

**NETWORK INNOVATION
ALLOWANCE (NIA)**

SUMMARY REPORT 2016/17





Welcome to Western Power Distribution's Network Innovation Allowance Report for 2016/17.

At Western Power Distribution we always seek to find better ways of working and our track record of innovation and change has helped us continually improve the way we deliver our services to customers. The challenge of operating a robust, sustainable network whilst meeting the increasing demands from Low Carbon Technologies and Distributed Generation has and will continue to call for Network Operators to become more creative and develop a new sophisticated and responsive network.

The rapid and continuing uptake of these technologies requires a flexible approach which can accommodate these changes when they arise. By carrying out a wide portfolio of innovative projects which build upon what we have already learnt and incorporating successful developments from other DNOs, we can ensure the network will meet all future needs and we will maintain our position as the leading performer in network availability and customer service.

We are applying our innovation strategy to deliver a robust programme of projects that will benefit our customers and help us operate our network in more flexible and efficient ways. This report outlines some of the activities we are investing in, through the NIA, to deliver significant benefits.

We continue to work with a wide range of partners from universities, small and medium enterprises through to large multi-national companies. We are also working across the electricity industry to share our knowledge with other network operators and learn from their projects. We collaborate on shared research with other operators to reduce costs. Our projects include new systems and techniques that will improve network flexibility and reliability through to new technologies to ensure we get the best from our existing assets. Our project portfolio has great potential to facilitate The Carbon Plan and drive improvement of the network for our customers.

Robert Symons
C.E.O. Western Power Distribution

Contents

Foreword	2
Contents.....	3
1. Executive Summary.....	4
2. Project Highlights	5
3. Our Innovation Strategy.....	8
4. Significant Learning.....	10
5. Implementation	11
6. Future Intentions	12
7. 2016/17 Activity Summary	13

1. Executive Summary

The Network Innovation Allowance (NIA) was introduced by Ofgem for the RIIO-ED1 Distribution Price Control Review period which took effect on 1st April 2015 and will continue until 31st March 2023. Following on from the successes of the IFI and LCNF mechanisms, Ofgem's continued commitment to innovation is welcomed by Western Power Distribution, as it facilitates the continued application of research and development projects on the network, which should bring significant benefits to our customers in the future.

Innovation continues to be core to our business strategy and as such we deliver a wide range of NIA projects to trial and demonstrate new and advanced systems, techniques and technologies to support the delivery of a fast changing and dynamic electricity network.

This year has seen us deliver a portfolio of 21 active NIA projects with a wide scope including LV Connect and Manage, which investigates how to optimise the performance of co-located EVs and domestic storage; Entire, which explores the possibilities for customers to participate in multiple DSR schemes and Improved Statistical Ratings for Overhead Lines, which is a joint DNO project focussing on re-rating overhead lines based on geographical conditions.

This report contains a summary of all NIA activity within the period from 1st April 2016 to 31st March 2017 for the four license areas of Western Power Distribution: South West, South Wales, East and West Midlands. This report has been produced in accordance with the Regulatory Instructions and Guidance (RIGs) issued by Ofgem.

2. Project Highlights



Project Name	Sunshine Tariffs
Description	This project aimed to investigate and report on the commercial viability of a PV specific sunshine tariff, exploring current and future value streams to fund it and to operate a domestic demand side response trial.
Lessons Learned	The findings demonstrated that customers with automated control technology were able to shift 13 percent compared to five percent for those without. The larger energy users tended to have more flexible load, such as a hot water immersion system or electric vehicle, and as a result were able to shift 18 percent of their daily demand into the 10:00-16:00 period.
Customer Benefits	The project has shown that there is currently limited demand that can be shifted in the current market conditions and that DSR isn't a feasible alternative to conventional reinforcement. It may be beneficial once certain key enablers such as half hourly settlement, widespread automation and the ability to gain value from multiple sources are readily available.
Planned Implementation	The offset connection agreement will not be rolled out. The cost, challenge of engaging and keeping domestic customers signed up to the offset scheme and trial outputs have shown that the methodology is not currently suitable for wider rollout. As such, in order to continue delivering maximum value to the end customer we will initially be focussing on transitioning the more mature, industrial and commercial DSR to business as usual.



Project Name	Global analysis of Smart Grid Telecommunications (Nexus)
Description	The purpose of this project was to complete a comprehensive global analysis of proposed and deployed Smart Grid Telecommunications solutions as well as identifying and quantifying the specific architectures, services and data-flows within the Smart Grid.
Lessons Learned	It has been identified that a number of telecoms solutions are required to facilitate the full transition to a flexible and dynamic electricity network. A suite of telecoms solutions has been identified and aligned to a specific technical requirement based on security and redundancy requirements.
Customer Benefits	Creating a suite of telecoms solutions with the correct security, reliability and redundancy will enable the fast deployment of electrical infrastructure whilst ensuring that best cost options are always delivered.
Planned Implementation	The outputs of the project are to be refined along with WPD's Surf Telecoms team to enable new and updated policies to be created that will drive new standards and processes to be followed when installing new or replacement plant on the system.



Project Name	Time Series Data Quality
Description	<p>This project sought to develop rules to identify data trends. One use of which was to identify reverse energy flows that traditionally has been difficult to distinguish between load and generation driven networks.</p>
Lessons Learned	<p>It has been demonstrated in the project that it is possible to visualise, analyse and model the analogue data using techniques such as automated bulk data plotting, curve fitting (by regression analysis), current summing, averaging (by season for example), template “typical response” creation and other statistical methods.</p>
Customer Benefits	<p>Through the advanced analysis of analogue data to understand more granularly the operation of the network and produce statistical representations of the network this data can be used to enable more accurate offerings of our existing and future active network management zones.</p>
Planned Implementation	<p>The pilot tools developed during the project are now being maintained and further developed for immediate ongoing use by engineers, a production system based on commercially available systems is being identified based on the findings of the pilot tools deployed and used in this project. This system may in future be integrated with data in other ongoing parallel activities such as the Integrated Network Model (INM) initiative which is capitalising on the Authorised Network Model (ANM) of the previous innovation project FALCON.</p>

3. Our Innovation Strategy

We rely on innovation to maintain our position as a frontier performer in network performance and customer service. Innovation is targeted at all of the key outputs of safety, cost efficiency, customer service, reliability and environment. In the past innovation has proved beneficial by allowing us to continually improve in these areas. Future innovation will allow us to continue these improvements and will also help us to address the challenges brought about by the Carbon Plan.

Our innovation projects are grouped into three main categories which are:

Assets

Projects in this category collect data from the network to enhance modelling. They also test alternative investment strategies that can postpone expensive investments.

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Customers

These projects develop new solutions to enable customers to connect low carbon technologies. They may also involve testing of new customer tariffs or working with communities to provide local energy solutions.

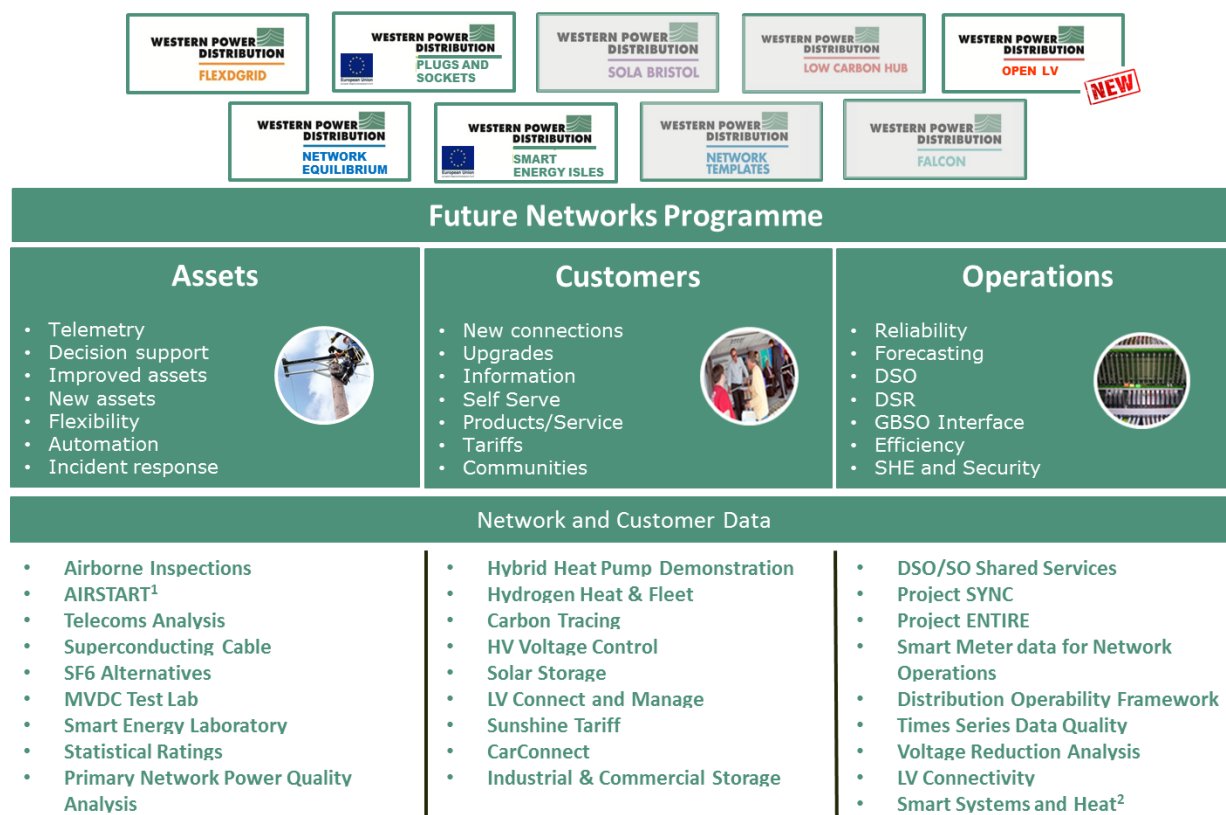
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Operations

This category of projects demonstrates direct benefits to active network operations from the application of technology.



The projects within our innovation programme are constantly changing as new ones are initiated and existing ones completed. Below is a snapshot of our programme:



Note: 1 – Funded by Aerospace Technology Institution; Note 2 – Funded by the Energy Systems Catapult

Our plans for smaller scale innovation will encompass all of the areas that we have developed in the past, whilst paying particular attention to the establishment of DSO capabilities. We will continue to refine existing innovative solutions across the whole range of business areas and add new innovations as they arise.

We will continue to develop new ideas from a range of sources, including our own teams, our stakeholders, our customer panel, manufacturers, academia, other DNOs, other industries and international developments. As new ideas are developed, we will review and update our project plans.

The latest progress on all of the projects detailed above can be found on both the WPD Innovation Website and the ENA Smarter Networks Portal.

www.westernpowerinnovation.co.uk
www.smarternetworks.org

4. Significant Learning

Optimised camera for aerial inspections

Over **270** customers
contracted for smart EV
charging trial

Superconducting cables are

75%

more expensive than
conventional solutions

Containerised
battery enabled fast
site deployment

Airborne Inspections

This project has investigated the optimal camera to be used for aerial inspections, which has shown rather than utilising the highest military grade cameras previously identified a more specific camera is most suited.

Another key learning has been the value of having an additional crew member after work load assessments following the installation of the camera indicated there may be capacity issues in certain areas.

Electric Nation

Previous innovation projects have struggled to gain the right amount of customer interaction and participation, however, through the Electric Nation project, where 500 contracted participants are required to lease an electric vehicle and have the project's smart charger installed; in the first few months of recruitment over 270 customer contracts have been signed.

This has been largely due to the relationship between our strategic partner, Drive Electric and car dealers, whereby customers have been much more likely to engage in a project where it is led by an organisation directly involved in the product being offered.

Superconducting Cables

It was calculated that a superconducting solution's initial capital cost is nearly 75 percent more than the conventional solution, thus highlighting the financial hurdles that the superconducting cables need to surpass to be economically viable.

Based on the calculated results, it is observed that the capital cost of superconducting solutions of shorter length could be comparable to conventional solutions in 5-10 years if prices keep reducing by 10 percent every year.

Solar Storage

The construction activities of the battery storage on the system were significantly reduced due to the battery being constructed off-site as part of a containerised solution, meaning much of the on-site works was reduced. It is recommended that future installations use containerised solutions.

The battery was both factory tested and tested when commissioned on site, however, over long term operation issues such as battery charging and discharging unbalance have been identified. It is key that, for new technologies, longer term 'soak' tests are carried out.

5. Implementation

We deliver innovation through an in-sourced model with a small team of specialists using the resources of our operational teams to deliver tools or products onto the network. The Innovation Team works alongside the company's Policy department where they interact with equipment specifiers and technical experts of the wider business. Once trials are successfully completed, the outputs are taken forward and replicated across our network.

As outputs are delivered, they are developed into new learning that can be taken forward and developed as business as usual. Outputs obtained from other DNO projects are fed into this process to ensure that we gain maximum benefit from innovation projects.

All solutions rolled out from innovation follow the same route as our other policies and techniques introduced into the company. Policies are reviewed by the senior network managers before they are introduced. The rollout process includes implementation plans and, where appropriate, training and dissemination sessions. We monitor all the projects as they develop and make use of learning and outcomes as they are reported.



6. Future Intentions

Our plans for smaller scale innovation will encompass all of the areas that we have developed in the past, whilst paying particular attention to the establishment of DSO capabilities. We will continue to refine existing innovative solutions across the whole range of business areas and add new innovations as they arise.

We will continue to develop new ideas from a range of sources, including our own teams, our stakeholders, our customer panel, manufacturers, academia, other DNOs, other industries and international developments. As new ideas are developed, we will review and update our project plans. Building on the work carried out as part of our NIC programme of works, whereby for the last two years we have successfully run a third party application process we will run a similar third party application for NIA projects in 2018.

The ideas we take forward are chosen to support and improve our performance in the broad areas shown on the table below. These areas feed into our main business output headings and will be used to improve our performance in these areas.

Future smaller scale innovation	Safety improvement	Cost efficiency improvement	Customer service improvement	Reliability improvement	Environmental improvement
SF6 alternatives	✓				✓
LV Connectivity	✓	✓	✓		
Smart meter data for network operations		✓	✓	✓	✓
Reactive power services		✓	✓		✓
Distribution Operability Framework		✓	✓	✓	✓
DSO/TSO Shared Services		✓	✓		✓
Network Analogues	✓	✓		✓	✓
High Voltage Power Electronics Test Lab	✓			✓	
Primary Network PQ Analysis			✓	✓	✓
H2 Energy Balance		✓	✓		✓
Innovative Vegetation Management	✓	✓		✓	✓
Supporting Vulnerable Customers	✓	✓	✓		✓
LV Network Management	✓	✓	✓	✓	✓

7. 2016/17 Activity Summary

	Internal Costs	External Costs	Total Costs	Status March 2017
NIA_WPD_004 Solar Storage	£36,582	£242,735	£279,317	Ongoing
NIA_WPD_005 Losses Investigation	£63,912	£836,778	£900,690	Ongoing
NIA_WPD_006 Sunshine Tariff	£17,242	£120,410	£137,652	Complete
NIA_WPD_007 Airborne Investigations	£13,722	£108,691	£122,413	Ongoing
NIA_WPD_008 Improved Statistical Ratings for Overhead Lines	£0	£30,491	£30,491	Ongoing
NIA_WPD_009 SYNC	£26,373	£49,545	£75,918	Ongoing
NIA_WPD_010 Voltage Reduction Analysis	£630	£4,813	£5,444	Complete
NIA_WPD_011 Time Series Data Quality	£15,253	£116,139	£131,391	Complete
WPD_NIA_012 Telecoms Analysis	£37,638	£189,662	£227,300	Complete
WPD_NIA_013 Electric Nation	£34,436	£1,474,843	£1,509,279	Ongoing
WPD_NIA_014 LV Connect & Manage	£14,110	£448,667	£462,777	Ongoing
WPD_NIA_015 Superconducting Cables - Feasibility Study	£16,339	£48,607	£64,946	Ongoing
WPD_NIA_016 Common Information Model	£24,045	£74,913	£98,958	Ongoing
WPD_NIA_017 Entire	£47,359	£150,938	£198,297	Ongoing
WPD_NIA_018 Electric Vehicle Emissions Testing	£6,310	£38,169	£44,479	Ongoing
WPD_NIA_019 LV Plus	£0	£24,901	£24,901	Ongoing
WPD_NIA_021 Industrial & Commercial Storage	£18,433	£236,784	£255,217	Ongoing
WPD_NIA_022 Carbon Tracing	£2,424	£4,580	£7,004	Ongoing
WPD_NIA_023 FREEDOM	£16,679	£756,459	£773,138	Ongoing
WPD_NIA_024 Time Series Data Tool Feasibility	£6,622	£54,896	£61,517	Ongoing
NIA_ENWL003 Review of Engineering Recommendation P2/6	£0	£63,273	£63,273	Complete
Totals	7%	93%	5,474,401	21 Active Projects in 16/17

Find Out More

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