Network Innovation Allowance Annual Summary 2022/23

July 2023

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Introduction

1. This report has been prepared by Northern Powergrid to inform interested parties of the innovation activities of its electricity distribution licensees, Northern Powergrid (Yorkshire) Electricity Distribution plc, and Northern Powergrid (Northeast) Ltd. It covers the period from 1 April 2022 to 31 March 2023.

2. A single report has been prepared because the two licensees are operated under common management, sharing best practice between them. Our approach to research and development is no exception, and we draw no arbitrary distinction in the innovation carried out for the two licensees and our innovation strategy is designed to be equally applicable across our full geographic area of operation. Projects and programmes are therefore set up and progressed jointly for both licensees.

3. The report focuses upon research and development work eligible for Ofgem's Network Innovation Allowance (NIA) however some details of our other activities are given where necessary to provide a broader context for some of the innovation being undertaken within the company. Innovation is funded through a variety of routes including other price control revenues, specialist industry funding sources (e.g. Innovate UK) and participation with universities (funded by UK research councils).

4. The report has been prepared in accordance with standard condition 46 of the electricity distribution licence, the associated Regulatory Instructions and Guidance (RIGs) and the Electricity Network Innovation Allowance Governance document. In particular, the obligations specified in sections 6.6 and 6.7 relating to the requirements for an annual summary of NIA activities.

Progress of Innovation Activities

5. The 2022/23 regulatory year has seen some recovery of our pre-pandemic position, with utilisation of 73% of our Network Innovation Allowance, up from a pandemic-impacted 37% in 2021-22. We are hoping to utilise the remaining ED1 budget of £1.2m in the 23/24 regulatory year to complete the ED1 projects.

6. Whilst our investment level over the longer term has been typically been greater than 90% of regulatory allowance, during this year the level has been 73%.

7. We are now in the process of mobilising new projects and are taking the opportunity to fully align these with our ED2 innovation strategy.

8. In this reporting year Northern Powergrid has participated in 20 separate NIA projects. Five of these are collaborative projects with at least one other GB electricity distribution network operator (DNO) or gas distribution network (GDN) operator.

9. Four new projects were registered in 2022/23 and are being mobilised (Readi, Step Up Transformer, Rural Electrification 2.0 and Pollywood II.

10. We continue to seek collaborative activities with other DNOs. We also have similar activities with some GDNs plus regional water companies. We will continue to undertake joint activities wherever possible, both for improved learning and project quality and to maintain good cost control. With Streetscore II coming to an end, we are developing further projects with NGN, primarily in support of vulnerable customers e.g. the Off Grid Customer Research project. We have SIF projects partnering with UKPN, ENWL and NGESO due to commence at the beginning of ED2,

11. The new ED2 Strategic Innovation Fund offers new opportunities to collaborate with both DNOs and Gas Distribution Networks on issues of mutual interest. It also has the potential to expose us to innovators new to our sector of industry. During the year we were advised of our success with four out of five project proposals submitted in the round 2 SIF competition gaining funding, with the discovery phase projects kicking off in April 2023. These each directly support one of our six transformational innovation needs and support delivery of our 2023-28 business plan commitments.

12. The following table shows the projects which have been active during the reporting period:

Project	Reference No.	Project Type
Integrel	**NIA_NPG_017**	**Northern Powergrid activity**
Micro-Resilience	**NIA_NPG_018**	**Northern Powergrid activity**
Customer-Led Distribution system	**NIA_NPG_019**	**Northern Powergrid activity**
Resilient Homes	**NIA_NPG_026**	**Northern Powergrid activity**
Boston Spa Energy Efficiency Trial	**NIA_NPG_032**	**Northern Powergrid activity**
Covid Vulnerabilty Study	**NIA_NPG_035**	**Northern Powergrid activity**
Silent Power II	**NIA_NPG_036**	**Northern Powergrid activity**
Polesight	**NIA_NPG_037**	**Northern Powergrid activity**
The Value of Flexible Heat Demand as a Service	**NIA_NPG_038**	**Northern Powergrid activity**
Community DSO	**NIA_NPG_039**	**Northern Powergrid activity**
Pollywood II	**NIA_NPG_040**	**Northern Powergrid activity**
TX Cooling	**NIA_NPG_041**	**Northern Powergrid activity**
Rural Electrification	**NIA_NPG_042**	**Northern Powergrid activity**
Step up transformer	**NIA_NPG_043**	**Northern Powergrid activity**
Readi	**NIA_NPG_044**	**Northern Powergrid activity**
Streetscore II	**NIA_NGN_338**	**EIC Collaboration, NGN lead**
Cage Capture - SF6 leak detection	**NIA_SSEN_0059**	**EIC Collaboration, SSEN lead**
Pole Pre-treatment Alternatives to Creosote (APPEAL)	**NIA_SPEN_0008**	**EIC Collaboration, SPEN lead**
Development of Oil-filled Cable Additive- Phase 2	**NIA_UKPN_0030**	**EIC Collaboration, UKPN lead**
Net zero service termination	**NIA_SSEN_0055**	**ENA Collaboration, SSEN lead**

13. The table identifies those projects where we are sole participant or, where we are working alongside other licensees, the nature of the collaboration involved. For projects where Northern Powergrid is either sole participant or, in the case of collaborative innovation, where Northern Powergrid is the designated lead licensee

we have posted the required annual progress update on the ENA Smarter Networks Portal.

14. We also continue to participate in several activities in a supporting role, either as engineering consultants providing insight into the network compatibility issues or acting in a more active steering role. These projects are not formal NIA funded activities but are important in allowing us to influence the development activities of others and to stimulate the market.

15. The Community DSO project NIC bid was successful in its 2022 funding application, with the £14.4m project being mobilised ahead of its formal start in April 2023. The Community DSO approach is intended to capture the potential for flexibility from individual consumers at the very lowest voltage level of the distribution network. It is believed that this can be achieved by creating energy communities – groups of engaged and physically connected customers who can both produce and consume power. Within this approach, these energy communities would become responsible for the management of energy flows at that level and perform at least some part of the DSO's role.

16. We also continue to benefit from the advantages of being part of a broader international organisation, Berkshire Hathaway Energy (BHE). Exchange of innovative ideas, best practice and other learning from an organisation with very similar technology but with a different perspective significantly enhances the quality of our overall innovation portfolio. We are now actively engaged in the sharing of innovation project outcomes and the depth of that interaction is increasing.

Innovation Strategy Delivery

17. In December 2021 we published our ED2 innovation strategy.

18. Our innovation strategy seeks to achieve four outcomes:

1. Chart the Best Course to Net Zero - Developing and deploying technologies and creative solutions that enable faster, lower-cost pathways to decarbonisation.

2. Collaboratively Unlock the Value of Open Data And An Increasingly Digitalised Network - Working with partners to open up new channels and techniques that significantly, efficiently and effectively increase the exploitation of data flows and digitalisation across the whole energy system.

3. Achieve Next-Level Energy System Dependability - Increasing the reliability, resilience and security of the powergrid to improve not only its own dependability, but also that of the overall energy system.

4. Make Sure All Customers Benefit - Promote and safeguard the interests of customers, particularly those who otherwise might be significantly disadvantaged or left behind in the energy system transition.

19. To achieve these outcomes, we have identified six areas where we will have to transform our current capabilities:

1. Identify opportunities to accelerate realising the benefits of flexibility.
2. Develop sophisticated data management and analytics to inform energy system forecasting, planning and real-time decision-making.
3. Enhance the connections process to facilitate higher volumes and different types of connection.
4. Increase the dependability of the electricity system as seen by the customer.

5. Remove barriers that prevent access to the energy market for all customers; particularly those not currently engaged or informed, vulnerable or less-advantaged, and including access to energy data.
6. Create capabilities to deliver a next generation local energy network that links up whole system energy sources and vectors, balancing in real time.

19. We are working with internal and external stakeholders to ensure our emerging project activities are spread across these transformations.

20. Storms, during December 2021 and January 2022, pointedly emphasised the importance to customers of network reliability. As society becomes more dependent on electricity this will become increasingly important. Projects such as MicroResilience aim to provide more inherent resilience within the network and a successful project will allow us to provide better support to the more isolated parts of our network. Equipment from the MicroResilience Innovation project will be deployed to the Integrel site to support the existing Northern Gas Networks control centre on site. The Integrel site is an important facility that will allow us to deliver whole systems projects going forward. As the installation nears completion, we will be continuing to develop collaborative project opportunities with NGN to utilise the opportunities this facility provides.

21. Projects such as Community DSO should allow the connection of more community based local energy schemes which as well as providing customers with cheaper simpler connections and lower electricity bill should also help to deliver more embedded resilience.

22. In support of decarbonisation, we have mobilised the Rural Electrification 2.0 project, which is looking to understand the impact of increasing electrification of the agricultural sector and rural communities / businesses on the distribution network in order to remove barriers, accelerate the transition to net-zero and improve rural network reliability.

23. Readi, a project which aims to develop a common framework that is intended to facilitate analysis and application of appropriate climate data among all stakeholders to enhance the planning, design, and operation of the power sector.

24. Step Up Transformer, which is exploring alternative operational approach to connecting generators to OHLs under emergency outage conditions.

25. Resilient Homes is aimed at supporting vulnerable customers through the installation of small-scale storage system to protect them in the event of scheduled or unscheduled interruption to service. The majority of the in-home installations have been completed this year, the project now moving on to the second phase which will evaluate the actual social and performance benefits to the customer as well as the grid and comparison to the forecast benefits from phase 1. On the back of the project learning to date, we are trialling a small-scale BAU roll out of battery packs into the homes of vulnerable customers.

26. We have continued to support the Energy innovation Centre (EIC) during 2022/23 as we have done since its inception in 2008. This is an activity undertaken in collaboration with the majority of DNOs and GDNs as well as other utilities. It is designed to both identify and encourage innovations from new sources, such as other industries or SMEs with no previous experience of working with the electricity distribution network operators.

27. We continue to work closely with the EIC and have been involving them in our portfolio planning to bring a diff perspective on our ED2 innovation challenges.

28. We are in the process of mobilising three further cross-industry projects with the EIC. These include: OHL collision avoidance looking at solutions to reduce the incidence of vulnerable lone workers in rural locations coming into contact with our network and the consequent risk of death or serious injury; Off-grid Communities, a collaboration with NGN looking at the least well served/non-served customers; and Step-up Transformer which will explore faster restorations on the HV system under storm conditions cf. traditional generator connection.

29. The costs of running the EIC have been distributed across the running projects identified from this activity. We see the EIC as an increasingly important forum for the identification and implementation of cross-vector, cross-utility projects.

30. Northern Powergrid also supports activities undertaken through the ENA. The Collaborative Energy Portfolio (CEP) activity is aimed at the delivery of innovative activities of mutual interest. We consider this a core collaboration activity for innovation through the ENA. All of the projects undertaken through the CEP are collaborative. While some of these are supported using innovation stimulus funding a significant proportion are funded as business-as-usual activities.

Learning

31. The annual reports for each of the individual projects are available on the ENA smarter networks portal. These address the learning, both in terms of the delivery process and the project outcomes for each activity in detail.

32. Many of our projects are in progress and their nature is such that the conclusions on the learning delivered cannot be fully understood in the context of a partially completed project and the activities must run to their scheduled end point before conclusions can be drawn.

33. The Customer Led Distribution System project has now ended. The project emphasised the benefits of customer flexibility in realising a smart, cost-efficient and decarbonised future energy system. It offered insights into the evolution of the distribution industry and market, in addition highlighting the importance of future DSO's role in market facilitation and whole-system coordination. The learnings from the project are summarised in the associated annual NIA report. These will help us gain more understanding of the possible future of flexible energy systems and the implications of our transition into the future role of the DSO.

34. The Value of Flexible Heat Demand as a Service project is complete. The project successfully analysed the customer options and take-up for de-carbonising heating by carrying out a research review of commercial and academic evidence on thermal demands and electricity peaks in different types and ages of dwellings. The findings helped to develop the models which successfully analysed a range of types and ages of domestic premises. Commercial software energy modelling was used to calculate thermal peaks for a set of five different property types and five different fabric specifications (corresponding to five distinct time periods) and compare their resulting annual electricity peak for gas boilers and heat pumps. The project successfully identified the types of stakeholders and the most common technical approach to HP systems. The most common building archetypes in the Northern Powergrid region were identified, and these formed the basis of the thermal modelling section of the project. These were catalogued and will be explored

in a future project. The future project will be based on the results of thermal modelling developed in this project.

35. The Community DSO NIA project is also complete. The project completed a feasibility study and value assessment of smart local energy systems (SLES), the results of which were used to inform the successful £14.4m NIC project bid.The NIC project will run throughout ED2. The overarching objective will be to identify and demonstrate at a theoretical level that there are community SLES solutions that could help deliver an optimised energy system and accelerate decarbonisation whilst providing local community benefit.

36. The Silent Power 2 project was stopped due to the additional cost associated with the bespoke inverter solution that was required to deliver a unit which could switch between single, split and three phase outputs, depending on the location of the network outage. It was determined that the technical benefits of delivering the prototype to completion did not outweigh the increase in budget required and, as the business case was no longer viable, the project was brought to a close.

37. On the Microresilience project, significant milestones have been reached in the design, procurement, building and testing of the two functioning units needed to deliver the MR proposition. Equipment from the MicroResilience Innovation project will be deployed to the Integrel site to support the existing Northern Gas Networks control centre on site. Installation is expected to be complete by the end of Q3 2023. Work to define the closedown reports, has been completed and preparations for other associated dissemination material are ongoing.

19. The Boston Spa Energy Efficiency Trial remains in the hardware/software implementation phase. There have been delays in the implementation of the OT infrastructure required to facilitate the dynamic set point trial, therefore open loop testing in the production system will not start until September 2023 (delayed from May 2022), with the closed loop trial starting in December 2023 (delayed from August 2022). We are especially keen that this project is successfully delivered given the ongoing saving of up to £40 per annum which can be achieved with low levels of additional investment

20. We continue to use the ENA Electricity/Energy Innovation Forums to disseminate project learning as it occurs. We will continue to support "The Summit" conference while it still serves our regulatory requirements.

Summary of 2022/23 Network Innovation Allowance Investment

21. We can also summarise the total network innovation allowance spending for the reporting period across the two Northern Powergrid licence areas:

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Eligible Project Spending (external)	£2,900,222
Eligible Project Spending (internal)	£535,547
IFIEt, Grand Total	£3,435,769

22. Internal spending represents 16% of the total investment. This is below the governance maximum limit of 25%.