Electricity
Transmission

Innovation
Annual Summary 2019/2020

nationalgrid

Contents

About us

National Grid Electricity Transmission (NGET) owns and maintains the high-voltage electricity transmission network in England and Wales. That includes 7,212 kilometres of overhead line, about 2,239 kilometres of underground cable and 346 substations.

We move electricity from where it's generated, down the 'motorway' of the electricity system, to our direct customers and to the distribution companies who deliver that power to homes and businesses.

We play a vital role in connecting millions of people to the energy they use, safely, reliably and efficiently. Through transformational engineering, we are helping our country to achieve its green targets, by ensuring our network gives fair access to cleaner sources of energy.

The transition to a low-carbon economy is one of the defining issues of the 21st century, and we can't make a bigger difference in today's, or tomorrow's, world than to create a road to net zero.

Welcome to our innovation annual summary 2019/2020

“We’re working hard to influence and deliver the transition to clean energy. We firmly believe that the key to success lies in innovation. Innovation which will help create a net zero future.”

The transition to a low carbon economy is one of the defining issues of the 21st century.

At National Grid Electricity Transmission (NGET), we know that society is growing ever more dependent on technology and is looking to us to provide reliable and affordable supplies of sustainable electricity. That’s why we’re focused on innovating today to create the energy systems needed tomorrow.

We’re working hard to influence and deliver the transition to clean energy. We firmly believe that the key to success lies in innovation. Innovation which will help create a net zero future.

But we know that we can’t do this alone. As Director of NGET, I continue to spend much of my time engaging with a broad range of customers and stakeholders, sharing our ambitions and learning about theirs. More than ever before, we are seeing the benefits of collaboration and engagement across our supply chain. During my conversations with small and medium-sized enterprises (SMEs) I’ve heard that we need to be easier to collaborate with. We’ve listened and we’ve made this a key area of focus for NGET over recent months.

So how are we developing the electricity transmission network in England and Wales? Throughout 2019/20, we’ve continued to develop new ideas and progress innovation projects to support the decarbonisation of transport, heat and industry (you can read more about this on page 29 in the Zero2050 case study). We are also working on a number of solutions to decarbonise our own operations (see the SF_6 case study on page 27) and improve the efficiency and safety of our network.

Our ongoing engagement with stakeholders has remained at the heart of our progress and has been instrumental to developing our innovation strategy for RIIO-2 (see page 15). This strategy provides two areas of focus: delivering cleaner, and cheaper, energy. We know that these will only be achieved by underpinning all that we do in NGET with a culture of innovation, and we work hard to learn from others as we continue on this journey in order to further improve how we meet our stakeholders’ needs.

As a key enabler for future innovation we have continued the delivery of our Deeside Centre for Innovation and I’m delighted that we have made significant progress throughout the year. The centre will provide a focal point for the development of the technology that is needed across the energy industry to deliver net zero, and we will carry on researching technologies that increase our cyber security and further digitise our grid infrastructure. The Deeside Centre provides a unique and exciting opportunity to accelerate the energy transformation. You can read more on page 11 (Deeside).

Achieving net zero by 2050 is a necessity if we want to protect our planet for future generations. So too is ensuring that we find affordable energy solutions for everyone. By placing innovation at the heart of NGET, it will continue to revolutionise how we approach the challenges we face, create greater network efficiency and transform the way stakeholders connect with, and use, the transmission network in the years ahead to deliver a better future for all.

David Wright
Director of Electricity Transmission
Group Chief Electricity Engineer,
National Grid Electricity Transmission

A successful year and looking ahead to the future

Over the past year NGET has seen a strong focus on innovation, putting it right at the heart of everything we do. We've consolidated learnings from the RIIO-T1 price control period to deliver a wide range of future focused innovation projects. In preparation for RIIO-2 we've set out a clear vision for where we want to take innovation aiming for long-term benefits to consumers and decarbonising the industry and society.

"We have a clear vision for where we want to take innovation in the coming decade. We're taking positive steps forward all the time, and by continuing to increase engagement with innovators and thought leaders from across the business, the wider industry and beyond, we'll make sure we're offering solutions fit for the UK's future energy needs."

Paul Gallagher
Head of Innovation,
National Grid Electricity Transmission

A successful year... continued

Our innovation highlights for the year 2019/20 include:

Publication of the Electricity Transmission innovation strategy

Our innovation strategy is responsive to our stakeholders and ultimately the end customer. By expanding our culture of innovation, we'll further deliver an affordable network that is safe, reliable and resilient, and play a critical role in decarbonising the UK economy.

Collaboration with the Energy Networks Association (ENA)

We've worked closely with the ENA on a variety of innovation-related areas, and contributed to the Electricity Network Innovation Strategy, which focuses on transforming the energy system for a zero carbon future.

Innovation awards recognition

We've been nominated for a range of awards, making the shortlists on two external awards for our innovative textured insulators (these are designed to extend the lifetime of composite insulators by using a textured surface). And our application of the Novel Transformer Dehydration Using Membranes won an Electric Power Research Institute (EPRI) Technology Transfer Award recognising the work we've done to move EPRI research into practice.

Continuing to deliver innovative projects

Throughout the year we have created 16 new Network Innovation Allowance (NIA) funded projects, finding innovative solutions across diverse areas to deliver better outcomes for customers.

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Our innovation strategy is responsive to our stakeholders and ultimately the end customer. By expanding our culture of innovation, we'll further deliver an affordable network that is safe, reliable and resilient, and play a critical role in decarbonising the UK economy.

To find out more, click on **underlined text** above.
Click here to watch the **Innovation Strategy Film** or scan the QR code.

A successful year... continued

Encouraging work with small and medium-sized enterprises (SMEs)

We've continued to build partnerships with parties that allow us to access the widest range of SMEs to work with. We've already developed opportunities through the Energy Innovation Centre launching four innovation calls throughout the year, along with working closely with i3P, a platform for collaboration on infrastructure innovation.

Smart Wires technology deployment acceleration

The successful result of an innovation project and effective engagement accelerated the introduction of Smart Wires (SW) technology into business as usual. SW will help decarbonise the UK by providing more controllability and flexibility over the power flow across our transmission boundaries. This enables us to transmit more renewable power to consumers at a lower cost.

Innovation thought leadership

More than 100 attendees from across the industry took part in our innovation stakeholder event in October 2019. We also presented the paper 'Resilient Future' at the 2019 Low Carbon Networks and Innovation Conference (LCNI).

Business plan for RIIO-2

We've consolidated learnings from the last price control period to deliver a bold and transformative business plan for RIIO-2, where our innovation is focused on our stakeholders' priorities: delivering cleaner, cheaper energy through encouraging innovation culture.

Deeside Centre for Innovation

We refurbished the Innovation Centre building that is ready to facilitate 24/7 operation when the facility is fully commissioned in 2021. Additionally, the design works have been finalised for test areas and we moved into the final year of construction (see page 11 for more information).

Zero2050

One of our pioneering innovation projects that demonstrates our commitment to collaborative multi-stakeholder engagement is the Zero2050 project, an initiative started by National Grid Electricity Transmission with the aim of speeding up the progress of the decarbonisation of South Wales. It is now a true partnership between network providers in South Wales and is co-funded by Wales and West Utilities, Western Power Distribution, and National Grid and is backed by the Welsh Government and the South Wales Industrial Cluster.

To find out more, click on **underlined text** above.
Click here to watch the **Innovation Strategy Film** or scan the QR code.

Our innovation in numbers

Electricity Innovation Strategy

178
Network Innovation Allowance (NIA) projects in T1 period so far

16
new NIA innovation projects started in 2019/20

14
FTE dedicated to leading our innovation projects and engaging with NGET teams and external stakeholders to deliver the desired outcomes

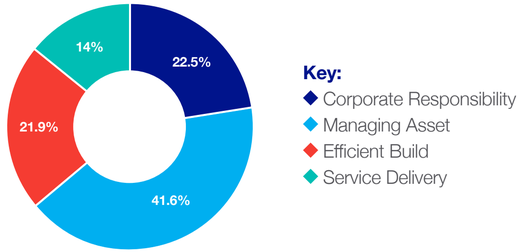
94.14%
of NIA ideas have progressed into projects during T1 so far

£7.62m
spent on NIA projects in 2019/20

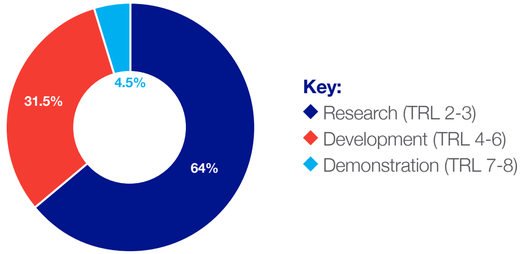
92.7%
of NIA allowance spent in 2019/20

£6.9m
forecast spend on NIA projects in 2020/21

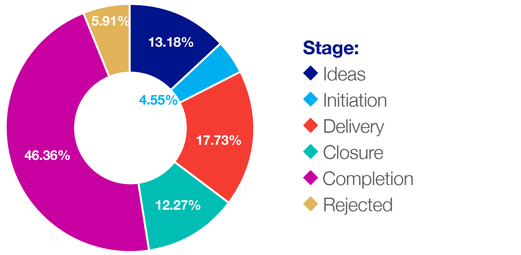
Percentage of projects aligned to strategy in T1



Distribution of Technology Readiness Level by volume of NIA project in T1



Project ideas split by stages in T1



RIIO-T1 overview

RIIO-T1 is our current regulatory period running from 1 April 2013 to 31 March 2021. With one year remaining we're able to look back at what we've achieved and learned, but more importantly think how we can improve moving forwards into RIIO-2.

Throughout RIIO-T1 we've focused on developing an innovation programme that provides asset, network and service delivery solutions in a responsible way. We continued to develop our approach to ensure we're agile and robust enough to meet the challenge of responding to rapid change both within our energy system and across clean energy solutions for other industry sectors.

Our strategy for achieving this focuses around four consumer value themes:

- Managing assets
- Efficient build
- Service delivery
- Corporate responsibility.

Innovation in RIIO-T1 comes through three different funding streams: Network Innovation Allowance (NIA), Network Innovation Competition (NIC) and our innovation partnerships.

The NIA has allowed us to deliver a total of 178 projects so far and in 2015 we secured £12m in Ofgem funding, through its annual Electricity Network Innovation Competition, and invested a further £14m to convert a decommissioned substation into a unique research and innovation facility – the Deeside Centre for Innovation.

Collaborative working and effective stakeholder engagement have been key to the success of all these projects, providing us access to important learnings and outputs that will shape RIIO-2.

Everything we do is for our customers, stakeholders and ultimately the end consumer. We're committed to continuing to boost stakeholder engagement and encourage new companies to work with us to enhance our capability and capacity.

Stakeholder engagement has also moved from being primarily focused on collaboration and seeking leveraged funding, to a stakeholder engagement framework where we've sought stakeholder input into our RIIO-2 business plans, strategy and innovation programme.

In previous years, we had already achieved a great deal of technical innovation so, as well as encouraging more collaboration externally, the past 12 months have seen us dedicate our efforts to creating the best culture to support innovation throughout our business.

We're striving for performance excellence to empower our people to deliver innovative ways of working; encouraging everyone on our team to look for solutions to tomorrow's problems, and adopt an entrepreneurial spirit in their approach to work.

To drive this, we've conducted innovation conversations with senior managers, held workshops and conducted an innovation culture survey across NGET to understand and identify areas for improvement. We still have a way to go on this journey but the culture of our business is instrumental in our future success.

Collaboration

"To ensure we're focusing on the right solutions, we use collaborative engagement to understand stakeholders' requirements and shape our focus. In the past year, this has included working with stakeholders to develop a new innovation strategy which aligns our focus areas with what they've told us is most important to them."

Paul Gallagher
Head of Innovation,
National Grid Electricity Transmission

Collaboration is the lifeblood of innovation. Sharing and being open to new ideas from across industries and academia allows us to successfully build projects to transform energy systems and bring the greatest possible benefits to our customers, stakeholders and to end consumers.

We make better decisions by being flexible, innovative and working together, so we're committed to attracting the right specialist partners to work with us on the right challenges, and to giving stakeholders plenty of time and opportunity to contribute and influence our decision-making.

Collaborating with industry and academic partners remains crucial to our work, so we're continuing to work closely with some exceptional external organisations, as well as encouraging contributions from a range of new partners. The close relationships we've developed have already, for example, helped us extend the operational life of our assets, and integrate more renewable generation into the network.

The Zero2050 initiative, which we're leading, to develop decarbonisation pathways for South Wales is just one example of how collaboration is unlocking unique opportunities to innovate. By attracting organisations with similar objectives to work together, we're speeding up the rate of progress towards achieving the Government's target of Net Zero by 2050. You can read more about the project on page 29.

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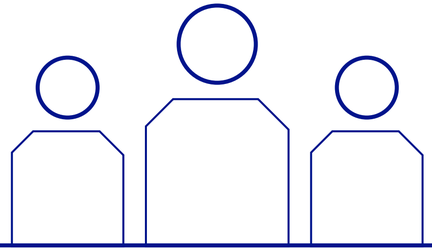
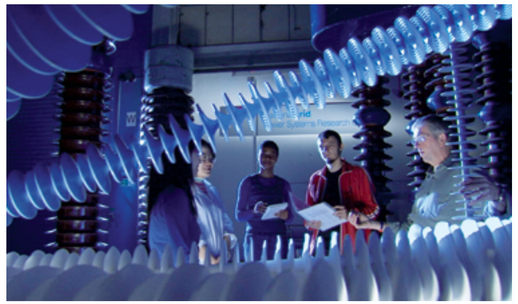


Collaborating is crucial to our work

Collaboration continued



"Everything we do is for our customers, stakeholders and ultimately the end consumer. We're committed to continuing to boost stakeholder engagement and encourage new companies to work with us to enhance our capability and capacity."

Robin Gupta
Regulatory Innovation Manager,
National Grid Electricity Transmission

Supply chain

The scope and value of projects we've been involved with throughout RIIO-T1 illustrates our commitment to collaboration.Through our corporate level membership of, and collaboration with, the Electric Power Research Institute (EPRI), we leveraged research funding from more than 100 international electricity utilities so that each £1 we invested in 2019 generated nearly £17 worth of research. We've also collaborated with academic institutions in the UK to leverage wider funding available through the Engineering and Physical Sciences Research Council (EPSRC).

Over the past 12 months, we've strengthened our involvement with the innovative i3P platform that is bringing together experts from across industry to deliver infrastructure for the future. We're participating actively in the Delivery Leadership Group (DLG), and through DLG we've also provided support to the IAND SME platform.

We've also built on our involvement with the Energy Innovation Centre (EIC). We've carried out a number of events seeking innovation providers across a range of the areas where we're looking to deliver improved performance and outcomes for customers. These activities have helped to connect us with some great suppliers with whom we're looking to build our relationships. Drawing on the extensive knowledge and experience of this non-profit organisation is helping us make it easier for SMEs to partner with us, and opening up new opportunities and ideas to take forward.

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Collaboration continued

We're encouraging all NGET employees to innovate and work together

Collaborating with industry and academic partners remains crucial to our work, so we're continuing to work closely with some exceptional external organisations, as well as encouraging contributions from a range of new partners.

Stakeholders

Additionally, our Innovation Team has reached out to stakeholders and showcased a range of our projects at 2019 conferences and exhibitions, including Utility Week Live, ET Innovation Stakeholder Events, and the LCNI Conference.

Throughout 2019 a series of stakeholder engagement sessions was hosted by the team to develop our Innovation Strategy for RIIO-2, including three webinars, a workshop and one-to-one meetings with a range of stakeholders, including academics, other transmission companies, communication and tech companies, the Government and NGOs.

We asked our stakeholders what was important to them, and they told us that innovating more on decarbonisation, providing a reliable energy system and lower energy bills were their top priorities. Above all, they want innovation to be a key element in the delivery of net zero.

This feedback has inspired changes to our innovation strategy, and increased our focus on delivering cheaper and cleaner energy for everyone. We wanted our stakeholders views to be at the heart of our strategy to ensure that it ultimately aligns with their collective needs. Read more on our Innovation Strategy on page 15.

Academia

We currently have three strategic academic partners: The University of Manchester, Cardiff University and the University of Southampton.

We're working with them on a wide range of innovation areas including exploring alternatives to SF_6 and aiming to develop and demonstrate a proof of concept to provide flexible enhanced circuit ratings.

We also have projects running with three other universities in the UK, including a project on multi-spectral imaging in asset management across the UK with Nottingham Trent University.

And, as well as encouraging external partners to work with us, we're also supporting collaboration and a spirit of innovation internally too. We're doing that by creating a culture that empowers all NGET employees to look at what is possible, generate ideas and adopt an entrepreneurial approach to thinking about and finding solutions to tomorrow's problems.

Deeside Centre for Innovation

Project update

In 2015, we secured £12m in Ofgem funding, through its annual Electricity Network Innovation Competition, to create the Offgrid Substation Environment for the Acceleration of Innovative Technologies (OSEAIT) project. We combined this with an additional £14m of National Grid investment to convert a decommissioned substation into a unique research and innovation facility – the Deeside Centre for Innovation (DCI).

The first of its kind in Europe, DCI aims to deliver benefits to consumers by accelerating the deployment of technologies able to reduce both the carbon footprint and cost of present and future energy networks.

At its core are substation and overhead line test areas designed to facilitate live trials at existing distribution and transmission voltages, and above.

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, seven days a week. While operational, 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.

Over the past 12 months the project has made significant progress. We finished refurbishing and went live with the Innovation Centre, which serves as an office and control centre for the facility. The building includes 12 desks, a kitchen, a lounge area for guests, a control room, board room, P&C room, and a locker room with shower and WCs.

In the Overhead Line (OHL) test area, the groundworks have been completed. This site is now ready for the test

Deeside Centre for Innovation

equipment to be installed and commissioning is due to take place in November 2020. Work has also progressed in the substation area (pictured, above). Its design has been finalised and construction works started in June this year, with the aim of commissioning it in June 2021.

Alongside the site work, in October 2019, we presented DCI at the Low Carbon Networks & Innovation (LCNI) Conference using a virtual reality model of the substation to showcase the final look of the facility and how it can be operated. And in January 2020 we chaired the Technical Advisory Board meeting to share the results of the work with stakeholders, including representatives from universities, utility companies and National Grid experts, and to approve construction proposals for the year ahead.

While construction is in progress, in RIIO-T1 we've also been delivering a number of projects designed to accelerate innovation, research and development, and extend asset life.

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Deeside Centre for Innovation continued

"Deeside Centre for Innovation is a unique facility with an ambition to assist all GB Network Licensees in developing technologies and methods to address climate change while maintaining security of supply. It will become a platform to support in accelerating innovation and de-risking new technology applications benefiting energy industry and consumers."

Alexander Yanushkevich
Deeside Innovation Manager,
National Grid Electricity Transmission

Retrofit cable sealing ends

We successfully concluded a project to investigate reducing the cost and operational impact and the risk mitigations put in place to address failures of 132kV cable sealing ends (CSEs). The project set out to deliver new condition monitoring techniques and an investigation of the underlying reason for the CSE failures. Tests and trials have now concluded and the reports have been prepared for submission to Ofgem. Knowledge from the project will be implemented at NGET in RIIO-2. Operational procedures were updated to reduce the risk to our employees working around these devices.

Textured insulators

We're continuing our work with Cardiff University and Allied Insulators to develop and deliver the world's first textured insulator. Installation of the longer-lasting composite insulators is expected to deliver £12,400 of savings per circuit kilometre, increase safety on our network and enable more efficient investment.

Modular bunds

Modular bunds that can be built off-site and assembled once in position will be installed at the substation this year as part of our construction programme. This will allow us to validate the cost and installation time savings achievable by using them to build new bunds for transformers and other large oil-filled assets.

Cemfree

A special concrete mix with a CO_2 footprint that's five times lower than conventional concrete will be trialled during the civil works at Deeside substation. Understanding its strength, how fast it cures and how we can work with it across the business will help us significantly reduce our CO_2 impact, and create a showcase for other utilities and industries to apply the technology.

Digital Substation

This is an innovative approach to controlling and protecting power systems. The trial installation at Deeside will help us understand how to install, commission and operate this type of system and develop plans for how the technology can be implemented within other National Grid substations.

Next steps

Construction works at the site have seen delays due to a range of factors including ground contamination and subsidence, interactions with other transmission projects which have reduced access opportunity to the site, and most recently by the Covid-19 pandemic impacts. We are, however, now pressing forward with all construction works across the site with the aim of completion by June 2021. Throughout the coming year we'll continue to lay the foundations for future benefits for the industry, customers and consumers with, among others, new condition monitoring projects, and a trial of innovative SF_6 leak management and repair techniques.

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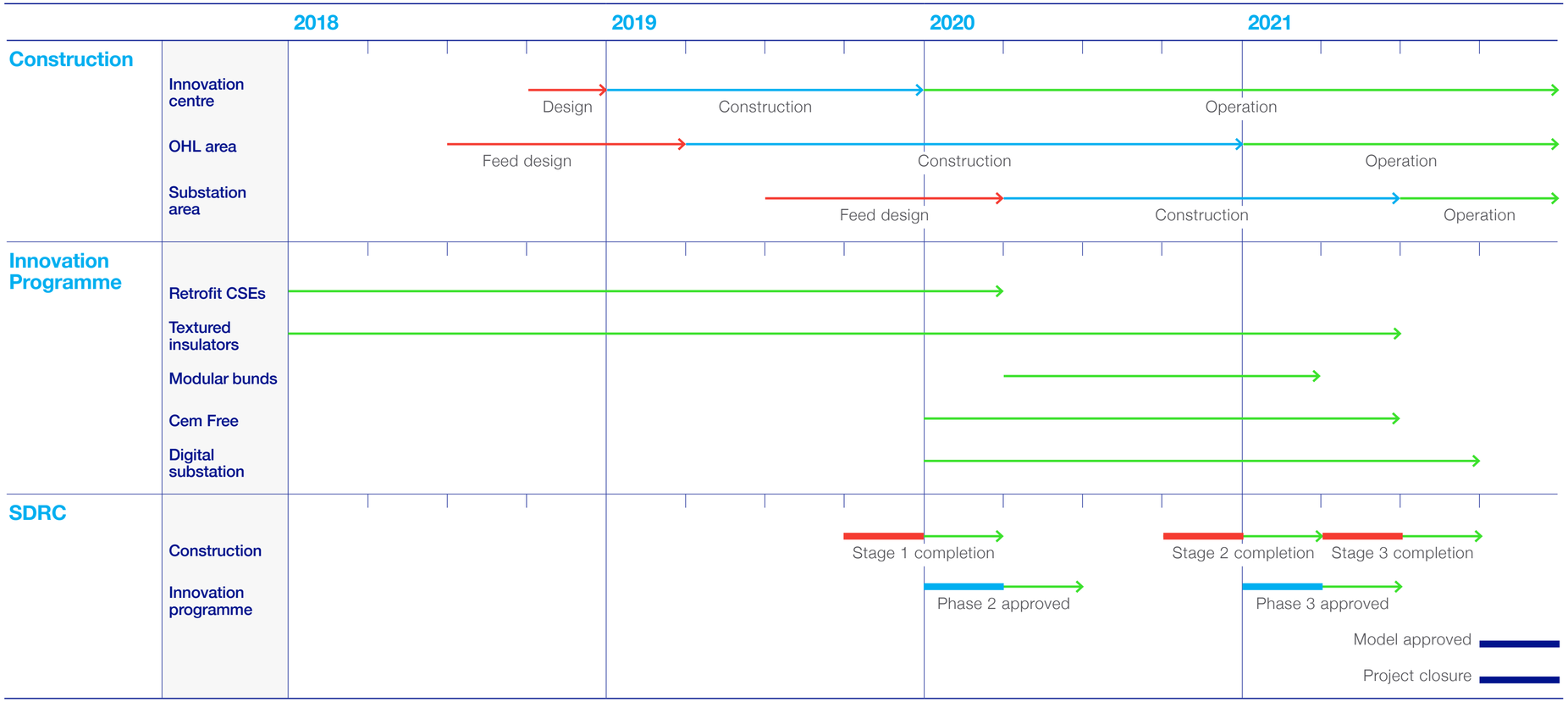
To find out more about Deeside, **click here**.

Deeside Centre for Innovation continued

Inside the newly refurbished centre

Delivery programme



Key:

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Deeside Centre for Innovation continued

Successful Delivery Reward Criteria reference table

Ref	Criteria	Description	Status
9.1	Formal agreement on Terms of Reference with Technical Advisory Board members	In order to achieve the efficiency required to meet the project's objectives it is essential that the other Transmission Licensees fully engage in the Technical Advisory Board. An early indication that this project will succeed will be this Board agreeing the Terms of Reference.	Complete
9.2	Detailed design of the facility completed and approved	The completion of both the infrastructure and technical layout designs are an important milestone on the way to delivery of the overall project, as they will determine the level of testing / evaluation that can be carried out and at which stage.	Complete
9.3	Design, develop and publish internet site	One of the fundamental knowledge and dissemination channels for the project is the utilisation of the facility website, which will provide a secure area to share the outputs with the other Transmission Licensees.	Complete
9.4	Scope of work for the Phase 1 innovation programme approved	With there being a phased handover of assets it is essential to the project's success that a detailed plan be put in place, based on the assets available and trials proposed during this phase. This plan will include costs of the proposed trial projects, their estimated benefits and justification for how the trials satisfy the Electricity NIC criteria. The plan will also include any NIA projects which are able to be undertaken at this time.	Complete
9.5	Completion of Stage 1 construction works	The completion of the Innovation Centre building renovation and the transfer of the protection and control panels to the telecoms & control room are a key milestone to the effective functioning and monitoring of the facility.	Complete
9.6	Scope of work for the Phase 2 innovation programmes approved	The continuation of the phased handover of assets is essential to the project's success and a detailed plan is to be put in place, based on the assets available and trials proposed during this phase. This plan will include costs of the proposed trial projects, their estimated benefits and justification for how the trials satisfy the Electricity NIC criteria. The plan will also include any NIA projects which are able to be undertaken at this time.	Complete
9.7	Completion of Stage 2 construction works	The completion of the construction of the internal access road is a key milestone to the effective functioning of the facility, as this will enable the necessary vehicles to access all areas of the facility. Completion of OHL test area is a key milestone to deliver innovation programme for OHL technologies.	Nov 20
9.8	Scope of work for the Phase 3 innovation programme approved	The continuation of the phased handover of assets is essential to the project's success and that a detailed plan is put in place, based on the assets available and trials proposed during this phase. This plan will include costs of the proposed trial projects, their estimated benefits and justification for how the trials satisfy the Electricity NIC criteria. The plan will also include any NIA projects which are able to be undertaken at this time.	Nov 20
9.9	Commencement of Phase 3 innovation programme	The delivery of the innovation programme testing / evaluation is a key milestone within the project and the ability to commence operations at the facility is fundamental to the measurement of its success.	Dec 20
9.10	Completion of Stage 3 construction works	The completion of the construction of the Substation area is a key milestone to the effective functioning of the facility, as this will enable the delivery of HV equipment testing / evaluation projects.	Jun 21
9.11	Approval of model for enduring facility	The Technical Advisory Board will determine, based on the flow of projects, the future of the facility.	Oct 21
9.12	Project close down	All project learning will be consolidated and disseminated appropriately.	Oct 21

Our focus for innovation in RIIO-2

At NGET we know we need to be bold, ambitious and innovative to deliver an energy network that is fit for the future. It's clear that the pressing challenges of climate change and the transition to a low-carbon economy won't be met by relying on existing thinking. The new engineering and wider system solutions we develop in the next regulatory price control period (RIIO-2) will allow us to thrive in a period of rapid change.

Working closely with our stakeholders, and building on experience from RIIO-T1, our innovation strategy for RIIO-2 identifies two strategy areas for innovation:

Delivering Cleaner Energy
We'll create a road to net zero by reducing our carbon footprint and helping others to reduce theirs

Delivering Cheaper Energy
Through a long-term innovation programme, we'll deliver a net zero whole energy system strategy at minimum achievable cost.

These areas will be critically enabled through our third strategy area:

Delivering an Innovative Culture
Driving a more externally referenced, collaborative, open and innovative approach across all of our organisational disciplines, while building capability and unlocking our people's potential.

We recognise there will be a wealth of opportunities during RIIO-2 for us to deliver innovation to the benefit of customers and, therefore, this year we'll be reaching out to work closely with a wide range of industry stakeholders to map the details for how we deliver each of these key areas and priorities, while understanding and responding to their needs.

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"Within NGET we're building a strong innovation culture and our strategy for RIIO-2 is to make sure that innovation is not just something we do; it's about putting it right at the heart of our business."

Paul Gallagher
Head of Innovation,
National Grid Electricity Transmission

Our focus continued

We'll achieve this by being agile and creating robust solutions around our six key priorities:

Transforming the business through digitisation

We'll develop tools and techniques that allow the digitisation of many of our processes, and overall management of data, as well as exploring the application of Artificial Intelligence across many of our activities

Being responsive to customers

We'll create new construction and installation techniques that will improve our agility for connecting renewable energy customers, while driving down carbon impact and overall cost, and delivering better customer experience

Facilitate decarbonisation of wider industries

We'll collaborate with and support industries cross-sector to decarbonise transport, explore opportunities for achieving net zero in industrial clusters, explore the appetite for transition to a hydrogen economy and the implications on network providers

Reducing the environmental impact of our activities

We'll develop options for driving down greenhouse gas emissions from SF_6 and other emitters, identify methods for minimising impact of construction, utilise novel materials, and develop new techniques to monitor and measure our performance

Provide long-term system benefits through Deeside Centre for Innovation

We'll open the innovation centre up to a wide range of stakeholders to allow improved development, better testing and faster implementation of low-carbon technologies

Continue to deliver technical innovation

We'll continue to technically innovate on the equipment and technologies we utilise across the network to drive down costs, minimise carbon impacts and deliver the levels of reliability that our stakeholders require

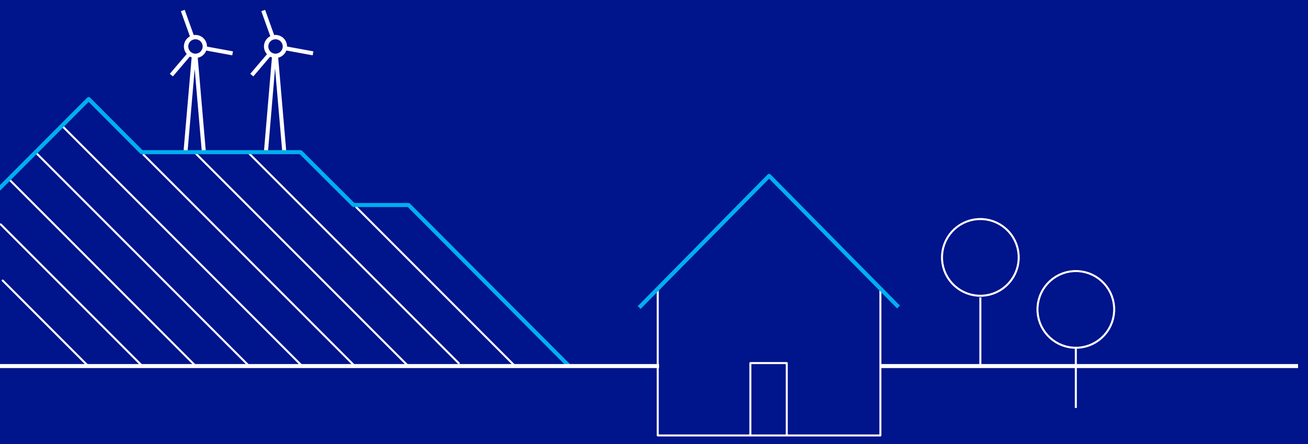
To find out more, you can visit the **strategy section** of Electricity Transmission website. Click here to watch the **Innovation Strategy Film** or scan the QR code.

We're also taking the opportunity to build the capabilities we will need in the future, and have made submissions to the Network Innovation Competition (NIC) for two of our larger innovation projects: Proteus, building a new type of transmission asset to support grid stability; and RICA, a lower-cost reinforcement solution for overhead lines. Both projects have gone through to the full submission stage later this year, which is testament to the strong innovation principles used throughout their development.

During RIIO-T1 we've already put the key building blocks for innovation in place. Looking ahead to RIIO-2, we'll continue our cultural transformation. By encouraging an entrepreneurial spirit from everyone in the business, we'll provide energy solutions fit for the 21st century.

Everything we do is for our customers, stakeholders and ultimately the end consumer. We are committed to innovating to deliver an affordable network that is safe, reliable and resilient and lead the way to net zero.

NIA project case studies



Innovative steelwork monitoring

Title: Automated Assessment of Steelwork Condition Using Innovative Imaging Techniques

Consumer value theme: Managing Assets

Project number: NGET0215

"By working with Nottingham Trent University, who are specialists in this field, to better understand how we can operate more efficiently, we believe this work has the potential to achieve consumer benefits of £700,000."

Anusha Arva
Innovation Engineer,
National Grid Electricity Transmission

Project overview

This project, carried out in conjunction with Nottingham Trent University, is about improving the efficiency of how we monitor the effects of corrosion on the 22,000 steel lattice towers in England and Wales.

Working with experts in multi-spectral imaging from Nottingham Trent University, we've looked at ways of improving the output of our aerial inspections. This is focusing on two key areas: whether we should upgrade our current methods of image capture to multi-spectral imaging, and the automation of image processing.

What stage is the project at now?

The project has so far identified potential improvements in the accuracy of our monitoring by refining the current approach for image capture rather than overhauling it. We've found that there is limited difference between using multi-spectral images and fully calibrated red green blue (RGB) images captured for the mapping of corrosion on steel lattice towers.

What are the next steps?

Our method, using the existing equipment, will be refined and requirements for implementation into business as usual considered in the remaining deliverables.

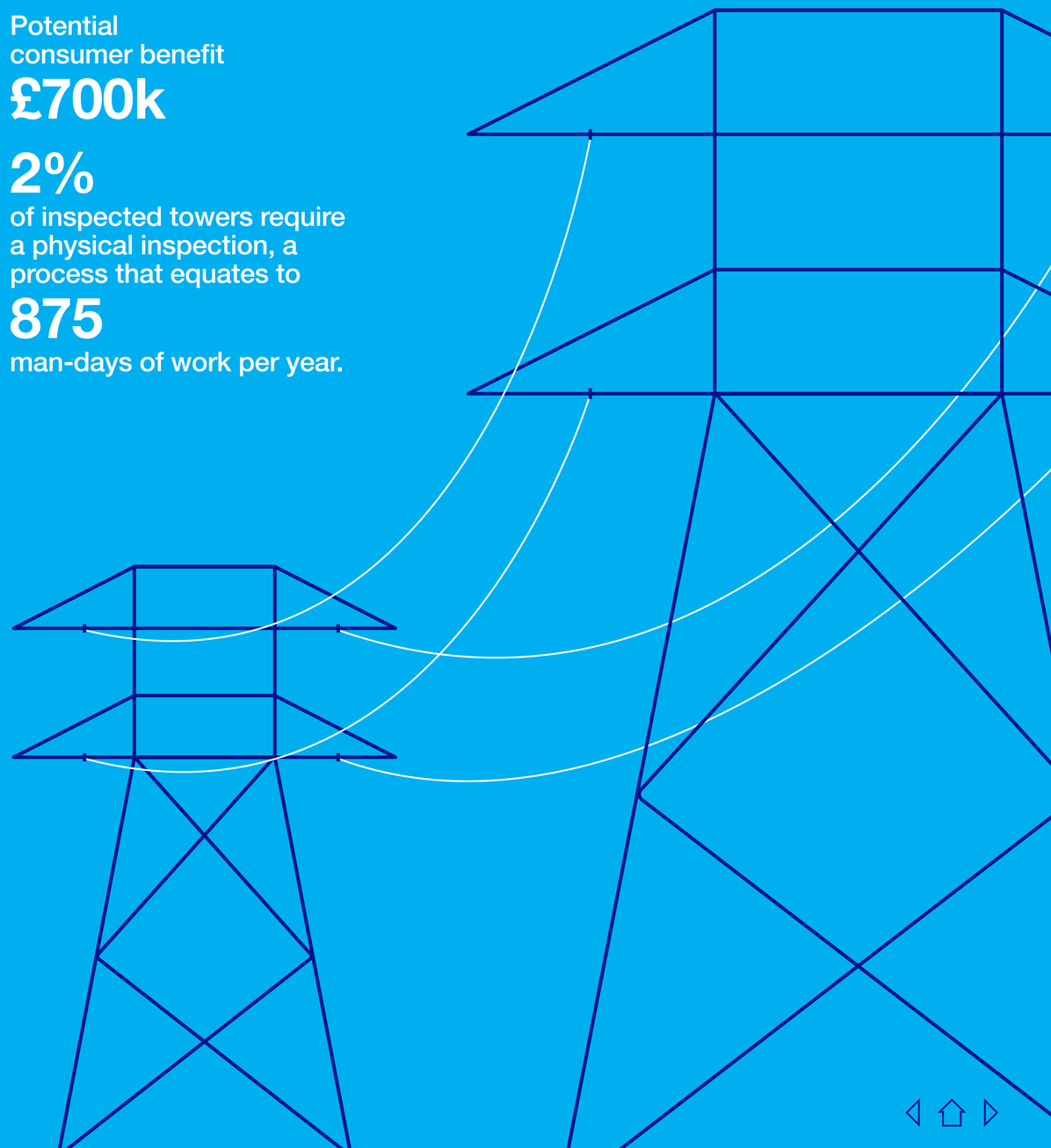
A key focus for the remainder of the project is undertaking a trial process for improving the calibration of the images taken through the existing method.

Potential consumer benefit

£700k

2%
of inspected towers require a physical inspection, a process that equates to

875
man-days of work per year.



Detecting environmental wear on overhead lines

Title: Environmental Exposure of Overhead Lines: Data Delivery for Physical Testing

Consumer value theme: Managing Assets

Project number: NGTO034

"This project will allow us to better understand how our OHLs respond to varying environmental conditions and optimise our replacement and maintenance strategy, potentially leading to savings of £16m."

Siyu Gao
Innovation Engineer,
National Grid Electricity Transmission

Project overview

We're always looking to improve our approach to managing our assets, and a major aspect of this is increasing our understanding of the relationship between the environment and our overhead line (OHL) infrastructure.

This project is about modelling the effect of wind-induced wear on OHLs, which causes them to degrade and eventually fail, to improve the efficiency of our replacement and maintenance planning, and more accurately monitor our assets' expected lifespan.

What stage is the project at now?

We're developing numerical models that generate environmental and asset health data in a form that will allow us to verify the accuracy by physical testing. If a desktop model can be created with verifiable accuracy, it will likely prove to be a more cost-effective method of monitoring the effects of wind-induced wear than current methods of destructive testing or extensive inspections.

What are the next steps?

We've been able to improve the data we model for wind-induced wear by looking not just at the total amount of wind energy on an OHL, but by considering the wind energy at different orientations. We can correlate this against the exact conditions that cause the wear to add to the efficacy of our model.

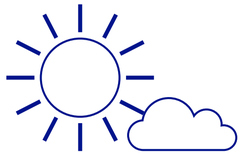
The next steps are to agree an appropriate format for that data and to generate it for the network.

A weather eye on managing assets

Title: Advanced Line Rating Analysis (ALiRA)

Consumer value theme: Managing Assets

Project number: NGTO014



"Extending the project has allowed us to return information that we can use to improve the current system for providing enhancement to our OHL ratings, potentially delivering consumer benefits of up to £9m."

Siyu Gao
Innovation Engineer,
National Grid Electricity Transmission

Project overview

With more than 7,200km of overhead lines (OHL) throughout the UK NGET is committed to exploring where improvements can be made in the management of those assets. The now-completed Advanced Line Rating Analysis (ALiRA) project, carried out in conjunction with Digital Engineering, used weather model analysis to test whether the current method of applying thermal ratings on a seasonal basis meant the ratings may be unnecessarily constrained. This could create inefficiencies by limiting power flows and resulting in unnecessary investment for load-related upgrades.

The project sought to identify areas where the weather conditions would allow routes to be uprated, improving efficiency compared to those delivered by the current method of seasonal rating.

To develop a clearer understanding of the modelled dataset, the project was extended, allowing time to test the theory that uncertainty found in the data was caused by the level of shielding of the OHLs by local features, such as woodland, forestry or urban environments.

What have we learned?

Now the project has concluded the data gives us an overview of the spans and circuits that have the most potential to be uprated. Combining this data with other route-specific information will identify where targeted weather analysis could be used to provide potential capacity and provide increases in OHL efficiencies.

Understanding transformer performance

Title: Condition and Climatic Environment for Power Transformers (ConCEPT)

Consumer value theme: Managing Assets

Project number: NGET0213

"This project looks at how the existing environment affects the performance of our assets and how that may change in future. It will help us understand how we can invest in transformers efficiently to meet the requirements of a changing climate."

Gordon Wilson
Senior Innovation Engineer,
National Grid Electricity Transmission

Project overview

ConCEPT is a wide-ranging project examining the ratings capability of our transformers and what impact climate and asset condition have on the ability of transformers to perform as expected. By better understanding how ambient temperatures influence transformer operation today, we can be more certain what future climate predictions will mean for transformer capability and the resilience of our network.

A key part of the project, which has now been completed, saw researchers at the University of Southampton look at climate change projections and the effects it could have on how we calculate the rating capability of our transformers.

What have we learned?

The research has shown that we have resilience in our network that can be maintained through a change to the way we calculate our ratings, which could adopt a regional, as well as the current seasonal approach. There is further work ongoing that explores the possibility of differentiating ratings in urban and rural areas.

At present the same seasonal ambient temperature assumptions are used for all of England and Wales, which can result in excessive rating conservatism in colder regions. This work quantified the potential increases in ratings if a regional approach was adopted.

This area of ConCEPT's work will provide cost benefits to our consumers by allowing us to defer investment into replacing or increasing the number of our assets by improving the efficiency of our ratings system.

What's next?

Further ConCEPT work packages looking at transformer ageing and its impact on ratings, as well work on the heat islanding effect, continue.

The ConCEPT project examines the ratings capability of our transformers

Improved data capture on cable degradation

Title: CSE Fault Analysis by 3D Monitoring

Consumer value theme: Managing Assets

Project number: NGTO015

"This project was all about finding a more cost-effective way of obtaining better information. We learned a lot about our current measuring system and how we can create cost-savings on the equipment needed for our condition monitoring."

Oliver Cwikowski
Senior Innovation Engineer,
National Grid Electricity Transmission

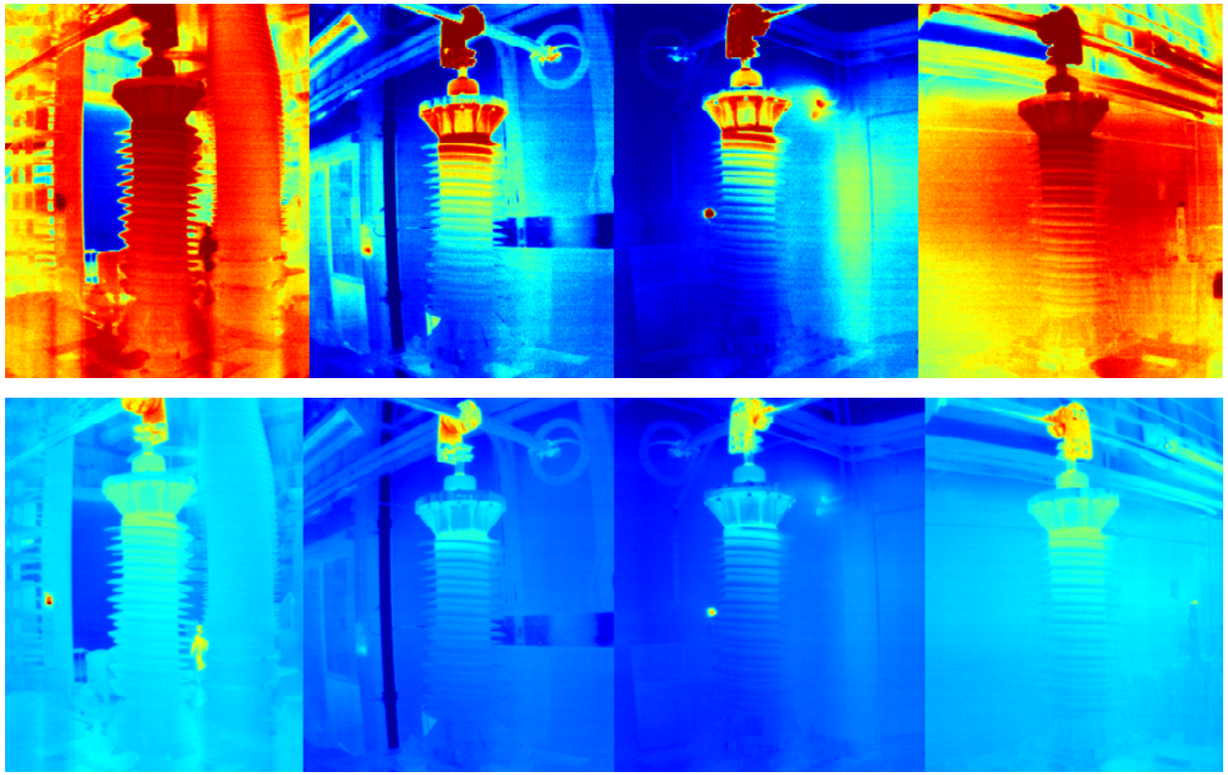
Project overview

A key part of monitoring of our high-voltage assets involves detecting unusual thermal activity using standard infra-red (IR) cameras; these signal the need for further investigations into the asset's performance. This project is about investigating the feasibility of creating a new, low-cost and robust 3D IR imaging system that would both make the data collection simpler and increase the accuracy of our monitoring. This would reduce false positives and negatives when assessing an asset's condition.

Working with the University of Manchester, we undertook testing on cable sealing ends (CSEs) to better understand their degradation modes. This specifically involved investigating asymmetrical heat profiles, where degraded CSEs could return different heat emissions when measured from different sides. This has the potential to create misleading results during condition assessments.

What have we learned?

The project has now concluded, and the data we have collected will be used during the next options assessment of our condition monitoring equipment. We believe that there is evidence of the benefits of using more cost effective equipment, which could lead to savings of tens of thousands of pounds, as well improving the accuracy and precision of our condition monitoring techniques.

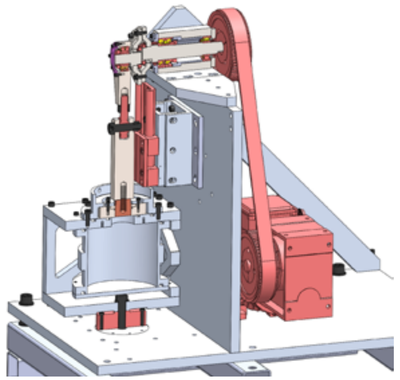


Ringing the changes

Title: Novel O-ring Designs (NORD)

Consumer value theme:
Managing Assets

Project number: NGTO032



"We've never looked at these O-rings in this much detail before. The combination of multi-physics simulation and experiments is generating knowledge, which helps our decision-making and strengthens the engineering assumptions we make."

Oliver Cwikowski
Senior Innovation Engineer,
National Grid Electricity Transmission

Project overview

The Novel O-ring Designs (NORD) project is about establishing which O-ring design can provide the best protection for cable sealing ends (CSEs) against water ingress.

Moisture ingress is a major concern as it can accelerate performance degradation in our assets, meaning they need maintenance or replacement earlier in their lifespan than expected, increasing costs.

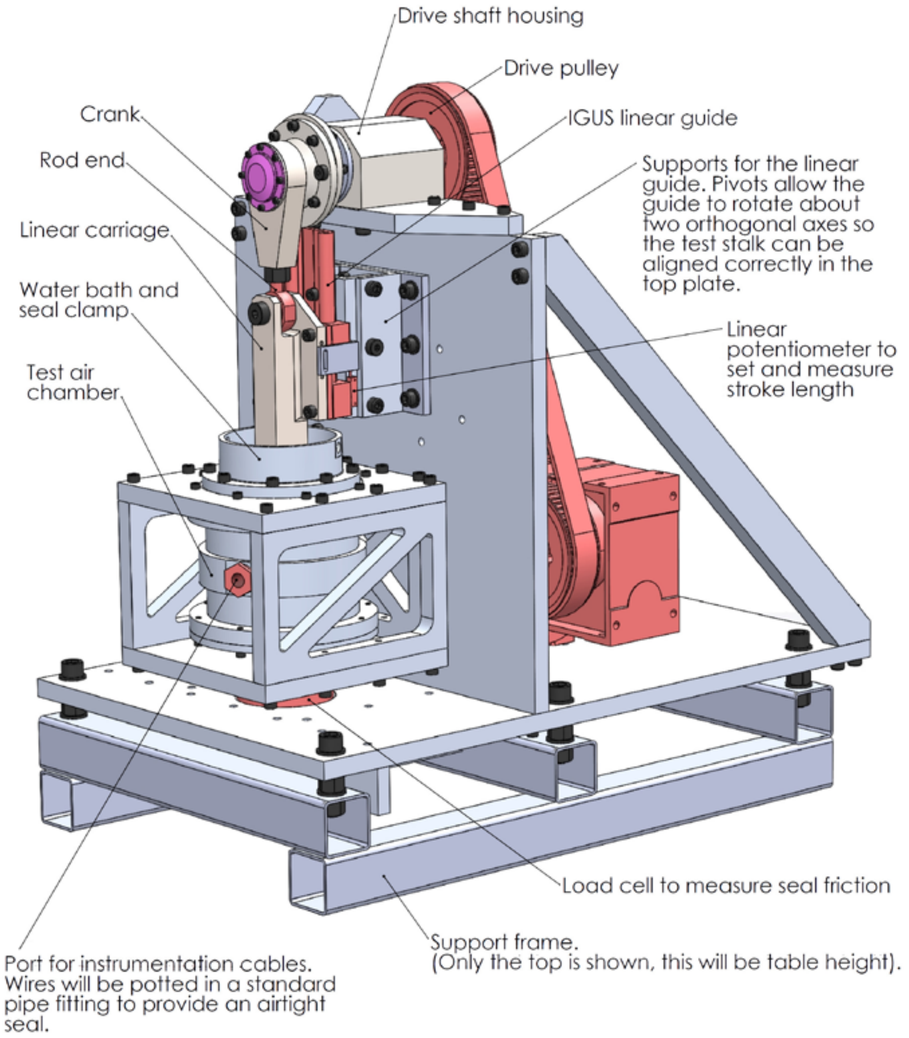
If we can establish how long O-rings can maintain a good seal, we can schedule a mid-life refurbishment before they fail. This would prevent the need to replace the whole asset. As the replacement of a set of CSEs costs around £100,000 to £200,000, NORD's findings could provide significant savings to consumers.

What stage is the project currently at?

The project has two major aims: to understand and track O-ring degradation through testing; and to explore a novel O-ring design that if subsequently developed and manufactured could lead to an increase in an asset's expected lifespan.

We are working closely with Cardiff University's Tribology department to build a synthetic test environment that can replicate the in-service environment. This will increase our understanding of how different O-ring designs function over time, and provide greater insight to existing data we have around moisture ingress and the age and performance of our assets.

A single model view of the NORD synthetic test environment



Transforming the future with EV technology

Title: Electric Road System for Dynamic Charging of Electric Vehicles

Consumer value theme: Service Delivery

Project number: NGTO001

“There’s a possibility of this type of technology being introduced in the future. Therefore, National Grid needs to be prepared for its potential widespread uptake.”

Mingyu Sun
Associate Innovation Engineer,
National Grid Electricity Transmission

Mingyu Sun, Associate Innovation Engineer, answers questions on innovative charging solutions for electric vehicles.

Q. What do we mean by the dynamic charging of electric vehicles?

A. The automotive industry has begun its transformation to an electrified future, in response to the increasing concern of carbon emissions and pollution.

Drivers, however, have generally been slow to embrace electric vehicles – one reason being the small range of a typical battery powertrain compared to a combustion engine. The stationary charging technology has been increasingly deployed around the world in recent years. However, due to the limitation of battery capacity and charging speed, vehicles need to stop for the service.

But new systems are being developed to charge vehicles while they’re travelling on our roads – this is known as dynamic charging.

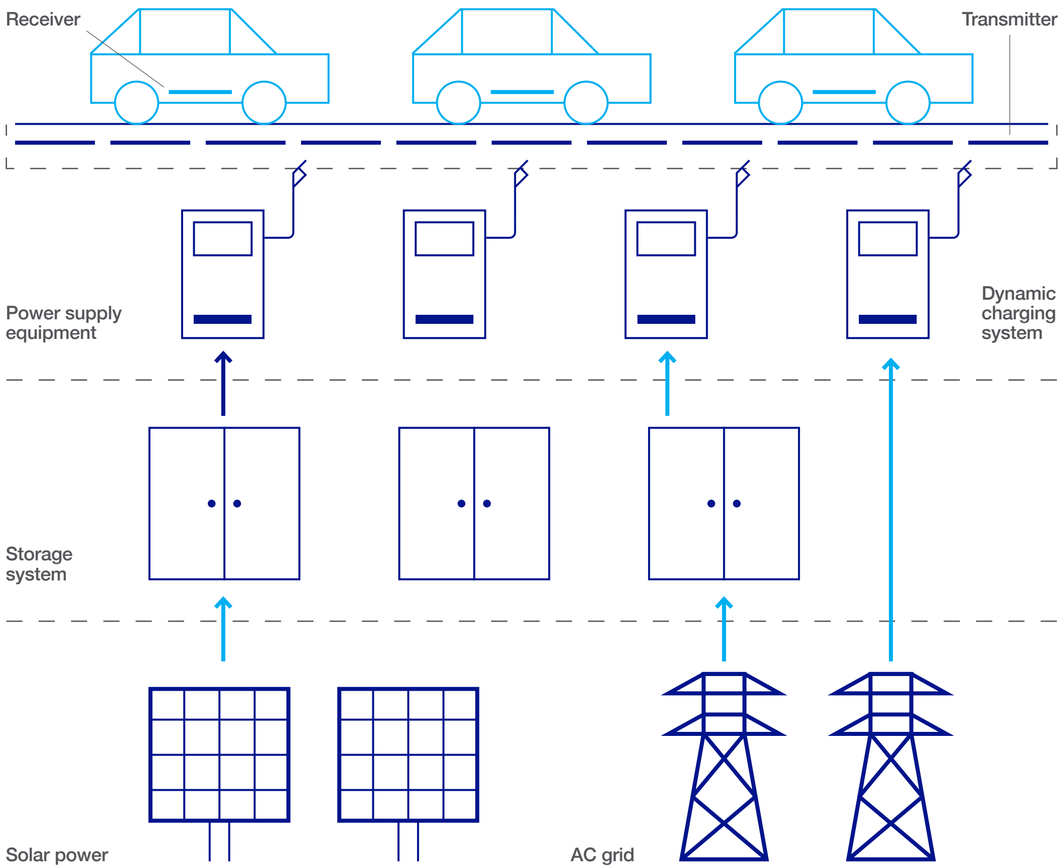
Q. What is the aim of this project?

A. We set up a study to investigate the feasibility of on-road charging systems, and what impact they might have on the electricity network if they were to be introduced.

We then developed a model to study potential dynamic charging systems to give us an idea of what future risks and opportunities might look like with the widespread use of electric vehicles.

Q. What did the study discover?

A. There’s a possibility of this type of technology being introduced in the future. Therefore, NGET needs to be prepared for its potential widespread uptake. It enabled us to further understand the alternative charging technology for EVs, to minimise and mitigate its risk, and where benefits can be brought to consumers.

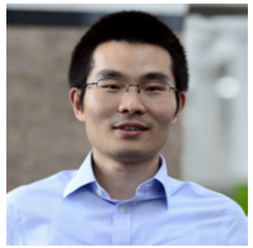


Investigating the impact of decarbonisation

Title: Multi Energy Vector Modelling

Consumer value theme:
Service Delivery

Project number: NGTO037



"The project will help us analyse the impact of the decarbonisation of heat and transport on the electricity transmission network infrastructure."

Linwei Chen
Innovation Engineer,
National Grid Electricity Transmission

Linwei Chen, Innovation Engineer, talks about multi-vector modelling to support decarbonisation.

Q. What's the background to the project?

A. The Government's Committee on Climate Change says the UK should aim to achieve net-zero greenhouse gas emissions by 2050. Decarbonising electricity will not be enough; we also need to collaborate with the heat and transport sectors if we're to hit these targets.

This project is developing a model for studying the impact of various heat and transport decarbonisation solutions, including new options such as the use of hydrogen, on the electricity transmission network infrastructure. It's looking at the Greater Manchester area as a case study.

Q. Why Greater Manchester?

A. Previous studies on how we can tackle the decarbonisation challenge have been based on a top-down approach – developing a UK-wide view, and then extrapolating at a regional level.

That approach is great for driving policy decisions, but not for tackling regional challenges and opportunities, or coming up with specific solutions to address the future energy demand.

Our bottom-up assessment of heating and transportation energy requirements will use a multi energy vector modelling approach to produce high temporal and spatial resolution demand forecasts. We're building on the information that we've previously collected about the area to examine what's going on in every postcode and substation across Greater Manchester. We'll then develop a modelling tool that's also applicable to other geographical areas.

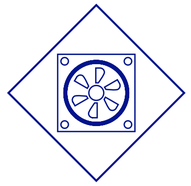
Q. What outcomes are you hoping for?

A. With the demand modelling, the project will assess various options for reducing the cost of the overall network reinforcement required, how we meet future energy demands, and how we deliver cost benefits to consumers.

It'll help us analyse the impact of the decarbonisation of heat and transport on the electricity transmission network infrastructure.

Then we'll deliver a prototype tool that NGET can use to run future whole-system network modelling studies.

The use of heat pumps is going to play an important role in decarbonising heating for residential or commercial buildings:



Air Source Heat Pump

Ground Source Heat Pump

Hybrid Heat Pump

Flexible energy sources bring huge benefits

Title: Feasibility Study into Unlocking Flexibility within UK Steelworks

Consumer value theme:
Service Delivery

Project number: NGTO0031

“Working closely with Cardiff University and Tata Steel, we’ve developed an optimisation modelling tool to assess the practicalities, methods and benefits of unlocking energy flexibility from large industrial and commercial customers to support the evolving low-carbon energy network.”

Xiaolin Ding
Senior Innovation Engineer,
National Grid Electricity Transmission

Xiaolin Ding, Senior Innovation Engineer, talks about her collaboration with Tata Steel to discover flexible energy sources for industry.

Q. What challenge does the project aim to solve?

A. As the electricity system moves towards renewable energy sources, both the supply and demand sides of the market are becoming less predictable, making it more difficult and costly to manage variations. More flexible energy sources are needed to support the evolution of a low-carbon energy network.

At the same time, large-scale industrial energy users such as the UK steel industry are being encouraged by the UK Government to develop new ways to lower their carbon footprint and participate in the evolving energy markets to support the future electricity system.

Q. How does the project address this?

A. We used Tata Steel’s works at Port Talbot as a case study. We investigated a range of ways our industrial users can unlock flexibility by developing innovative methods of reducing their overall energy cost and participating in ancillary services. This included demand side response and Black Start services. These solutions help industrial sites to reduce high energy costs by optimising operation schedules based on the analysis of electricity market option. For example, the industrial sites can lower the demand they place on the system during peak times. These users can also receive revenue from the ancillary services they participated in to support the energy system, e.g. Short-Term Operation Reserve (STOR), Black Start etc.

Q. What is the current progress and next steps?

A. Working closely with Cardiff University and using data from Tata Steel, we’ve developed an optimisation modelling tool to assess the practicalities, methods and benefits of different solutions. When we complete the project in autumn 2020, we’ll have a good measure of how the solutions we’ve investigated can reduce cost for users and increase network flexibility.

Q. Why do you like this project?

A. With its focus on Tata Steel in Port Talbot, it’ll benefit our Zero2050 initiative, which aims to speed up the progress of the decarbonisation of South Wales. I’m also excited by the potential it’ll uncover for strengthening the future energy market.

Finding a greener solution

Title: Alternatives to SF_6 for Retro-filling Existing Equipment

Consumer value theme: Corporate Responsibility

Project number: NGET0199

“There’ll likely be cost benefits associated with this project, but the real motivation is the reduction in the usage of the greenhouse gas SF_6. This work unlocks the potential to replace SF_6 in many of our assets without having to replace the equipment completely.”

Mark Waldron
Technical Leader,
National Grid Electricity Transmission

Project overview

Sulphur hexafluoride (SF_6) is highly effective electrical insulation used in high-voltage electrical applications and is found in many of our assets. However, it’s also a greenhouse gas, with a global warming potential (GWP) 23,500 times that of carbon dioxide (CO_2), making it a substantial contributor to our carbon footprint.

We want to find an SF_6 alternative with a much lower GWP, but which still performs as well. While we have been at the forefront of introducing SF_6 alternatives in new assets, this project, in which we are working alongside the University of Manchester and benefitting from technical support from 3M, focuses on how we can retrofit an alternative into our existing assets.

What have we learned?

Finding a retrofill alternative to SF_6 is a balancing act between testing the right mix of 3M’s Novec™ 4710 and CO_2, and finding the right operating pressure at which its properties most closely mirror those of SF_6. A key objective was to find a way to do this without also having to make significant and costly changes to the associated equipment, such as gasket materials.

We now believe we can demonstrate that a retrofill operation is possible using a roughly 80/20 mixture of CO_2 and Novec™ 4710.

What’s next?

The project will conclude in November 2020, after which we’ll look to engage the original equipment manufacturer and agree a type-testing procedure at a certified test laboratory.

This would enable us to develop a retrofilling programme to introduce the benefits of an SF_6 alternative into our network without needing to replace whole assets, thereby reducing time, cost and carbon intensity.

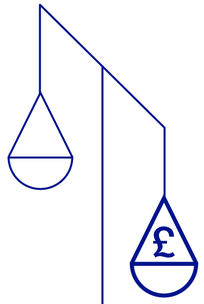
The gas-insulated bus bar demonstrator that NGET is using to conduct its research into SF_6 alternatives

Targeted infra-red technology

Title: Optimised Infra-Red Image Systems (OsIRIS)

Consumer value theme:
Corporate Responsibility

Project number: NGTO036



"The main driver for this project was to improve safety for everybody: our employees and our customers. Reducing the number of false positives also means we can deliver work faster, get customers connected quicker and save hundreds of thousands of pounds."

Oliver Cwikowski
Senior Innovation Engineer,
National Grid Electricity Transmission

Project overview

We use infra-red (IR) images to perform inspections on our transmission assets non-invasively. Any non-invasive assessment has the potential to generate false positives. This is where the data appears to indicate that an asset needs maintenance or repair when it's functioning normally. A false positive would flag that asset for follow-up work, which increases our costs and safety risks to our employees.

With this project we worked closely with the National Physics Laboratory, benefiting from its essential knowledge to understand how we could better optimise our use of IR images for condition assessment. We wanted to learn more about the uncertainty in our measurements so we could adjust the thresholds at which further inspections are triggered.

What have we learned?

OsIRIS has now completed all of its deliverables and we're looking to implement some of the project's recommendations into business as usual. A key outcome is that the temperature threshold to trigger further inspection will be reviewed in light of OsIRIS's findings, which will mitigate unnecessary repeat visits to our assets. This could lead to potential savings of hundreds of thousands of pounds a year.

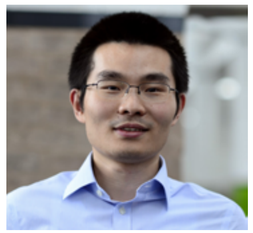
A future energy system for South Wales

Title: Zero 2050: South Wales (Whole System Analysis)

Consumer value theme: Corporate Responsibility

Project number: NGTO040

Ben Kuchta
Associate Innovation Engineer,
National Grid Electricity Transmission



"Our aim is to develop an optimised pathway that helps South Wales meet this target. It will also form a framework for other regions in England and Wales to do the same."

Linwei Chen
Innovation Engineer,
National Grid Electricity Transmission

What is the project designed to achieve?

National Grid is partnering with a number of network providers on an ambitious project to speed up progress towards making South Wales zero carbon by 2050.

Linwei Chen, Innovation Engineer, explains: "Our aim is to develop an optimised pathway that helps South Wales meet this target. It will also form a framework for other regions in England and Wales to do the same."

Ben Kuchta, Innovation Engineer, says: "While National Grid started this initiative, it's now become a true partnership between network providers operating in South Wales and is co-funded by Wales and West Utilities, Western Power Distribution, and National Grid. The project is also backed by the Welsh Government and the South Wales Industrial Cluster (SWIC)." The SWIC comprises a group of major industrial and manufacturing companies who aim to develop a world-leading, sustainable industry befitting the societal needs of 2050 and beyond.

The partners involved are providing overall direction on the project.

What areas does the project cover?

Working groups have focused on seven key areas:

- cities – helping Swansea, Cardiff and Newport in their transition to low-carbon communities with a focus on heating and road transport
- industry – supporting businesses to lower their emissions and still thrive
- transport – accelerating reduced emissions by finding ways to offer clean transport choices for the road, railway, marine and aviation sectors
- generation – further embracing renewable energy sources
- network reinforcement – estimating costs for both electricity and gas infrastructure, and considering various innovation solutions
- carbon capture and storage – conducting techno-economic assessments of CO_2 capture and storage solutions
- optimisation – integrating the outputs from all working groups to develop optimised pathways for various decarbonisation scenarios.

Linwei Chen said: "Our work could help lead to a net-zero economic transformation in the region, which covers 14 local authorities and is home to two-thirds of the population of Wales."

"A whole system design approach, which takes into account regional perspective and cross-sector collaboration, may potentially reduce infrastructure investment requirements. Even if this results in a 1% saving for net-zero transformation, it would still have a significant cost benefit for consumers."

You can find out more, and follow us on our website at **zero2050.co.uk**.

ZERO 2050 South Wales

RIIO-T1 project portfolio

Here is our full list of NIA projects throughout the RIIO-T1 period so far. To find out further information about any of our innovation projects please click on the project name.

Project ref	Project name	Partners
NIA_NGET0003	Simulation of multi-terminal VSC HVDC system by means of Real Time Digital Simulation (RTDS)	University of Birmingham
NIA_NGET0010	Optimised Location for Surge Arresters on the Transmission Network	Cardiff University
NIA_NGET0011	Detection and Measurement of ACSR Corrosion	Hydro-Québec
NIA_NGET0012	Induced voltages and currents on transmission overhead lines under NSI 4 working practices	Cardiff University
NIA_NGET0013	Tablet interface for a SF6 mass flow top-up device	University of Hertfordshire, DILO
NIA_NGET0014	Transformer & System Reliability	University of Manchester
NIA_NGET0015	Dinorwig Thermal Cycling and Cable Rating	Doble Powertest Ltd, University of Southampton
NIA_NGET0017	Oil/Paper Insulation HVDC Performance	University of Southampton
NIA_NGET0018	Potentials and profiles around earth electrodes and opposite-side injection for large-area earthing	Cardiff University
NIA_NGET0019	Reliability Assessment of System Integrity Protection Schemes (SIPS)	University of Manchester
NIA_NGET0024	Composite Cross-Arms Study	University of Manchester
NIA_NGET0025	Feasibility Study for Sustainable Substation Design	Ove Arup and Partners Ltd
NIA_NGET0033	Wireless Condition Monitoring Sensors with Integrated Diagnostics	University of Strathclyde
NIA_NGET0034	Fibre-optic Acoustic Monitoring	N/A
NIA_NGET0035	Long Term Performance of Silicon Based Composite Insulators	University of Manchester
NIA_NGET0036	ThermoMechanical Forces in XLPE Cable	University of Southampton, Mott MacDonald, Cable Consulting Incorporated
NIA_NGET0038	Design of a smart tool for detecting hidden errors in protection setting files	University of Strathclyde, Alstom Grid
NIA_NGET0040	Magnetic Models for Transformers	University of Manchester, Cardiff University
NIA_NGET0042	HVDC EngD – Richard Poole	University of Hertfordshire
NIA_NGET0043	Live Line Working Equipment	Bond Helicopters Europe
NIA_NGET0044	Transformer Oil Passivation and Impact of Corrosive Sulphur (TOPICS)	University of Southampton, Doble
NIA_NGET0045	Multi-terminal VSC HVDC operation, control and AC system integration	University of Manchester

Project ref	Project name	Partners
NIA_NGET0046	Flexible rating options for DC operation	University of Southampton
NIA_NGET0047	Dynamic Ratings for improved Operational Performance (DROP)	University of Southampton
NIA_NGET0048	Cables with Long Electrical Sections	University of Southampton
NIA_NGET0051	33kV Superconducting Fault Current Limiter	Applied Superconductor
NIA_NGET0053	RESNET	University of Manchester
NIA_NGET0054	Load cycling and radial flow in mass impregnated HVDC Submarine cables	Sintef Energy and NTNU (Trondheim) via a consortium with Statnett & Tennet
NIA_NGET0055	Electromagnetic transients (EMT) in future power systems – Phenomena, stresses & modelling	Sintef Energy
NIA_NGET0056	Humber Smartzone Pilot Project	University of Manchester
NIA_NGET0057	DC Circuit Breaker Technologies	University of Manchester, Ampacimon
NIA_NGET0060	Application of DC circuit-breakers in DC Grids	Cardiff University
NIA_NGET0064	Alternative Bus Bar Protection Solution	Schweitzer Engineering Ltd
NIA_NGET0065	Voltage Optimiser Pilot	EMS Powerstar
NIA_NGET0067	Trial & Performance Assessment of ACCR Conductor (3M)	3M
NIA_NGET0072	Alternative Differential Unit Protection for Cable only and Cable & OHL hybrid installations	Cooper Power System
NIA_NGET0073	Partial discharge monitoring of DC cable (DCPD)	University of Southampton
NIA_NGET0074	SF6 Capture & Leakage Repair	University of Liverpool, Furmanite, Belzona, Siemens
NIA_NGET0075	Temporary Oil Containment	N/A
NIA_NGET0079	Rapid Deployment Ballistic Screens	Doble, Radnor, Redman Composites
NIA_NGET0080	400kV Synthetic Ester Filled Transformer Pilot Project	Alstom, M & I Materials
NIA_NGET0082	Rating Impact of Non-isothermal Ground Surface (RINGS)	Doble, C3, University of Southampton
NIA_NGET0083	Cable Oil Regeneration	Enervac Corporation, JSM Construction
NIA_NGET0087	Cable Installation Design & Innovation Project (CIDIP)	University of Southampton

RIIO-T1 project portfolio

Project ref	Project name	Partners
NIA_NGET0088	Transformer Research Consortium	University of Manchester
NIA_NGET0089	Impact of HVDC Cable Operation on Telecommunication Lines	Powersure Technology Limited
NIA_NGET0090	Cable Extraction	JSM
NIA_NGET0091	Impact Assessment of Seismic Analysis on Electricity Towers and Substation Equipment / Structures	Mott MacDonald
NIA_NGET0092	Partial Discharge on Existing HV Cable	Elimpus Limited, NDB Technologies, Prysmian Cable and Systems Limited, Doble PowerTest
NIA_NGET0093	Online Gas in Oil Analysis on Existing HV Cables	Doble, ISL and C3 Global
NIA_NGET0098	Computer Vision For Cable Tunnels	N/A
NIA_NGET0099	Thermal Efficiency Trials	Rook Services
NIA_NGET0102	13kV Shunt Reactor Refurbishment	ABB
NIA_NGET0103	Modelling the tape corrosion process for oil-filled underground cables	University of Leicester
NIA_NGET0104	Proof of Concept for IEC61850 Process Bus Technology	ABB
NIA_NGET0107	Stakeholder attitudes to electricity infrastructure	University of Exeter
NIA_NGET0108	Incident Investigation Review	Taproot, Sigma
NIA_NGET0109	Bushing and Instrument Transformer Test Tap Connection Condition Assessment Tool	Elisys Engineering Limited
NIA_NGET0112	Enhanced AC and DC safety voltage limits assessment	Cardiff University
NIA_NGET0113	Control of Debris and Dust from the Treatment of Grade 4 Tower Steelwork (G4T)	CLC Contractors Ltd, Spencer Coatings Ltd, PDC Protective & Decorative, Fountains Environmental Limited
NIA_NGET0115	Cable Stripping Truck	Utilise Limited
NIA_NGET0116	Combustible Gases in Redundant Oil Filled Cables	Utilise Environmental
NIA_NGET0117	Bulk Oil Circuit Breaker Bushing In Situ Refurbishment	ORE Catapult Development Services Limited
NIA_NGET0118	Understand and Improving Condition, Performance, and Life Expectancy of Substation Assets	The Watt Consultancy
NIA_NGET0122	Identification and Mitigation of Large Equipment Transport Issues	Wynns Ltd
NIA_NGET0123	EPRI Research Collaboration on Substations	EPRI INTERNATIONAL INC.
NIA_NGET0124	EPRI Research Collaboration on Electromagnetic Fields and Radio Frequencies	EPRI INTERNATIONAL INC.
NIA_NGET0126	EPRI Research Collaboration on Overhead Circuits.	EPRI INTERNATIONAL INC.

Project ref	Project name	Partners
NIA_NGET0130	Determining a threshold for magnetophosphenes perception at 50Hz	Lawson Health Research Institute
NIA_NGET0132	UltraWire	University of Cambridge
NIA_NGET0133	Identifying Opportunities and Developments in Electric and Magnetic Fields Research	Formex Archive Services Ltd, Torrance Ltd, Market Opinion Research Ltd, Resource Strategies Ltd
NIA_NGET0135	Enhanced Sensor Development (ICASE Award)	University of Manchester
NIA_NGET0136	Impact of Seabed Properties on Ampacity and Reliability of Cables (ICASE Award)	University of Southampton
NIA_NGET0137	Noise Assessment of ACCR Conductor	3M, Bruel & Kjaer
NIA_NGET0140	OHL Condition Assessment	Brunel University, Amey OWR
NIA_NGET0141	T-pylon Structure and Composite Insulator Testing	LAPP/Mosdorfer, Pfisterer and Allied Insulators, STRI (Sweden), CEPRI (China), EPL Composites, MIRA, University of Southampton, Cranfield University (England)
NIA_NGET0143	Transient and Clearances in the Future Electrical Transmission Systems (ICASE Award)	University of Manchester
NIA_NGET0146	Assessment of Electronic (Analogue and Numeric) Protection equipment end of life mechanisms	Quanta Technology, University of Manchester, Nottingham University
NIA_NGET0147	Condition Monitoring of Power Assets (COMPASS)	The Watt
NIA_NGET0148	Network Reliability Asset Replacement Decision Support Tool	University of Manchester
NIA_NGET0149	Investigation of Aeolian Insulator Noise	Cranfield University School of Management, University of Manchester, Campbell Associate
NIA_NGET0150	EPRI Research Collaboration on Underground Transmission	EPRI
NIA_NGET0153	Life Cycle Costing and Value Optimisation (ICase Award)	University Of Bath
NIA_NGET0157	EPRI Research Collaboration on Substations	EPRI INTERNATIONAL INC.
NIA_NGET0158	EPRI Research Collaboration on Overhead Transmission Lines Project	EPRI INTERNATIONAL INC.
NIA_NGET0160	Feasibility of Risk based Network Planning	University of Manchester
NIA_NGET0162	Digital Substation – Virtual Site Acceptance Testing & Training	University of Manchester
NIA_NGET0163	SF6 Management and Alternative Gases	Cardiff University
NIA_NGET0164	Evaluation of a Novel Variant of ACCC HTLS Conductor	Nexans Benelux SA, LAPP Insulators GMBH
NIA_NGET0165	Transformer Rating Modelling Tool Enhancement	Oxford Computer Consultants, Southampton Dielectric Consultants, University of Southampton

RIIO-T1 project portfolio

Project ref	Project name	Partners
NIA_NGET0166	VSC-HVDC Model Validation and Improvement (iCASE)	University of Manchester
NIA_NGET0168	A New Independent Methodology For P&C Coordination Studies Using Real Time Digital Simulation	Birmingham University
NIA_NGET0171	EPRI Research Collaboration on Electric and Magnetic Fields Health and Safety	EPRI INTERNATIONAL INC.
NIA_NGET0172	EPRI Research Collaboration on Substations	EPRI INTERNATIONAL INC.
NIA_NGET0173	EPRI Research Collaboration on Overhead Transmission Lines Project	EPRI INTERNATIONAL INC.
NIA_NGET0176	Feasibility study on the application of advanced materials	University of Manchester
NIA_NGET0178	Environmental Containment solutions for Midel 7131	WSP-PB, Adler and Allen
NIA_NGET0179	Travelling Wave Fault Locator Trial	Qualitrol
NIA_NGET0180	EPRI Research Collaboration on Electric & Magnetic Fields Health & Safety (P60) 2016	EPRI INTERNATIONAL INC.
NIA_NGET0181	Classification of Wind Exposed Overhead line Spans	Digital Engineering
NIA_NGET0182	Feasibility study on suitability of protection policy for future energy scenarios	University of Manchester, Quanta Technology
NIA_NGET0184	Identify opportunities and developments in EMF Research (2016-2018)	Formex Archive Services Ltd, Torrance Ltd, Market Opinion Research Ltd
NIA_NGET0185	Investigation of transient and safety issues in gas insulated systems	Cardiff University
NIA_NGET0186	Condition Monitoring of Circuit Breakers – iCASE	University of Liverpool
NIA_NGET0189	Security Assessment of Industrial Control Systems (ICS)	University of Birmingham
NIA_NGET0190	EPRI Research Collaboration on Cyber Security 2016 (P183)	EPRI INTERNATIONAL INC.
NIA_NGET0191	EPRI Research Collaboration on Grid Planning (P40)	EPRI INTERNATIONAL INC.
NIA_NGET0194	Detailed design of 400 kV 240MVA Mobile Substation Bay	Abb Ltd (Alliance)
NIA_NGET0195	EPRI Research Collaboration on Substations 2016 (P37)	EPRI INTERNATIONAL INC.
NIA_NGET0196	EPRI Research Collaboration on Overhead Lines 2016 (P35)	EPRI INTERNATIONAL INC.
NIA_NGET0197	Development of fittings analysis model	Amey OWR Ltd
NIA_NGET0198	Cost effective removal of conductor crossing clearance constraints	Jacobs U.K. Limited
NIA_NGET0199	Alternatives to SF6 for retro-filling existing equipment	University of Manchester
NIA_NGET0200	Study into the Concept of High Impact, Low Probability Events	University of Oxford, Strathclyde University, EA Technology, and Ernst & Young (EY)
NIA_NGET0201	Portable Earthing Device	Aldercote Limited

Project ref	Project name	Partners
NIA_NGET0202	Development of a Universal Bushing	BTRAC
NIA_NGET0203	Novel acoustic attenuation feasibility study	WSP Environmental Ltd
NIA_NGET0204	Frequency Response Analysis for Transformer Characterisation and Objective Interpretation of Results	University of Manchester
NIA_NGET0206	Novel methodology for assessing environmental exposure of OHL routes	Digital Engineering
NIA_NGET0207	Development of Tools for the Assessment and Control of Impressed Voltage	P&B Weir Electrical
NIA_NGET0208	EPRI Research Collaboration on Electric & Magnetic Fields Health & Safety (P60) 2017 -2021	EPRI INTERNATIONAL INC.
NIA_NGET0209	EPRI Research Collaboration on Overhead Lines (P35) 2017	EPRI INTERNATIONAL INC.
NIA_NGET0210	EPRI Research Collaboration on Substations (P37) 2017 – 2020	EPRI INTERNATIONAL INC.
NIA_NGET0211	Controllable Series Impedance at 275 and 400kV (CSI)	Smart Wire Grid Inc
NIA_NGET0212	Positioning ballistic screening on substation sites	N/A
NIA_NGET0213	Condition and Climatic Environment for Power Transformers (ConCEPT)	University of Southampton
NIA_NGET0214	Transformer and Transformer Oil Life Optimisation and Management Through Analysis and Modelling	University of Manchester, University of Southampton
NIA_NGET0215	Automated assessment of steelwork condition using innovative imaging techniques	Nottingham Trent University
NIA_NGTO005	EPRI Research Collaboration on Information and Communication Technology (P161)	EPRI INTERNATIONAL INC.
NIA_NGTO007	EPRI Research Collaboration on Electric Transportation (P18)	EPRI INTERNATIONAL INC.
NIA_NGTO001	Electric Road System for Dynamic Charging of Electric Vehicles	Cardiff University
NIA_NGTO002	Long Term Stability of Alternative Gases	Cardiff University
NIA_NGTO006	Automated identification of failures in HV assets	University of Manchester
NIA_NGTO003	EPRI Research Collaboration on Overhead Lines (P35) 2018-2021	EPRI INTERNATIONAL INC.
NIA_NGTO0031	Feasibility study in to unlocking flexibility within UK Steel Works	Cardiff University
NIA_NGTO008	The FMEA Studies and Risk-based Maintenance for Emerging Power Electronics Assets within GB Power Networks	University of Manchester
NIA_NGTO009	Electrical Characterisation of Silicone Oil (ECOSO)	Unviersity of Manchester
NIA_NGTO010	Liquids for cable sealing ends (LiCaSE)	University of Southampton

RIIO-T1 project portfolio

Project ref	Project name	Partners
NIA_NGTO011	Energy Highways	BMT Defence Services
NIA_NGTO012	The application of Parametric Design to automate substation development	Atkins
NIA_NGTO013	Predicting Vibration Fatigue for Overhead Line Conductor Systems	University of Manchester
NIA_NGTO014	Advanced Line Rating Analysis (ALiRA)	Digital Engineering
NIA_NGTO015	CSE fault analysis by 3D monitoring	University of Manchester
NIA_NGTO016	WATTS – Weather Analytics for The Transmission System	Digital Engineering
NIA_NGTO017	Voltage source converter based series controlled impedance technology	Smart Wire Grid Inc
NIA_NGTO018	Harmonic Compliance	Power System Consulting Ltd
NIA_NGTO019	UnlockingTransmission Transfer Capacity	Quanta Technology
NIA_NGTO020	IEC 61850 Cyber Resilient Electric Substation Technologies	University of Manchester
NIA_NGTO021	Decarbonisation vision for South Wales	Progressive Energy Limited
NIA_NGTO022	High frequency earthing and its impact on the transmission system	Cardiff University
NIA_NGTO023	Increasing Transmission Boundary Power Flows using an Active Power Control Unit	Siemens Transmission & Distrib Ltd
NIA_NGTO024	Investigation into the Properties and Behaviour of Liquid Soil (LS) Technology	Cardiff University
NIA_NGTO025	Substation Time Synchronisation to Safeguard the Network	National Physical Laboratory
NIA_NGTO026	Health Monitoring of cables using Acoustic Emission Measurement Techniques	Cardiff University
NIA_NGTO027	Smart Geo Grid	Cardiff University
NIA_NGTO028	EPRI Research Collaboration on Underground Transmission (P36+ P34 part) 2018 – 2021	EPRI INTERNATIONAL INC.
NIA_NGTO029	Assessment of Wireless Technologies in a Substation Environment	Affini
NIA_NGTO030	Overload Rotation to Increase Capacity of Transmission Boundaries	University of Manchester
NIA_NGTO032	Novel O-ring Designs (NORD)	Cardiff University
NIA_NGTO034	Environmental Exposure of Overhead Lines: Data Delivery for Physical Testing	Digital Engineering
NIA_NGTO035	Power Electronic Enabled Transformers (PEETs)	University of Manchester
NIA_NGTO036	Optimised Infra-Red Image Systems (OsIRIS)	National Physical Laboratory Ltd
NIA_NGTO037	Multi energy vector modelling	University of Manchester

Project ref	Project name	Partners
NIA_NGTO038	Economic Ageing of Transformers (EAT)	University of Southampton
NIA_NGTO040	Zero-2050: South Wales (Whole system analysis)	NG Gas Transmission, Wales and West Utilities and Western Power Distribution
NIA_NGTO041	Big Data Analytics for Cable Systems	Digital Engineering
NIA_NGTO042	Impact of System inertia on the Critical Clearance Times (CCT) on the GB Transmission Network	Atkins Ltd
NIA_NGTO043	Short-term Voltage Stability Monitoring Using PMU data	University of Manchester
NIA_NGTO044	Sub/Near Synchronous Instability in the GB Network	Cardiff University
NIA_NGTO045	Risk mitigation of power electronics connections	Imperial College London
NIA_NGTO046	Advanced Weather Forecasts for Dynamic Line Rating	The Met Office
NIA_NGTO047	Challenging Composite Insulator Design Rules (Champions)	Cardiff University
NIA_NGTO048	Future power network simulations	Electranix Corporation
NIA_NGTO0050	New online tools for assessment of bushing condition (Not-ABC)	Doble Powertest Ltd
NIA_NGTO051	Long term stability testing of alternative gases 2: C5F10O	Cardiff University
NIA_NGGT0047	Resource and asset reuse toolkit	SKM Global
NIA_SHET0008	HVDC Nanocomposite Insulation	Led by SHET
NIA_NGET0084	Optimisation of Node Configuration In Offshore Supergrids	Imperial College London

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.

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