Network Innovation Allowance Annual Summary 2023/24

July 2024

Version Control	
Version 1.0 Final	
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2023/24 NIA Annual Summary

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Revision Record

Version	Date	Revision Details	Author
0.1	15/5/24	First draft	Emma Burton
0.9	10/07/24	Final review	Emma Burton
1.0	16/07/24	Document revised to v1.0	Emma Burton
1.0	23/07/24	Approved for Release	Chris Goodhand

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 2023 to 31 March 2024.

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. Strategic Innovation Fund (SIF)) 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. In 2023/24 we utilised £2.17m of our Network Innovation Allowance, 20% of our total ED2 NIA allowance of £7.5m when adjusted for 2020/21 base prices and inflation.

6. The carry-over ED1 allowance of £1.34m was fully utilised in the regulatory year on the seven remaining ED1 projects.

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

8. In this reporting year Northern Powergrid has participated in nineteen separate NIA projects. Six of these are collaborative projects with at least one other GB

electricity distribution network operator (DNO) or gas distribution network (GDN) operator.

9. Three new projects were registered in 2023/24 and are progressing well against their plans. The projects are Overhead Line Collision Avoidance, Storm Triage and BESS P28.

10. We continue to collaborate with other DNOs and GDNs and will undertake joint activities where possible. Projects which we have supported in 2023_24 include the Off-grid Customer Research project and The Vulnerability Visualisation Tool Phase 2 with Northern Gas Networks, both primarily in support of vulnerable customers.

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.

12. During the year we were awarded funding for seven projects in the Strategic Innovation Fund competition. Four round 2 discovery projects were completed between April and June 2023. These were: Inform, Artificial Forecasting, Resilient Customer Response and DFQM. Three of these projects were taken forward to Alpha phase (Inform, Artificial Forecasting and DFQM), with the fourth (Resilient Customer Response) being mobilised as a NIA project, due to begin later in 2024. These projects each directly support one of our six transformational innovation needs and support delivery of our 2023-28 business plan commitments.

13. We were advised of our success with a further five Discovery project proposals gaining funding in the round 3 SIF competition. The discovery phase projects kicked off in March 2024 and will run to the end of May 2024.

14. The following table shows the NIA 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**
Resilient Homes	**NIA_NPG_026**	**Northern Powergrid activity**
Boston Spa Energy Efficiency Trial	**NIA_NPG_032**	**Northern Powergrid activity**
Polesight	**NIA_NPG_037**	**Northern Powergrid activity**
Pollywood II	**NIA_NPG_040**	**EIC Collaboration, NPg lead**
Tx Cooling	**NIA_NPG_041**	**Northern Powergrid activity**
Rural Electrification 2.0	**NIA_NPG_042**	**Northern Powergrid activity**
Step up transformer	**NIA_NPG_043**	**EIC Collaboration, NPg lead**
Readi	**NIA_NPG_044**	**Northern Powergrid activity**
Overhead Line Collision Avoidance	**NIA_NPG_045**	**EIC Collaboration, NPg lead**
BESS P28	**NIA_NPG_046**	**Northern Powergrid activity**
Storm Triage	**NIA_NPG_047**	**Northern Powergrid activity**
Cage Capture - SF6 leak detection	**NIA_SSEN_0059**	**EIC Collaboration, SSEN lead**
Vulnerability Visualisation Tool Phase 2	**NIA_NGN_422**	**EIC Collaboration, NGN lead**
Environmentally Acceptable Wood Pole Pre-treatment Alternatives to Creosote (APPEAL)	**NIA_SPEN_0098**	**EIC Collaboration, SPEN lead**
Off-grid Customer Research Project	**NIA_NGN_360**	**EIC Collaboration, NGN lead**
Fluid Cable Care Phase 3	**NIA_UKPN_0089**	**EIC Collaboration, UKPN lead**
Truly Sustainable D&T Substations	**NIA_SPEN_0077**	**EIC Collaboration, SPEN lead**

15. The table identifies those projects where Northern Powergrid is the sole participant or, where we are working alongside other licensees and 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.

16. 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.

17. 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. This year, the Readi project has been delivered as part of this interaction with the broader organisation.

Innovation Strategy Delivery

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

19. 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.

20. 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. This includes participating in the ENA Basecamp activities where two responses to our proposed challenges were taken forward and developed into SIF discovery projects.

20. We continue to hold Strategic Technology Days, bringing together stakeholders from across the Business with a technology partner, to ideate in support of our aforementioned innovation challenges.

21. 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.

22. Storm Triage aims to provide an additional IT enabled communications option to speed up responses reducing restoration times and contribute to reducing the impact of major outages on vulnerable customers.

23. 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.

24. In support of decarbonisation, the Rural Electrification 2.0 project, 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.

25. Readi, aimed 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.

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

27. 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.

28. The BESS P28 project seeks to develop methodologies for assessing voltage fluctuations as more Battery Energy Storage Systems (BESS) are being connected to distribution networks.

29. In support of safety, OHL collision avoidance is 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.

30. During the year we were advised of our success in the new Strategic Innovation Fund competition. Four out of five project proposals submitted in the round 2 discovery competition were successful in gaining funding of over £0.605m, with the discovery phase projects kicking off in April 2023 and completing in June 2023. Each of these projects; Inform, Artificial Forecasting, Diversified Flexible Queue Management and Resilient Customer Response directly supports one of our six transformational innovation needs and the delivery of our 2023-28 business plan commitments.

31. Three projects (Inform, Artificial Forecasting and Diversified Flexible Queue Management) were taken forward for alpha project submissions and successfully secured a total of £1.273m in alpha project funding. The three

projects were completed between October 2023 and March 2024. The outcomes of DFQM have already been taken forward into BAU processes.

32. The Resilient Customer Response project was not suited to an alpha SIF project submission due to the customer engagement aspects of the project being more suited to the flexible timescale of a NIA project. The next phase of this project will be delivered using NIA funding.
33. We have continued to support the Energy innovation Centre (EIC) during 2023/24 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.
34. We work closely with the EIC and have been involving them in our portfolio planning to bring a different perspective on our ED2 innovation challenges. This year we began four 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.
35. 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.
36. Northern Powergrid also supports activities undertaken through the ENA some of which are done through the Collaborative Energy Portfolio (CEP).
37. 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.
38. 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.
39. In support of decarbonisation, the Rural Electrification 2.0 project has been focussed on understanding the impact of increasing electrification of the agricultural sector and rural communities / businesses on the distribution network, with a view to removing barriers, accelerating the transition to net-zero and improving rural network reliability. The project has been progressing against plan and through its engagement activities with the agricultural sector it has become more apparent that a cross-sector approach will be necessary for both the networks and the rural industries to achieve their decarbonisation goals. Project learnings are expected to be disseminated in Q3 2024.
40. On the Microresilience project, significant milestones have been reached in – design, procurement, building and testing of the 2 functioning units needed to deliver the MR proposition. Installation and commissioning is expected to be complete by the end of Q2 2024. Data collection from site will commence thereafter. Learning from the project will be leveraged to support a SIF round 2 BETA phase project submission.
41. Storm Triage has developed a digital application which will allow field staff to take photos of network damage as they survey the network and then for machine learning to classify the fault type. The enabling of an appropriately trained and experienced field engineer on site to take over the restoration co-

ordinator role, rather than leave it to someone working remotely, would enable faster, more dynamic and accurate ground level assessment of network damage during a storm and in turn reduce response time, thus reducing the number of customers becoming vulnerable. The platform could also be made accessible to various partners who assist NPg during a major incident (e.g., emergency services, local authorities, army etc.) as well as the general public. Initial results from the trial phase are encouraging and full dissemination will take place in Q4 2024.

42. Readi aimed to develop a common framework intended to facilitate analysis and application of appropriate climate data among stakeholders to enhance the planning, design, and operation of the power sector. Understanding climate risks is only the first step, creating an implementation plan involves buy in from subject matter experts and incorporation into processes and procedures. Communication and collaboration is key to building more resilient infrastructure. There have been a number of datasets and publications issued throughout the project which can be accessed via EPRI Climate Readi. Further development is however required to provide an understanding of the inherent uncertainty and limitations of the methods.

43. The Boston Spa Energy Efficiency Trial is seeking to create a non-network solution to creating capacity while simultaneously reducing customer bills. The Phase 2 'Dynamic Voltage Optimisation Trial' has been progressing well with the open loop testing in the production system running for three months and proving the systems were functioning as expected. A phased open-loop to closed loop trial started in January 2024 and is still on-going. This is allowing the system to alter the system voltage within set limits which are being increased as confidence in the system grows. Full closed loop testing is expected to start in May 2024 (delayed from August 2022).

44. BESS P28 is making a critical assessment of EREC P28 in relation to BESS operation, providing clarity on the three assessment areas of P28: voltage step, rapid voltage change and flicker. A comprehensive list of proposed clarifications and additional guidance associated with P28 is being identified to ensure it is fit-for-purpose.

45. Design work and customer engagement on our Resilient Homes project, a key initiative for vulnerable customers, is now complete and installation of circa 30 units has been completed. The project utilises a domestic battery solution for ensuring that medically electrically dependent customers remain on supply if a fault occurs on the network. A successful outcome may have positive implications more widely for vulnerable and electrically dependent customers, associated commercial offerings that a third party might develop from our work. Initial results have been positive with users not experiencing disruption of supply and informed they're in outage conditions due to receiving the application notification.

46. Polesight, building on our previous NIA project, Foresight, set out to improve our understanding of indicative pre-fault behaviour relating to pole mounted substations, their outgoing circuits and the development of management options for LV Overhead Line networks (OHL). The project deployed both Guard and VisNet devices on pole mounted transformers and successfully demonstrated that OHL events can be located in a similar way to underground cable events. A full report by EA Technology Ltd has been published. We continue to use the ENA Electricity/Energy Innovation Forums to disseminate project learning as it occurs. We will continue to support Energy Innovation Summit conference while it still serves our regulatory requirements.

Summary of 2023/24 Network Innovation Allowance Investment

47. We can also summarise the total network innovation allowance nominal spend for the reporting period across the two Northern Powergrid licence areas. This includes the ED1 carry-over allowance of £1.34m:

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Eligible Project Spending (external)	£3,131,253
Eligible Project Spending (internal)	£384,509
IFIEt, Grand Total	£3,515,762

48. Internal spending represents 11% of the total investment. This is below the governance maximum limit of 25%.