Energy Networks Innovation Strategy
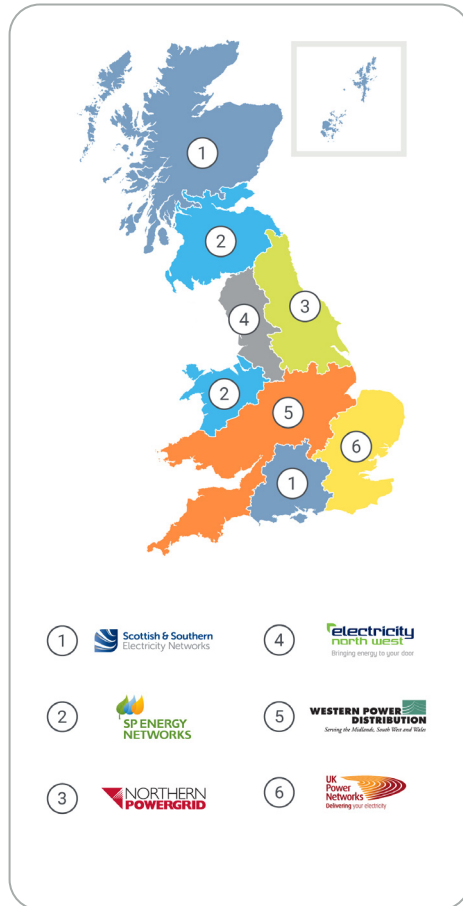
March 2022

ena
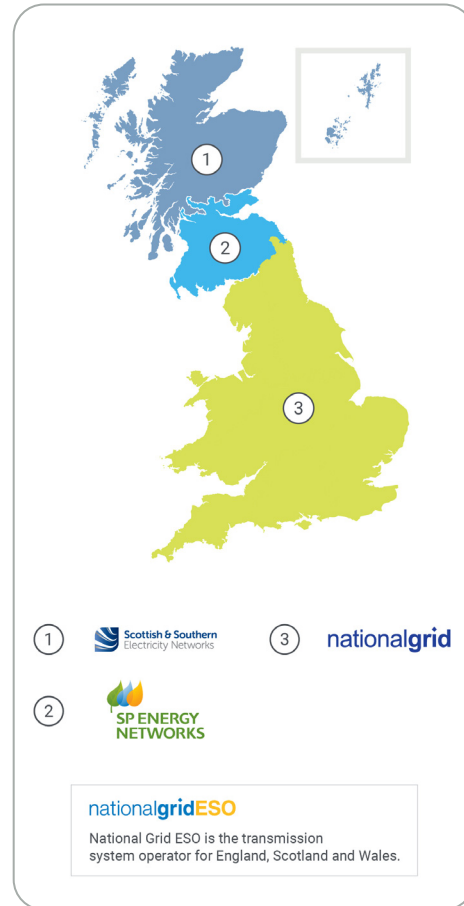energy**networks**
association

The voice of the networks

Contents

Energy network companies

Electricity Distribution

1. Scottish & Southern Electricity Networks
2. SP ENERGY NETWORKS
3. NORTHERN POWERGRID
4. electricity north west — Bringing energy to your door
5. WESTERN POWER DISTRIBUTION — Serving the Midlands, South West and Wales
6. UK Power Networks — Delivering your electricity

Electricity Transmission

1. Scottish & Southern Electricity Networks
2. SP ENERGY NETWORKS
3. nationalgrid

nationalgridESO

National Grid ESO is the transmission system operator for England, Scotland and Wales.

Gas Distribution

1. SGN — Your gas. Our network.
2. Northern Gas Networks
3. Cadent — Your Gas Network
4. WALES&WEST UTILITIES

Gas Transmission

1. nationalgrid

This Energy Networks Innovation Strategy has been produced for Energy Networks Association (ENA) and participating Licensed Network Operators (LNOs). ENA is the voice of the networks, representing the 'wires and pipes' transmission and distribution network operators for gas and electricity in the UK and Ireland.

Foreword

We are excited to launch our ambitious 2022 Energy Networks Innovation Strategy which has been designed with our stakeholders at its heart. It sets out our ambitions for network innovation and will ensure that all network innovation projects share the same strategic direction and deliver benefits to our consumers.

Energy Networks Association (ENA) is the voice of the networks and brings together the innovation teams within each of the network companies to creatively consider challenges that require innovative solutions, share learnings and collaborate.

For the first time, we have developed one combined gas and electricity strategy to ensure that network innovation takes a fully whole system approach and aligns with the UK's overall low carbon innovation portfolio. This strategy has been shaped by an extensive and carefully designed programme of stakeholder engagement and we could not have developed it without your feedback.

Since we last published the Gas and Electricity Network Innovation Strategies in 2020, not only have stakeholder views and priorities evolved but so has the innovation landscape.

This includes the funding streams for network innovation projects which have undergone a significant transformation. The revised mechanisms and the new funding opportunities have an increased focus on achieving Net Zero equitably, clearer partnership working with Innovate UK and increased contributions from network companies.

We know that the energy landscape will continue to see rapid change, with rising bills, changing weather patterns and the changing nature of consumer vulnerability just some of the dynamic challenges that our networks face. Innovation projects can help us to address some of these challenges by allowing us to integrate new technologies and practices into our energy networks.

The views of our stakeholders have been critical to the development of this strategy. We thank you for your commitment and willingness to share both your time and thoughts to shape the future of network innovation.

David Smith
Chief Executive, ENA

Introduction

The aim of this strategy is to enable our stakeholders to understand the key priorities for network innovation and how you can get involved. With your help we want to ensure network innovation projects have clear strategic goals and deliver benefits to consumers by tackling the key issues facing our energy system.

The strategy sets out the key principles and themes that will guide network innovation and enable us to deliver safe, resilient networks that facilitate the energy system transition and meet the evolving needs of energy consumers.

CONSULTANCY/
NETWORKS
ACADEMIA/RESEARCH
ENERGY SUPPLIER
ASSET OWNER
DATA ORGANISATION
COMMUNITY ENERGY ORGANISATION
OTHER
ADVISORY
NON-PROFIT

343
Individual stakeholders engaged to develop the innovation strategy

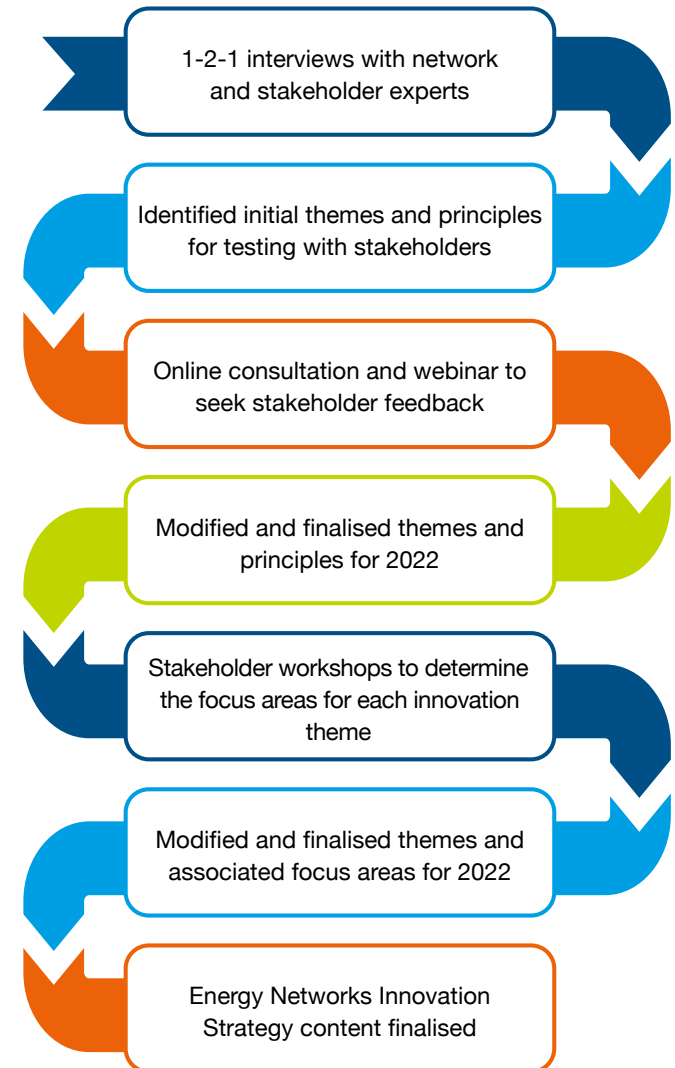**GOVERNMENT/REGULATION**
TECHNOLOGY COMPANY

Stakeholder feedback has shaped every section of this strategy. In particular,

- The addition of "innovation culture" as a new principle. Embedding this within the energy networks is a critical enabler for whole system innovation and will accelerate our work to support Net Zero.

- The addition of "data and digitalisation" as a specific theme with significant scope for innovation as we transition to data-driven networks.
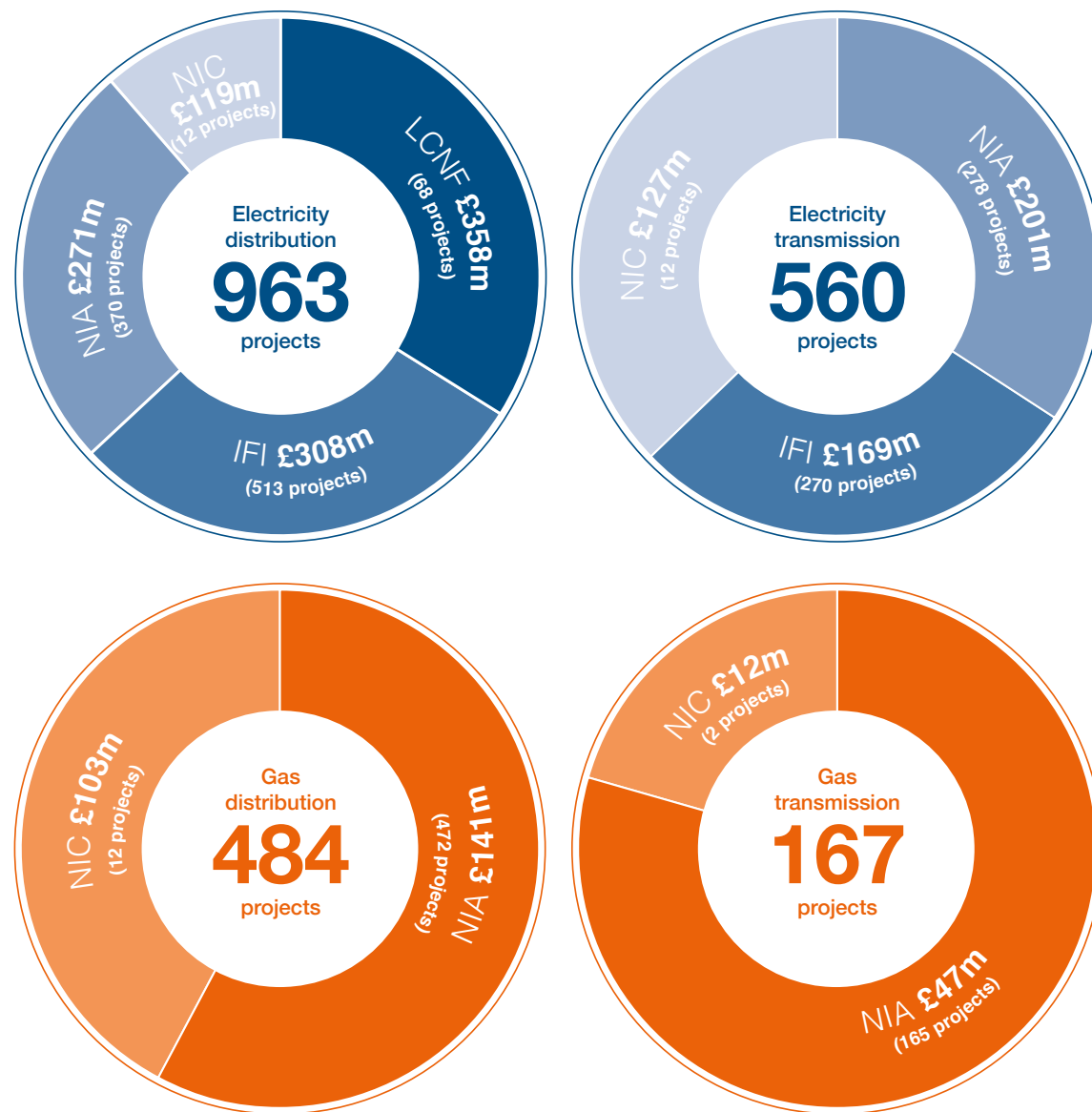
Perhaps most significantly, by combining the Gas and Electricity Network Innovation Strategies, we are aiming to ensure network innovation takes a fully whole system approach; with network companies working together and with other sectors to identify new and efficient solutions to the Net Zero challenge that will benefit consumers.

We recognise that we cannot solve the complex challenges in the energy system on our own. We want to continue to open innovation activities to an ever-broader range of organisations and individuals both within and beyond the energy sector. This strategy sets out where we would like your help to develop, trial and implement innovative ideas that address some of our most pressing challenges, and details how you can get involved.

Stakeholder engagement process to develop the innovation strategy

- 1-2-1 interviews with network and stakeholder experts
- Identified initial themes and principles for testing with stakeholders
- Online consultation and webinar to seek stakeholder feedback
- Modified and finalised themes and principles for 2022
- Stakeholder workshops to determine the focus areas for each innovation theme
- Modified and finalised themes and associated focus areas for 2022
- Energy Networks Innovation Strategy content finalised

Network innovation to date

Electricity distribution
963 projects
- NIC £119m (12 projects)
- LCNF £358m (68 projects)
- IFI £308m (513 projects)
- NIA £271m (370 projects)

Electricity transmission
560 projects
- NIC £127m (12 projects)
- NIA £201m (278 projects)
- IFI £169m (270 projects)

Gas distribution
484 projects
- NIC £103m (12 projects)
- NIA £141m (472 projects)

Gas transmission
167 projects
- NIC £12m (2 projects)
- NIA £47m (165 projects)

Data source: Smarter Networks Portal, November 2021

We are building on an extensive and impactful portfolio of innovation projects, with network companies having developed, trialled and tested over 2,000 innovative ideas since 2009. Through our Smarter Networks Portal, stakeholders can see the valuable learning and expected benefits from each project. We are now putting in place much more sophisticated means to continually measure and track the benefits realised through all our innovation activities, so we can see the impact our projects have on local communities, as well as carbon emissions.

88%
of innovation projects in 2020/21 included collaboration with third party organisations.

95%
of innovation projects in 2020/21 included collaboration between network companies.

Whole Systems Cost Benefit Analysis Framework

This methodology has been collaboratively developed through our Open Networks Programme, working with network companies to evaluate options to achieve Net Zero across electricity and gas networks on a whole system basis. It will enable the comparison of costs and benefits across different sectors, stakeholders (including current and future consumers) and scenarios. The methodology was recognised by Ofgem in 2021 as an essential part of the evaluation of network proposals, including innovation projects, and its potential to articulate the benefits that the wider energy industry delivers.

The changing innovation landscape

The innovation landscape has undergone a significant transformation since the previous network innovation strategies were published in March 2020. This includes in the funding streams available for network innovation.

Ofgem published its **Innovation Vision for 2021 – 2025** which highlights the priority areas for innovation. These innovation priorities all share three common principles, forming the foundation of all innovation activity and aiming to drive value for all energy consumers.

Ofgem and Innovate UK are collaborating on the new **Strategic Innovation Fund** (SIF), which replaces the **Network Innovation Competition** (NIC) in the second RIIO price control period. With £450m available over the next five years, the vision for the SIF is to enable a 'giant leap together' in network innovation, helping to deliver Net Zero at the lowest cost to consumers by enabling strategic change. Working with other public funders of innovation, the SIF aims to deliver real net benefits to network companies, energy users and consumers, and help the UK become a global hub of energy innovation: a 'Silicon Valley' of energy.

Ofgem will continue to offer the **Network Innovation Allowance** (NIA) to each of the energy networks in RIIO-2, with a revised focus on the energy system transition and addressing consumer vulnerability.

The network companies have now set their innovation priorities in their RIIO-2 business plans and know how much money they can spend on innovation projects in this period. Typically, the networks use their own funds to transition an innovation project into **business-as-usual** or to explore new efficiency methods to drive continuous improvements.

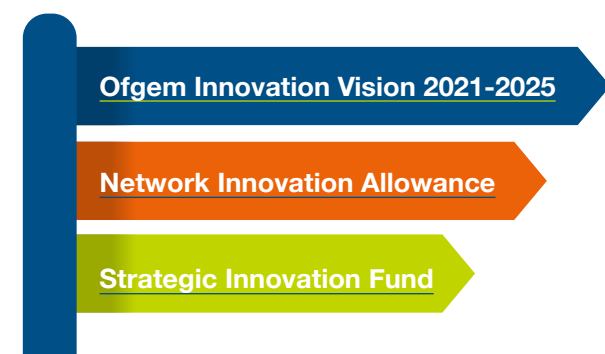## Ofgem's innovation principles

- Innovation should create value for the whole system
- Innovation should be customer focused
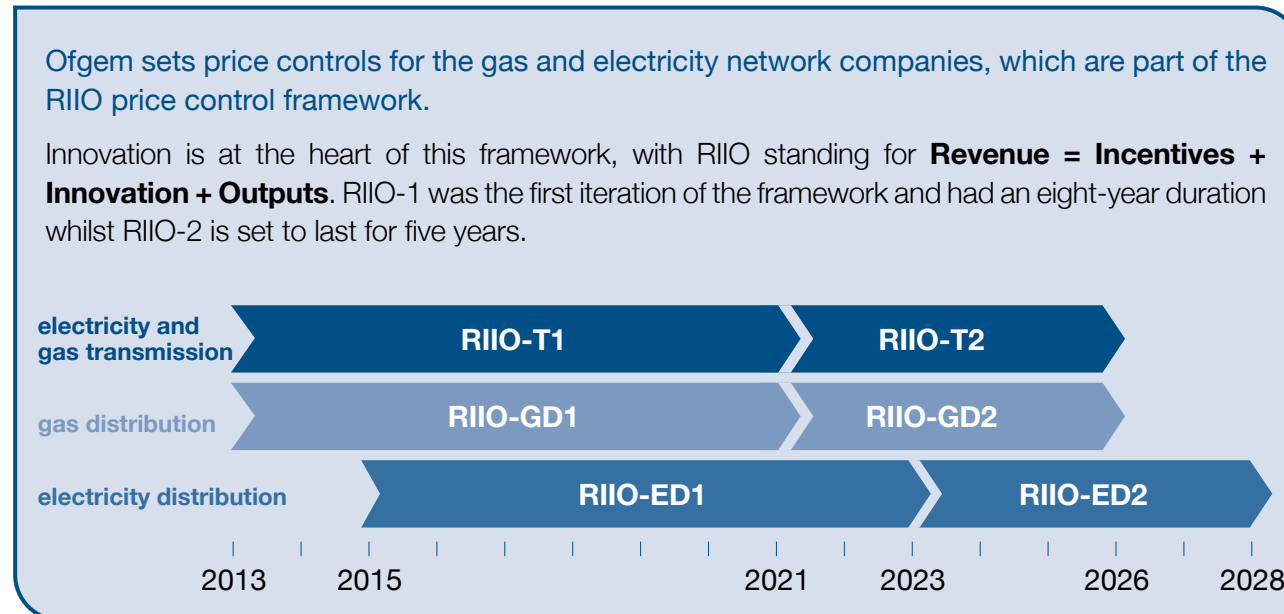- Information on innovation should be widely disseminated

- Ofgem Innovation Vision 2021-2025
- Network Innovation Allowance
- Strategic Innovation Fund

Ofgem sets price controls for the gas and electricity network companies, which are part of the RIIO price control framework.

Innovation is at the heart of this framework, with RIIO standing for **Revenue = Incentives + Innovation + Outputs**. RIIO-1 was the first iteration of the framework and had an eight-year duration whilst RIIO-2 is set to last for five years.

electricity and gas transmission	RIIO-T1	RIIO-T2
gas distribution	RIIO-GD1	RIIO-GD2
electricity distribution	RIIO-ED1	RIIO-ED2

2013   2015   2021   2023   2026   2028

Network innovation strategy

This shared strategy is intentionally high-level because we want to use it to inspire and excite the innovation community without being too prescriptive.

The strategy is centred around three **overarching network innovation objectives**. These are the three consumer-facing outcome categories set by Ofgem that underpin all network innovation activity.

The underlying **network innovation principles** apply to all innovation activity and should be considered at all stages of an innovation project.

The **shared network innovation themes** are the priority innovation areas for all networks and ensure a shared strategic direction. Network innovation projects must fit under one of these themes to ensure they are focused on solving our biggest challenges.

To add clarity to the project ideas we are seeking, we have identified key **focus areas** within each of these themes. These focus areas have been developed with our stakeholders and aim to help innovators better understand how they can collaborate with us.

Objectives, themes and principles
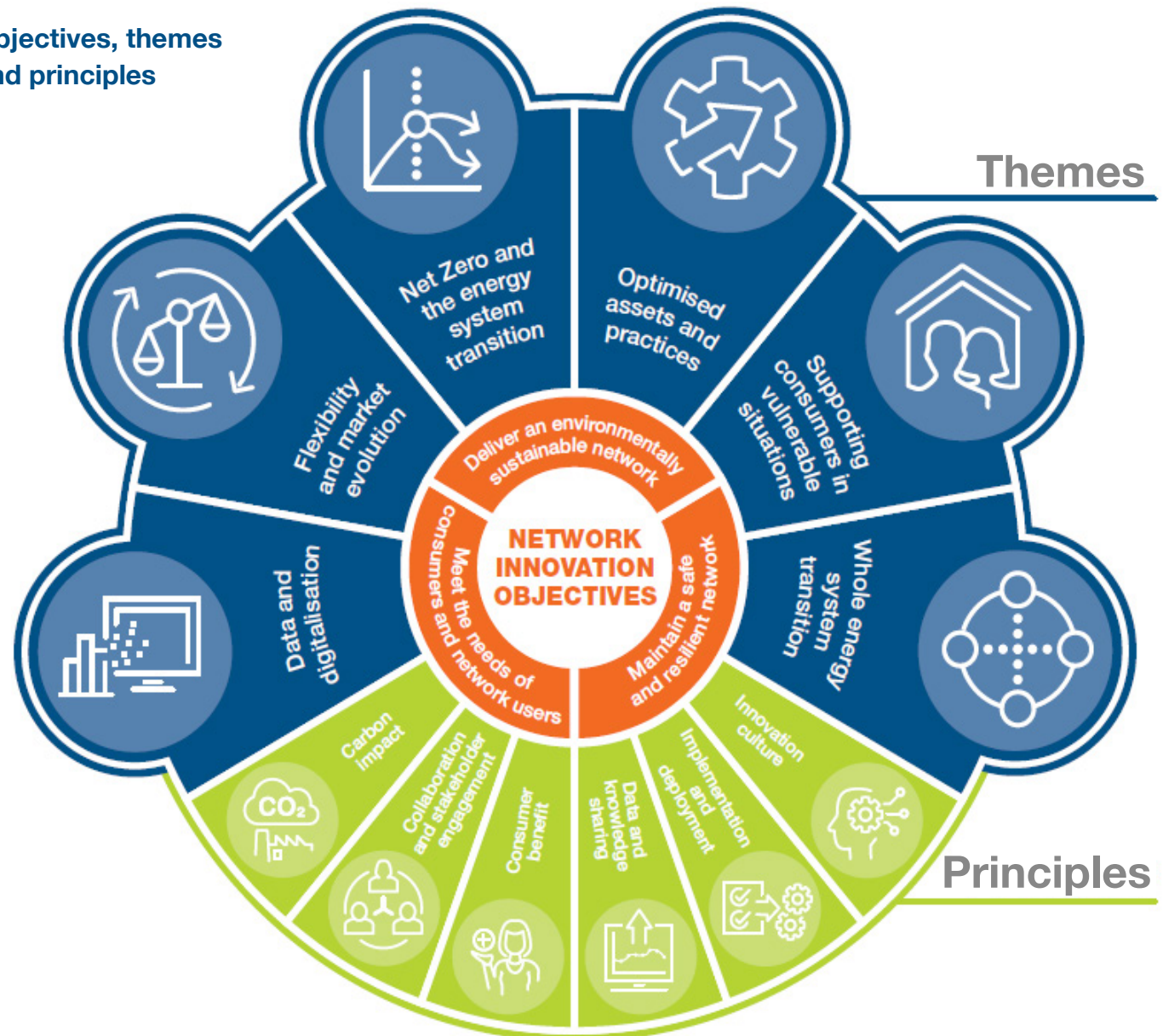
Principles of innovation

Carbon impact

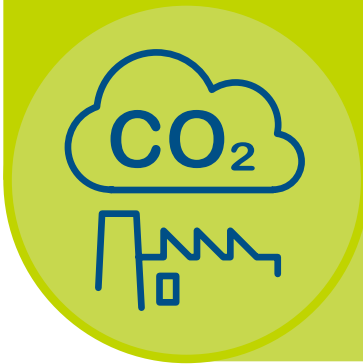Collaboration and stakeholder engagement

Consumer benefit

Data and knowledge sharing

Implementation and deployment

Innovation culture

Principle
Carbon impact

Innovation projects should have a positive impact on the environment and the UK's Net Zero emissions target.

Innovation projects can reduce carbon emissions and deliver a wide range of benefits to the environment.

This principle applies to all our innovation activities and, while certain innovation projects will be specifically focused on facilitating and accelerating the UK's transition to Net Zero carbon emissions, all projects should aim to have a positive impact on carbon emissions.

Following feedback from our stakeholders, we have modified this principle to now explicitly include wider environmental impacts. We recognise that we have an important role to play in providing additional environmental benefits, for example by enhancing biodiversity.

The impact of our innovation activities in terms of both carbon and the environment must be analysed and assessed. Some projects, such as safety or cyber security innovations, may have very little direct environmental and carbon impact. However, where we do have an environmental impact, we will strive for this to be positive without compromising the project objectives.

ENA's **Whole System Cost-Benefit Analysis** tool incorporates the impact of the following environmental factors:

- CO_2 emissions associated with the final gas/electricity/hydrogen demand.

- CO_2 emissions associated with electricity losses.

- Greenhouse gas emissions, including Hydrogen (H_2), Sulphur hexafluoride (SF_6) and methane (CH_4).

- Nitrogen oxides (NO_x) emissions.

- Oil or methane leakages.

- Shrinkage.

In addition to analysing these environmental factors, there are other ways that innovation could look to improve the environment. For example, where real-world trials are carried out as part of our innovation activities, projects should aim to improve the environment of the trial site and surrounding area.

> "It is good to see the carbon impact principle has been broadened to encompass wider environmental impacts (e.g. biodiversity enhancement, natural capital increase, etc.)
>
> *Stakeholder feedback*

> "Acting on the climate and ecological emergency is not just about getting to zero carbon, but also stopping and reversing biodiversity loss and extinction.
>
> *Stakeholder feedback*

Collaboration and stakeholder engagement

Network innovation activity should provide shared learning and increase collaboration between networks companies and stakeholders.

Collaboration and effective stakeholder engagement are crucial for innovation. By working together, we can ensure our stakeholders inform and guide the strategic direction of our innovation activities, while successful collaboration will result in new ideas, shared learning and avoid duplication.

An energy network stakeholder is any individual, group or organisation that has an interest in the future of our energy system. For example, this includes:

- Government and regulatory bodies.
- Non-energy utilities and wider industry.
- Research and academia.
- Industry associations.
- Our supply chains.
- Consumers and consumer representatives.
- Expert consultancies.
- The energy sector.
- Technology and equipment providers.
- Communities and community groups.
- Independent Network Operators.

By engaging more of our stakeholders, we will find the most innovative ideas that will deliver benefits to consumers. To do this, we want to build on our work with our current innovation partners and work with the ever-broader range of organisations whose ideas and expertise we will need.

Working together under ENA, we have developed a range of collaborative initiatives which include:

The **Low Carbon Technology Working Group** works with industry, BEIS and Ofgem to agree strategies for low carbon grid connections.

The **Smarter Networks Portal** shares key details and learnings for all regulatory-funded projects.

The **Open Networks Programme** seeks to work collaboratively with industry to lead the transition to a smart, flexible, Net Zero energy system in Great Britain.

The **Gas Goes Green Programme** shares learning to deliver Net Zero gas.

BEIS, Ofgem, UKRI and industry meet with the networks at the **Whole Systems Group** to collaborate on standardisation and interoperability opportunities.

The **Data and Digitalisation Steering Group** seeks to collaboratively address energy data issues.

Showcase and conference events such as the annual **Energy Networks Innovation Conference** and quarterly Energy Innovation Forums.

The **Electricity Innovation Managers and Gas Innovation Governance Group** aims to coordinate network innovation activities.

Consumer benefit

Network innovation activity should ultimately benefit consumers financially, supporting them in a just transition.

Energy consumers comprise anyone who connects to one or more of our gas and electricity networks, uses energy or pays an energy bill.

We recognise that consumers are individuals whose needs and priorities will change depending on where they live and work. We will be working to ensure that the specific needs of our consumers within each of our network regions are reflected in the innovation projects that we run.

We will also seek to communicate our innovation work with our consumers, minimising any disruption they may cause. Where consumers are directly involved in innovation projects we will ensure we are transparent, open and accessible in all our communications.

A cornerstone of all our innovation activity is exploring new and more efficient ways of working to support all our consumers in two key ways:

- Financially benefit our consumers by reducing energy costs.
- Ensure equity and fairness for our consumers as we transition to Net Zero.

Innovation projects can deliver a wide range of benefits to our consumers

- A more reliable energy supply
- Inclusive engagement
- Wider socio-economic benefits
- Accelerated decarbonisation
- Efficiency improvements
- Positive impact on our employees
- Safer and more secure energy networks
- Reduced environmental impact

Putting consumers at the heart of innovation

With all our innovation activities we seek to put consumers at the heart of our decisions, and we understand that their needs change dynamically.

Working collaboratively with all the network companies, Wales and West Utilities have recently developed the Consumer Vulnerability Impact Assessment Tool. This easy-to-use tool will be employed by all network companies to evaluate the potential impact that innovation projects may have on consumers in vulnerable situations.

By including this analysis in the early stages of each innovation project, we can more easily identify how to maximise the potential benefits of an innovation project for our consumers whilst mitigating any adverse impacts. This will enable us to deliver better outcomes for consumers in vulnerable situations in the transition to Net Zero.

Principle
Data and knowledge sharing

Data and knowledge should be shared with stakeholders in a transparent and accessible way.

All innovation projects, whether successful or not, can provide valuable learning to increase the chance of success for future projects through effective knowledge sharing.

We are committed to ensuring that learning and insights from innovation projects should be 'presumed open', and network companies have developed Digitalisation Strategies and Action Plans to set out the process for digitalising and sharing their network data.

The Energy Data Taskforce sets out three key data principles which are all applicable to network innovation projects:

- Data should be discoverable, searchable and understandable.
- Data should adhere to standard structures and interfaces.
- Data should be secure and resilient.

The network companies have also collaborated to develop the **National Energy Systems Map**. This proof-of-concept, in-depth digital energy system map of the UK will demonstrate the power of data to support a more efficient pathway to Net Zero.

You can find information about all network innovation projects on the **Smarter Networks Portal** including the outputs of a project when it has concluded.

All network innovation projects should, where possible, make the following information available and accessible:

- Key project outcomes and learning.
- An overview of the key outputs and results.
- Project datasets, data tables and supporting information (such as method statements, registers or process diagrams).
- Key information that may be of use to future innovation projects.

You can also contact the networks directly about specific projects; contact details for each project are provided on the Smarter Networks Portal.

Project dissemination events are held by the networks and ENA throughout the year, including the annual **Energy Networks Innovation Conference**.

Annual innovation project progress reports and project closedown reports are on the **Smarter Networks Portal**

ENA publishes the links to each **networks' annual innovation report**

ENA holds regular Energy Innovation Forums

More information on the **Energy Networks Innovation Conference**

Principle
Implementation and deployment

Viable initiatives should be implemented and deployed into business-as-usual.

Innovation is about developing, testing and trialling new ideas and approaches. The ultimate objective of any innovation project is to be successfully deployed into business-as-usual. This is when the benefits will start to be realised and value for consumers maximised.

Of course, some innovation projects will not get this far but will still be able to provide valuable learning that will make future innovation projects more likely to succeed.

Some innovations will develop over several stages to ensure they are effective in solving the challenges they aim to address. In the demonstration and trial phases of an innovation project the aim is to ensure the network is safe and secure, the innovative solution delivered has been thoroughly tested for cost effectiveness and value for consumers and that all alternatives have been considered.

We are committed to implementing and deploying proven innovations as quickly and cost effectively as possible:

- We build robust requirement specifications with the teams who will lead the deployment into business-as-usual to ensure technologies are relevant, effective and safe.

- We involve key staff in the innovation process before transitioning to business-as-usual to lead the adoption of new approaches.

- We have created specific roles or teams to prepare for and facilitate future change.

- We ensure that engineering and regulatory standards, industry codes and policies are updated (or created) as a result of innovation projects.

- We collaborate between network companies to facilitate the deployment of solutions at scale.

- We always consider the cost of deployment into business-as-usual within our benefits calculations to ensure value for energy consumers.

Innovation Measurement Framework (IMF)

In the RIIO-2 price control, we will use the IMF to report on innovation outcomes, including collaboration and partnerships, the speed at which successful innovation is transitioned into business-as-usual for network customers and the benefits delivered.

We use consistent methodologies to estimate the net benefits that are delivered by our innovation projects. ENA has published the NIA Project Benefits Guide which uses pre-determined values from government publications to provide graded ranges of non-financial benefits.

ENA facilitates the data gathering from each network and the expected and delivered benefits of each innovation project are calculated using the IMF. From 2022, this information will be published annually for our NIA portfolio. As a holistic tool, the IMF has the potential to be adapted for collective reporting across all our future innovation activities.

Innovation culture

Network companies should embrace an innovation culture throughout their businesses to better enable them to deliver transformative change.

An innovation culture is one where people working across the network companies feel empowered to think creatively and explore new ideas to drive value for all our consumers through improved products, services or processes.

All network companies are committed to developing a culture of innovation that is tailored to each network company. Some of the ways we are doing this include:

- **Raising and maintaining the profile of innovation across our organisations.** By showcasing the variety of our innovation activities and the benefits these have brought to our consumers, we want to encourage our people to think about solving challenges in a collaborative, agile and innovative way. We will encourage people from across all areas of the network companies to get involved by holding events such as hackathons, collaboration days and innovation think-tanks.

- **Driving stronger links between the network companies, including through our innovation teams and other areas of our organisations.** In many cases, innovation projects are already led by dedicated leads from across the networks to encourage a smooth and successful transition into business-as-usual.

- **Building innovation into personal objectives across all areas and levels of our organisations,** including those of our senior leadership teams. Where appropriate, innovation projects will be sponsored by a senior member who can provide support to the delivery team and help to ensure its success by mitigating risks and roadblocks.

Embracing an environment where innovative thinking is encouraged will enable greater creativity to accelerate our journey to Net Zero and this is recognised by the support our stakeholders showed for the inclusion of this new principle.

*"There is no innovation and creativity without failure. Period" - **Brené Brown***

Business-as-usual involves following tried and tested processes to achieve a known, quantifiable outcome, whereas innovation is about trialling new, unproven ideas, making innovation inherently uncertain. Failure is a necessary part of innovation and can provide valuable learnings that make future projects more likely to succeed.

Ofgem and Innovate UK are adopting a 'fail fast' approach in the Strategic Innovation Fund by ensuring regular and appropriate progress reviews that will accelerate projects that can demonstrate they have met their objectives.

> The new principle [for 2022] about networks embracing innovation culture is spot on.
>
> *Stakeholder feedback*

Shared network innovation themes

Data and digitalisation

Flexibility and market evolution

Net Zero and the energy system transition

Optimised assets and practices

Supporting consumers in vulnerable situations

Whole energy system

Theme
Data and digitalisation

Developing new data services and applying data science methods to harness the power of digitalisation to solve both system operation and wider stakeholder challenges.

The shift to data-driven, digitally-enabled networks is critical as we move towards Net Zero. This new theme signifies the scope of innovation to explore new data methods and techniques.

Innovative use of data and improved data practices can deliver benefits to consumers by driving efficiencies in the way we manage and operate our networks as well as improving resilience.

As our networks become smarter, digital initiatives will play a greater role in optimising how we use and manage our networks. The future energy system will be more dynamic than ever before and it is crucial we support the adoption of new data methods, including artificial intelligence, predictive analytics, augmented and virtual reality and the internet of things.

Data quality and assurance, accessibility and cross-industry interoperability are the core foundations of all energy network data and these will become increasingly important as the networks become smarter and more data-driven.

BEIS, in its 'Digitalising our energy system for Net Zero' strategy and action plan, highlights the following benefits of a digitalised energy system:

- Decarbonising the energy system at least cost to consumers.
- Creating a fair deal for consumers.
- Stimulating economic growth across all sectors.

BEIS, Ofgem and Innovate UK launched the Energy Digitalisation Taskforce (EDiT) in 2021. Its 'Delivering a Digitalised Energy System' report recommends:

- Unlocking value of customer actions and assets.
- Delivering interoperability.
- Implementing new digital governance approach and entities.
- Adopting digital security measures.
- Enabling carbon monitoring and accounting.
- Embedding a digitalisation culture.

87%
of you agreed that this is a key theme for network innovation

" Digitalisation is key to the future. It is essential that we embrace it. "

Stakeholder feedback

Theme
Data and digitalisation

Focus areas

These are the five focus areas the near-term priorities:

- Develop new toolsets to improve and ensure the standardisation and interoperability of network data.

- Explore new approaches to develop and prioritise use cases for the data-driven networks of the future.

- Use digitalisation to support new techniques that accelerate the transformation to Net Zero.

- Explore new methods of improving and enhancing the security of all consumer data.

- Test innovative methods to develop a digitally-ready workforce.

Future Control Room
Scottish & Southern Electricity Networks, UK Power Networks
January 2021 – April 2022

Scottish & Southern Electricity Networks and UK Power Networks are working together to explore the potential use cases, user requirements and architectural design for a future control room simulator and to assess the challenges, opportunities and resulting benefits to the holistic electricity system and energy consumers. By doing this, they expect to provide new learning on the functionality of future control rooms and the changing role of our Control Room Engineers through evaluation and potential use of new analytical techniques (such as machine learning and artificial intelligence) and how these can be used to better maintain network resilience.

Satellite Infrastructure Monitoring
SGN
October 2019 – July 2020

SGN has explored whether satellite remote sensing and data analytics can support the identification of ground motion and environmental interference, such as changing river courses, along gas transmission pipeline routes. This project successfully proved that satellite data and data techniques can accurately identify changes in ground topography. This illustrates the potential for satellite surveys and new data methods to complement, and potentially replace where appropriate, the existing helicopter aerial surveillance activities to ensure the continued safety of our transmission pipelines.

Flexibility and market evolution

Developing and testing market-based solutions to increase the flexibility and efficiency of the energy system; accelerating the adoption of low carbon solutions.

We need to quickly and efficiently respond to the rapidly evolving needs of the energy system by embracing new methods of flexibility and new commercial arrangements.

BEIS and Ofgem define flexibility as "the ability to shift in time or location the consumption or generation of energy". Innovation can help us explore new flexibility offerings and market-based solutions to accelerate the adoption of low carbon solutions and a smarter network.

Effective integration and management of flexibility such as energy storage and demand side response into our **electricity networks** is becoming increasingly critical to cope with peaks in generation and demand and to reduce the need for network reinforcements. Our flexibility first approach already ensures that flexible solutions take priority over network reinforcements.

Our **gas networks** are managing a more complicated network of inputs and offtakes with greater variation in generation and use. New commercial arrangements could encourage further growth in the number of green gas projects connecting to the gas networks, such as those injecting biomethane. We will need to ensure we adapt our forecasting models and methodologies to maximise the value that these sites can bring. Our networks will also need to continue to evolve to supply alternative gases like hydrogen.

We will need to ensure we use flexible low carbon technologies and navigate the new commercial arrangements, markets and incentives that underpin them to drive the best value for our consumers.

83%

of you agreed that this is a key theme for network innovation
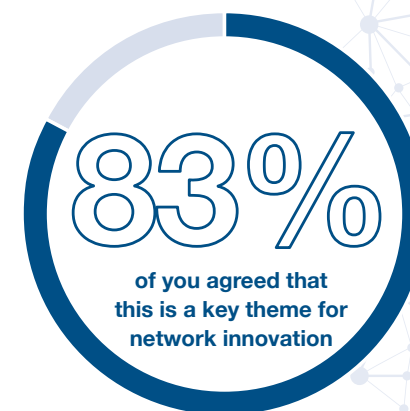
> " We very much support the increased emphasis on market-based solutions, as this will allow industry to adapt with the networks and enable new business models to provide tools for the energy transition. "
>
> *Stakeholder feedback*

Flexibility and market evolution

Focus areas

These are the five focus areas the near-term priorities:

- Simplify flexibility market structures and eliminate barriers to entry for smaller market entrants.

- Trial and implement innovative arrangements and market-based solutions to support network management, flexibility and storage solutions.

- Support all consumers to fairly participate in, and benefit from, flexibility markets.

- Identify regulatory barriers and make recommendations for reform.

- Develop commercial arrangements for connecting and supplying green hydrogen.

BiTraDER
Electricity North West
May 2022 – May 2026

BiTraDER is a multimillion-pound NIC-funded project that will explore options for introducing a bilateral flexibility trading market. The Distributed Energy Resource (or 'merit order') stack determines the order in which flexibility providers could be asked to restrict their output at times of high demand. Electricity North West will explore whether, by enabling providers to trade their position within the stack, more generators can be encouraged to provide flexibility services. Not only could this reduce the need for network reinforcements, but it could also remove some of the barriers preventing low carbon generators from connecting to our network. This could result in significant value for our consumers and substantial carbon savings.

Flexible Generation Forecasting
Wales & West Utilities, Northern Gas Networks, National Grid ESO, SP Energy Networks
September 2020 – April 2021

Gas demand has historically been fairly predictable, but with more flexible gas generation plants connecting to the network, it is becoming more challenging to accurately forecast this dynamic demand. The collaborating networks scoped, designed, built and tested a new flexible generation forecasting model that could enable improved operation of the gas networks both now and in the future. After a thorough testing programme, they found that this model could successfully forecast flexible gas generator operations and we will use it to further explore how network operations might be impacted by future renewable generation challenges and how the gas networks can support more renewable generation.

Net Zero and the energy system transition

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

The UK government has published a clear strategic direction for our transition to Net Zero by 2050 and the devolved governments of the UK have also set ambitious targets, with Scotland pursuing Net Zero by 2045. Some local and regional governments are also pursuing accelerated Net Zero timelines. This is reflected in the UK's ambition to fully decarbonise the electricity system by 2035 and we are also exploring the decarbonisation of the gas networks through the Gas Goes Green programme.

The **role of the gas network in a Net Zero future** is a key area of innovation for 2022. We want to continue to explore the role our gas networks will play as the energy system transitions by investigating, trialling, implementing and delivering safe, low carbon alternatives to natural gas.

A **Net Zero future for the electricity networks** includes supporting and managing the connection of more low and zero carbon sources of energy generation, storage and demand to both the transmission and, increasingly, the distribution networks as energy resources become more decentralised. To enable this, we will need innovative methods of effective network management and new ways of accessing flexibility which build on our efforts to improve visibility, forecasting and modelling of low carbon technologies.

We need a multi-faceted, whole-systems approach to achieve Net Zero greenhouse gas emissions and it is imperative we engage effectively with our consumers to better understand the changing way in which energy is used both domestically and commercially and how this impacts the networks. To do this, we want to work together to develop new commercial models and technical solutions that facilitate consumer choice and help us to manage the networks effectively.

Innovation can help us to meet the challenges and seize the opportunities presented by the increasing speed and scale of the rollout of low and zero carbon technologies.

97%
of you agreed that this is a key theme for network innovation

"
The work the networks do with this theme is very positive.

Stakeholder feedback

Net Zero and the energy system transition

Focus areas

These are the five focus areas the near-term priorities:

- Facilitate and support the adoption of flexibility and smart systems.

- Develop market solutions to enable the energy transition for all consumers.

- Enable the transition to low and zero carbon transport and heating for all users.

- Explore the optimal use of different energy vectors in the energy system transition.

- Support all consumers to engage in the energy system transition.

Customer Energy Village
Northern Gas Networks, Northern Powergrid
November 2021 onwards

With funding from the UK government's 'Getting Building' fund and the NIA mechanism, Northern Gas Networks and Northern Powergrid will construct residential buildings typical of different decades of construction to represent the UK's diverse building stock. They will then install and assess energy-saving technologies and engage with consumers to better understand how they can positively influence heat decarbonisation and support a fair transition for consumers. Northern Gas Networks have also secured funding through the SIF for the next stage of this project.

Future Grid
National Grid Gas Transmission
2021 onwards

National Grid Gas Transmission's £9.07m NIC-funded project will build a hydrogen test facility which will be used to trial blends of up to 100% hydrogen at transmission pressures and assess and analyse how the network assets perform. The learning gained will help us to understand how we can deliver low carbon energy reliably and safely to all consumers.

Optimise Prime
UK Power Networks, Scottish & Southern Electricity Networks
January 2019 – February 2022

Optimise Prime is the world's biggest trial of commercial EVs. Working with Royal Mail, Centrica and Uber, this project seeks to better understand the charging behaviour, flexibility and journey data of commercial vehicles. With businesses buying 58% of all new vehicles in the UK, this project will test and implement the best approaches for commercial EV rollout.

Theme
Optimised assets and practices

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

Innovation has a key role to play in ensuring our networks continue to remain reliable, safe, secure and resilient to our changing climate. Optimising our assets and practices is a critical enabler of the energy transition.

All our network assets face significant changes in the coming years both in how we manage our assets and the way consumers use them. We need to make sure we continue to invest in our infrastructure to ensure we are well placed to facilitate and respond to:

- Increasing numbers of new low and zero carbon technology connections.
- Evolving patterns in consumer demand.
- Changing security threats.
- Appropriate workforce planning to ensure technical expertise is retained within our businesses.
- Our changing climate.
- Evolving regulation and industry codes.

It is imperative that we can safely trial and implement new ways to future-proof our network assets and practices to ensure we proactively support the energy system transition and deliver value for our consumers. To do this, we need to think of new ways to improve:

- Asset health and monitoring capability.
- Physical and digital security.
- Resilience and reliability.
- The safety of our assets and our people who work with them.
- The impacts our assets have on the environment.
- Our digital tools for risk management.

Innovation can accelerate the optimisation of our assets and practices by building on the activities that we continue to undertake in this area as part of our business-as-usual portfolio.

82%
of you agreed that this is a key theme for network innovation
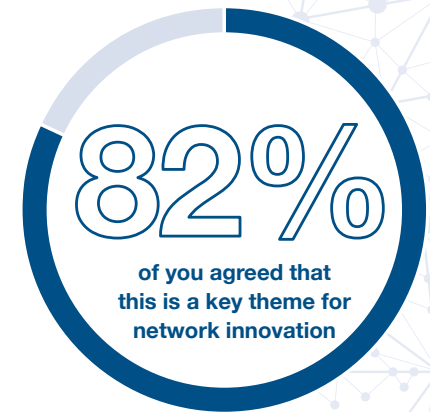
" I think that it is important to renew networks for optimising assets and improving practices.

Stakeholder feedback

Optimised assets and practices

Focus areas

These are the five focus areas the near-term priorities:

- Reduce and mitigate future unplanned outages, supply interruptions and wider disruptions.

- Minimise the impact of networks on the environment.

- Ensure the networks are resilient and adaptable to climate change.

- Test and explore innovative methods to train and upskill the workforce.

- Explore how to future-proof assets and practices.

Assessment of Wireless Technologies in a Substation Environment
National Grid Electricity Transmission
January 2019 – June 2020

National Grid Electricity Transmission is exploring the use and capabilities of wireless technologies in substation environments and developing the associated cyber threat models to better understand the impact on substation security. This project tested how our critical national infrastructure could benefit from these technologies to improve asset monitoring and maintenance activities (for example, by automatic data collecting processes) and will help us to support investment decisions to mitigate cyber threats.

Pipeline Spacers
Cadent
March 2020 – September 2022

As part of the Iron Mains Risk Reduction Programme (IMRRP), the gas networks are required to replace iron pipes within 30m of a building with hydrogen and biomethane-ready polyethylene by 2032. The current practice is for an engineer to enter the large diameter cast iron pipes to assist the process. This project is seeking to eliminate the need for this by improving the method for inserting the plastic pipe. Not only will this improve the safety of our teams, but it will also speed up the process and therefore minimise the associated consumer disruption.

SINE Post
SP Energy Networks
January 2017 – January 2021

The current method of identifying power quality issues on overhead lines is very time consuming. This project seeks to develop an expert system that can more efficiently locate faults and assess the associated maintenance requirements, enabling us to quickly respond to faults on the network and reduce costs.

Supporting consumers in vulnerable situations

Exploring how best to support the needs of consumers who find themselves in vulnerable situations, today and in the future, to enable a just transition.

Equality and fairness are the foundations of a just transition to Net Zero. As we move to a smarter system we need to better understand all types of vulnerability, and its changing nature, to ensure no one is left behind.

Energy consumers can find themselves in vulnerable situations at different times and for different reasons. Consumers in vulnerable situations are significantly less likely to be able to protect their interests in the energy market, are more likely to be disadvantaged as the energy system changes and may need more support during outages.

Increasingly, consumers who find it challenging to engage with digital technologies are much less likely to experience the benefits of the energy transition. The Centre for Sustainable Energy's '**Smart and Fair**' project explored how the transition to Net Zero can be achieved equitably and practically.

Ofgem, in its **Consumer Vulnerability Strategy 2025**, defines vulnerability as when a "consumer's personal circumstances and characteristics combine with aspects of the market to create situations where they are:

- Significantly less able than a typical domestic consumer to protect or represent their interests; and/or

- Significantly more likely than a typical domestic consumer to suffer detriment or that detriment is likely to be more substantial."

Innovation is central in exploring how we can best support all our consumers who find themselves in vulnerable situations by testing and trialling new technologies, services and best practices. For example, for the electricity Distribution Network Operators (DNOs), there will be greater opportunities to engage directly with consumers as a result of the transition to Distribution System Operators (DSOs) and innovation can help us to explore new ways of engaging effectively, accessibly and inclusively.

80%

of you agreed that this is a key theme for network innovation
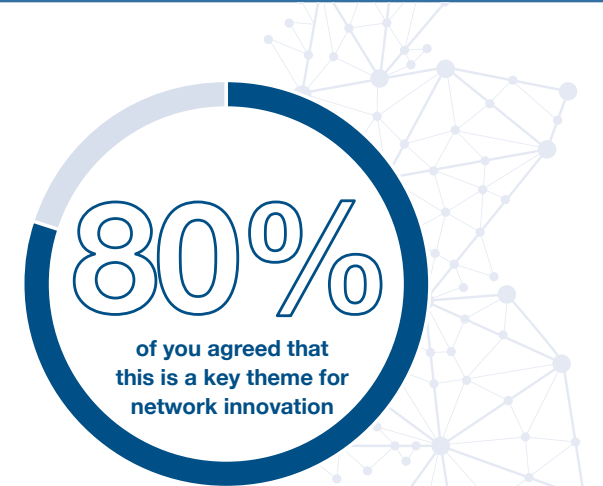
"The change in language [for 2022] is reflective of the better understanding of vulnerability. People move in and out of vulnerable situations depending on life events and the theme reflects that this is not a static pool of people.

Stakeholder feedback

Supporting consumers in vulnerable situations

Focus areas

These are the five focus areas the near-term priorities:

- Understand and support the transient and situational nature of vulnerability.

- Explore how to reduce the financial impact of Net Zero on consumers in vulnerable situations.

- Understand how network companies can support the fuel poor and improve affordability for consumers.

- Improve network engagement with consumers in vulnerable situations to build on and strengthen trusted relationships.

- Collaborate with appropriate organisations to better support consumers in vulnerable situations.

Project VENICE
Western Power Distribution
July 2021 – March 2023

Project VENICE is exploring how to better support vulnerable consumers and communities through the energy transition in three ways:
- Establishing how Net Zero is likely to impact fuel poverty and exploring new ways for vulnerable consumers to participate.
- Analysing whether smart meter data can identify vulnerability markers.
- Examining the changes in electricity use during the pandemic and how these may impact vulnerable consumers.

By examining evolving energy use patterns, including likely changes as a result of the pandemic, WPD aims to better target support and investment at the communities and households that need it the most.

Equal Electric Vehicles
Scottish & Southern Electricity Networks
October 2020 – April 2022

There are over 2.3 million disabled parking badge holders in the UK who face unique barriers that may be hindering their uptake of EVs. Disabled parking bays are often not equipped with EV charge points and bulky, trailing EV cables can be difficult to operate. Scottish & Southern Electricity Networks is working with Connected Kerb, an EV infrastructure provider, and disabled motorist groups to explore the barriers preventing disabled motorists and those in vulnerable situations from adopting EVs. This is also an opportunity to understand how energy consumers could find themselves in vulnerable situations if they are unable to use their EV due to supply outages and the additional support these consumers may need.

Whole energy system

Develop joined-up approaches across sectors and energy vectors.

Ofgem and UKRI define a whole energy system approach as "considering the full range of opportunities, risks and interdependencies that exist across the full energy system to integrate and optimise them in a way that best serves the consumer".

Innovation and a whole systems approach are intrinsically linked. Applying whole systems thinking, and partnering collaboratively across sectors, will drive value for our consumers by finding efficiencies in how we plan, forecast, design, construct, operate and maintain our networks. One of the ways we can do this is by improving how we share network data to leverage additional value and insights.

We will also need to continue to improve our understanding of the interactions across all the networks through joined-up forecasting and planning that recognises the changing demands and evolution of our energy networks.

The rapid decarbonisation of our energy system makes employing a whole systems approach increasingly important. For example, we will need to work more closely with cities and regional bodies to understand how we can enable their Net Zero ambitions.

Looking to and learning from other sectors will highlight innovative ideas that we can trial on our networks. For example, some innovative technologies now implemented by the gas distribution networks have their origins in the water industry.

Network companies are already working together successfully and we recognise that the more we seek to learn from each other, the more we can encourage new innovations to come forward. We would particularly like to work more closely with other sectors including:

- Industry sectors such as transport, buildings and power.
- Other utilities such as water, waste and telecommunications.
- Local energy systems, cities and regions.
- Generators and consumers.

93%

of you agreed that this is a key theme for network innovation

> "For me, this is the most critical factor; everyone working together to achieve the same common goal."
>
> *Stakeholder feedback*

Whole energy system

Focus areas

These are the five focus areas the near-term priorities:

- Explore data sharing opportunities between networks companies and with other service providers.

- Coordinate the operation of a whole energy system through collaboration.

- Join up approaches to regional network planning and forecasting.

- Develop a whole system life cycle assessment approach.

- Collaborate on enabling the growth and operation of low and zero carbon solutions.

Zero2050 South Wales

National Grid Electricity Transmission, National Grid Gas Transmission, Western Power Distribution, Wales & West Utilities
2018 - 2021

Zero2050 was a collaborative project that explored ways to accelerate the journey to Net Zero emissions for the whole energy system in the South Wales region. By undertaking extensive modelling to understand the future energy demands across different sectors, the collaborating networks explored plausible decarbonisation pathways that would meet these projections. The extensive analysis undertaken resulted in several key recommendations for practical measures to speed up the clean energy transition in the region and added to the growing national evidence base on the challenges and solutions required to achieve Net Zero by 2050.

Optimal Coordination of Active Network Management (ANM) Schemes and Balancing Services Market

National Grid ESO, Western Power Distribution
June 2020 – June 2021

As more distributed generation connects to the electricity system, collaboration between the ESO and the distribution networks will be crucial. This project identified and analysed different ANM schemes and explored methods to optimise both inter-scheme coordination and interaction with the Balancing Services Market.

CommuniHeat

UK Power Networks
October 2020 – June 2022

UK Power Networks is working with community energy group Ovesco to develop a roadmap for rural, off-gas communities to seamlessly transition to low carbon heating solutions. The learnings from this project will demonstrate how to balance the decarbonisation of off-gas communities whilst maintaining a reliable and resilient network.
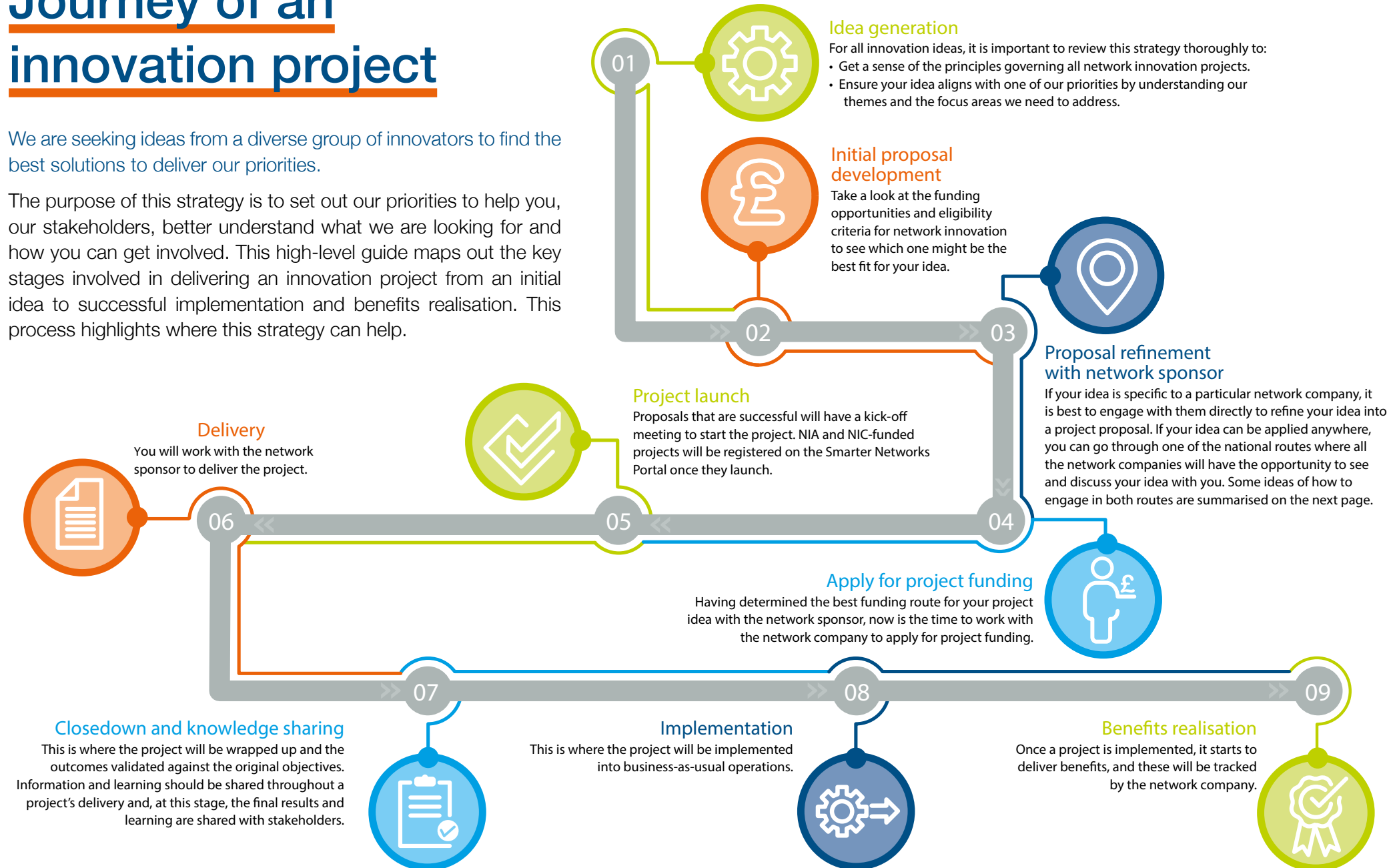
Journey of an innovation project

How to get involved

Journey of an innovation project

We are seeking ideas from a diverse group of innovators to find the best solutions to deliver our priorities.

The purpose of this strategy is to set out our priorities to help you, our stakeholders, better understand what we are looking for and how you can get involved. This high-level guide maps out the key stages involved in delivering an innovation project from an initial idea to successful implementation and benefits realisation. This process highlights where this strategy can help.

01

Idea generation
For all innovation ideas, it is important to review this strategy thoroughly to:
- Get a sense of the principles governing all network innovation projects.
- Ensure your idea aligns with one of our priorities by understanding our themes and the focus areas we need to address.

Initial proposal development
Take a look at the funding opportunities and eligibility criteria for network innovation to see which one might be the best fit for your idea.

02

03

Proposal refinement with network sponsor
If your idea is specific to a particular network company, it is best to engage with them directly to refine your idea into a project proposal. If your idea can be applied anywhere, you can go through one of the national routes where all the network companies will have the opportunity to see and discuss your idea with you. Some ideas of how to engage in both routes are summarised on the next page.

Project launch
Proposals that are successful will have a kick-off meeting to start the project. NIA and NIC-funded projects will be registered on the Smarter Networks Portal once they launch.

Delivery
You will work with the network sponsor to deliver the project.

06

05

04

Apply for project funding
Having determined the best funding route for your project idea with the network sponsor, now is the time to work with the network company to apply for project funding.

Closedown and knowledge sharing
This is where the project will be wrapped up and the outcomes validated against the original objectives. Information and learning should be shared throughout a project's delivery and, at this stage, the final results and learning are shared with stakeholders.

07

Implementation
This is where the project will be implemented into business-as-usual operations.

08

Benefits realisation
Once a project is implemented, it starts to deliver benefits, and these will be tracked by the network company.

09

How to get involved

How to...

propose, share and discuss an innovation idea:

National routes include:

- The **Smarter Networks Portal** is the window into network innovation for regulatory-funded projects where you can see details on current projects, find partners and propose ideas for all network companies to review and consider.

- The **UK Research and Innovation (UKRI)** website contains details of UKRI's key funding programmes and includes a 'funding finder' tool where you can search for current funding opportunities across UKRI, research councils and Innovate UK.

- The **Knowledge Transfer Network (KTN)** is part of **Innovate UK** and exists to connect innovators with new partners who will work with you to refine your idea and direct you to appropriate funding opportunities.

For ideas that are specific to a particular network company, you can engage with them by:

- Exploring the individual energy networks' innovation websites and social media accounts (including LinkedIn).

- Looking at the individual innovation strategies or business plans published by the network companies and reading the networks' and ENA's newsletters.

- Talking to the networks at events held throughout the year, including the annual **Energy Networks Innovation Conference**.

How to...

refine your innovation idea and develop your project proposal:

The best way to refine your proposal is to work with the network sponsor who you will be collaborating with to deliver the project.

Each network has its own innovation website (click on the logos below to follow the links) and you can often find some of the key questions you will need to answer about your idea. These questions (or criteria) can also be found in the relevant funding mechanism governance documents.

How to get involved

How to…

learn more about the key network innovation funding mechanisms and their eligibility criteria:

- The **Network Innovation Allowance (NIA) mechanism** is for research, development and demonstration projects and covers all types of innovation including commercial, technological and operation. The NIA has been available throughout RIIO-1 and will continue in RIIO-2.

- The **Network Innovation Competition (NIC)** is only available in the RIIO-1 period and is for large-scale projects which can specifically deliver carbon or environmental benefits.

- The **Strategic Innovation Fund (SIF)** is the replacement for the NIC in RIIO-2 and will support network innovation that contributes to the achievement of Net Zero, while delivering net benefits to energy consumers.

- The network companies can also use their own funds to transition an innovation project into **business-as-usual** or to explore new efficiency methods to drive continuous improvements. If you think your idea might suit this type of funding, it is best to engage directly with the network.

More about the SIF

Sign up for SIF updates

Watch short summaries of the SIF projects launched in March 2022

> The SIF aims to find, fund and nurture ambitious ideas in stages, with the strongest proposals progressing to large-scale projects. The first call, which launched in March 2022, resulted in 40 collaborative early-stage projects, involving a wide range of partners. We look forward to discussing your ideas through further annual challenge-led competitions.
>
> *Innovate UK, March 2022*

How to…

apply for funding:

Once you have agreed an idea to take forward with your network sponsor, they will help you apply for the appropriate funding.

The eligibility criteria and application questions for each of the key network funding mechanisms are included in the governance documents, linked opposite.

The **Energy Networks Innovation Process (ENIP) Overview and Governance Document**, published by ENA, is a valuable resource which delves into all of these points in much greater detail.

It explains how innovation projects are delivered, how third parties can get involved and contains the full details of the end-to-end industry led process for reporting, collaboration and dissemination of regulatory funded innovation projects.

We will review and update this strategy again in 2024.

Your feedback will be key to ensuring that the updates to the principles, themes and focus areas are the right ones and we will continue to engage with you to seek your views.

If you have any questions or would like to discuss this strategy in more detail, please get in touch: **smarter@energynetworks.org**
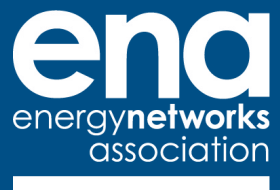
Energy Networks Association
4 More London Riverside
London SE1 2AU

Tel +44 (0)20 7706 5100
www.energynetworks.org

@EnergyNetworks

Energy Networks Association

© ENA 2022

The voice of the networks