Electricity Transmission

Enter

Innovation Strategy 2023

nationalgrid

Welcome to our interactive National Grid Electricity Transmission Innovation Strategy 2023

Look out for this symbol for interactive content throughout the document. If you experience any difficulty viewing the interactivity click here for the online version.

Contents

Welcome to our Innovation Strategy 2023

This document sets out our refreshed innovation strategy, following our previous publication in 2020 as part of our RIIO-2 engagement activities.

Over the last few years we have seen an increasing and more urgent need to decarbonise across the whole energy economy to ensure it remains secure, affordable and sustainable for future generations. In the UK, commitments made include those at COP26 in 2021 and in the British Energy Security Strategy published in 2022, in response to the war in Ukraine. These represent a step-change in the UK Government's ambitions to drive forward decarbonisation of the electricity sector in particular.

As a result of these developments, we felt that it was the right time to evolve our strategy. We want to make sure it's aligned to the transformational shifts we're making across the sector to deliver on our decarbonisation ambitions, while also ensuring that we achieve a fair and affordable transition that works for all.

Despite the change we have seen over the last two years, the major driver for change within our industry remains the same – we must reach net zero carbon emissions across Great Britain by 2050. However, the interim milestones and plans to reach this goal are more ambitious than ever. The technology landscape continues to evolve as the entire energy system seeks to decarbonise and we look for new and innovative ways to deliver on our commitments.

We need to make use of new and innovative technologies in NGET and understand how we effectively interface new customer technologies across the transmission system. This is critical to ensure we can deliver a safe, reliable, resilient and affordable service for GB consumers.

Responding to your feedback

We're also updating our strategy in response to your feedback. You've told us we need to be even clearer about the specific engineering challenges that we need your help to address, so that we can work more effectively with you to bring forward innovative solutions. You want us to share our specific technical priorities over the next couple of years and how these relate to the strategy. This is what we've sought to do in this document, and we'd welcome your feedback on this.

Many of our stakeholders were also part of developing the Energy Networks Association's innovation strategy that was published earlier this year, and we wanted to make sure we're aligned to this as much as possible in our updated strategy. Our refreshed strategy isn't a significant change to our approach – we've been, and continue to be, focused on how we deliver the net zero transition in a fair and affordable way. However, we know we can be more ambitious, clearer, and more specific in our aims to enable you to work more effectively with us to drive innovation into our network.

The next decade is critical in preparing Great Britain for success – as is innovation in delivering the net zero transition.

In NGET we cannot deliver the network required without it, and this is reflected in the strategic priorities of our organisation. But we also know we cannot deliver it on our own, and we hope our revised strategy will enable us to work more effectively with new and existing partners to deliver the transition that's so critical to all of us.

"We want to work collaboratively with both new and existing partners to realise our innovation ambition in NGET, and to ultimately support the decarbonisation of the energy sector in the UK. We have published our updated innovation strategy to help us do that and we welcome your feedback."

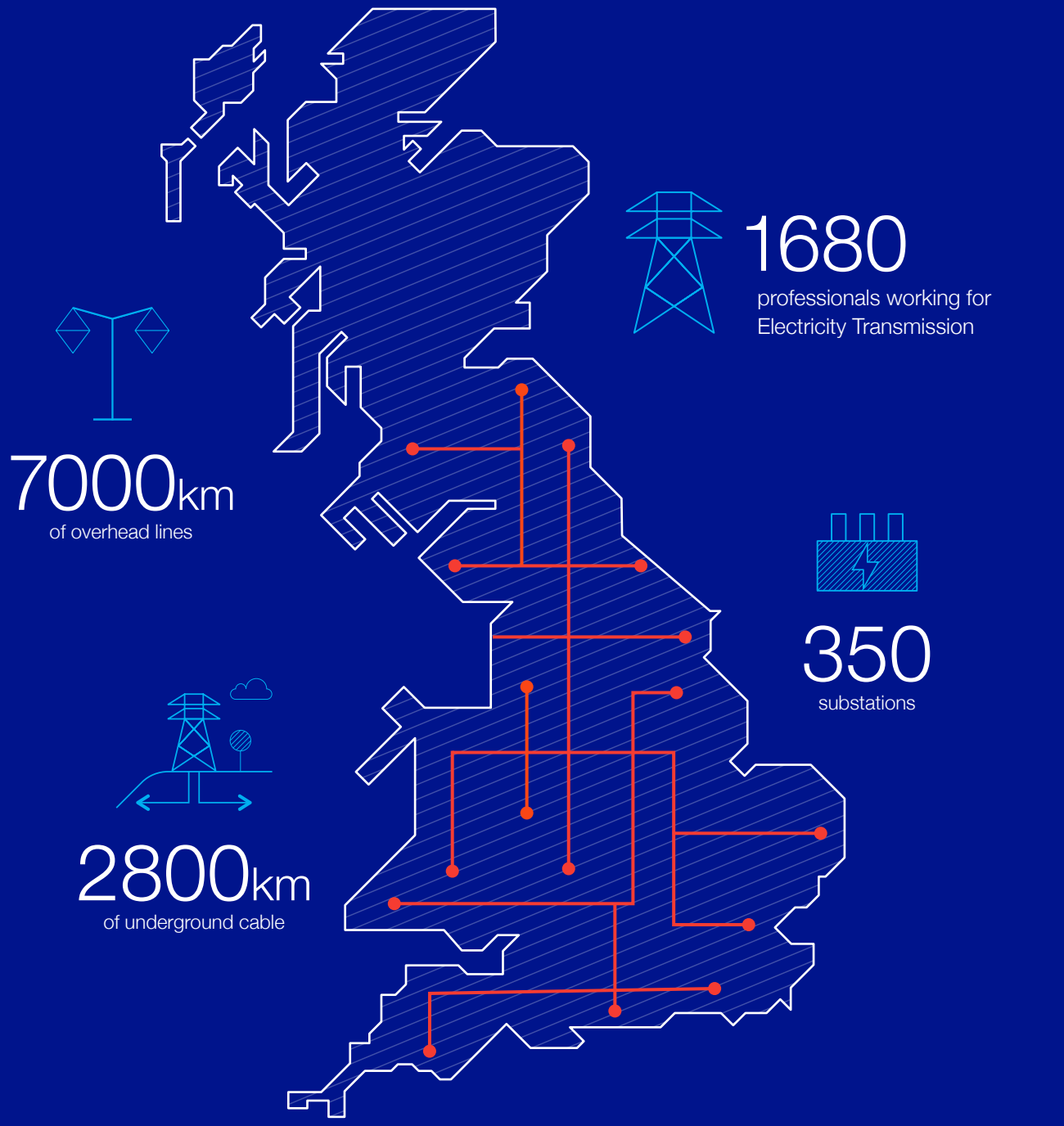
Nicola Todd
Head of Strategy and Innovation

Who we are and what we do

National Grid Electricity Transmission (NGET) owns and maintains the high-voltage electricity transmission network in England and Wales. Every time a phone is plugged in, or a switch is turned on, we've played a part, connecting you to the electricity you need.

We take electricity generated across England and Wales, including from windfarms and nuclear power stations, and transport it through our network, consisting of more than 7000 kilometres of overhead line, 2800 kilometres of underground cable and 350 substations, on to the distribution system, so it reaches homes and businesses.

We're investing in the network, connecting more and more low-carbon electricity – it's a crucial role and pivotal in turning the UK's net zero ambitions into reality.



Our purpose, vision and values

Please roll-over each section to see more detail on the purpose, vision and values shared by National Grid and NGET.

Our purpose

Bring energy to life

Our vision

To be at the heart of a clean, fair and affordable energy future

Our strategic priorities

- Enable the energy transition for all
- Deliver efficiently for our customer
- Grow our organisational capability
- Empower our people for great performance

Our values

- Do the right thing
- Find a better way
- Make it happen

Our innovation ambition

On page 5 we described how National Grid's vision is to be at the heart of a clean, fair and affordable energy future.

We know that the transition to net zero means we have to innovate; we cannot do things the way we always have. Therefore our ambition is that NGET will be the most innovative and pioneering energy network company in the world, with innovative mindsets and capabilities part of our DNA.

We will work in collaboration with new and existing partners to deploy and scale transformational technologies and asset management approaches at pace.

Engineering outcomes we need to deliver

Our innovation strategy is designed to help us enable the transition to net zero for society and become a responsible net zero organisation. To achieve this, we need to address a number of outcomes, which we've set out below.

Enabling the net zero transition for society

To enable the net zero transition for society, we'll need to deliver the following engineering outcomes:

1. Maximise the use of our current network capacity.

We seek to minimise the need for new network capacity by ensuring we use the existing network as effectively as possible. This reduces overall network costs.

2. Accelerating connections for our customers.

The evolving and growing customer landscape is driving a need for faster connections to the transmission system, and this is critical to supporting GB's broader decarbonisation ambitions.

3. Effectively interface and integrate new transmission and customer equipment across the network.

This is about making sure the long-term operability of the transmission network remains safe and secure as it becomes more complex.

4. Maintain the health of an ageing asset base efficiently and economically.

We must continue to deliver power to consumers – efficiently and economically – as we provide a critical service to the country. This will become even more important as we transition to net zero and consumers become more reliant on electricity.

5. Facilitate system access for all work as demand grows.

We need to maximise work delivery by reducing the requirement for outages and optimising how we use the time we have available to do work – ultimately increasing network availability and helping to reduce network operation ('constraint') costs.

6. Understand the role of whole energy system solutions and their impact on the transmission system.

The whole energy economy is becoming more closely integrated. Understanding key interactions between sectors, and how these will impact the transmission system, allows us to develop whole system solutions that drive down overall costs for consumers.

7. Deliver significant new onshore and offshore network capacity while minimising impact on communities and the environment.

The net zero transition is driving significant growth in the transmission network. We need to move at pace while minimising the impact of that network on the communities that we serve.

Become a responsible, net zero organisation

If we're to become a responsible, net zero organisation, we need to deliver the following engineering outcomes:

8. Reduce the emissions associated with our SF_6 inventory to achieve net zero by 2050, as well as interim reduction targets.

We need to do our part to minimise our direct impact on the climate, in line with our Responsible Business Charter commitments, while seeking to minimise the cost of doing so.

9. Reduce the emissions of construction activity, moving to net zero by 2026.

We must find ways to minimise the need for materials and limit the climate impact of those we need to use, in line with our Responsible Business Charter commitments.

10. Ensuring we can maintain resilience against a more challenging external threat landscape, both from natural climate events and cyber events.

We need to provide a safe and reliable transmission network that enables the stable delivery of electricity to consumers.

Our short-term technical priorities

We recognise that the engineering outcomes outlined are broad areas for consideration. For each of these we have identified a number of specific tactical priorities that we need your support with over the next few years.

Enabling the net zero transition for society

Enduring challenge	Tactical priority (where we need your help)
1. Maximise the use of our current network capacity.	• Increase useful capacity of existing substation and overhead line assets. • Enable significant uprating of existing transmission routes.
2. Accelerating connections for our customers.	• Developing new design solutions to enable more standardised and modular approaches to customer connections.
3. Effectively interface and integrate new transmission and customer equipment across the network.	• Understand and optimise power controller interaction. • Understand and manage a low fault-level, low inertia transmission system.
4. Maintain the health of an ageing asset base efficiently and economically.	• Improve understanding of the condition of our assets and failure modes.
5. Facilitate system access for all work as demand grows.	• Develop enhanced asset management practices, such as non-intrusive condition monitoring. • Develop technology to enhance understanding of real-time system performance.
6. Understand the role of whole energy system solutions and their impact on the transmission system.	• Digitise processes for design, development, construction, maintenance and operation of the network. • Improve approach to evaluating the societal impact of NGET activities. • Develop and understand capabilities of whole energy system modelling.
7. Deliver significant new onshore and offshore network capacity while minimising impact on communities and the environment.	• Increased capacity/lower cost onshore transmission routes. • Explore ultra-high voltage technology for use on the onshore network. • Develop offshore HVDC technologies and our modelling capability for those technologies

Become a responsible, net zero organisation

Enduring challenge	Tactical priority (where we need your help)
8. Reduce the emissions associated with our SF6 inventory to achieve net zero by 2050, as well as interim reduction targets.	• SF_6 alternatives, retro-filling assets with new gases. • Leak detection and repair. • Lifecycle management.
9. Reduce the emissions of construction activity, moving to net zero by 2026.	• Low-carbon materials for construction.
10. Ensure we can maintain resilience against a more challenging external threat landscape, both from natural climate events and cyber events.	• OT (operational technology) cyber security: automated detection and management. • Understand and develop mitigation measures for network and asset resilience in the face of climate change.

Our process for innovation

The diagram shown here is a simplified overview of the process we use for innovation. It is a broad approach but some elements, for example Project Registration and dissemination requirements, are NIA-specific.

Innovation is incremental, iterative and builds on earlier projects. It also builds on what we learn within projects as they progress.

The process includes seeking feedback – both during projects and between them. This is essential for sharing learning and informs decision-making on whether to implement solutions.

How we'll achieve our innovation ambition

There are a number of critical enablers that will help us achieve our innovation ambition. These enablers are:

- Shifting our innovation culture
- Working in partnership with others
- Improving the transition of innovation projects into BAU, including how we use the Deeside Centre for Innovation to support innovation deployment and acceleration.

Culture

We're continuing to develop an innovative approach across all our organisational disciplines, while building capability and unlocking our people's potential.

Our innovation culture cannot be isolated from the overall culture of our organisation, so the link between innovation and our overarching cultural transformation requirements is key.

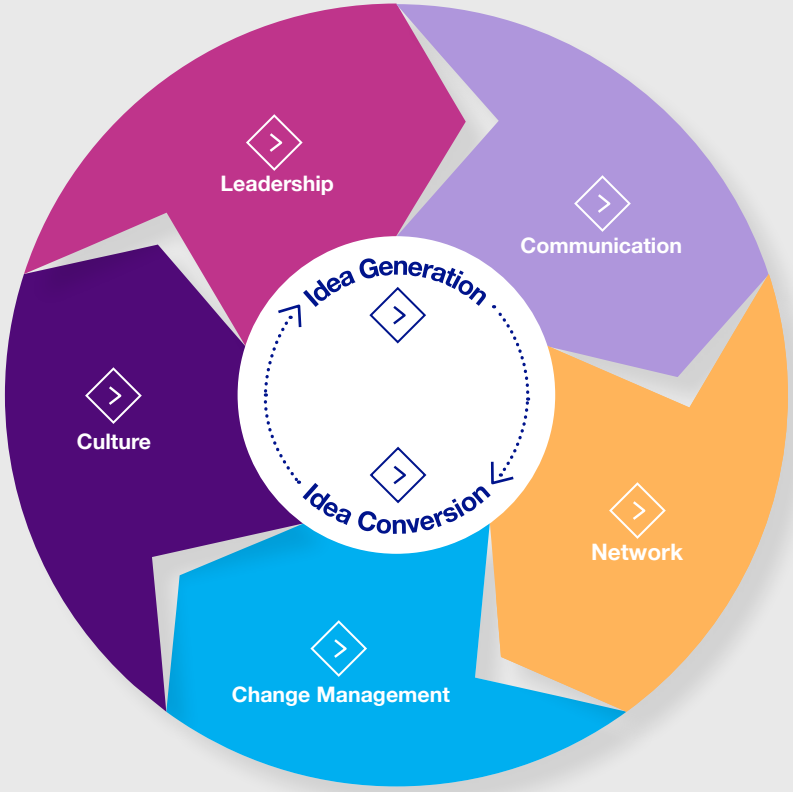
We are in the in the process in NGET of updating our view of our transformation themes and future capability requirements that will set the direction for our cultural transformation internally over the coming years. This will enable us to carry out a gap analysis and determine the work we need to do to shape the innovation element of our culture.

We'll use this alongside internal and external feedback to formulate a new cultural roadmap for NGET to help us achieve our innovation ambition. At the same time, we're undertaking 'no regrets' activities to help drive our culture around innovation further forward:

- We've completed our strategic capability project, developing learning pathways for all employees to improve their digital and data acumen – this includes elements that are critical to innovative working, such as how to work in a more agile way.
- We've completed our 'ET Ignite' programme, which has brought together business subject matter experts (SMEs) to develop their capability for innovation and design thinking. They can then further develop these approaches in the business.
- We're currently working with Ofgem, UK Research and Innovation (UKRI) and other network companies on a broader project to look further at innovation culture in networks. This will help us better learn from others inside and outside the industry. It will also help us develop plans for our future innovation culture.

Culture survey

To check whether we're making the progress we need for our innovation culture, we'll continue to conduct an annual innovation culture survey. The survey will measure:



Working with others

Collaboration is the key ingredient in innovation; now more than ever is the time for the energy industry to work together to innovate for net zero.

Sharing and being open to new ideas from across industries and academia allows us to develop projects to transform energy systems and bring the greatest possible benefits to our customers, stakeholders and end consumers.

As we decarbonise as a country, the whole energy economy is becoming more closely connected. For example, as we decarbonise transport and heat, there are inevitable interactions with the electricity and gas networks. Success will require companies across the energy economy to work closely together, focusing on whole system approaches and finding the right solutions for consumers.

Clearly articulating our challenges and the outcomes we need to achieve

On page 8 we've set out the technical priorities for our innovation work. By clearly articulating where we need help to meet our challenges, we hope to encourage a wide range of innovators to engage with us. This includes organisations and businesses who may be less familiar with the energy industry, but who have developed solutions to similar challenges within their own sector.

Our approach to working with others

Our approach will include the following engagement activities and collaboration:

- An annual programme of stakeholder engagement events, both virtual and in person.
- Industry partnerships with organisations, which currently include the Energy Innovation Centre (EIC), Energy Networks Association (ENA) and the Infrastructure Industry Innovation Partnership (i3P). These enable us to learn, share best practice and find opportunities for collaboration.
- University partnerships to facilitate closer working on innovation projects, focusing in particular on those that are part of our innovation framework for T2.
- Calls for innovation, where we invite businesses to help find solutions to a specific technical challenge we're facing. These may be directly from National Grid or through third-party organisations.
- Collaborative research, such as our support for the Electric Power Research Institute's Climate READi framework.
- Collaborative innovation projects, such as our NIA-funded work.

How to work with us

We're always on the lookout for new ideas and opportunities to partner on innovation projects. If you'd like to find out more about the way our innovation process works, the NGET Innovation team will be happy to speak to you and share details of our innovation portfolio.

See 'meet the team' on page 16 for details.

You can also contact us via:

- Our website
- Our LinkedIn page
- Email: box.NG.ETInnovation@nationalgrid.com

Implementation of innovation into business as usual (BAU)

As we've described on page 5, innovation is linked to our strategic priorities. This means that we'll have a focus on innovation as an organisation from the top down.

Our Deeside Centre for Innovation will have an important role to play in helping us deliver our innovation strategy. It will enable us and all GB network licensees to test assets associated with electricity networks, and trial new technologies and methods to address climate change and maintain security of supply – while optimising investments in a controlled, off-grid environment, 24 hours a day, seven days a week.

The centre will also collect valuable data by monitoring performance of assets on site. The facility will underpin the effort we, along with energy industry stakeholders, are investing in innovation and will play an essential role in delivering innovations in RIIO-2 and beyond.

As a commercial test facility, our partners can also use Deeside Centre for Innovation to support their own technology development. Additionally, we can use the Centre for training. This is part of the way we're evolving our innovation culture.

We also recognise that there is more that we can do internally to better drive innovative solutions into BAU. We will ensure our innovation team work more closely with our teams to ensure we can co-create solutions – breaking down the silos that can sometimes exist between our central innovation team and delivery teams.

We'll continue developing our thinking around the 'value' proposition of innovation (see page 10), making sure it aligns to delivering business outcomes and supports the flow of innovation into reality. This will build on the cost-benefit analysis work that we do, so we can fully understand and articulate the benefits for the teams involved. This is critical to ensuring innovation is implemented successfully and will help us create a 'pull' for innovation across our organisation.

Developing our innovation culture has a critical role to play in achieving this. So, we'll build on our cultural change programme to find opportunities to accelerate the growth of our innovation culture.

How we'll measure success

All the projects we undertake must be aligned to the engineering outcomes and tactical focus areas that we've set out in this strategy. Beyond this, we must then understand the value proposition that each project presents.

Value within our portfolio will cover a broader range of benefits other than financial savings that relate directly to NGET's investment processes. It's critical that we consider a much broader definition of value, so we can make sure we make the right decisions for consumers and society. Some of these value areas are quantifiable and some are qualitative.

We'll conduct a cost-benefit analysis (CBA) on all our innovation projects beyond a certain maturity level, so we can measure its impact. Quantifiable areas that we include to make sure this is a holistic assessment are:

- constraint cost savings (the cost of operating the network)
- emissions impacts
- reducing the cost of maintenance or investment in the network.

We'll also consider the qualitative impact of our innovation work. Initially this work will involve how our innovation projects improve safety and their socio-economic impact. We'll continue to evolve our thinking and processes to broaden our understanding of value created by our different innovation projects.

As we're early in the RIIO-T2 regulatory cycle, we've been focused on the benefits pipeline we're creating, working to better understand the holistic benefit of our innovation portfolio. By 2024, we'll have a more evolved approach to measuring benefits implementation as we start to see our innovation projects move into business as usual (BAU).

Appendix

How our projects are funded during RIIO-2

We receive funding for our innovation portfolio from two main sources – the Network Innovation Allowance (NIA) and Strategic Innovation Funding (SIF).

NIA

Ofgem's NIA provides an allowance to network licensees to fund research, development and demonstration trials that meet six specific eligibility requirements.

Each must:

1. Facilitate energy system transition and/or benefit consumers in vulnerable situations
2. Have the potential to deliver a net benefit to consumers
3. Involve research, development or demonstration
4. Develop new learning
5. Be innovative
6. Not lead to unnecessary duplication.

There's no maximum or minimum spend criteria for projects, and each should carry a risk profile.

Network licensees need to demonstrate why they cannot fund such a project as part of their BAU activities.

During RIIO-2, we'll receive £49.3m of NIA funding – a 35% increase over the first RIIO regulatory period. This funding covers 90% of the cost of our projects; the remaining 10% comes from NGET. During the five-year RIIO-2 period, we will have £54.2m to spend on our NIA projects.

SIF

For RIIO-2, Ofgem replaced its Network Innovation Competition (NIC) framework with Strategic Innovation Funding (SIF), with £450m available for GB networks over the five-year regulatory period.

Network companies must comply with the SIF Governance Document, and their applications for funding should respond to the innovation challenges published by Ofgem. Each of these challenge descriptions defines the problem, success criteria, funding available and any other requirements.

Meet the team

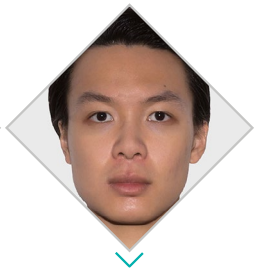
We're always on the look out for new ideas and opportunities to partner on innovation projects. If you'd like to find out more about the way our innovation process works, the NGET Innovation team would be happy to speak to you and share details of our innovation portfolio.

Net Zero Innovation team

Nicola Todd
Head of Strategy and Innovation

Gary Stockdale
Net Zero Innovation Manager

Xiaolin Ding
Senior Innovation Engineer



Siyu Gao
Innovation Engineer

Kerri Hayes
Innovation Support

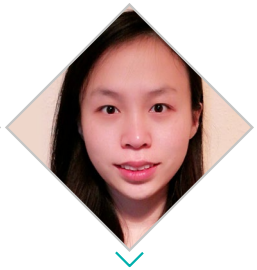
Gemma Pead
Innovation Stakeholder Lead

Amrit Sehmbi
Regulatory Innovation Lead

Gordon Wilson
Senior Innovation Engineer

Ibukunolu Oladunjoye
Innovation Engineer

Tinashe Edward Chikohora
Innovation Engineer



Wangwei Kong
Innovation Engineer

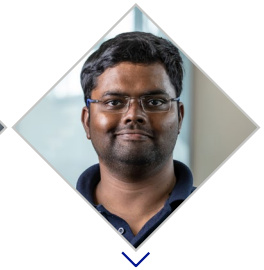
Muhammad Shaban
Associate Innovation Engineer

Deeside team

Sean Coleman
Deeside Centre for Innovation Manager

James (Jimmy) Deas
Senior Innovation Engineer

Ibrahim Iddrissu
Lead Test Engineer



Prem Ranjan
Test Engineer

Hadassah Clough
Innovation Contract Lead

Contact us

We'd really like to hear from you – our communities, consumers, customers, employees, investors and stakeholders. We want to make sure we're focusing on the right areas and delivering the right results.

Email
box.NG.ETInnovation@nationalgrid.com

LinkedIn
Innovation at National Grid

Web
nationalgridet.com

National Grid plc
National Grid House
Warwick Technology Park
Gallows Hill
Warwick CV34 6DA
United Kingdom
Registered in England and Wales No. 4031152

nationalgridet.com

April 2023. P4284/44