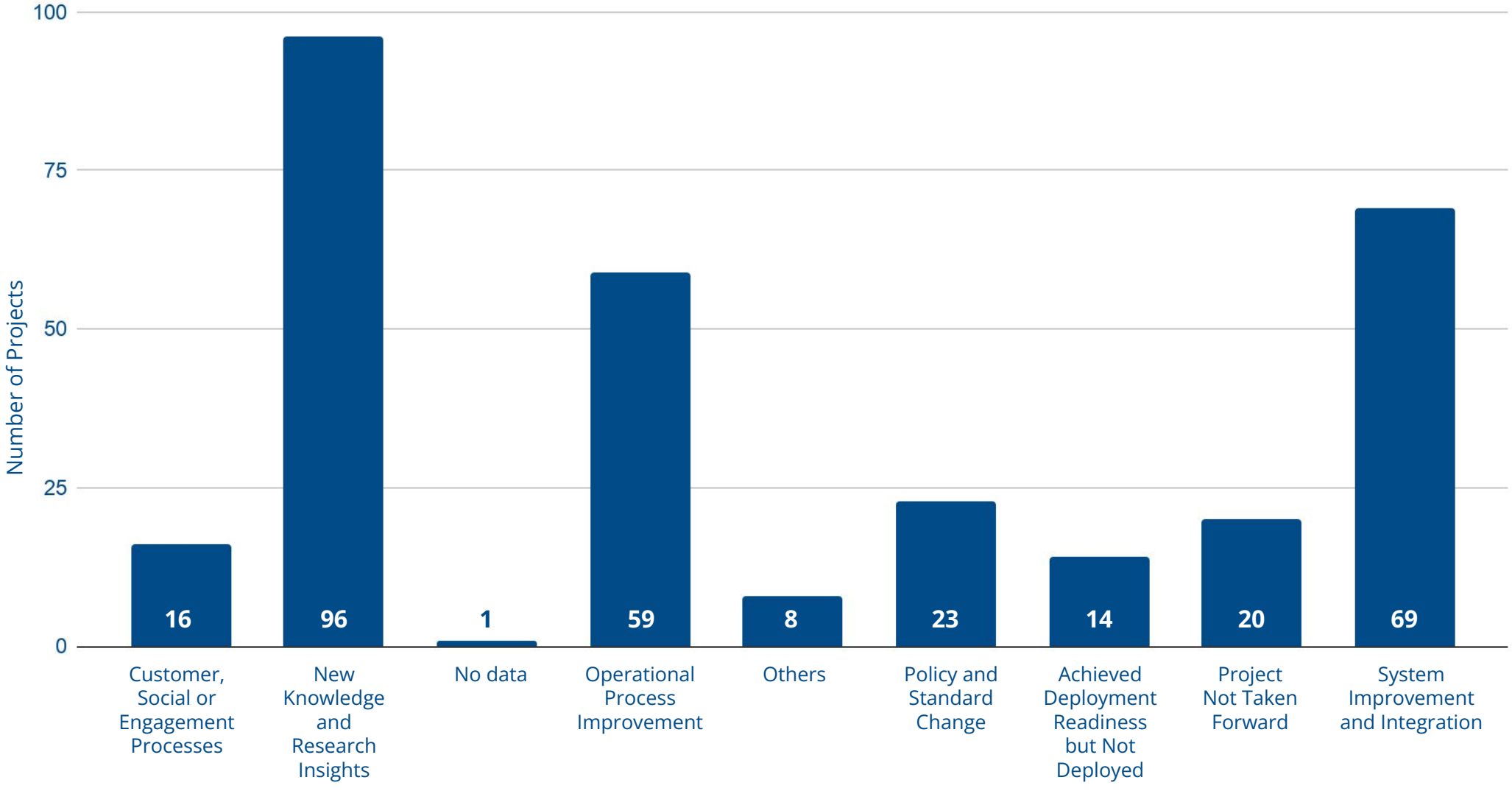
Beyond knowledge generation, the next most common outcomes were system improvement and integration (23%) and operational process improvements (19%). This distribution reflects the overall nature of the innovation portfolio, with 77% of projects focused on enhancing physical infrastructure and software systems. These findings demonstrate that much of the innovation activity was aimed at improving infrastructure and digital optimisation, with benefits more directly accruing to network operators rather than end consumers.

There is evidence of challenges in progressing projects to implementation across the portfolio. A total of 20 projects (7%) were not taken forward, reflecting that progression is not guaranteed and is influenced by factors such as regulatory changes, unsuccessful outcomes, or a lack of economic viability. A further 14 projects (5%) reached deployment readiness but were not ultimately implemented, indicating barriers between development and real-world application. This is particularly evident for physical infrastructure projects, which account for 8 of these 14 cases. These barriers stem from shifting business priorities, the emergence of new technologies, or challenges related to usability and scalability, as well as a disconnection between innovation and BAU teams, limiting the transition from project development to operational adoption.

A proportion of projects did not progress further or reached deployment readiness but were not ultimately deployed. This is not unexpected, as innovation inherently involves uncertainty. Many projects deliver value through knowledge generation, testing new approaches, and informing future developments, even where they do not progress to implementation. However, while deployment should not be considered the sole measure of success, it remains a key mechanism consumers, who are the primary funders of these projects, can receive direct and tangible benefits. As such, ensuring that viable projects are supported to progress beyond the development stage, where appropriate, is important for maximising the overall impact of innovation funding.



Innovation Project Outcomes (R110-1)



Customer Involvement and Scaling

Consumer involvement across the portfolio was limited. Only 47 projects (15%) demonstrate evidence of consumer involvement, while 249 projects (81%) show no such involvement, and a further 10 projects (3%) have no available data. This suggested that consumer engagement was not a central feature of most innovation activities. This distribution reflects the nature of the innovation portfolio, with the majority of projects (75%) focused on improving network hardware and software assets. This highlights the strong focus on technical and system-level improvements across the innovation portfolio, where direct consumer engagement may be less relevant for some projects. It is also important to recognise structural factors across the sector. Electricity and gas transmission networks, as well as the Electricity System Operator (ESO), are inherently less likely to engage directly with consumers compared to distribution networks. As a result, across the portfolio, only two projects explicitly demonstrated direct consumer engagement.

Within the 21 projects categorised under "customer, social and engagement processes," around 38% did not involve consumers directly in their design or delivery. This indicates that even in projects explicitly intended to deliver customer or social benefits, meaningful consumer participation is not consistently embedded. The absence of early and sustained engagement can limit opportunities to test solutions in real-world contexts, gather user feedback, and refine approaches based on actual experience.

Most innovation projects (79%) were not scaled beyond the host network's licensed area. It reflects several characteristics of the innovation portfolio, a third of these innovation projects leading to the generation of new knowledge and research insights and a relatively small portion (22%) progressing to higher levels of technical maturity, which suggests that a substantial share of projects are not in a form suitable for wide replication. It also reflects the infrastructure and system-focused nature of the portfolio, where solutions are more difficult to replicate across different network contexts.

Cumulative Innovation

Across the portfolio, 206 projects (67%) were recorded as not building on a previous innovation project, compared with 82 projects (27%) that did. This pattern differs significantly by funding mechanism. Under the NIA, only 23% of projects were identified as building on earlier innovation, whereas under the NIC this rises to 66%. This suggested that NIA projects are more often standalone or early-stage in nature, while NIC projects are more likely to form part of a continuing innovation pathway.

Overall

The innovation portfolio is dominated by NIA-funded projects and is strongly focused on technical innovation, with most activity centred on physical infrastructure and software systems and relatively limited emphasis on consumer-facing solutions. The most common outcome is the generation of new knowledge and research insights (31%), while progression to higher levels of technological maturity remains limited, with only 22% of projects reaching TRL 7 or above. A number of projects were not taken forward (11%) or reached deployment readiness but were not implemented (5%), highlighting challenges in progression and moving from innovation to real-world application. Consumer involvement across the portfolio is low, and both the wider adoption of innovation and evidence of cumulative innovation remain limited.

Results by Sector

This section further breaks down the overall findings by energy sector, including ET, ED, GT, GD, and the ESO. By analysing each sector separately, the report provides a clearer view of the innovation profile across the energy system.

Electricity Transmission Networks' Innovation Projects

There are three electricity transmission network operators in Great Britain: National Grid Electricity Transmission, SP Energy Networks Transmission, and Scottish and Southern Electricity Networks Transmission. Transmission networks transport electricity over long distances at high voltage from generating plants to points of distribution.[29] In this analysis, a total of 54 innovation projects were identified within the electricity transmission sector. Of the 54 projects reviewed, 48 were funded through the NIA and 6 through the NIC. Notably, all projects undertaken by National Grid Electricity Transmission were funded through the NIA.

Focus of Innovation

Innovation activity within the electricity transmission sector was strongly concentrated on physical infrastructure. Approximately 80% of projects focused on hardware and network assets, while a smaller proportion (15%) related to software, digital tools, and data. Very few projects addressed organisational or policy changes (2%), customer, social, and engagement processes (2%) or other areas (2%). This distribution indicated that innovation in the electricity transmission sector was primarily focused on enhancing physical network assets, reflecting the asset-intensive nature of transmission systems. There were very few projects focused on customer engagement or social processes. This reflected the role of transmission networks, which primarily serve large generators and transport electricity to distribution networks rather than interacting directly with end consumers. As a result, transmission operators had limited direct engagement with end users, and innovation activity was less focused on delivering direct consumer benefits.

Project Outcomes

A significant proportion of projects (43%) primarily generated research insights. This suggested a strong focus on early-stage exploration. As one Transmission Operator explained, many projects were designed to test feasibility, reduce risks, and explore new ideas. While these were important steps in responsible innovation, they did not always lead to deployment.

A smaller proportion of projects (6%) were not taken forward, reflecting a range of barriers to progression. These included changing system needs, the emergence of new technologies, lack of economic viability, and external factors such as COVID-19. For example, the Cable Oil Regeneration project was discontinued as declining oil replacement needs made it economically unviable.

In addition, 5% of projects reached deployment readiness but were not implemented. Notably, two of these projects—Thermal Efficiency Trials and Portable Earthing Device—did not provide clear explanations for why they were not taken forward, despite reporting positive outcomes such as valuable performance insights and encouraging early testing results. This highlighted gaps in reporting and record-keeping, limiting understanding of why projects failed to move to the BAU stage.

Customer Involvement and Scaling

Customer involvement was extremely limited across the portfolio, with none of the reviewed projects directly engaging consumers. This reflected the nature of transmission-level innovation, where the primary customers are large generators and major demand customers rather than households or small businesses. As a result, projects were focused on improving system performance—such as efficiency, reliability, and resilience—rather than delivering direct consumer-facing outcomes. While consumers were not directly involved, they may still have benefited indirectly through a more stable and cost-efficient electricity system.

Most projects (87%) had not been scaled beyond the original network area, indicating limited cross-network adoption of innovations. However, some projects had a wider impact, with their outcomes adopted by other networks and even internationally. For example, the Introduction of Environmentally Friendly Alternatives to SF6 project led other Transmission Operators to adopt alternative gases. Similarly, the Multi-Terminal Test Environment (MTTE) for HVDC Systems project provided technical insight and support to all GB Transmission owners, the ESO, and major projects such as NSL and Eastern Link. It also contributed to international programmes, including NREL and PROMOTioN. These examples showed that, while large-scale deployment may be limited, some innovation projects could still deliver wider benefits beyond their original licence areas.

However, there were challenges in tracking impact. For instance, the Innovative Approach for Transmission Harmonics Issues project reported being scaled, but could not confirm whether other operators had used its findings. This highlighted the need for better tracking of how innovation outputs were adopted across networks.

Cumulative Innovation

Cumulative innovation appeared limited within the transmission sector, with 72% of projects operating as standalone initiatives rather than building on previous work. Among the minority of projects that demonstrated continuity, most (71%) built on earlier NIA-funded projects. This suggested that the NIA played an important role in supporting early-stage experimentation and helping projects develop further over time.

Overall Assessment

The electricity transmission innovation portfolio was predominantly focused on improving physical network assets and enhancing system performance, reflecting the structural role of transmission networks. Innovation outcomes were largely exploratory, with most projects centred on generating new knowledge and testing early-stage concepts. While the majority of projects had not been scaled beyond their original network area, some achieved wider impact through adoption by other network operators and, in some cases, internationally. However, many projects remained standalone initiatives, with limited evidence of progression from earlier work.

Electricity Distributors' Innovation Projects

At the time of RIIO-1, there were six electricity distribution network operators in Great Britain: UK Power Networks, Northern Powergrid, Electricity North West, SP Energy Networks, Scottish and Southern Electricity Networks, and National Grid Electricity Distribution (formerly Western Power Distribution in RIIO-1). These operators manage and maintain local electricity networks within their licence areas, delivering electricity from the high-voltage transmission system to homes and businesses. They are also part of the system that interacts most directly with consumers, including managing connections and responding to power outages.[30] A total of 95 innovation projects were reviewed, of which 83 were funded through the NIA and 12 through the NIC. Northern Powergrid is the only network in this sample with no NIC-funded projects.

Focus of Innovation

Innovation within electricity distribution networks was primarily focused on asset upgrades, with 42% of projects targeting physical infrastructure and a further 32% focused on software, digital tools, and data. Compared with transmission networks, customer-focused innovation was more noticeable (13%). This reflected the role of DNOs, which interact directly with consumers and are therefore more likely to develop projects aligned with customer needs. Examples include projects such as *Project Avatar*, which aims to better understand and anticipate customer needs to improve service delivery and inform future investment decisions, and *Empower*, which focuses on identifying customers at risk of fuel poverty to enable more targeted support. These examples demonstrated the potential for innovation to deliver direct consumer benefits where projects were designed with customer needs in mind. These types of customer-focused innovation projects could be given greater priority within Ofgem's approach to innovation funding.

Project Outcomes

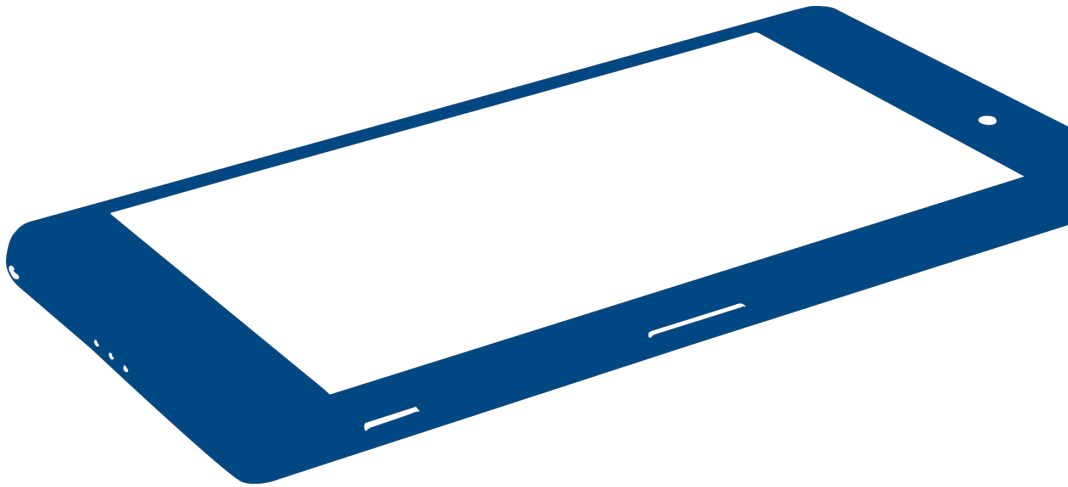
The most common outcomes of innovation projects in this sector were related to improvements in system performance, with around 45% of projects delivering enhancements to hardware (24%) and software (21%). This reflected the RIIO-1 framework's focus, which placed a strong emphasis on improving network performance, efficiency, and reliability. As a result, many innovation projects were designed to upgrade physical assets and enhance digital systems.

A substantial proportion of projects (34%) had knowledge generation as their main outcome. This suggested that over a third of the projects helped lay the groundwork for future work, either by informing follow-on projects or by stimulating new research areas. For example, insights from the *An Electric Heat Pathway – Looking Beyond Heat Pumps* project directly informed the subsequent *Demand Diversification Service* NIA project, which developed a new flexibility product. In addition, some projects identified new areas for further exploration. For instance, the *Harmonic Mitigation* project highlighted the need to improve communication between inverters and enable systems to adapt automatically to changing network conditions.

However, not all projects progressed. A small proportion were not taken forward (5%), while a further 4% reached deployment readiness but were not implemented. Reasons included external changes, economic or practical constraints, technical challenges, and changing business priorities. This reflects the nature of innovation, where not all projects, even those with technical potential, move into real-world use.

Customer Involvement and Scaling

Customer involvement was higher than in the transmission and gas sectors, with 33% of the reviewed projects demonstrating some level of engagement. This reflected the closer relationship between DNOs and end users. However, engagement was not consistent across all projects. Of the 13 projects categorised as customer, social, or engagement-focused, three did not involve consumers directly. In two cases, this was reasonably justified, as the work was desk-based or involved engagement with relevant charity organisations. However, the *Network Damage Reporter* project raised greater concern. As a mobile app intended for public use and emergency services, it would have been expected to involve users to ensure its accessibility and effectiveness. The absence of consumer involvement, with no clear explanation for this absence, suggested there was scope to strengthen engagement practices, particularly when projects are designed directly for end users.



A quarter of innovation projects were used beyond their original network area, a higher proportion than in other energy network sectors. Some projects were widely adopted—for example, the *Drones Within Visual Line Of Sight* project was used by multiple network operators to inspect critical infrastructure. However, projects were not always adopted in full by other networks. In many cases, adoption was partial and adapted to suit different system needs and contexts. For example, the *ATLAS* project, which aimed to improve demand forecasting, was not implemented end-to-end elsewhere. Instead, elements of the project were used to support wider industry work, such as contributing to standardisation through ENA Open Networks and sharing data (e.g. heat pump profiles) with other DNOs. This shows that innovation projects can still contribute to the wider sector in different ways, even where they are not directly adopted by other networks.

Cumulative Innovation

As in other sectors, cumulative innovation remained limited. The majority of projects (63%) were standalone and did not explicitly build on previous work. However, this report identified inconsistencies in how this was recorded. For example, *Endbox G38 Level Detection* and *Portable – Low Voltage Fault Passage Indicators (Portable – LV FPI)* were recorded in the Smarter Networks Portal as building on earlier NIA projects, whereas the information provided by distributors indicated that they did not. These discrepancies pointed to issues with data accuracy and recording practices, making it difficult to assess the extent of cumulative innovation and learning across projects.

Overall Assessment

Electricity distribution innovation under RIIO-1 was largely focused on improving network performance through hardware and software upgrades. While distribution networks have more direct interaction with consumers, innovation specifically designed with consumer needs in mind remained relatively limited. This reflected the design of the NIA and NIC frameworks, which primarily prioritised improvements in network efficiency, reliability, and performance. This focus was also evident in project outcomes, which were largely centred on system improvements and knowledge generation. Compared to the gas distribution sector, there was greater evidence of consumer involvement and cross-network adoption. However, many projects remained standalone initiatives. Inconsistencies in data recording were also identified, reducing transparency and making it harder to assess the long-term impact of these projects.

Gas Transmission's Innovation Projects

National Gas Transmission (NGT) owns and operates the high-pressure gas transmission system across Great Britain and is the sole gas transmission operator in GB. It transports gas from import terminals and storage facilities to gas distribution networks, power stations, and large industrial users. It does not supply gas directly to households.[31] A total of 34 innovation projects were reviewed: the majority (31 projects) were funded through the NIA, while three were funded through the NIC. This showed that, as in other sectors, the majority of innovation activity in gas transmission was supported by allowance-based funding rather than by large competitive schemes.

Focus of Innovation

The results showed that innovation at NGT was mainly focused on technical improvements. Half of all projects related to hardware and physical network assets. A further 24% focused on software, digital tools, and data. This meant that nearly three-quarters of projects aimed to improve the technical performance of the transmission network infrastructure.

In contrast, just 6% focused on customer, social, or engagement processes. Like the electricity transmission operators, this pattern reflected the nature of NGT's role in the energy system. As the operator of the national high-pressure gas transmission network, NGT did not have a direct relationship with domestic consumers. Instead, it mainly worked with industrial users, generators, and gas shippers. As a result, its innovation activity naturally concentrated on system performance, safety, and operational efficiency, rather than direct consumer benefits.

Project Outcomes

The most common outcome was system improvement and integration (38%), particularly through hardware upgrades. This reinforced the finding that innovation in RIIO-1 was largely focused on strengthening infrastructure and improving technical capability. In addition, 24% of projects generated new knowledge and research insights, and 21% delivered operational process improvements, often through digital tools. Only one project (3%) led to policy impact or standard change.

However, not all projects progressed to full implementation, even where they had reached a deployable level of maturity. Around 12% of projects achieved deployment readiness but were not ultimately deployed, while a further 3% were not taken forward. The reasons for this varied and included certification challenges, limited measurable benefits, and wider strategic considerations. For example, in the *i40 Connectivity Project*, the outputs were shared internally for potential use, but the project was not progressed due to certification issues. While this reflected the inherent uncertainty associated with innovation, it also highlighted a gap between technical readiness and real-world implementation. This suggests that technical feasibility alone was not enough to determine whether projects were adopted. Factors such as cost, operational fit, and alignment with business priorities also played an important role in determining whether projects were ultimately moved into BAU.

Customer Involvement and Scaling

Customer involvement was extremely limited, with 97% of the projects showing no direct customer involvement. This again reflected NGT's structural role as a transmission operator, which did not directly serve domestic customers.

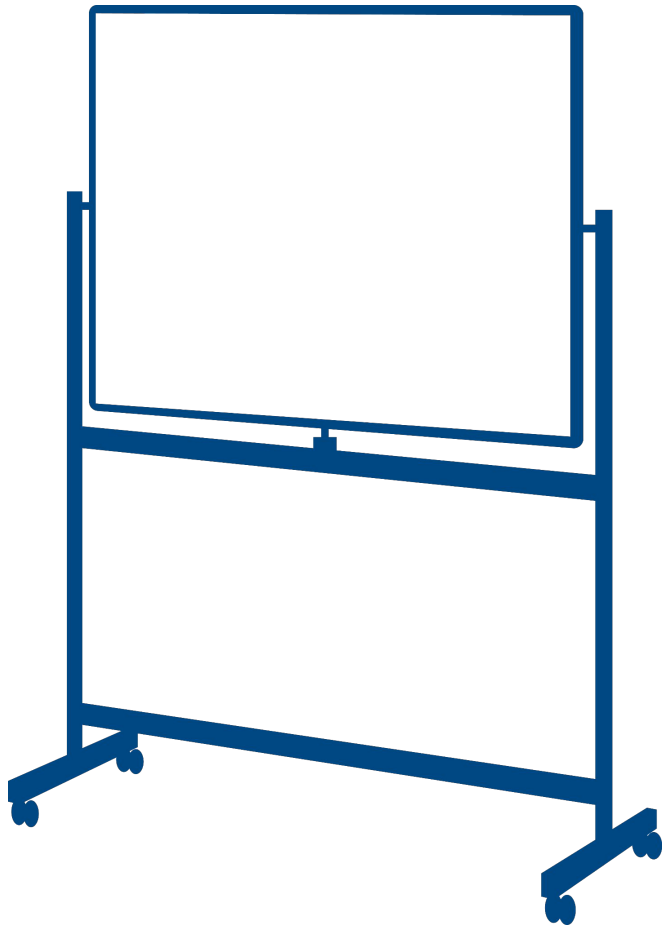
All projects were classified as not deployable outside the licence area. This was because NGT operated a single national transmission network across Great Britain. Since its licence already covered the entire transmission system, there were no additional GB licence areas where projects could be deployed.

Cumulative Innovation

29% of projects demonstrated some degree of continuity. One clear example was the i40 Connectivity Project, which was built on earlier projects such as the Open Source SCADA Platform, Open Source SCADA Platform Phase 2, and Secure AGI – Intrusion Detection System (IDS). This demonstrated the cumulative nature of innovation, where earlier digital and cybersecurity investments were combined and strengthened over time to improve overall system performance.

Overall Assessment

NGT's innovation portfolio was mainly focused on technical and infrastructure improvements, particularly around system reliability, safety, and efficiency, reflecting its role within the energy system. A small number of projects did not move to implementation despite showing technical potential, often due to external factors. Consumer involvement was limited, as gas transmission operators do not directly serve end users. Cross-network scaling was also not applicable because NGT operates a single national network. Most projects were standalone, suggesting limited cumulative innovation.



Gas Distributors' Innovation Projects

There are four gas distribution networks in Great Britain: Cadent, SGN, Wales & West Utilities, and Northern Gas Networks. These companies own, operate, and maintain the gas pipelines that deliver gas to homes and businesses within their licensed areas.[32] A total of 106 projects were reviewed, of which 98 were funded through the NIA and 8 through the NIC.

Focus of Innovation

Innovation within gas distribution networks was predominantly focused on improving physical infrastructure and operational systems, with 55% related to hardware and 15% to software and data. As one gas distributor noted, the RIIO-1 innovation framework largely encouraged operational and technical innovation, which helps explain the strong focus on asset performance and system improvements.

Despite gas distributors having more direct interaction with consumers, the share of projects focused on customer-related areas remained low. Only around 5% of projects involved customer, social, or engagement elements, which was slightly lower than the 6% observed in gas transmission. This was somewhat unexpected given distributors' closer relationship with consumers. Compared with ED, GD also had a lower proportion of projects focused on consumers, at 5% compare to 13%.

Among the projects categorised as "others" by networks, two focused on developing new research methodologies: *Regional Future Energy Scenarios* and *Alternative Preheat Solution*. These projects may be more appropriately classified under "Generation of New Knowledge and Research Insights," as their primary contribution is the development of evidence and analytical approaches to inform future innovation. This highlighted challenges in accurately capturing and reporting the true nature of projects.

Project Outcomes

The outcomes of innovation projects were relatively balanced. Around 23% focused on system improvement and integration, 21% generated new knowledge and research insights, and 20% delivered operational process improvements. This indicated a mix of practical improvements and exploratory work.

Compared with gas transporters, NESO, and electricity transmission networks, a larger share of gas distribution projects (10%) contributed to policy and standard development. These projects supported industry discussions on key topics such as hydrogen and the future of the gas market. For example, the *H21* project provided important evidence for hydrogen safety and heating policy, while the *Opening Up the Gas Market* project informed discussions on gas composition standards and market frameworks.

Not all projects progressed or moved to deployment. Around 10% were not taken forward or did not reach implementation, with networks citing a range of reasons, including technical incompatibility, changing system needs, timing issues, and external factors such as COVID-19. For example, *Novel Seal PPE – Phase 2* was not compatible with existing systems, *Eye in the Sky* was affected by pandemic disruptions, and *Paw Patrol (Gas Detection Dogs – Phase 2)* faced operational challenges and competition from new technologies. These examples showed that a mix of technical, operational, and external factors can prevent projects from progressing and moving to deployment.

Customer Involvement and Scaling

Although gas distributors had more direct interaction with consumers, consumer involvement in innovation projects remained relatively low (less than 15%), particularly when compared to the ED sector (33%). However, Engagement was more common in projects with a direct consumer impact. For example, the *Easy Assist ECV Phase 2* project involved customers during field trials, with their feedback informing the Gas Policy approval process. This suggests that consumer engagement was more likely to occur where projects directly affect end users.

Most projects (68%) had not been scaled beyond their original network area. However, some achieved wider adoption. The *Network Outperformance Measure Risk Trading Methodology* was a notable example, having been adopted across all gas distribution networks and influencing other parts of the UK energy sector, including gas transmission and electricity networks.

However, gaps in data recording made it harder to assess consumer involvement and cross-network adoption. For 10 projects, there was not enough information to determine whether consumer engagement took place or whether projects were adopted elsewhere. Gas distributors explained that RIIO-1 did not require this level of reporting, and that some records were incomplete due to the time passed since GD-1. This highlights the need for better data recording and clearer reporting requirements.

Cumulative Innovation

Cumulative innovation appeared limited (22%) across the portfolio. However, some projects may have built on earlier learning without this being formally recorded. As noted by one gas distributor, previous insights may inform new projects without being formally linked to earlier innovation projects. As a result, the available data may understate the level of cumulative innovation. This also reflected the RIIO-1 governance framework, which did not require formal tracking of project linkages.

Overall Assessment

Innovation among gas distributors was mainly focused on operational, asset, and system improvements, reflecting the priorities of the RIIO-1 framework. Project outcomes also showed a strong focus on system performance and efficiency. However, the findings also indicated limited customer involvement, cross-network scaling, and cumulative innovation. Gaps in data on cross-network adoption also made it harder to assess the longer-term impact of these projects.

ESO Innovation Projects

The Electricity System Operator (ESO), now known as the National Energy System Operator (NESO), is responsible for managing the national electricity system in Great Britain.[33] Unlike transmission or distribution network operators, NESO does not own or operate physical infrastructure. Its main role is to ensure that the electricity supply meets demand in real time through system balancing and coordination. This is known as "balancing the system."[34] A total of 17 innovation projects were reviewed, all funded through the NIA.

Focus of Innovation

Innovation within ESO was predominantly focused on software, digital tools, and data, accounting for 82% of projects. Only a small number related to hardware (12%) or organisational and policy change (6%). This strong digital focus contrasted with organisations such as National Gas Transmission, where innovation was more infrastructure-led. The difference reflected ESO's role in the energy system. Since it did not own transmission or distribution assets, its innovation activity naturally centred on improving forecasting, coordination, system visibility, and operational decision-making. As a result, innovation was mainly data-driven and analytical rather than asset-based.

Project Outcomes

When examining outcomes, 65% of projects mainly generated new knowledge and research insights. The high proportion of research-based outcomes may have been linked to the TRL at the start of many projects. A large proportion of reviewed projects started at low levels of technological maturity: 94% began at TRL 4 or below and progressed technically during the project but did not reach a deployable stage. For example, *Enhancing Energy Flexibility from Wastewater Catchments through a Whole System Approach* and *Hybrid Grid Forming Converter* advanced from TRL 3 (proof of concept) to TRL 4 (bench-scale research). While this showed technical progress, it remained within early-stage development.

This suggested that ESO's innovation portfolio under RIIO-1 was weighted more toward experimentation. While this supported knowledge development and future capability building, it may have limited the immediate practical impact of innovation as only 18% of projects led to operational process improvements and 12% resulted in system integration or hardware-related outcomes. If most projects remained at the research stage, there was a risk that innovation would generate insights without delivering clear and tangible benefits to consumers.

Customer Involvement and Scaling

Customer involvement was limited. Only one project (6%) directly involved consumers, while 94% did not. This partly reflected NESO's system-level role, as it did not typically interact directly with domestic consumers. However, in cases where innovation directly affected consumers' experience of using energy, involvement had taken place. For example, *Project Samuel – Grid Data and Measurement Systems* involved field trials with domestic demand-side devices in real households. This showed that consumer involvement could still form part of system-focused innovation where relevant.

All projects were classified as not deployed outside a licensed area. As ESO was not a licensed network operator in the same way as transmission or distribution companies, project outputs were not designed for direct deployment across network licence areas. Therefore, the concept of "scaled deployment outside licence area" did not apply in the same way as it did for transmission or distribution operators.

Cumulative Innovation

Most projects (71%) did not build on previous innovation. This suggested that many projects remained at an early stage of development. One example of cumulative development was the *Vector Shift Initial Performance Assessment*, which built on earlier research from the *Assessment of Distributed Generation Behaviour during Frequency Disturbances*. This showed how new ideas can be developed by building on prior knowledge and investment, creating additional value over time.

Overall Assessment

ESO's innovation portfolio was highly digital, research-focused, and closely aligned with its system coordination role. The findings suggested that innovation under RIIO-1 was predominantly exploratory rather than implementation-driven. Consumer engagement, cross-network scaling, and cumulative innovation were also limited, reflecting the early-stage nature of many projects and the strong focus on research and experimentation.

Imbalance in RIIO-1 Innovation

The RIIO-1 innovation framework showed a structural imbalance, with a strong focus on technical development but weaker arrangements for rolling projects out into BAU. Follow-up after project completion was limited, and there were few clear mechanisms to assess whether projects were ready to move into real-world use.

Innovation Funding with Limited Emphasis on Direct Consumer Outcomes

The design of the RIIO-1 innovation framework reveals a structural imbalance that favours technical and system-focused innovation over consumer outcomes. Under the NIA, projects were required to be new or unproven and fall outside business-as-usual activities. However, the governance framework did not explicitly require projects to support vulnerable consumers—unlike in RIIO-2, where benefiting consumers in vulnerable situations is a specific requirement for NIA-funded projects.[35] While the RIIO-1 framework stated that projects should deliver "net financial benefits" to customers, this was generally interpreted as reducing network costs compared with existing approaches. The underlying assumption was that lower network costs would ultimately translate into lower consumer charges. However, this link was rarely clearly demonstrated or quantified at the project level, including how much consumers would actually save or whether those savings would translate into tangible consumer benefits.

For example, the *Take Charge* project estimated savings of £23.8 million if rolled out across Great Britain. Similarly, a separate project on introducing a single communications hub interface estimated savings of up to £40,000 per distribution substation. However, in both cases, it remains unclear how much of these savings would be passed on to consumers, and therefore what these benefits and outcomes would mean for consumer bills and experience.

A similar imbalance is evident in the NIC. The assessment criteria in the governance documents placed strong emphasis on supporting the low-carbon transition, delivering environmental benefits, and achieving net financial benefits for existing and future network customers.[36] There was far less focus on consumer needs or the challenges faced by vulnerable groups. This differs from the SIF under RIIO-2, where supporting consumers through the energy transition and addressing vulnerability are core priorities.[37] Under RIIO-1, consumer considerations were not central to innovation decision-making. As a result, the NIC was often used to fund projects that improved network operations and system performance, rather than initiatives delivering direct benefits for consumers. This is reflected in the project data: of the 29 NIC projects reviewed, only one (around 3%) was categorised as customer, social, or engagement-focused, while the majority (around 76%) focused on asset improvement, including both physical infrastructure and software.

This imbalance was reinforced by the high degree of autonomy given to network companies in selecting projects. Unlike the more strategically guided approach under the SIF where priorities are set through challenge areas, the NIC gave network companies to determine which projects to submit. With limited strategic direction from Ofgem, innovation priorities were largely driven by the networks themselves. This led to a portfolio focused mainly on engineering-led solutions, particularly physical infrastructure and system optimisation. As noted by a network operator, the high degree of autonomy resulted in innovation activity being concentrated on hardware and asset-level interventions, rather than on consumer-facing innovations.

The limited emphasis on consumers in RIIO-1 was reflected in weak consumer engagement throughout the innovation process, with no explicit requirement to involve consumers in project development—even where projects directly affected them. As a result, nearly 40% of consumer-related projects did not engage consumers at any stage. This shows a gap between the aim of delivering consumer benefits and how far consumers were actually involved in shaping innovation projects. This lack of engagement likely reduced the effectiveness of projects in addressing real consumer needs and delivering meaningful outcomes. Later frameworks, such as the SIF in RIIO-3, have placed greater emphasis on consumer involvement by requiring projects to consider end-user needs and demonstrate meaningful stakeholder engagement.[38]

Overall, the RIIO-1 innovation framework lacked strong expectations for consumer-focused outcomes while granting significant autonomy to network operators. This contributed to a portfolio where 77% of the NIA and NIC projects examined focused on engineering and technical improvements, while 80% of their funding supported system enhancements rather than direct consumer needs. The limited involvement of consumers further suggests that consumer perspectives were not a core component of innovation design, reinforcing the structural imbalance within the innovation framework.

Ineffectiveness of Innovation Rollout Mechanism

While the NIA and NIC supported the development and testing of new technologies, there was early recognition that successful projects might struggle to move into BAU operations. To address this gap, Ofgem introduced the IRM reopener. The IRM was intended to provide additional funding for companies that could demonstrate a proven innovation could not be rolled out within their existing totex allowance. In doing so, it aimed to move beyond pure experimentation and enable the scaling and deployment of successful innovations capable of delivering tangible benefits.

Although the IRM was designed to bridge the gap between innovation and implementation, the IRM was rarely used.[39] This mechanism was perceived as complex, difficult to access, and administratively burdensome, limiting its effectiveness as a route for scaling up innovations.[40] As a result, the IRM was discontinued in RIIO-2. The subsequent reintroduction of the deployment funding in RIIO 3 indicates that the gap between successful trials and wider deployment remained unresolved in RIIO-2.[41] RIIO-3 has introduced additional

mechanisms, including Innovation Delivery Groups to support the transition of projects into business-as-usual, and deployment funding that seeks to improve scaling by requiring projects to demonstrate how their solutions can be adopted across multiple networks.[42]

The limited effectiveness of the IRM highlights a broader structural imbalance in the design of the RIIO-1 innovation framework. Incentives were stronger at the trial stage, encouraging technical development and learning, while support for embedding proven innovations into routine operations was comparatively weak. As a result, successful and potentially beneficial projects were not always taken forward, limiting the benefits that consumers could receive from innovation.

Limited Follow-Up After Project Completion

The RIIO-1 innovation framework exhibits a structural imbalance between supporting innovation activity and tracking its long-term impact and project outcomes. While the framework placed strong emphasis on delivering projects and sharing outputs during the funding period, there were limited requirements to monitor what happened after project ended. Companies were not required to track wider adoption, realised benefits, or whether outcomes were sustained over time, As a result, there is limited visibility of long term project impacts. This was made worse by gaps in record keeping, with one network operator noting that older project data was no longer available. These factors made it difficult to assess the full impact of RIIO-1 innovation funding.

This imbalance is also reflected in the Smarter Networks Portal, where project information is not always accurate or up to date. For instance, network operators reported 29 completed NIC-funded projects, only 22 were recorded as completed on the portal during the project selection process. This discrepancy arose because several completed projects, including Fitness, Visor, Phoenix, Angle-DC, LV Engine, and Fusion, were listed as “Live,” while others, such as Charge, could not be found on the portal at all (as of March 2026). As a result, these projects were not identified as completed at the point of sampling and were excluded from our initial selection. This highlights an imbalance in the framework, where less attention was given to maintaining accurate project data after completion, making it harder to track the full lifecycle and outcomes of innovation projects.

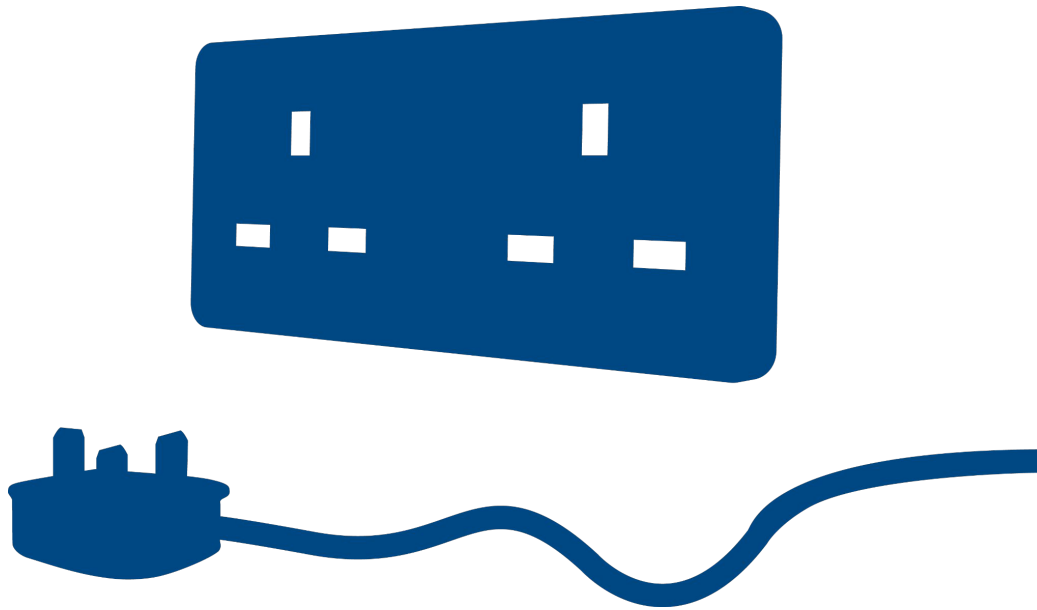
Finally, there is limited follow-up for projects that reached deployment readiness but were not implemented. Although only 14 projects in our review, representing around £15 million of registered budget, reached deployment readiness but were not ultimately deployed, we found no evidence of systematic review or investigation into these projects to assess the barriers to deployment after project completion. While some of these issues may have been explored through other routes like internal company reviews, stakeholder discussions, or informal learning processes, there is limited transparency or publicly available evidence of this. This lack of transparency reinforces the imbalance between experimentation and deployment by limiting the sector’s ability to learn from failure, identify wider barriers to implementation and develop solutions to address them.

Technology Readiness Level as an Incomplete Measure of Innovation Readiness for Deployment

The use of TRLs in the RIIO-1 framework further reflects a structural imbalance in how innovation is assessed. TRLs are widely used to assess the maturity of technology. However, in complex network environments such as the energy system, TRLs create a misleading signal: a high TRL is often interpreted as readiness for deployment. However, in reality, TRLs primarily measure performance in isolated or controlled conditions. This approach overlooks the challenges of integrating new technologies into highly interconnected and regulated systems such as the electricity grid, where interoperability, system stability, and compliance with existing network standards are critical.

One example raised by a network operator is the adoption of DC circuit breakers in the GB network. While this technology has been developed and deployed in China and is considered to have reached TRL 9, it is not yet ready for deployment within the British network context. This is due to differences in regulatory frameworks, technical standards, operational methodologies, and other system-specific requirements. This illustrates that technical maturity alone does not equate to system readiness.

As a result, reliance on TRLs reinforces an imbalance in the innovation framework by overemphasising technical progress while underrepresenting the factors needed for real-world application. As one network operator observed, technology readiness is not a complete view, how a technology integrates into a system is what matters.



Lessons Learned

Lessons Learnt

We acknowledge significant differences between the RIIO-1 and RIIO-2 innovation frameworks, with RIIO-2 placing a much stronger emphasis on consumer outcomes and on supporting vulnerable customers. A number of important changes have been introduced in RIIO-2 and further developed in RIIO-3. These included the introduction of SIF, a more active role for Ofgem in setting innovation priorities and improvements in reporting structures and data quality expectation. However, despite these improvements, there remains scope to further strengthen the framework .

While these developments represent a clear shift in approach, there is still room to strengthen the framework further. In this context, the experience of RIIO-1 remains valuable in highlighting areas where further improvements can be made to enhance the effectiveness of innovation funding in the future.

First: based on the nature and outcomes of the reviewed innovation projects, innovation activity was largely focused on engineering-led development, with limited emphasis on direct consumer outcomes or consumer involvement. This reflects the relatively hands-off approach taken under the RIIO-1 framework, where project priorities were largely determined by network companies.

- ➔ We recommend that Ofgem takes a more proactive role in shaping the direction of innovation across the NIA, SIF, and any future innovation funding mechanisms. Where there is a clear consumer benefit, Ofgem should provide stronger strategic guidance and signal regulatory priorities to ensure such projects are developed at pace. Greater regulatory involvement would help rebalance innovation activity, ensuring that it not only advances technical solutions but also delivers direct benefits for consumers.

- ➔ As set out in our response to the ED3 Sector-Specific Methodology Consultation, we recommend that Ofgem reconsiders the design of innovation incentives to prioritise projects with clear public value and strong consumer benefits. And Ofgem could require that a defined proportion, either as a specific number or percentage, of innovation projects demonstrably deliver benefits for consumers.[43]

- ➔ Where projects are relevant to consumers, meaningful consumer engagement should be embedded throughout the project lifecycle—from design and development to testing and implementation. As highlighted in our response to the ED3 Sector-Specific Methodology Consultation, the NIA eligibility criteria could be strengthened by introducing an explicit requirement for consumer engagement at the design stage.[44] Embedding this requirement would help ensure that projects are shaped with consumers in mind from the outset, enhancing their relevance and increasing the likelihood of delivering tangible consumer benefits.

Second: a number of network operators engaged for this report highlighted that funding is not the only barrier to deployment. In many cases, successful roll-out depends on timing, with projects requiring the right market conditions and system needs before they can be implemented at scale. Policy uncertainty was also identified as a key constraint, as unclear or evolving regulatory frameworks can delay investment decisions and reduce confidence in scaling up new technologies.

- ➔ We recommend that Ofgem, in coordination with DESNZ, provide longer-term policy clarity on key areas, including market design and the role of emerging technologies such as hydrogen. A clear and stable strategic direction would give network operators greater confidence to scale proven innovations.

- ➔ We recommend that Ofgem and network companies review projects that reached deployment readiness but were not implemented, as well as those that did not progress, to better understand the barriers they face and address these issues.

Third: network operators reported difficulties accessing complete and accurate records, largely due to the time elapsed since the start of RIIO-1 and the completion of many projects. This is also reflected in the Smarter Networks Portal, where some completed projects are still listed as "Live," while others cannot be found in the system at all, suggesting that project information has not been consistently updated. Operators also noted limited visibility on whether successful projects had been scaled beyond their original licence areas. These issues point to gaps in record-keeping and in the monitoring of innovation projects after completion.

- ➔ As set out in our *Making Innovation Count* report, we recommend that Ofgem strengthen its oversight mechanisms to cover not only the project lifecycle but also post-completion outcomes.[45] This includes mandatory follow-up reviews to track what happens to innovation projects after they end, including whether they are deployed or adopted by other networks. Stronger oversight would improve record-keeping, preserve learning over time, and provide greater clarity on project outcomes and their overall value.

- ➔ We also recommended enhancing the Smarter Networks Portal in our *Making Innovation Count* report.[46] The Portal should be strengthened through mandatory updates and regular audits to ensure it provides a complete and accurate record of innovation projects, including their final status and impact.

- ➔ Alongside stronger regulatory oversight, network companies should also take greater responsibility for maintaining robust records and tracking the outcomes of their innovation activities. This includes ensuring that project data is consistently captured, preserved, and accessible over time, as well as proactively monitoring whether innovations are scaled, replicated, or deliver intended benefits. Strengthening internal governance and accountability within network operators would complement Ofgem's enhanced oversight.

Fourth: TRLs are an insufficient tool for evaluating whether a technology is ready for deployment, as they overlook the broader set of factors that determine successful integration into the existing system. In a complex environment like an energy network, deployment does not depend solely on technical maturity, but also on other factors like system compatibility and regulatory alignment under real-world conditions.

- ➔ We recommend that Ofgem reform TRLs into a multi-dimensional readiness framework for projects at TRL 7 and above that would help address the misalignment between technical maturity and real-world deployability. This could include additional dimensions such as system integration readiness, which assesses how well a technology can operate within existing infrastructure, as well as considerations of regulatory and market readiness. Such an approach would provide a more complete and accurate picture of whether an innovation is genuinely ready for deployment. It would also help identify key bottlenecks in the transition from development to implementation, improving transparency and enabling more informed decision-making across the innovation landscape.

- ➔ Network companies need to ensure innovation projects that are designed with a clear pathway to rollout from the outset, including early consideration of how these innovation projects will integrate into the existing systems.

Limitations and Future Priorities

Limitations

This research has a few limitations which we want to acknowledge openly.

First, a significant amount of time has passed since the start of RIIO-1 and the completion of many RIIO-1 projects. As a result, some records are incomplete, inconsistent, or no longer easily accessible. As one respondent said, "The entries provided have therefore been completed on a best endeavours basis from the information now available, including feedback from internal resources and corporate memory." This could potentially affect the overall accuracy of the data reviewed, and explains why some fields in the templates submitted by the networks remained blank, making robust analysis and scrutiny of innovation activity across price control periods difficult.

Second, this study reviewed only a fraction of all innovation projects funded under RIIO-1. While the sample provides useful insights, it may not capture the full range of projects or outcomes across the framework. Therefore, the findings should be interpreted as indicative rather than comprehensive.

Third, network operators may not have full visibility of how projects have been taken forward elsewhere in the industry. This limits the evidence available on whether innovations have been adopted beyond the host network. As a result, it is difficult to accurately assess the extent to which innovation projects have been scaled or replicated across different licence areas.

Fourth, this report does not seek to provide a definitive assessment of the full value of RIIO-1 innovation projects. As noted by network operators, the benefits of innovation often take time to materialise, particularly for projects focused on long-term system change. Many impacts may not yet be visible within the timeframe of this analysis, and the absence of immediate results should not be taken as a lack of value.

Potential Future Work

Future research could assess whether the changes introduced in the RIIO-2 innovation framework—particularly the stronger focus on consumer outcomes—have led to a fundamental shift in the nature of the innovation portfolio and its outcomes. A robust assessment will require a more complete dataset, and should therefore be undertaken after the end of RIIO-2 in 2028, when the majority of innovation projects have been completed and sufficient data is available for analysis.

One limitation of this report is that it does not quantify the overall value delivered by innovation projects. As a result, several key questions remain unanswered, including whether innovation funding generates benefits that exceed the costs ultimately borne by consumers, and who benefits most from this funding—network companies or consumers. More fundamentally, it remains unclear whether the current approach to innovation funding delivers the best value for consumers or whether reform may be needed. Addressing these questions represents an important area for future research.

Another area for future research would be to examine a small number of innovation projects that successfully moved into BAU. This could explore the factors that helped these projects progress from innovation activity into real world implementation. The research could also identify whether there are common practices that could be applied more widely across the sector to support the rollout of future projects.

Appendix

Key Changes in Innovation Funding under RIIO-2 and RIIO-3

Area	RIIO-2	RIIO-3
Funding Mechanisms	NIA and introduction of the SIF (replacing NIC)	NIA and SIF with integrated deployment funding to support transition to BAU
Strategic Direction	Greater Ofgem-led strategic direction through SIF Challenges	SIF Challenges alongside the establishment of the Energy Networks Innovation Taskforce to identify and recommend Innovation Challenges
Deployment	Removal of the Innovation Rollout Mechanism	Introduction of deployment funding and establishment of Innovation Delivery Groups to address delivery barriers, support transition to BAU, and reduce non-delivery
Innovation focus - rebalance innovation away from purely asset-focused projects; stronger emphasis on consumer benefits	Enhanced NIA and SIF governance with increased emphasis on consumer outcomes, including provisions for NIA projects to demonstrate benefits for consumers in vulnerable circumstances	Further rebalancing towards consumer and system outcomes, including removal of the mandatory 10% contribution for consumer-focused SIF projects
Consumer Engagement		Enhanced SIF requirements for consideration of end-user needs and meaningful engagement in development and adoption
Tracking and Reporting	Introduction of a staged SIF approach (Discovery, Alpha, Beta), supporting the tracking of project development, complemented by the Innovation Measurement Framework (IMF) to capture outcomes and benefits	Retention of the staged approach, with stronger requirements for projects to demonstrate how they build on previous innovation and deliver additional value; increased scrutiny of NIA reporting quality, including engagement with companies to address poor reporting; and ongoing updates to the Smarter Networks Portal and the Innovation Measurement Framework (both under review and development as of April 2026)
Scaling across networks		Stronger focus on scaling through deployment funding, requiring projects to demonstrate adoption across multiple licensees

References and bibliography

1. Citizens Advice, Making Innovation Count - A Transparency Review of NIA and SIF Projects, p.17
2. Ofgem, RIIO-3 SIF Governance Document, p.12
3. Ofgem, RIIO-3 SIF Governance Document, p.12
4. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document, pp12-2
5. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document, p.15
6. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document,p.15
7. Citizens Advice, Making Innovation Count - A Transparency Review of NIA and SIF Projects, p.11
8. Ofgem, RIIO-2 Sector Specific Methodology, p.67
9. CEPA, Review of the RIIO Framework and RIIO-1 Performance, p.147
10. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document P.7
11. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document P.7
12. Ofgem, RIIO-1 Electricity Network Innovation Allowance Governance Document P.7
13. Ofgem, Consultation on funding the cost of preparing submissions for the Network Innovation Competition and the Governance of the Network, p.1
14. Ofgem, Electricity Network Innovation Competition Governance Document P.7
15. Ofgem, Electricity Network Innovation Competition Governance Document P.6
16. Ofgem, Electricity Network Innovation Competition Governance Document P.8
17. Ofgem, Electricity Network Innovation Competition Governance Document P.7
18. Ofgem, Electricity Network Innovation Competition Governance Document P.7
19. Ofgem, Gas Network Innovation Competition Governance Document p.7
20. Ofgem, Decision on the 2017 Electricity Distribution Innovation Roll-out Mechanism, p.2; Ofgem, RIIO-T1 Gas Transmission Price Control –Regulatory Instructions and Guidance: Version 8.2, p.49
21. Ofgem, Decision on the 2017 Electricity Distribution Innovation Roll-out Mechanism, p.2; Ofgem, RIIO-T1 Gas Transmission Price Control –Regulatory Instructions and Guidance: Version 8.2, p.49
22. Ofgem, Decision on the 2017 Electricity Distribution Innovation Roll-out Mechanism , p.7
23. Ofgem, Decision on the 2017 Electricity Distribution Innovation Roll-out Mechanism p.8
24. Regen, Report: Playbook for Network Innovation, p.5
25. Citizens Advice, Making Innovation Count: A Transparency Review of NIA and SIF Projects, p.17
26. Citizens Advice, Making Innovation Count: A Transparency Review of NIA and SIF Projects, p.17
27. It is important to note that the registered budget does not necessarily reflect the final cost of a project because the registered budget represents the initial or approved funding allocation, rather than the actual expenditure or outcomes achieved.
28. Ofgem, RIIO-2 Sector Specific Methodology – Core document, p.84; Ofgem, Ofgem Strategic Innovation Fund Round two Innovation Challenges: final decision, p.2

References and bibliography

29. National Grid, What's the difference between electricity transmission and distribution?
30. National Grid, About us
31. National Gas, Our network and assets
32. Cadent Gas, Who we are
33. The Electricity System Operator (ESO) became a legally separate business from National Grid in 2019.
34. ENA, How do the UK's energy networks work?
35. Ofgem, RIIO-2 NIA Governance Document, p.14
36. Ofgem, Electricity Network Innovation Competition Governance Document p.19
37. Ofgem, SIF Governance Document v2, p.13-14
38. Ofgem, RIIO-3 SIF Governance Document, p.17
39. Ofgem, RIIO-2 Sector Specific Methodology, p.67
40. Cadent Gas, cadent-response-to-ofgem-open-letter-on-the-riio2-framework.pdf. P.27
41. Unlike the IRM under RIIO-1, which operated through two fixed application windows, deployment funding under the SIF in RIIO-3 is more flexible, aligning with the three SIF funding cycles each year and enabling projects to access funding when they reach an appropriate level of readiness. Ofgem, RIIO-3 SIF Governance Document, p. 46
42. Ofgem, RIIO-3 SIF Governance Document, p.12 & 49
43. Citizens Advice, Citizens Advice response to Ofgem's Sector-Specific Methodology Consultation for ED3, p.53
44. Citizens Advice, Citizens Advice response to Ofgem's Sector-Specific Methodology Consultation for ED3, p.49
45. Citizens Advice, Making Innovation Count - A Transparency Review of NIA and SIF Projects, p.8
46. Citizens Advice, Making Innovation Count - A Transparency Review of NIA and SIF Projects, p.9

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