Energy Networks Annual Innovation Report 2022

The voice of the networks

Contents

Executive Summary

The Value of Energy Network Innovation

The energy industry in the United Kingdom transitioning to a low-carbon future and the target is set for 2050 for net zero greenhouse gas emissions. Now, more than ever, innovation is needed to meet these targets, while maintaining resilience and flexibility of the energy system. The energy network is the key infrastructure that delivers gas and electricity in the United Kingdom. This infrastructure is owned and operated by 15 Licenced Network Operators (LNOs, referred to in this report as the Networks, depicted below).

The Networks undertake a range of innovation activities, and this report aims to paint a picture of this activity and its outcomes. This high-level report on innovation activity intends to highlight projects across strategic innovation themes and demonstrate trends evident in the project data as the Networks progress through the RIIO-2 price control. The innovation measurement framework (IMF) is used in this report to outline how innovation within the networks is performing against several key performance indicators.

1. Electricity distribution operators
2. Electricity transmission operators
3. Gas distribution operators
4. Gas transmission operators

The RIIO-2 price control commenced on 1 April 2021 for electricity transmission, the electricity system operator, and gas transmission and gas distribution networks. The electricity distribution networks will commence ED2 price control on 1 April 2023, therefore they will become a contributor to this report in 2023.

Through the price control, Networks are awarded a Network Innovation Allowance (NIA) to fund innovation projects and can compete for funding through the Strategic Innovation Fund (SIF) which is managed by UKRI on behalf of Ofgem. As this funding flows from the customer, Networks are required to provide transparency to Ofgem and other stakeholders concerning the portfolio of activities undertaken and the benefits derived from this funding per licence requirements.

Since the inception of NIA in RIIO-1, Networks have published a view of NIA activities through their individual innovation annual summaries. The combined Annual Innovation Report was introduced as a RIIO-2 requirement and is the first year the Innovation Measurement Framework (IMF) has been used to track benefits from innovation projects and RIIO-2 NIA activity has been reported on collectively. This year's report covers the financial year (FY22) (April 2021 – March 2022) and will be produced annually for the remainder of RIIO-2.

On reviewing the projects advanced through the first year of RIIO-2 it is clear how essential the role of the NIA mechanism is for network innovation. The introduction of the SIF alongside the established NIA funding from RIIO-1 means that Networks can work in an agile environment to ensure that consumer benefits are delivered efficiently. The energy system is evolving and the situation in Ukraine has raised questions about energy security, NIA allows Networks to understand challenges in greater detail and enables the quick mobilization of projects to meet these evolving demands. The large proportion of Research (low TRL) projects reflects this situation, and such projects ensure a solid foundation for using SIF funding for larger-scale demonstration projects which involve wider industry participation. As SIF is challenge based, with challenges set each year it is a restricted window to apply for, this results in a larger use of NIA, but for smaller value/duration (£473k/1.5-year average) projects. As this is the first year of SIF being in place, there are still learnings to take in about the operation of the mechanism.

This report is a collaborative effort between the Networks, will summarise their activities, and provide a dashboard-style view of aggregated annual results. The findings will enable the Networks to identify collective focus areas for process improvement and address shared challenges, ensuring the innovation project portfolios continue to deliver benefits to stakeholders and customers into future years. Visibility of the project purposes, delivery, and outcomes is important to ensure shared learning and to drive benefits back into the wider energy system.

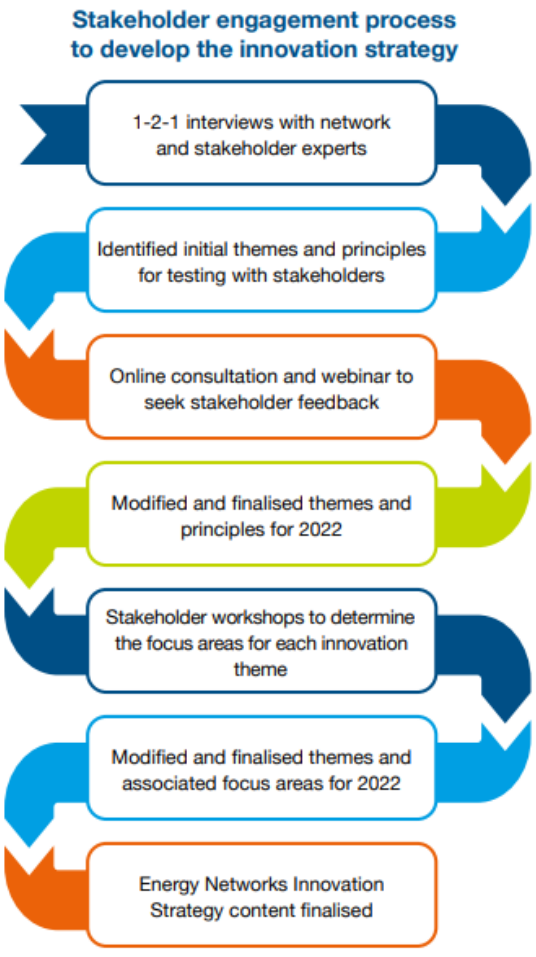
Annual Results FY22

Overview

The Energy Networks strive to deliver value for the UK energy system and consumers through the innovation activities they deliver. Innovation funding has enabled the networks to drive improvements, efficiencies, and new technologies/systems into the energy networks to help ensure the safe, resilient delivery of energy to consumers. As part of the transition to the RIIO-2 period, the innovation processes have been redefined and reporting mechanisms have been developed to enable visibility of innovation progress year on year.

FY22 is the first year of the new price control RIIO-2; RIIO-2 innovation funding (NIA and SIF) focuses on the energy system transition and consumers in vulnerable situations. This year's Annual Report will focus on innovation project idea development, progress, and predicted value as many projects are just beginning, and at this stage of RIIO-2, only a few have progressed right through to deployment.

The Innovation Measurement Framework (IMF) was developed in collaboration with the Energy Networks, Stakeholders, Regulators, and Partners and provides a consistent reporting mechanism for innovation activity. The IMF intends to capture the outcomes of network innovation and measure progress against several performance indicators identified as key enablers of innovation, including collaboration and partnerships, the speed innovation is delivered, and the benefits realised. A key success from FY22 is in the engagement with collaborators and innovators across the globe and the number of ideas this has created for the networks to action. It is recognised that the Networks cannot solve the complex challenges in the energy system independently. The networks have undertaken several activities to enable this from direct engagement to open innovation events. The Energy Network Innovation Conference (ENIC) 2021 was undertaken virtually for the second year due to COVID-19 and the continued disruptions to travel. This event enabled dissemination to a wider global audience with 3,500 delegates registered from 116 countries, maximising the opportunities of a virtual event over previous in-person events and raising the profile of the ongoing and completed work.



The Energy Networks Innovation Strategy was published in March 2022. This document reflects the changes in the energy system landscape and those introduced through the RIIO-2 price control. This year, the Networks moved away from publishing separate gas and electricity strategies and unified with a single strategy. This reflects the shift towards a whole systems approach to network innovation and an innovation culture, where networks work with other sectors to deliver outcomes. The Strategy has been widely disseminated and will be a continued platform from which the networks can direct innovation and challenges to the supply chain and stakeholders.

Networks have assessed and reviewed a significant number of ideas, leading to the development of projects with a wide variety of partners across several funding mechanisms. Many networks have expanded their innovation portfolio outside of NIA to include the new SIF funding mechanism, Business as Usual (BAU) funding, and other external funding sources such as BEIS and UKRI.

Future iterations of this report will look to provide greater insight into the deployment of innovation. One of the key challenges with innovation is that the value of innovation activities can take several years to be realised in the business and be demonstratable against the regulatory outputs in the RIIO framework. Therefore, RIIO-2 projects may not deliver benefits until the following price control (RIIO-3) and in the case of energy transition projects, until the deployment of net zero solutions commences.

The benefits across projects can vary and materialise in many forms, both quantitative (financial and environmental benefits) and qualitative (safety, skills, knowledge, and future proofing benefits). The IMF in its current format is focussed on the financial benefits and the energy networks will likely review this approach over the coming year to enable the robust recording of the wider impact of the innovation projects.

467
ideas gathered with 309 from external collaborators

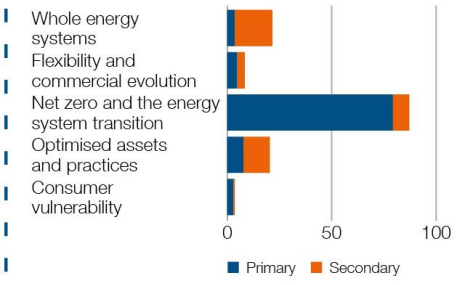
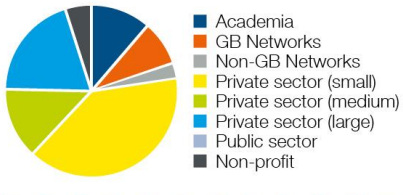
93
projects commenced

142
different Project Partners

Energy Strategy Refresh

The Balanced Scorecard

Four key performance indicator groups have been identified for the energy networks to report progress against **Strategy & Vision, Organisation & Culture, Capabilities & Technology, and Results & Outcomes.** These measures have been identified as key enablers of innovation, including collaboration and partnerships, the speed at which innovation is delivered and the benefits innovation has realised. It is one element in a set of activities developed collaboratively by the Networks which demonstrates how innovation is performing.

	Initiation and Evaluation	Demonstration, Iteration and Learning	Deployment and Optimisation
Strategy & Vision	**Energy Networks Innovation Strategy 2022**	**138** Stakeholders engaged in the strategy update	
Organisation & Culture	**467** Innovation ideas generated	TRL Map / % Projects / % Spend TRL 2: 42% / 35% TRL 3: 26% / 24% TRL 4: 14% / 34% TRL 5: 8% / 5% TRL 6: 5% / 2% TRL 7: 5% / 1% TRL 8: 0% / 0%	**93** Projects Registered April 2021 – March 2022
Capability & Technology	**309** 3rd party ideas received **83** 3rd party ideas taken forward to date	**29** Total number of registered projects from 3rd party ideas	**142** Project partners 
Results & Outcomes	**190** Ideas approved at idea stage	**16** Projects completed in FY22	**£62.5m** Project benefits predicted

Outcome Area One: The focus of Innovation

Outcome Area One aims to demonstrate the spread of projects across the five innovation themes. Shared network themes are the priority innovation areas derived from the Innovation Strategy. Demonstrating how projects align with these themes is important because as priorities, these are what consumers, stakeholders, and other key industry players want from network innovation.

The Strategy is shaped by a robust, multi-step stakeholder engagement process, and the views of contributors are reflected in updates and improvements to the strategy. Strategic priorities are tested with stakeholders, for example, the 2022 iteration of the innovation strategy included the new theme of ‘Data and Digitalisation’, demonstrating that stakeholders view this area as a critical enabler for whole system innovation.

The spread of projects over the last price control year demonstrates how the focus of innovation has shifted in RIIO-2 to have an emphasis on the energy transition and vulnerable consumers. There is certainly a need to continue to have a solution focussed approach to the future, and with that in mind, Network innovation aims to continue to overcome challenges by delivering projects that align with these themes. Continued improvement and efficiency of networks remain requirements, and it is because of this that the Networks have moved multiple areas of innovation to business-as-usual activity.

An example is the GT&Ms inline isolation project which at the end of RIIO-1 was in early feasibility study stage and has now progressed in RIIO-2 through development and demonstration via business funding rather than innovation funding. The current reporting database does not allow the recording of projects not associated with Ofgem funding to be recorded, this is a key improvement requested by the Networks as they progress through RIIO-2.

The focus themes currently included in the innovation measurement framework have progressed as indicated below:

- **Consumer vulnerability**

  Exploring how best to support the needs of consumers in vulnerable circumstances today and in the future, ensuring that everyone can experience the benefits of the energy transition and that any adverse effects of change is minimised.

  The networks have undertaken several workshops in FY22 to identify key areas to target in the consumer vulnerability theme. The energy transition could have serious impacts on vulnerable consumers, and it is important to take this into account in the work we do. An NIA project led by Wales & West Utilities (WWU) 'Consumer Vulnerability Impact Assessment Tool' has provided the Networks with a desktop evaluation mechanism to assess the potential impact on consumers of the NIA projects. This is now in use as part of the PEA registration process for each innovation project.

- **Net Zero and the energy system transition**

  Facilitating and accelerating the UK's transition to Net Zero greenhouse gas emissions before 2050.

  This theme is a focus for RIIO-2 projects and there is a vast wealth of activity across the networks. The improved capacity and efficiency of the electricity network alongside the repurposing of the gas networks contribute to the majority of the innovation project portfolio. An NIA project led by NGET 'Retrofitting Oil Source Heat Recovery to Transformers', has been exploring the impact of heat exchanges to feed local district heat networks.

  Each gas network has a programme of work to determine the opportunity for hydrogen in their network, working collaboratively they are partnering on each other's programs and sharing learning to help accelerate the opportunity of repurposing assets for net zero. A key project developed by Cadent at the end of RIIO-1 and into RIIO-2 is HyNET, a case study below shows an example of the consumer research work package and demonstrates how projects may cut across multiple strategic themes.

- **Optimised assets and projects**

  Developing and implementing industry-leading techniques for optimising assets and practices for energy networks.

  The continued optimisation of assets and business investments is ongoing through business-as-usual activities not yet reported in the innovation measurement framework. There are few projects with the primary theme of optimised assets in the NIA and SIF portfolio however many have this as a secondary theme. An example of this is the 5G Art of the Possible project which developed an understanding of the level of data flow required for a whole system network of the future and considered how 5G and future communications systems could support the transition.

- **Flexibility and commercial evolution**

  Developing and testing innovative solutions to increase the flexibility, transparency, and efficiency of the energy system, enabling information to be more open and networks to be more responsive to change.
  Flexibility in the networks and systems is key to enabling the energy system transition, both physical and digital flexibility are being investigated alongside alternative commercial arrangements. An NIA project led by NGESO 'Crowdflex', has been exploring the opportunities for households to provide reliable support to the network through aggregated energy flexibility. This project has been taken forwards under SIF supported by Octopus Energy, Ohme Technologies, SSEN, and National Grid Electricity Distribution. An early estimate of

benefits could potentially reduce consumer electricity bills by up to 11% and reduce CO2 emissions related to their electricity use by 17%.

HyNTS Deblending a SIF project looking at developing gas separation techniques for the high pressure networks and Hy4Transport a BEIS funded project looking at gas separation for distribution networks; look to enable flexibility in the gas network by allowing the network to support a different blend to that needed by its customers.

- **Whole energy system**

Enabling joined-up and efficient approaches across multiple aspects of the energy system around planning, forecasting, design, construction, operation, maintenance, and data.

Ensuring a whole systems approach for the energy transition is vital and has been a focus at the beginning of RIIO-2 to enable us to identify the key activities required to enable this. Three key projects for the transmission system have been commenced Gas and Electricity Transmission Infrastructure Outlook (NGGT), The Role of Hydrogen as an Electricity System Asset (NGESO), and Role and value of electrolysers in low-carbon GB energy system (NGET), each project is a collaborative effort with the other transmission networks and will provide clear guidance to how the whole system transmission network may look in 2050.

Next year's Annual Report will reflect updates to the innovation strategy themes, the updates to the themes are listed below:

- Supporting consumers in vulnerable situations
- Net Zero and the energy system transition
- Optimised assets and practices
- Flexibility and market evolution
- Whole energy system
- Data and digitalisation

Further information on the new Energy Networks Innovation Strategy and how the themes fit with the revisited objectives and principles can be found in Appendix Two of this document.

The case studies below were selected as they reflect the spread of projects across the innovation themes of Net Zero and Energy System Transition.

Case Study: Protection Solution to perform for Lower Levels of Fault Current on AC Networks (PSL-FC)

Reference: NIA_SHET_0033
Lead Network: SSEN Transmission
Project Partners: Strathclyde University
Budget: £671,000

Project overview: The aim of this project is to complete a multi-vendor investigation into the effectiveness and reliability of new Protection and Control (P&C) equipment. With an increase in renewable generation and power electronic equipment expected to connect to the network over the coming years, this investigation will identify how robust P&C equipment will be on an electricity system of the future. The approach to achieving this will be through a combination of network simulations and open-loop device trails.

Results: To date, the project has identified several protection and control devices that are being developed by a range of manufacturers. The main area of focus is to identify if these devices can operate at low fault current. A programme of tests has commenced that aims to assess the capabilities of each device.

Benefits: P&C products are designed to respond to a future electrical network where the fault current spike is low but prolonged. The present mitigation measure for areas of the network that may be exposed to lower levels of fault current is a device called a Synchronous Condenser. A Synchronous Condenser can replicate a traditional fossil fuel power source and in the event of a fault, it will respond with a very large, sudden, single bolt of current enabling currently deployed P&C devices to respond but would cost around £15m per installation on the network. If this project can evidence that new P&C products have the potential to respond effectively in a lower-level fault current environment, then the expected benefits will be realised through the avoidance of deploying costly Synchronous Condensers.

Case Study: HyNet Homes Understand Phase & Hydrogen Village Consumer Research

Reference: NIA_CAD0072 and NIA_CAD0074
Lead Network: Cadent
Project Partners: WWU, SGN, NGN, Kiwa, Progressive Energy, Element Energy and WSP UK
Budget: £1,335,830

Project overview: These two projects were in support of the Government's ambition for a Hydrogen village conversion project, as set out in their 10-point plan in November 2020. The HyNet Homes understand phase was a technical pre-feed study on a potential hydrogen village in the North West of England. The areas that were investigated included – hydrogen production and resilience, network considerations and infrastructural requirements, in-home considerations (e.g appliances, meters), commercial and regulatory implications of a village trial, and finally safety case considerations. Undertaking studies on each of these areas and then applying them to village locations enabled a hydrogen village location to be selected. Alongside this work, we also led a project in collaboration with all of the gas distribution networks, to understand how domestic consumers and businesses are likely to respond to converting to hydrogen. The project scope included understanding consumer attitudes, behaviours, and perceptions towards the use of hydrogen as a solution for heating, cooking, and the impact of conversion. The consumer research was carried out in three stages; Inform (consolidating existing research), Qualitative (which included using a short-term online deliberative community of 100 consumers indicatively representing a broad UK consumer base), and Quantitative (to test at scale the output of the inform stage along with the themes and findings of the qualitative research). The quantitative stage provided views from a large-scale sample of the UK's consumer base. The outputs of both projects were worked up further to form a proposal, which was then submitted to BEIS and OFGEM for funding in Dec 2021.

Results: Both projects are complete, but the outputs are now being used in support of Stage 2 of the Hydrogen village project (which is to convert the village on Whitby in the NW).

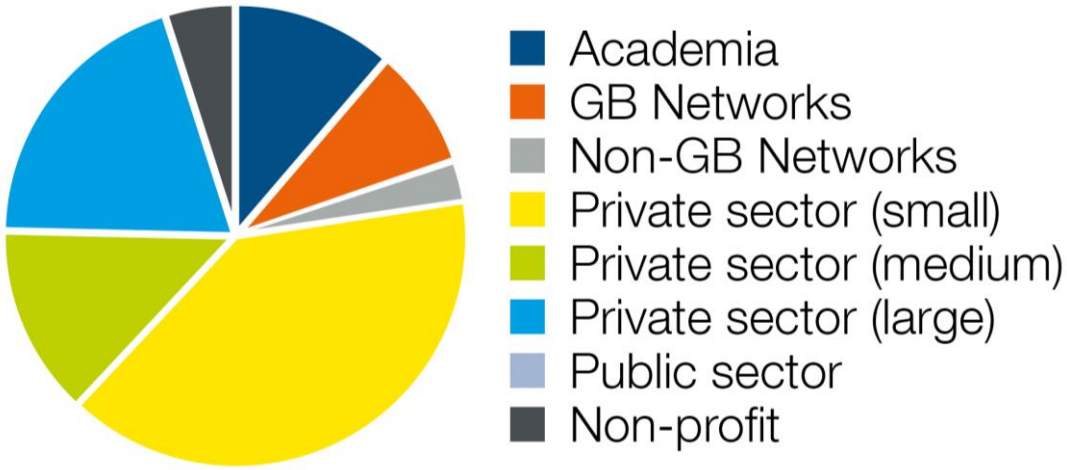
Benefits: The projects informed the decision for BEIS over which hydrogen village conversion projects to take forward to the next stage, which is the detailed design.

Outcome Area Two: Working with Partners

Collaboration has become a key feature of innovation projects and the first year of RIIO-2 saw engagement with 142 project partners across the Networks. This reporting year there has been a shift from working with single suppliers to building wider consortiums of project partners. There is a need to tackle the challenge of the energy transition with a range of partner organisations to drive the delivery of innovative solutions, and innovation teams across the Networks have adapted their ways of working to accommodate this. The Networks continue to refine their approach to working with partners and are beginning to see an acceleration of collaborative processes and ways of working as they move into the second year of RIIO-2.

The Smarter Networks Portal, hosted by ENA enables third-party innovators to pitch innovative ideas directly to the Networks, and this year there were 45 ideas submitted to the portal. This year a total of 66% percent of projects taken forward came from ideas of external parties, demonstrating the key role third parties play in idea generation.

The types of organisations engaged in collaborative projects with the networks range from small, medium, and large enterprises to academia and not-for-profit. The graph below demonstrates the total number of project partners and provides a view of the representation in collaborative projects:



Engagement methods

Networks work directly with suppliers, customers, and partners to identify challenges, and ideas and develop projects. At the commencement of a project, the initial approach can come from either the Network or the third party. Encouraging new partners and suppliers to engage with the Networks is vital, and innovation teams are aware that they need to be accessible to hear pitches from innovators and accommodate collaboration.

Effective stakeholder engagement is critical for driving innovation that will deliver benefits to customers. The discovery of a new, promising idea to take forward on the journey of an innovation project is an exciting part of the process. The Networks engage with a wide range of partners and stakeholders to maximise their exposure to new ideas and disseminate learnings. Conferences, workshops, and open innovation events are known to be successful methods to enable this, and the Networks utilise such forums for this reason.

This reporting year the Networks attended a variety of external and internal events, with the slow return of in-person events, events leaned in favour of online rather than in-person environments. Headline external facing which Networks attended included COP 26, ENIC, Utility Week Live, SPARK, and Energy X South. These events traversed a range of themes not just specific to network innovation and included heat decarbonisation, transport, consumer vulnerability, and the energy system transition. In 2021 the Networks also hosted two energy innovation forums through ENA and reached a range of stakeholders through this mechanism, keeping these relationships alive and interesting.

External stakeholder survey

One of the measures within the reporting framework (IMF) is the external stakeholder survey. This section of the report is designed to provide a view of stakeholders' experiences of working with the Networks across the spectrum of innovation of activities.

In December 2021, ENA circulated the Innovation Strategy online consultation to gain feedback on the principles and themes included in the first draft. The questions below form the stakeholder survey component of the IMF and were included with the survey questions on the strategy.

The 10 questions depicted in the graphic below were answered by 138 respondents. As demonstrated by the collation of data, responses to the questions were overwhelmingly neutral across all 10 questions. The questions circulated were designed in the infancy of the IMF and have not yet been updated to reflect changes to strategic documents such as the Innovation Strategy and The Energy Networks Innovation Process (ENIP). After trialling these questions, Networks are well positioned to make changes to both the questions and the scoring metric. It is hoped that these updates will help to prompt more decisive responses to report on in the future. The Networks, therefore, welcome feedback from Ofgem on possible improvements to the questions in this survey.

The responses have been reviewed and while it is positive that there is not a strong demonstration of negative impressions of working with the Networks, the Networks recognise that there is some work to be done in this space and have a plan going forward to improve the scores in this survey. It is hoped that with the increase in in-person networking events, stakeholders will have more chances to have meaningful engagements with the Networks and this will increase the perception that the stakeholders have constructive working relationships with the Networks. The Networks plan to ensure the visibility of important resources including the updated innovation strategy, annual summaries and will have results from this survey in mind when producing the updated Energy Networks Innovation Process document for March 2023.

To what extent do these statements describe your experience with the network companies?	Strongly disagree	Disagree	Neutral	Slightly agree	Agree	N/A
Network companies support us to innovate and take a proactive approach to facilitate positive change	10%	22%	24%	27%	7%	10%
There are individuals/teams within the companies that are actively looking for opportunities to engage and partner on new innovative activities	4%	15%	20%	31%	23%	7%
The companies are diligent and transparent in their approach to selecting the ideas and initiatives with which they engage	9%	22%	32%	20%	7%	9%
The companies give clear articulation of their innovation strategy, and their activities align with it	9%	24%	26%	24%	9%	7%
The companies are investing widely in innovation, with the projects funded likely to provide significant benefits for future consumers	12%	22%	30%	22%	8%	7%
The companies are eager to understand the latest innovative products and services in the market and how they impact networks	8%	17%	32%	23%	9%	11%
The companies are keen to test out new ideas through trials	12%	19%	31%	22%	8%	8%
The companies allocate the appropriate amount of time to pursue new opportunities and facilitate developments in the market that require their support	12%	28%	28%	17%	5%	10%
The companies have a cross-industry community and open channels of communication that enable knowledge sharing and learning freely	12%	28%	33%	15%	5%	7%
Companies have an open approach to working with other parties and are receptive to new ideas	12%	24%	33%	17%	7%	7%

Working with partners is the focus for this Outcome Area, and the case studies below were selected as examples of projects which demonstrate effective collaboration:

Case Study: A Common Framework for a Virtual Energy System

Reference: NIA2_NGESO0014
Lead Network: National Grid ESO
Project Partners: ARUP, Energy Systems Catapult, and IcebreakerOne
Budget: £350,000

Project overview: Our energy landscape is becoming increasingly complex as we move towards operating a low-carbon energy system. To navigate this complexity and to ensure we continue to operate the electricity system in the most clean and cost-effective way, dynamic data-driven decision making is essential. The VirtualES project aims to create a digital twin of the whole GB energy system, mapping out the entire network's assets (such as generators, substations, homes, etc) with data about each to help the ESO optimise dispatch decisions, better understand the impact of new technologies such as EVs, heat pumps and battery storage, and to support system stability. At the moment this information is 'siloed', recorded in different places by different stakeholders. So, before we can bring it all together to build the VirtualES, we need a Common Framework so each stakeholder can contribute their data and information in such a way that the data sets can be connected to create a virtual energy ecosystem. The Common Framework project is a feasibility study that looks at what is needed to make this collaboration a reality.

Results: Working in partnership with consultancies ARUP, Energy Systems Catapult, and IcebreakerOne, the project started by exploring existing best practice examples from around the world and in different industries where cross-sector organisations have brought together assets, systems, and digital twins. This gave us an insight into what elements we should be replicating and help us to understand the scope of the project. With the benchmarking complete, we mapped out the key elements we would need for the Common Framework and looked at the industry standards which would be needed to roll it out in the future. At each step in the project, we have engaged stakeholders from industry, academia, research, and local government, holding regular open 'show and tell' calls to share our latest findings and to seek feedback.

Benefits: The ESO will be able to use data-driven decision-making to operate the network more efficiently, and to optimise operations to achieve net zero targets. Generating cost savings for the ESO, the connected digital twins and ultimately the end consumers. The Common Framework and the subsequent VirtualES will become a valuable asset which can evolve and grow with the ESO, as the repeatable interfaces can be added to or used for other projects to increase the pace of future innovation projects.

Case Study: Regional Decarbonisation Pathways

Reference: NIA_WWU_2_02
Lead Network: Wales and West Utilities
Project Partners: Energy Systems Catapult and Costain
Budget: £609,753

Project overview: The UK has an extensive gas network that delivers around 600TWh of natural gas to domestic, commercial and industrial consumers and a further300TWh to generate power, and low-carbon solutions are required in all of these sectors to meet net zero. Hydrogen will be required to deliver a fully decarbonised gas network that can service the UK's energy requirements. We, therefore, needed a robust, independent investigation into the future of the gas network and a roadmap for how we get there.

We undertook two integrated studies to devise a strategic plan and a conceptual plan for the decarbonisation of the gas network. The strategic plan was developed by ESC, with input from Costain, and consisted of whole system modelling and assessment of the network implications, while the conceptual plan was an engineering analysis by Costain showing what the gas network could look like and how to achieve it.

The analysis is based on three credible energy system pathway scenarios to net zero by 2050:

- a high hydrogen scenario
- a high electrification scenario
- a balanced scenario lying midway between these.

Results: In all three scenarios, hydrogen and gas networks have a significant role to play. Natural gas was largely removed, with industrial and heating demand being met by hydrogen, although some use alongside carbon capture and storage by industry was modelled in all three scenarios. Alongside these results, the project also demonstrated how Wales could become a net exporter of hydrogen in the future thanks to the potential for production in the South Wales Industrial Cluster.

Benefits: Both in-depth plans have helped provide the data and analysis we need to advise on energy network transformation policy on the pathway towards net zero. In particular, they demonstrate:

- Hydrogen has an important role in the energy system
- Designs that cost-effectively meet carbon budgets and Net Zero goals
- Adopting hybrid heating systems offers significant value to the energy system
- Hydrogen can completely replace liquid fossil fuel use in industry

- The decisions made by industry will have a large impact on the scale of hydrogen production
- The transition to hydrogen can be achieved by developing a dedicated hydrogen backbone.

Outcome Area Three: The Innovation Funnel

The journey of an innovation project begins at idea stage, ideas 'funnel' through to the Networks and follow a multi-step process through to the final stage of implementation and benefits realisation. This reporting year, the first of the RIIO-2 price control, 467 ideas were received by Networks, generated from the following sources:

- Third party ideas submitted to the ENA Smarter Networks Portal
- Third party ideas submitted directly to an Energy Network and organisations
- ENA led calls for ideas
- Energy Networks internally sourced ideas
- Follow on work from other projects

Of the ideas received, 66% were submitted from external sources, this is a reflection of the Network's collective efforts to ensure third parties understand the challenges facing the energy industry and the work which has gone into ensuring a straightforward process for third parties to submit project proposals. This has been facilitated by the bi-annual publication of the Joint Network Innovation Strategy which details the key priorities for network innovation and how third parties can get involved and concentrated efforts around stakeholder engagement.

Almost 40% of the ideas received in 2021/22 have been taken forward to innovation projects. A further 41% of the ideas received were not progressed for several reasons including:

- Did not align with strategy
- Did not meet NIA or SIF criteria
- Insufficient benefits expected
- Duplication of previous work
- A lack of internal resource to support delivery
- On hold due to business prioritisation or availability of resource
- Currently still being assessed

Ideas received 66 days on average to progress to an initial decision, reflecting the Networks ambition to take an agile approach to managing ideas and inform third parties of the decision within a timely fashion. Almost 20% of the ideas received were still being assessed at the time of the benefits table submission.

As 2021/22 was the first year of RIIO-2, most of the registered projects are currently in delivery. Of the 93 projects registered, 16 have been completed. The majority of completed projects (58%) had positive outcomes with the knowledge generated and lessons learned incorporated into the business and disseminated with the public and the other Networks vis the Smarter Networks Portal. Three projects completed require additional research and will likely lead to follow-on NIA projects to progress the TRLs further. The outcomes from two completed projects were transitioned into BAU in 2021/22:

1. NIA_WWU_2_06 Consumer Vulnerability Impact Assessment Tool (Wales & West Utilities)
2. NIA2_NGESO007 Decarbonisation of Heat – Integrated Market Study (National Grid ESO)

The Networks expect to see the number of completed projects increase through the progression of RIIO-2 and this will provide greater insight into the outcomes from innovation (e.g the number of projects leading to further projects and the number of projects moved into BAU).

Outcome Area Four: Benefits for Customers

The Networks predict, track, and record a range of benefits for their innovation projects. This helps to ensure the project resourcing and spending delivers value to the networks and their customers. Benefits can be both quantitative (financial and environmental benefits) and qualitative (safety, skills, knowledge and future proofing benefits) and are equally important. This report focuses on the quantitative benefits of projects alongside a review of engagement.

Within the current RIIO-2 portfolio, 70% of the initiatives are research projects, and the Networks expect the maturity of these concepts to progress through the TRLs and deliver more tangible benefits down the track. In the meantime, the understanding, and insights these projects offer are vital for identifying challenges and providing potential solutions to overcome them. The Hydrogen Village projects, for example, are designed to build the networks' understanding of consumer perceptions of hydrogen/hydrogen technology, and the feasibility of switching existing infrastructure to be hydrogen ready. The findings from these projects are essential for refining and targeting further innovation work and will continue to build evidence and understanding of the role of hydrogen in a Net Zero world. The networks continue to build on customer engagement and education through the village projects and WWU is progressing case study.

Similarly, within the electricity transmission network, the Multi-Terminal Test Environment (MTTE) project established a new collaborative facility that enables the planning, development and testing of High Voltage Direct Current (HVDC) transmission solutions in Great Britain. Originally funded through the Network Innovation Competition (NIC), the facility, known as the National HVDC Centre, has since enabled several innovation projects that are aimed at supporting the deployment of HVDC projects. Through the unique testing capabilities, the National HVDC Centre is helping to mitigate against any associated risks to the reliable operation, control, and resilience of the GB network.

There is no one-size-fits-all method for value tracking, so the approach has focused on developing a robust methodology that allows the flexibility to capture a range of benefits, both tangible and intangible while ensuring the data is accurate and verified. A set of processes has been developed and controls that enable the identification of potential benefits, test the values ascribed to these, and ensure figures accurately represent the value achieved. This is compared to the expected value set out within the Project Eligibility Assessment (PEA) at registration.

Predicted benefits are calculated by first understanding the 'baseline' what of would happen if you did not do the innovation project, then considering the 'method' of what could the outcome look like when the project is deployed. The method may have several potentials with different assumptions associated, each of these would be considered, and a likelihood associated with each. To attain the final benefits, the baseline is taken away from the method, and the difference is provided as the predicted benefits. These predicted benefits are depicted in the proposal and PEA documents for the innovation projects and recorded centrally by each network.

Upon closure of the project, a review of the predicted benefits is undertaken and updated in the closure documents of the project, these are then the benefits to be tracked and deployed into business as usual. Each innovation project has a different deployment regime:

- One-off Implementation – Fully implemented after the project and no further value is expected, one-off cost or benefit
- Annually Accruing – Each year networks expect a recurring value achieved. A validation exercise is undertaken to confirm the additional benefit has been achieved
- Per Use – There have been specific applications that have been quantified and recorded, but further applications would require specific analysis

Review periods are assigned to each project so that the team can track and report the benefits as appropriate.

Benefits are then reported on deployment of the innovation, this is done by obtaining evidence of the implemented technologies' cost to innovate, cost to deploy, and savings realised. In some cases, the evidence of savings can be difficult to attain as the projects provide benefits through cost avoidance, in these instances a record of the assumptions made and reasoning for the cost avoidance is recorded instead.

Being one year into the RIIO-2 price control period means that many projects are still active, therefore have not delivered final outputs, or are projects that have built knowledge and capability around a specific theme. In future years those projects consisting of both evidence base and elements that can be adopted will be implemented into BAU. This will help to progress the Networks goals to the transition to low carbon heat while supporting a fair transition for all our customers.

Many project benefits from RIIO-2 projects will not be seen during the RIIO-2 period due to the focus being on the energy transition, and such benefits are likely to be seen in RIIO-3 and thereafter. For example, a large proportion of the hydrogen work undertaken is not likely to be deployed until the RIIO-3 price control. The TOs and the ESO do not have a direct connection to consumers and therefore are unable to differentiate project benefits that impact consumers and those in vulnerable situations. All Networks will continue to put the consumer at the heart of their innovation activities by ensuring the delivery of robust consumer benefits from projects and facilitating better consumer participation in the energy markets.

The networks use a process for identifying, developing, and delivering innovation projects. Upfront high-level benefits are usually determined and refined as project discussions continue. Where a project has a low Technology Readiness Level (TRL), it is difficult to calculate the benefit that can be realised and projects with a higher TRL will have a more detailed benefits case completed. Networks use a Cost Benefit Analysis (CBA) model to assess this. It should be noted that many of these models only look at quantifiable benefits in monetary value and there are other important benefits such as safety, environment, and knowledge that are more difficult to quantify.

The case studies below have been selected for this outcome area as they demonstrate the wide variety of benefits realised by consumers.

Case Study: Visual Inspection and Condition Assessment Platform for OHL Steelwork (VICAP)

Reference: NIA2_NGET0009
Lead Network: National Grid Electricity Transmission
Project Partners: Keen AI, sees.ai
Budget: £430,000

Project overview: We, as the owners of approximately 21,900 steel lattice pylons, inspect around 3,650 of them each year, to better understand the health of the network and to plan condition-based interventions. This involves capturing high definition still colour images of steelwork using helicopters and manually flown drones where there are access issues for the helicopters. Currently, these images are captured and processed manually by a pool of inspectors. We're looking to fully automate the capture and processing of corrosion-related condition assessment data for the steelwork on our steel lattice pylons. Collaborating with deep tech start-ups Keen AI and sees.ai, we're developing a process that uses automated drones flown 'beyond visual line of sight' (BVLOS). These will gather close-quarter data of the overhead line steel lattice pylons, which is then processed using artificial intelligence (AI). We'll also be making an application to the Civil Aviation Authority for connected and autonomous drones to be flown nationally under licence for this specific use case – under the supervision of remote operators in a secure remote operation centre.

Benefits: Automating data capture and processing for these assessments will:

- Enable the capture of data that's optimal for automated processing, linking the images to exact positions on the tower and geographic locations on the network
- Increase efficiency and consistency of data processing
- Reduce the risk and environmental impact of data capture.

If the trials are successful and we implement this innovation, we anticipate savings of around £1.2 million for UK consumers by 2031. This includes benefits realised through reducing the use of helicopters, avoiding fuel costs and faster processing times for assessments

Case Study: Transmission OHL Crossing Protection Stage 1

Reference: NIA SPEN 0054
Lead Network: SP Energy Networks
Project Partners: RED Engineering
Budget: £80,000

Project overview: During the reconductoring of transmission overhead lines there can be issues when the transmission line crosses a section of distribution overhead line. Action must be taken to ensure that the transmission overhead line cannot drop and make contact with the distribution line and become re-energised. The result of such an event could cause serious harm to the operatives who are working on the isolated line. This is, currently avoided by undergrounding the section of distribution line, but this can be very expensive once costs such as outages, excavation, and reinstatement are factored in. This project will consider a system to prevent contact with the distribution overhead line by covering it from above.

This will be a system installed using live line methods and will initially be used to protect 132kV systems. A feasibility study has been carried out, and this project will develop a detailed design for the system. The scope includes the design of the protection system which will be designed to allow a large proportion of distribution crossings to be protected on the current planned reconductoring projects. This project will cover only the design to allow assessment against the requirements of the transmission business and to ensure that it can be applied to enough of these crossings to make its use cost-effective.

Results: The objective of this project is to develop a technical design of a system to cover distribution overhead lines while transmission reconductoring is being carried out overhead, with an assessment of how this meets the needs of the business, and what number of crossings this can be applied to. SP Energy Networks appointed RED Engineering (RED) to take over the concept design and further develop it after REECE Innovation, which was awarded the project through a competition, withdrew. RED carried out a quick analysis with specialist software to gain clarity on load cases from cable failure. RED has assessed the current concept against load cases and identified significantly higher loading. In addition, lateral loading was not considered in the concept, and RED raised concerns that the top section cannot be manufactured as intended and that the system is not deployable. RED had completed an initial design which was then reviewed by SP Energy Network's team; however, it was not accepted as the direction of the design was not going to work. Machine/vehicle-based solution has been ruled out and current design focus is on pole mounted system which avoids the cost of mobilising vehicle to mount the unit on. The project team is currently developing a new concept which will be presented for review by the end of 2022.

Benefits:

- Avoided Cost - There is the potential for significant cost avoidance per annum during the RIIO-2 price control against cost spend for a typical crossing [about 500 planned during this period], by utilising a cheaper and more efficient protection system.
- Health and Safety improvement – using a new protection system will help reduce the potential of dropped overhead lines.

- Customer interruptions - help reduce the impact of potential interruptions due to conductors being dropped while reconductoring is carried out.

Case Study: CH4RGE

Reference: NIA_NGGT0164, NIA_NGGT0174 and SIF10020609
Lead Network: National Grid Gas Transmission and Metering
Project Partners: Project Environmental Solutions Ltd (PESL), Mott MacDonald
Budget: £404,670

Project overview: Across the National Transmission System (NTS), gas losses occur for various reasons including planned and emergency venting, or through unforeseen leaks. These losses are classified as fugitive or venting emissions.

With the introduction of net zero targets, such emissions are increasingly becoming a focus and driving National Grid to make significant emission reductions to avoid financial, environmental, and, reputational harm.

CH4RGE (Methane Reduction from Gas Equipment) is a series of projects designed to explore the potential use of innovative technologies to reduce methane emissions on UK NTS sites. Phase 1 was a Feasibility study on the technologies and systems that could be utilised, Phase 2 involved continued development and Pre-FEED activities on the viable solutions identified to date as well as a conceptual design for a chosen solution at a pilot site and the SIF Project begun to develop the FEED for a demonstration later in RIIO-2. This project has now moved to a reopener so that we can accelerate the use of these emissions reduction technologies through demonstration and into use.

Results: Working with Project Environmental Solutions Ltd (PESL) and in the later phases Mott MacDonald, the team has explored a range of potential technology options that could be used to reduce the emissions from all gas equipment and reviewed which of these could be a viable solution if implemented across the business.

The solutions being explored consider emissions from modern dry seal gas turbines and electric drives only, and initial calculations suggest that an investment of £6.5m could deploy a technology solution at 11 frequently used NTS sites, where these turbines are already in use.

This phase advanced the FEED element of the technology progress to a pilot on the NTS. Mott MacDonald was selected as the FEED partner organisation.

This project has now moved to a reopener so that we can accelerate the use of these emissions reduction technologies through demonstration in 2023 and into use in RIIO-3.

Benefits: Further development of the venting calculator tool with increased functionality to support decision-making on investment and emissions potential.

Using a venting calculator tool, the team has looked at the potential cost savings that each solution could realise – based on a value of £45 per tonne of carbon – the figure currently used by the business when making investment decisions and a cost that is likely to increase over time.

Deploying such a solution could result in an emissions reduction of approximately 80% or 550,000 tCO2e, over a 20-year period. A reduced cost of carbon exposure of just under £25 million.

Conclusion

The Networks first year of RIIO-2 has been a successful one, with 93 new projects registered across all eligible networks. This demonstrates the Networks ambition to deliver the energy system transition while ensuring that consumers in vulnerable situations are not left behind. The conflict in Ukraine has increased the focus on energy security for all energy users, with greater ambitions to decarbonise quickly, efficiently, and safely.

The introduction of the new SIF funding mechanism alongside the established NIA funding from RIIO-1 helps enable Networks to work in an agile environment to ensure that consumer benefits are delivered quickly and efficiently. As the energy system is evolving, NIA allows Networks to understand the challenges in greater detail while swiftly mobilising projects to meet changing demands. This is reflected in the large proportion of Research (low TRL) projects. These projects can help to form a solid foundation for the use of SIF to fund larger-scale demonstration projects.

The portfolio of innovation projects in RIIO-2 demonstrates a clear focus on the energy transition with improved collaboration between networks, no duplication, and increased engagement from project partners. Several working groups between the networks and stakeholders are in place and supporting the direction of the portfolio such as the Hydrogen Grid Research and Development BEIS Gas Network Group and Data and Digitalisation Steering Group. Looking ahead, the ED2 (Electricity Distribution 2 Price Control) starts in April 2023 and Networks see this as an opportunity to keep working together to solve industry challenges. This linked-up approach is reflected in the joint Innovation Strategy, published in March 2022. The ENA's Collaborative Energy Programme (CEP) Framework has been expanded to all Networks to allow faster collaboration between Networks and suppliers for a quicker mobilisation of an initial idea, without having to run a full public procurement process. The CEP framework will be operational in late 2022.

Plans for the coming year are again ambitious, and networks will continue to drive forwards. At the time this report was prepared, the Networks hosted their first in-person innovation conference post-pandemic. Previously known as Energy Networks Innovation Conference, the event was rebranded for 2022 as the 'Energy Innovation Summit' with an updated, wider industry focus, featuring whole system engagement. Networks continue to plan more touchpoints with stakeholders and are working on expanding engagement to continue to encourage third-party innovators.

The Energy Networks Innovation Process (ENIP) is due for a full review in March 2023 and as part of this review, the Networks will be paying extra attention to the following areas:

- Innovation Strategy themes (will be updated as per the most recent strategy)
- Data Quality and Measurement Framework
- Innovation Measurement Framework
- Intellectual Property
- Dissemination

The IMF is owned by ENA and administered by EIM (Electricity Innovation Managers) and GIGG (Gas Innovation and Governance) groups. When the framework was developed in 2018, the recommendation by Baringa was that it be reviewed every two years, to align with the review of the Energy Networks Innovation Strategy. Innovation activity within the Networks has transformed since the inception of this measurement framework. The evolution across the Networks is reflective of changing economic and social landscapes, including increased prioritisation of the energy system transition.

ENA intends to uphold the recommendation to review the IMF in parallel with the innovation strategies, however, there is also the intention to review the IMF against the backdrop of changes to the industry environment.

In 2023, the learnings can be taken from this first cycle of reporting, and there will be more information as to what is working well and what could be improved within the framework. This will be an opportune time to make changes ahead of the next Electricity Distribution price control period starting in April 2023.

Appendix 1 – Network Overview

Energy Networks

Membership at Energy Networks Association is open to all owners and operators of energy networks in the UK. Companies which operate smaller networks or are licence holders in the islands around the UK are eligible for associate membership, and other are some companies that have an interest in the UK transmission and distribution market are also able to benefit from the work of ENA through associate status.

The licensees who have contributed to this report are those who have entered the RIIO-2 price control (below). On April 1 2023 RIIO-2 will commence for the Electricity distribution licensees and they will become a contributor to this report.

About ENA

Energy Networks Association (ENA) represents the owners and operators of licenses for the transmission and/or distribution of energy in the UK and Ireland. Its members control and maintain the critical national infrastructure that delivers these vital services to customers' homes and businesses.

ENA's overriding goals are to promote UK and Ireland energy networks ensuring the networks are the safest, most reliable, most efficient, and sustainable in the world. ENA aims to influence decision members on issues that are important to its members. These include:

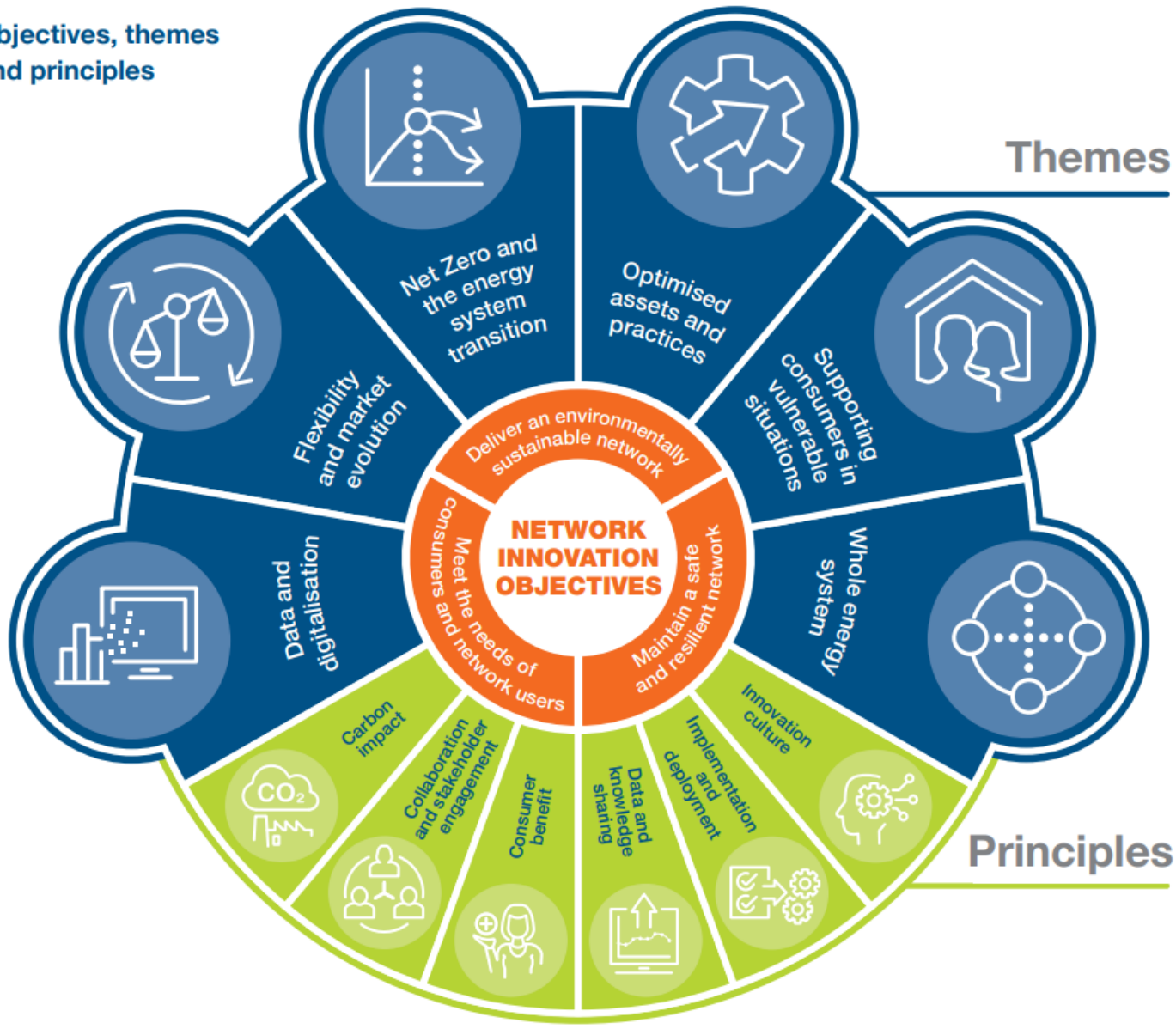
- Regulation and the wider representation in the UK, Ireland, and the rest of Europe
- Cost-efficient engineering services and related businesses for the benefit of members
- Safety, health, and environment across the gas and electricity industries
- The development and deployment of smart technology
- Innovation strategy, reporting, and collaboration in GB

As the voice of the energy networks sector, ENA acts as a strategic focus and channel of communication for the industry.

Appendix 2 - The Innovation Strategy

In March 2022 ENA published the Energy Networks Innovation Strategy on behalf of the Gas and Electricity Networks. This year, the Networks made the shift from separate Gas and Electricity strategies to a single combined strategy. This alignment of strategic priorities reflects the move toward an integrated, whole-systems approach to innovation and the energy system transition.

The strategies help to set out how Energy Networks want to work with innovators on new solutions which help to deliver safe, resilient networks that facilitate the Net Zero transition and meet the needs of stakeholders and customers.



The strategy sets out key objectives, principles, and themes which will guide network innovation and help the Networks provide infrastructure that is safe, resilient, and meets the evolving needs of energy consumers across the United Kingdom.

The overarching network innovation objectives are consumer-facing and outcome-driven, and these underpin all innovation activity. Principles form part of the process as they apply to all innovation activity and are considered at each stage of an innovation project.

The shared network innovation themes are the priority innovation areas. The innovation themes are particularly relevant to the Annual Innovation Report as projects and thematic alignment inform one of Outcome Area One of the Innovation Measurement Framework. The most recent iteration of the innovation strategy included addition of theme of Data and Digitalisation and next years' iteration of the Annual Report will reflect updates to the Strategy.

Appendix 3 – The IMF

Background to the Innovation Measurement Framework (IMF)

The aim of the IMF was to consider what successful innovation would deliver and how these outcomes could be captured and measured. Over a two-year period of development, a range of stakeholders were engaged to provide insight into what benefits could and should be recorded by the networks building a framework to gather project data within. The Networks trialled the framework and provided feedback on its use in RIIO-1.

The RIIO-2 innovation project governance requires that all projects focus on the energy transition and/or vulnerable consumers. This change has altered the period for the benefits to be realised across many of the networks and through utilising the IMF in RIIO-2 several updates have been identified to ensure the usability of the framework, these are detailed in the conclusion.

The IMF can be described as a holistic tool used by the Networks to report a broad range of innovation outcomes, including collaboration and partnerships (with other LNOs and external parties), the speed at which successful innovation is moved into business as usual (BAU) and the benefits which integrating innovation into BAU has delivered for customers.

The reported outcomes from tracking projects through IMF will be published annually to allow stakeholders to view performance in delivering innovation outcomes, the results from tracking projects through IMF will be used to form the basis for the Annual Report.

The components of the IMF

The IMF consists of the following working components:

- **The reporting framework**: The measures which LNOs will report against and where they sit within the innovation framework; and
- **The Benefit tables**
  - **Idea log**: Where information on all innovation ideas are captured;
  - **Project log**: Where information on innovation projects is captured;
  - **BAU log**: Where information on all innovations which have been moved into BAU are captured; and
- **Definitions and Guidance**: Where the definition of each data point to be captured is provided and guidance outlined on how to complete the Idea, Project and BAU logs
- **The External stakeholder survey:** The survey questions that the ENA will ask external stakeholders on behalf of all LNOs.

Appendix 4 – RIIO-2 Project List & Status

Below is a list of projects started by the Energy Networks in the RIIO-2 price control:

Network	Project Reference	Project Name	Funding	Status
Cadent	CAD_SIF001	SIF Alpha 2021 - Cadent Digital Platform for Leakage Analytics	SIF	In Progress
Cadent	CAD_SIF001	SIF Discovery 2021 - Cadent - Digital Platform for Leakage Analytics	SIF	In Progress
Cadent	NIA_CAD0072	HyNET Homes - Understand phase (Technical)	NIA_RIIO-2	Complete
Cadent	NIA_CAD0073	Common Future end states and transition pathways	NIA_RIIO-2	Complete
Cadent	NIA_CAD0074	Hydrogen Village Consumer Research (formerly HyNet Homes customer research)	NIA_RIIO-2	Complete
Cadent	NIA_CAD0075	HyNet – Management of Additional Sources of Hydrogen Supply	NIA_RIIO-2	Complete
Cadent	NIA_CAD0068	Cumbrian Hydrogen vision and pathway – phase 1 feasibility	NIA_RIIO-2	Complete
GT&M	10020605	SIF Alpha 2021 - HyNTS Deblending for Transport Applications	SIF	In Progress
GT&M	10020605	SIF Discovery 2021 - HyNTS Deblending	SIF	In Progress
GT&M	10020609	SIF Discovery 2021 - CH4RGE - Emissions Capture	SIF	In Progress
GT&M	10020620	SIF Discovery 2021 - Gas Network Interoperable Digital Twin	SIF	In Progress
GT&M	10020622	SIF Alpha 2021 - HyNTS Pipeline Data Set	SIF	In Progress
GT&M	10020622	SIF Discovery 2021 - HyNTS Pipeline DataSet	SIF	In Progress
GT&M	10021808	SIF Discovery 2021 - Gas Analyser Systems for Hydrogen Blends	SIF	In Progress
GT&M	10022352	SIF Discovery 2021 - NGM Hydrogen Metering	SIF	In Progress
GT&M	10022648	SIF Discovery 2021 - Hydrogen Barrier Coatings for Gas Network Assets	SIF	In Progress
GT&M	10023216	SIF Discovery 2021 - Green Hydrogen Injection into the NTS	SIF	In Progress
GT&M	10023632	SIF Alpha 2021 - HyNTS Compression	SIF	In Progress
GT&M	10023632	SIF Discovery 2021 - HyNTS Compression	SIF	In Progress
GT&M	10024392	SIF Discovery 2021 - Nuclear Net Zero Opportunities (N-NZO)	SIF	In Progress
GT&M	NIA_NGGT0170	EPRG 2021 - 2026	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0171	PRCI - Pipeline Research Council International 2021-2026	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0172	Risk Assessment Methodologies for Pipelines & AGIs 2021-2026	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0174	CH4RGE - Methane Reduction from Gas Equipment - Phase 2	NIA_RIIO-2	Complete
GT&M	NIA_NGGT0175	5G - Art of the Possible	NIA_RIIO-2	Complete
GT&M	NIA_NGGT0176	Hydrogen Fuel Gas for NTS Compressors	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0177	Hydrogen Deblending Feasibility Phase 2	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0178	Collaborative Visual Data Twin - Phase 1	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0179	HGR&D ST - Assessment Methodologies	NIA_RIIO-2	Complete
GT&M	NIA_NGGT0180	NTS Materials Testing to Enable Hydrogen Injection in High Pressure Pipelines	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0181	HyDew	NIA_RIIO-2	Complete
GT&M	NIA_NGGT0182	Multifunctional Graphene Coatings for Pipeline Protection	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0183	Inhibition of Hydrogen Embrittlement Effects in Pipeline Steels	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0184	Gas and Electricity Transmission Infrastructure Outlook	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0185	NSIB Hydrogen Skills & Competencies	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0188	Variable hydrogen blend compression	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0192	New Pipeline AI Route Planning	NIA_RIIO-2	In Progress
GT&M	NIA_NGGT0194	Impact of Hydrogen on Polymer Materials	NIA_RIIO-2	In Progress
GT&M	NIC_NGGTGN04	FutureGrid (NIC)	NIA_RIIO-2	In Progress
GT&M	10036954	SIF Alpha 2021 - HyNTS Protection	SIF	In Progress
NGESO	10026595	Virtual Energy System	SIF	In Progress
NGESO	10027180	Crowdflex: Discovery	SIF	In Progress
NGESO	NIA2_NGESO001	CrowdFLEX	NIA_RIIO-2	Complete
NGESO	NIA2_NGESO002	Solar PV Nowcasting	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO003	Probabilistic Machine Learning Solution for Dynamic Reserve Setting	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO005	Stability Market Design	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO006	Resilient Electric Vehicle charging (REV)	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO007	Decarbonisation of Heat – Integrated Market Study	NIA_RIIO-2	Complete
NGESO	NIA2_NGESO008	Future of Reactive Power Market	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO009	D3 - Data-Driven Power System Model Development for Control Interaction Studies	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO010	The Role for Hydrogen as an Electricity System Asset	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO011	Optimal Outage Planning System	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO013	Advanced Dispatch Optimisation	NIA_RIIO-2	In Progress

Network	Project Reference	Project Name	Funding	Status
NGESO	NIA2_NGESO014	A Common Framework for the Virtual Energy System	NIA_RIIO-2	In Progress
NGESO	NIA2_NGESO017	Probabilistic planning for stability constraints	NIA_RIIO-2	In Progress
NGET	10027585	SIF Alpha 2021 - NGET Eye in the Sky	SIF	In Progress
NGET	10027585	SIF Discovery 2021 - NGET - Eye in the Sky	SIF	In Progress
NGET	NIA2_NGET0001	Impedance Scan Methods	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0002	Role and value of electrolysers in low-carbon GB energy system	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0003	Retrofitting Oil Source Heat Recovery to Transformers	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0004	Centralised PAC	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0005	NIA2_NGET0005 Environmental Risk and Assurance (ERA)	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0006	Non-invasive In-situ Monitoring and Interpretation of SF6 Alternatives in GIS Equipment	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0007	EPRI Research Collaboration on Electric & Magnetic Fields Health & Safety (P60) 2021-25	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0008	EPRI Substations (P37) and Analytics (P34) 2021-2025	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0009	Visual Inspection and Condition Assessment Platform for OHL Steelwork (VICAP)	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0011	Alternative Approaches to Tower Painting Preparation	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0012	EPRI Research Collaboration on Underground Transmission (P36) 2021-2025	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0013	Overhead Line Sagging Monitoring Using 5G Signals	NIA_RIIO-2	In Progress
NGET	NIA2_NGET0014	Secure Edge Platform	NIA_RIIO-2	In Progress
NGN	10027276	SIF Discovery 2021 - NGN - Thermal Imagery Analysis	SIF	In Progress
NGN	NIA_NGN_301	H21 - Failure modes and permeation testing of PE	NIA_RIIO-2	In Progress
NGN	NIA_NGN_302	H21 - Wider Impacts of Hydrogen	NIA_RIIO-2	In Progress
NGN	NIA_NGN_303	IoT Pressure Sensor Pilot	NIA_RIIO-2	In Progress
NGN	NIA_NGN_337	Biomethane Study	NIA_RIIO-2	Complete
NGN	NIA_NGN_338	Street Score 2	NIA_RIIO-2	In Progress
NGN	NIA_NGN_345	Customer Energy Village: Energy Efficiency	NIA_RIIO-2	In Progress
NGN	NIA_NGN_348	H21 Occupied Trials - Phase 1 Safety Case	NIA_RIIO-2	Complete
NGN	NIA_NGN_357	Community Resilience	NIA_RIIO-2	In Progress
SGN	10027183	SIF Alpha 2021 - SGN Intelligent Gas Grid	SIF	In Progress
SGN	10027185	SIF Alpha 2021 - SGN Velocity Design	SIF	In Progress
SGN	10027191	SIF Alpha 2021 - SGN Predictive Safety Interventions	SIF	In Progress
SGN	10025731	SIF Discovery 2021 - SGN - Digital Twin - Exploring the commercial, societal and operations benefits on green hydrogen projects	SIF	In Progress
SGN	10027059	SIF Discovery 2021 - SGN - Digital Twin - Exploring the societal, operational and cross industry whole system, benefits on Gas Distribution	SIF	In Progress
SGN	10027183	SIF Discovery 2021 - SGN - Intelligent Gas Grid	SIF	In Progress
SGN	10027191	SIF Discovery 2021 - SGN - Predictive Safety Interventions	SIF	In Progress
SGN	NIA2_SGN0001	Grangemouth to Granton LTS Futures	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0002	Energy Storage Strategy	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0003	H100 ‘town’ Expansion-Storage Solution: Balgonie Feasibility Study	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0004	Phoenix IIoT Demonstrator	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0005	Data Sharing Protocols	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0006	Industrial & Commercial Plant Hydrogen Sensitivity Assessment	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0007	North East Scotland Pre-FEED	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0008	HyPurge	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0009	H100 Fife Phase 2 Village Pre-FEED	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0010	HyScale Academic Review	NIA_RIIO-2	Complete
SGN	NIA2_SGN0011	Levenmouth Wastewater Treatment Works	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0012	Recommissioning Grangemouth to Granton	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0013	Long Term, Large Scale Hydrogen Storage Database	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0014	Technical assessment and feasibility study into water requirements for hydrogen production	NIA_RIIO-2	In Progress

Network	Project Reference	Project Name	Funding	Status
SGN	NIA2_SGN0016	Glenmavis Masterplan Options Appraisal	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0017	Bio CNG – SIU Feasibility Study	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0018	Hydrogen Entry Unit Design	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0019	Retrofit Excess Flow Valves (EFVs)	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0020	Leakage Management in the Energy System Transition	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0021	Hydrogen Navigator	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0022	H100 Specific Fire & Risks	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0023	Hydrogen MOBS Data Analysis Phase 1	NIA_RIIO-2	In Progress
SGN	NIA2_SGN0024	HyScale LOHC Phase 2 Project	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0062	Dynaload	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0064	CyberSAFEN	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0071	A Holistic Intelligent Control System for flexible technologies (T2)	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0072	Project Synthesis – Effective Regional Inertia Monitoring and Automatic Control with a Whole System Approach (T2)	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0073	Transmission OHL Crossing Protection Stage 1 (T2)	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0074	Project Conan (T2)	NIA_RIIO-2	In Progress
SPEN-T	NIA_SPEN_0075	Landslide Protection Asset (T2)	NIA_RIIO-2	In Progress
SSEN-T	NIA_SHET_0033	Protection Solutions to Perform for Lower Levels of Fault Current on AC Networks (PSL-FC)	NIA_RIIO-2	In Progress
SSEN-T	NIA_SHET_0034	Low Profile 132kV Steel Poles	NIA_RIIO-2	In Progress
SSEN-T	NIA_SHET_0035	TOTEM (Transmission Owner Tools for EMT Modelling) Extension	NIA_RIIO-2	In Progress
SSEN-T	NIA_SHET_0036	Condition Assessment of SF6 Alternatives	NIA_RIIO-2	In Progress
SSEN-T	NIA_SHET_0037	Probabilistic Modellig for Connection Studies	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_01	SWIC Hydrogen Supply Pipeline Infrastructure	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_02	Regional decarbonisation pathways	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_03	SWIC Market-Accelerating Hydrogen Distribution and Storage	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_04	Tools of Engagement Phase 2	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_05	Safely switching vulnerable consumers to hydrogen	NIA_RIIO-2	In Progress
WWU	NIA_WWU_2_06	Consumer Vulnerability Impact Assessment Tool	NIA_RIIO-2	Complete
WWU	NIA_WWU_2_07	SWIC: Assessment of potential hydrogen demand in 2030 - 2050	NIA_RIIO-2	In Progress
WWU	SIF_WWU_2_01	HyPark	NIA_RIIO-2	In Progress

Energy Networks Association
4 More London Riverside
London SE1 2AU
t: +44 (0)20 4599 7700
w: energynetworks.org

The voice of the networks