Network Innovation Allowance Annual Summary 2019/20

July 2020

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2019/20 NIA Annual Summary

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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 2019 to 31 March 2020.

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. We continue to expend the vast majority of our Network Innovation Allowance. This reflects the continuing uplift in innovation activity initiated in 2017/18. The large increase in new projects during that year means that the number of projects started during 2019/20, much like 2018/19 has remained relatively low with a total of 3 initiated during the review period. This is reflective of maintaining the portfolio at around its maximum size. For the reporting year Northern Powergrid has participated in 32 separate NIA projects. 9 of these are collaborative projects with at least one other GB electricity distribution network operator (DNO) or gas distribution network (GDN) operator.

6. We continue to have at least one collaborative activity with each of the 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. The trend direction over the last year has been for an increasing number of project activities to be undertaken on a collaborative basis and with the increased relevance of whole system thinking we anticipate that this will continue although experience has shown that opportunities which fit within NIA and NIC criteria under both GD1 and ED1 are currently difficult to identify.

7. We continue to seek cross-vector projects but this has continued to be difficult to achieve. Progress on the Integrel project, in which we collaborate with Northern Gas Networks, has been slow during the year. This has been the result of access and wayleave issues outside the direct control of the project. These issues are now moving towards resolution and better progress is anticipated during 2020/21.

8. The following table shows all of the projects which have been active during the reporting period:

	Reference	Project Type
Integrated substation Condition Monitoring (ISCM)	NIA_NPG_002	Northern Powergrid activity
Development of An Improved Distribution Load Estimates Methodology	NIA_NPG_004	Northern Powergrid activity
Activating Community Engagement (ACE)	NIA_NPG_005	Northern Powergrid activity
FORESIGHT – LV pre-fault recognition and management	NIA_NPG_007	Northern Powergrid activity
Development of Oil-filled Cable Additive	NIA_NPG_009	EIC Collaboration, NPg lead
Pollywood - Alternative wooden pole system for OHL	NIA_NPG_010	Northern Powergrid activity
Distributed Storage & Solar Study (DS3)	NIA_NPG_011	Northern Powergrid activity
Improving Demand Forecasting	NIA_NPG_012	Northern Powergrid activity
Measuring the Societal Impact of Network Activities	NIA_NPG_013	EIC Collaboration, NPg lead
Vehicle to Grid (V2G) - the network impact of grid integrated vehicles	NIA_NPG_014	Northern Powergrid activity
Geospatial PV Mapping	NIA_NPG_015	EIC Collaboration, NPg lead
Silent Night - Hybrid EV Generator	NIA_NPG_016	Northern Powergrid activity
Intregrel - Baseline Implementation	NIA_NPG_017	NPg/NGN Collaboration
Micro-Resilience	NIA_NPG_018	Northern Powergrid activity
Customer-Led Distribution System	NIA_NPG_019	Northern Powergrid activity
Smart Network Design Methodologies	NIA_NPG_020	Northern Powergrid activity
Holistic Fault Anticipation	NIA_NPG_021	Northern Powergrid activity
Drones Within Visual Line of Site (Drones WVLOS)	NIA_NPG_022	Northern Powergrid activity
AutoDesign: LV Connections Self Service Tool	NIA_NPG_024	Northern Powergrid activity
Lightning Prediction	NIA_NPG_025	Northern Powergrid activity
Resilient Homes	NIA_NPG_026	Northern Powergrid activity
Centralock Remote Access Management System	NIA_NPG_027	Northern Powergrid activity
Pragmatic Security	NIA_NPG_029	Northern Powergrid activity
Switchgear Enhanced Ratings	NIA_NPG_030	Northern Powergrid activity
Health Index Study of Electrical Energy Storage Systems within Electricity Networks.	NIA_NPG_031	Northern Powergrid activity
Boston Spa Energy Efficiency Trial	NIA_NPG_032	Northern Powergrid activity
Impact of LCTs on the LV Network	NIA_NPG_033	Northern Powergrid activity
Assessment & Testing of Alternative Cut-outs	NIA_UKPN0029	ENA Collaboration, UKPN lead
Low Cost Fault Current Measurement of Wooden Poles	NIA_SPEN_0025	EIC Collaboration, SPEN lead
Environmentally Acceptable Wood Pole Pre-treatment Alternatives to Creosote (APPEAL)	NIA_SPEN_0008	EIC Collaboration, SPEN lead
Eye in the Sky	NIA_WWU_0045	EIC Collaboration, WWU lead
Thor Hammer	NIA_SPEN_0039	EIC Collaboration, SPEN lead

9. 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.

10. In addition to these activities 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.

11. The success of the Autodesign project has shown the value of data and digitalisation. We are continuing to seek similar added-value project opportunities to use the data and information that we already hold. In further support of this we

are leading a 2020 Network Innovation Competition bid called Flexr. This project is designed to provide a high integrity repository for energy system data, built on open standards, to support the energy system transition, new 3rd party commercial services, analytics and a variety of other activities that would be enabled by easy access to data of a consistent quality. This is a collaborative project with most of the other DNOs taking an active role in delivery alongside Northern Powergrid.

12. We are also taking part in the preparation of a Network Innovation Competition proposal alongside SPEN and the other DNOs called Reheat. This project, will investigate the role that domestic and other heat storage might have in economically mitigating network issues associated with increasing levels of low carbon technology penetration.

13. 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.

Innovation Strategy Delivery

14. Our innovation strategy contains four strategic objectives that remain highly relevant:

- the creation of a smarter powergrid;
- the introduction of smart meters;
- continued growth in web-based and digital-enabled services; and
- issues of affordability.

15. Further, the priority areas identified in the innovation strategy are:

- Network environmental footprint (including safety);
- Network reliability and availability;
- Network management and flexibility;
- Demand side response (including customer flexibility);
- Network planning and design;
- Communications and engagement;
- IT enabled process improvements; and
- Social obligations

16. The bulk of our current activities remain focussed on the first five of these priority areas. These areas represent key engineering strands of our innovation requirement that have been in place for several years. However the shift in priority flagged last year to include more work on social obligations and particularly vulnerable customers is now beginning to deliver.

17. The DS3 project is now complete and final reporting is progress. This project used a mutually beneficial approach, providing additional storage equipment for vulnerable customers alongside local PV generation. Useful learning on economics, system behaviour and optimisation, charge/discharge regimes and available resource for network support has been gained. The work also informs our DSO thinking and how

distributed, privately owned and operated resources might provide network services.

18. 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. Initial feasibility work has been successfully completed and a second field trial phase is underway during 2020/21.

19. The success of the Autodesign project has demonstrated the value of IT enable process improvement, particularly where this uses innovation stimulus funding to build on other investment. We will be seeking to initiate further projects in the digitalisation and IT area during 2020/21

20. We have continued to support the Energy innovation Centre (EIC) during 2019/20 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. The remit of the EIC is being expanded and, for example, we are currently in discussions about mutually supportive projects and benchmarking for rail.

21. With other EIC members a balanced score card type methodology was developed and piloted during 2018/19. During 2019/20 this methodology has been shared more widely through the ENA and now forms the basis of an innovation measurement approach with the potential for regulatory application.

22. 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.

23. The Northern Utilities Joint Innovation Group (NJUIG) continues to meet. NJUIG supports the innovation needs of Infrastructure North and consists of representatives of Yorkshire and Northumbrian Water as well as Northern Gas Networks and ourselves. Following an attempt to try to develop this during the year we have now reverted to the previous operating mode although this has had an impact on the level of activity during 2019/20.

24. Northern Powergrid also supports activities undertaken through the ENA. The Collaborative Energy Portfolio (CEP) activity is aimed at the delivery of innovative activitie4s of mutual interest. All of the projects undertaken through the CEP are collaborative. While some of these are supported suing innovation stimulus funding a significant proportion are funded as business-as-usual activities.

25. We have continued to develop and enhance the role of our executive team in innovative activities. The strategy board continues to contribute to innovation direction. This has been further complemented during 2019/20 by the initiation of an innovation programme board to improve management of and engagement with tactical issues arising from the management of the overall portfolio of innovation projects.

Learning

26. 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.

27. 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.

28. Significant learning has been disseminated from the Autodesign project during this year. This project has allowed customers to undertake their own basic design work for connections which provides a quicker, more cost efficient service to them and allows Northern Powergrid to use scarce resource to serve customers with more complex needs. The system has now gone live, via the internet. This project builds on the very significant (non-innovation) investment made in our asset management and geographic information systems over the last few years.

29. Further significant learning has also been delivered by the DS3 project. This looked at the use of both privately-owned domestic battery storage and small scale network storage alongside domestic photovoltaic generation. The project examined battery operation regimes, achievable network benefits and economics and has provided useful information for both customers and networks that have interesting implications for future DSO operation.

30. The Switchgear Enhance Ratings project was substantially completed during the review period. This has indicated that there are issues with some of the fundamental underlying assumptions used in the long-standing CIGRE standards. Work is underway to clarify this and the implications for network operations and future design.

31. The Pollywood project is now substantially complete and the closedown report is imminent. This project has investigated the use of a sustainable, low environmental impact alternative to creosote-treated wooden poles. The replacement poles are wood veneer composite material that can be sustainably sourced and have significant advantages in easier handling whilst remaining compatible with current pole management processes. Having met the objectives of the initial project a second phase follow-up activity is now being designed to bring the new pole designs to full field trials.

32. The Geospatial project is now complete and awaiting final reporting. This project has shown the value of image analysis to improve our understanding of the physical reality and impact of what is attached to our network, in this case domestic and other photovoltaic generation. While demonstrating the value of the image analysis it is clear that satellite imagery is not significantly more useful than other imagery that can be collected during other routine operations such as aircraft-based overhead line inspection. Further activities will now be undertaken in this area with partner DNOs.

33. The Silent Power project has moved rapidly forward during the review period. This project has designed and developed a van-mounted battery system to be used in circumstance where a generator would normally be deployed. This has significant advantages with respect to reduced noise pollution, lower local emissions, and ease of deployment as it replaces a trailer mounted system. Pilot usage has demonstrated the value of this innovation and a rapid deployment into business as usual will now be undertaken.

34. We continue to use the ENA Electricity/Energy Innovation Forums to disseminate project learning as it occurs. This has been used to disseminate the learning from the Autodesign project and the final learning the DS3 project during 2019/20.

Summary of 2019/20 Network Innovation Allowance Investment

35. 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)	£3,268,382
Eligible Project Spending (internal)	£850,773
IFIEt, Grand Total	£4,119,155

36. This is a slightly lower figure compared with 2018/19 (£4,257,964). This difference was due to some project timing issues pushing some planned expenditure into the 2020/21 regulatory year and we retain our ambition to ensure that the ED1 annual allowance is fully utilised.

37. Internal spending represents 20% (cf 21% 2018/19) of the total investment. This is below the governance maximum limit of 25%.