electricity north west

Bringing energy to your door

Our Innovation Strategy

30 September 2018

CONTENTS

VERSION HISTORY

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OUR INNOVATION STRATEGY

Welcome to our innovation strategy which I hope you will agree builds on our earlier work and is a significant part of our commitment to our customers.

In this document we have laid out our values, why we innovate for our customers and how we ensure we deliver value for them through a series of innovations.

This document forms an integral part of our business plan and is designed to enable our stakeholders to gain a deeper understanding of our strategy to deliver their needs.

We have detailed how we identify projects, how we manage them and how we select partners to help us deliver them.

Our partners are as much a part of our business as our teams and their support is critical to delivering success.

Innovation enables a modern business to deliver excellence for its customers.

The challenges faced by electricity network operators such as Electricity North West from the UK's ongoing decarbonisation of heat and transport are significant. The challenge is greater than that faced by previous generations and finding affordable solutions is important, not just for our customers, but for the environment and the sustainability of our business.

I hope you find this document accessible and informative and I would like to hear what you think of our strategy and how we can improve it.

Steve Cox
Engineering and Technical Director
Electricity North West

1 WHAT IS INNOVATION?

The Department for Business, Energy and Industrial Strategy (BEIS) defines innovation as "the application of knowledge to the production of new and improved goods and services. It means improved product and service quality and enhanced process effectiveness."

While innovation underpins our business plan and is therefore a key enabler to reducing the cost of providing our services to customers, our approach to innovation goes further. We are seeking to innovate across our business to provide new and improved services for our customers, which increases flexibility and allows customers greater choice in the way they interact with our network.

We will meet the future needs of our customers and stakeholders in an increasingly uncertain energy future by maximising the opportunities provided by:

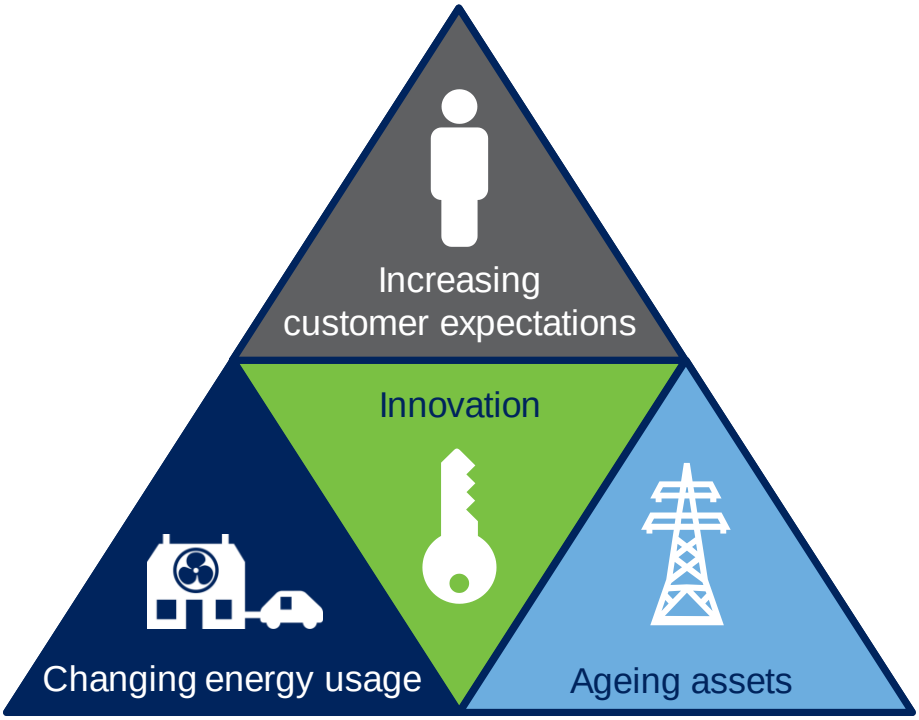
- New technologies
- New business and commercial models
- An appropriately supportive regulatory framework with associated incentives.

2 OUR CHALLENGES

In addition to the traditional day-to-day challenges we face, there are significant longer-term challenges which are common to all UK distribution network operators (DNOs) and which can be categorised as:

- Changing energy usage
- Increasing customer expectations
- Ageing assets.

Figure 1: Operator trilemma



Innovation is key to resolving these challenges and hence central to our business plan. We will explore each of these in turn and describe how we intend to approach these challenges through the use of innovation.

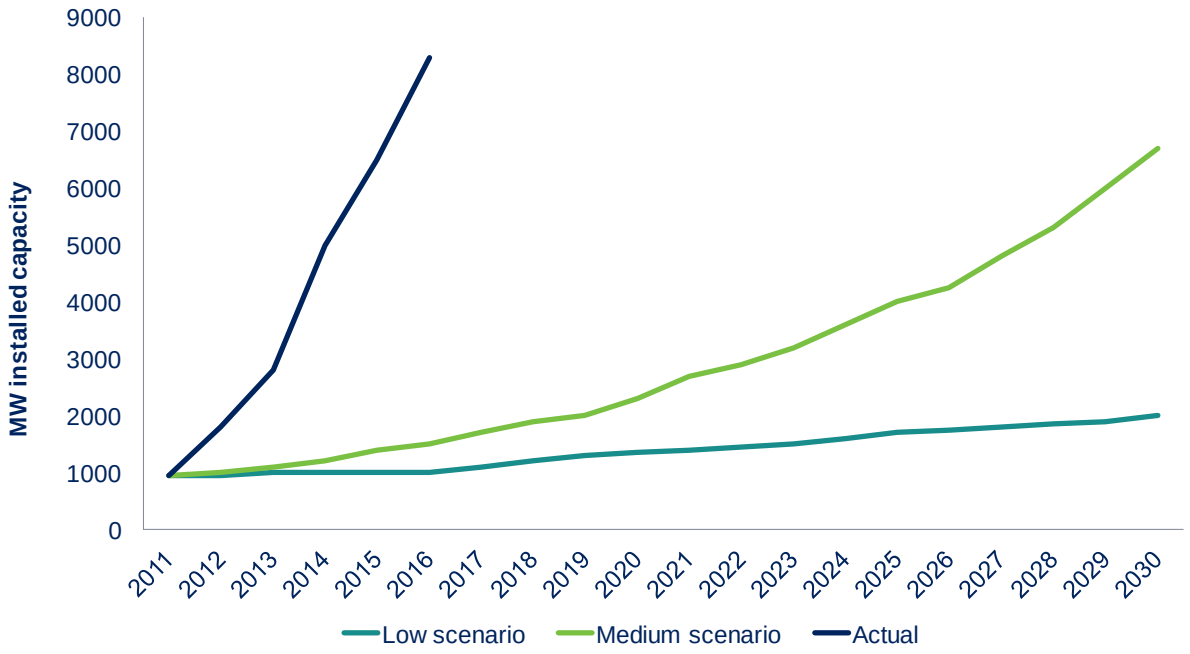
2.1 Changing energy usage

As part of its ongoing commitment to internationally agreed targets on the reduction of greenhouse gas emissions, the UK government has launched a number of initiatives on energy efficiency, carbon costs, renewable energy generation and electric vehicles. Combined with a general increase in customer awareness of energy, these initiatives will drive changes in customer behaviours and are expected to impact significantly upon electricity consumption both in terms of patterns and overall levels.

One of the key challenges for DNOs is the connection of low carbon distributed generation (DG) to the network in volumes sufficient to meet carbon targets. Our network already has DG equal to over 50% of our maximum demand and networks in areas (such as North Cumbria and the Fylde Coast) rich in renewable resources (such as wind) are already at or approaching their maximum available capacity.

Stimulus packages such as solar PV feed-in tariffs introduced in 2011 have resulted in the installation of large volumes of DG on our low voltage (LV) network. The uptake of PV has been much larger and quicker than previously forecast. Figure 2 below illustrates the actual PV capacity connected versus the forecasts contained in the 2012 study carried out by EA Technology for the Department of Energy & Climate Change (DECC) – now the Department of Business, Energy and Industrial Skills (BEIS).

Figure 2: PV uptake



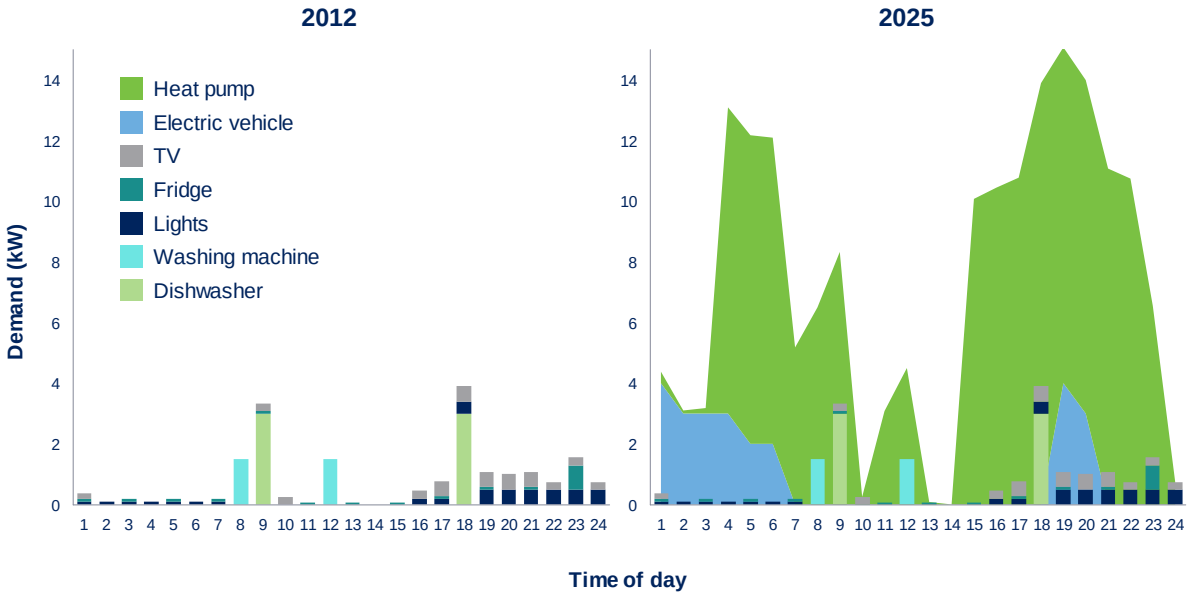
Source: EA Technology 2012, DECC

We expect that future renewable heat incentives coupled with falling prices for technologies such as heat pumps will result in a similar level of customer adoption, leading to substantial additional demand. Therefore, one of the biggest challenges facing network operators is the future customer adoption of a range of devices such as PV micro generation, heat pumps and electric vehicles, all of which are supplied from legacy electrical networks.

The vast majority of our 2.4 million customers are domestic and are supplied from our low voltage (LV) networks. For many years these networks have followed predictable and stable demand patterns. Management of demand growth on these networks has been relatively simple with historically stable and predictable growth.

Figure 3 below illustrates the likely changes in domestic customer demand between 2012 and 2025 when customers are expected to adopt heat pumps and electric or hybrid vehicles at scale. This shows that the adoption of such technologies could change daily loading patterns and the magnitude of their power consumption, which will introduce significantly greater uncertainty in daily demand patterns.

Figure 3: Daily domestic demand profile over time



In the medium term to 2030, the illustrative scenario for the fourth carbon budget[1] suggests that the UK will see a "30% demand increase from that in 2020, reflecting increased uptake of electric vehicles and heat pumps". It also suggests that by 2030, 60% of new vehicles will be electric or plug-in hybrid, and heat pumps will provide 25% of residential heating requirements and around 60% of the non-residential sector.

While our future projections for domestic customer load growth have upper and lower limits, it is clear that under all scenarios the migration of heat and transport to a low carbon economy will significantly increase load levels on our electricity networks. As a result, new and innovative commercial and technical solutions are essential if we are to mitigate the potentially prohibitive cost to customers of traditional reinforcement-based solutions.

We believe that these emerging challenges, coupled with the increasing demands placed on networks, will necessitate the emergence of DNOs as distribution system operators (DSOs). Our DSO Vision document sets out our view of the role and makes the case for the evolution of the role of DNOs to deliver DSO services. Such an evolution is essential if the UK is to meet its low carbon targets in a timely, inclusive, cost-efficient and secure way.

To ensure we can plan for and deliver our customers' future needs we are developing much more sophisticated methods of demand forecasting. These will allow us to plan with our key stakeholders and help us mitigate the risks associated with the uncertainty in low carbon technology uptake. These tools will help us understand future network demands, the effect on network investment and which new solutions we will need to put in place for our customers.

[1] http://www.theccc.org.uk/wp-content/uploads/2013/12/1785a-CCC_AdviceRep_Chap3.pdf p30

2.2 Increasing customer expectations

The adoption of low carbon technologies will mean that customers increasingly derive their heat and transport energy needs from electricity networks. Customers' dependence on the reliability of their electricity supply will be even more critical than it is today. Our customer research tells us that it will simply not be acceptable for customers to lose electricity supply for protracted periods. Delivering even higher reliability levels from an ageing asset base will require innovation in network management, energy management, active automation systems, fault detection and repair technologies.

Customers will also expect to have improved information on any network outages and to receive enhanced support from us to reduce their inconvenience. By working with other organisations at the cutting edge of customer service we are learning how best to interact with customers. We will continue to engage with our customers to better understand what information they want from us and in what format; and we will develop and deploy the technology needed to meet their expectations.

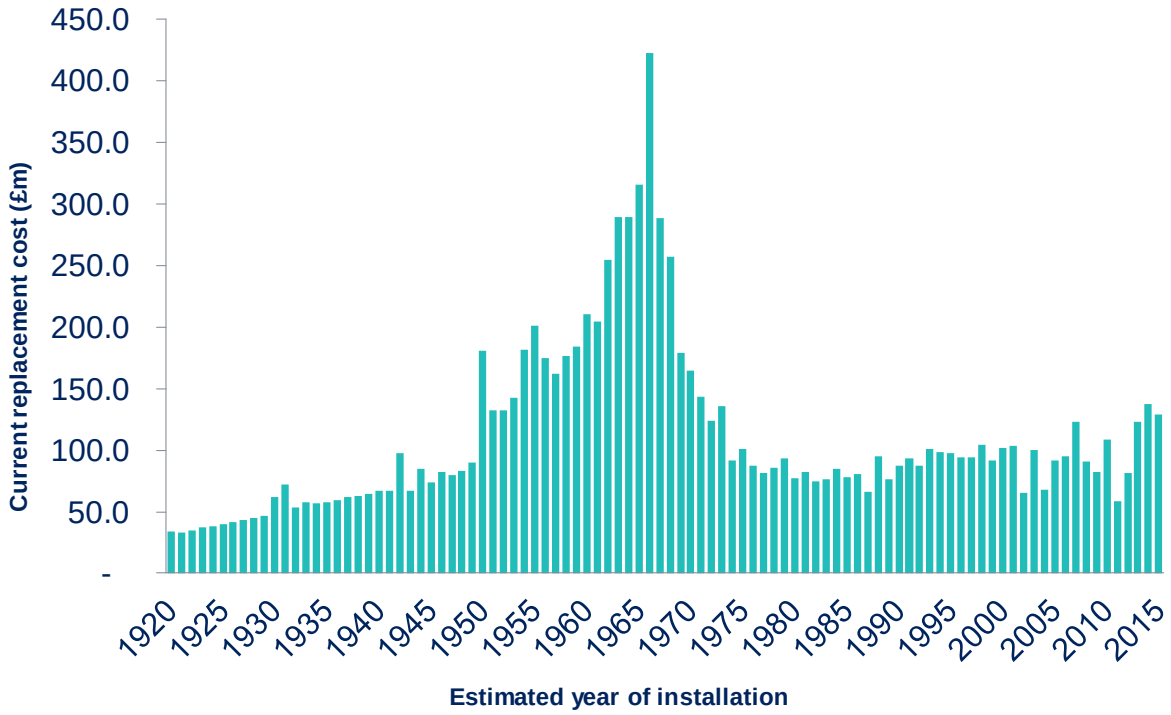
As part of this work we are working to understand the value that various customer segments place on supply reliability. This will determine the type and level of future investments that we will make in our network. Without this understanding of our customers' willingness to pay we firmly believe that we will be unable to meet their needs efficiently.

2.3 Ageing assets

DNOs manage an increasingly ageing asset base with many of our assets now approaching their previously assumed end of life.

As shown in Figure 4, Electricity North West's asset base was mainly installed in the 1950s and 1960s. These assets have served our customers well but are ageing and increasingly being asked to perform new functions. Finding ways to manage these older assets and refurbish them for continued service while retrofitting new technology is a key challenge for innovation. When an asset is due to be replaced, advanced analytical techniques and appropriately specified replacement equipment is key for continued network performance.

Figure 4: Age profile shown as estimated cost of replacement



3 OPPORTUNITIES

Our innovation work is driven by the challenges we face and is key to unlocking the opportunities made available to us through the availability of new technologies, new emerging markets, the deployment of smart meters and the changes to our regulatory environment. Our approach is to maximise the potential that these new opportunities bring to address the challenges highlighted above.

3.1 New technology

New technology has the ability to transform what we do. We are excited by the opportunities provided by new technology and the potential benefits to our customers. An example of this is our development of sophisticated centralised automation software to replace manual operation of switches by field operatives. This transformative technology has significantly reduced the time taken to restore supplies in the event of a network fault and is now enabled across our entire high voltage (HV) network.

We have led the way in the deployment of intelligent LV fuses on our networks which have transformed the way transient faults are managed. This work has enabled us to significantly reduce the number of these faults which are one of the highest causes of customer complaints. Supported with new commercial models, we are now using this technology in new and innovative ways to proactively manage our LV networks, enabling us to identify and fix emerging faults before they affect our customers.

The innovation supply chain plays a central role in meeting the future needs of our customers. We continue to work with small and medium enterprises (SMEs) to help and encourage them to develop new technologies which will help us meet the challenges facing our industry. A good example of this is our involvement in the development of LV circuit breakers and switches which use improved communications infrastructure and centrally held optimisation software to give us visibility and control of our LV network. We have trialled this technology as part of our Smart Street project and expect it to become the default solution to the problems associated with the connection of low carbon technologies to LV networks.

Our customers are increasingly using mobile IT and handheld devices as part of their everyday lives and will expect to access our services through real and virtual channels in the future. For example, when a network fault occurs, customers will expect us to provide improved information through existing traditional communication platforms and to use new virtual channels. Our innovation programme will examine what customers want and how these services can be delivered using information retrieved automatically from our systems and made available to customers through a variety of channels.

A significant energy transformation is expected to take place as a result of emerging smart electrical home appliances and other low carbon technologies. Customers will have the opportunity to earn financial rewards by providing services which help us manage local and system constraints. These technologies will also enable us to provide new services to customers to help them with their energy requirements. To enable all of this we will work with customers directly and with suppliers or other third parties who can facilitate these services.

Technology and innovation are only valuable to our business if they help us improve our services or reduce costs for customers. To ensure we meet the expectations of our customers, we will investigate new technologies on the market and how they might be utilised to help us meet our challenges; we will continue to work with SMEs and survey the market for new entrants.

3.2 Energy storage

Energy storage is now emerging as a potential solution to some of our challenges by helping network operators manage demand uncertainty. Storage can help customers and larger

communities improve the efficiency of their local generation by storing energy at times of high generation/low demand to be used at times of high demand/low generation.

Storage can also provide wider system benefits such as in the ancillary services and demand response markets. As a DNO it is not beneficial for us to own storage but we have already seen an increase in customers wishing to connect storage to our networks and we expect this to increase and move into the domestic sector. We will look for opportunities to engage with these customers and help them gain the maximum benefit from their investments.

3.3 Smart meters

Smart meters will allow us to monitor how much power our customers are using or producing in near real time. This gives us improved visibility of the network and will enable us to operate our network more responsively to their needs. The more responsive we can make our network, the more efficiently it operates, which helps us keep customer bills down.

The improved visibility provided through smart meter data offers the potential to monitor power flowing throughout our entire network. This will improve our demand forecasting, allow us to target investment and ensure capacity is available for customers when they need it.

They also offer a number of important service benefits for customers who experience faults. At present we are notified of faults on the LV network from customer calls; but smart meters offer the potential for automatic notification of loss of supply for individual customers. We will utilise this functionality to enable more rapid restoration of supplies, particularly during storm events. These features are particularly important to our vulnerable customers who depend on power for their safety and wellbeing.

3.4 New markets

Our innovation portfolio contains a significant body of work, developing new markets through which customers can earn value while helping to solve network constraints. Our work so far includes projects such as Capacity to Customers (C_2C), a new form of demand response; and Respond which is the UK's first commercial solution to fault level issues.

Offering customers genuine choice is a cornerstone of our innovation strategy and we will continue to explore the opportunities provided by new and emerging markets.

Part of our strategy is to develop innovative commercial contracts to purchase demand or generation response from existing and new industrial customers to manage network constraints. This provides us with the opportunity to monitor load growth and reduce the risk of under-utilised investment if additional capacity is installed. It also presents a mechanism which provides us with time to develop solutions to resolve multiple loading issues. We have already developed contracts for post-fault response and these will be expanded to cover all constraints when we have deployed active network management (ANM) as part of our new network management system (NMS).

When our customers need more capacity we will explore demand side response (DSR) opportunities alongside other smart technologies and more traditional forms of reinforcement so that the best value solution is obtained.

To consistently deliver the best possible value for our customers we have developed and successfully introduced the 'real options' model. This is a very sophisticated financial model that significantly enhances our ability to undertake a robust economic assessment of comparator solutions. The model uniquely allows us to examine the value of each solution under all possible future demand scenarios ensuring our investments are future-proofed. This model is crucial to ensuring customers do not pay for capacity that will not be needed.

Further market opportunities are emerging as a direct consequence of learning outcomes from our Low Carbon Networks Fund trials. A great example is our CLASS project that allows us to provide services to the system operator to address challenges associated with the

changing generation and demand mix. In January 2017 Electricity North West approved a project to roll out CLASS functionality to 80% of our primary voltage electricity network. The project embeds multiple technical firsts for Electricity North West and is funded via the Directly Remunerated Service 8, Value Added Services (DRS8) mechanism which allows consumers to benefit by sharing any net revenue from the project.

Our strategy is to consider the widest application of our innovation by adopting a holistic 'whole system' approach, which focuses on the impact on our network and how the innovation can be deployed to maximise benefit to customers. This could be through entering an existing market to provide services at lower cost or working with other industry participants to define new products and services for which markets can be developed.

3.5 Regulation

We recognise that there is significant change in energy systems and we want to be at the forefront of developing regulatory models that support the changes needed. Our innovation strategy will inform our thinking and enable us to play an active role in identifying and forming new regulatory models to support a transforming energy system.

Ofgem's innovation policy continues the use of incentives and funding mechanisms to promote innovation. It also aims to remove barriers and encourage innovation by working in partnership with others. We are very supportive of this approach and will work closely with Ofgem and all our regulators to ensure that we maximise opportunities to deliver value to our customers through innovation.

We will actively engage with our regulatory stakeholders and through our industry leadership we will reduce the barriers to our industry for new technologies and partners.

Our strategy is to fully utilise all new innovation opportunities for the benefit of customers in our own region and across GB.

3.6 Distribution system operator (DSO)

We will continue to develop new solutions to ensure networks deliver the level of service that our customers expect. The DSO will have a central role in determining where innovation is required. We are developing new and quicker ways of seeing potential faults on our network before they become issues so our customers do not face disruption.

There are a lot of technical parameters, such as voltage, that we have to consider when operating our network and we are looking how we can 'flex' these in new ways to increase the efficiency or effectiveness of our operations without causing disruption or inconvenience to our customers.

We are also looking at how technologies like smart meters and energy storage may be able to improve our understanding and operation of the network.

4 STAKEHOLDER ENGAGEMENT

4.1 Our strategy

We have a large and diverse group of external stakeholders, ranging from domestic customers to large industrial electricity consumers. We actively engage with each of these as appropriate to better inform the development of our innovation strategy.

Our external stakeholders include environmental groups, charitable organisations, local authorities, educational establishments, and national stakeholders such as our regulator Ofgem, the Department for Business, Energy and Industrial Strategy (BEIS) and wider government agencies including the Health and Safety Executive (HSE). We also consult with

key industry stakeholders including the Energy Networks Association (ENA), other DNOs, energy suppliers, National Grid, equipment suppliers and manufacturers.

Many of our innovation projects are focused on specific regions and we are keen to expand our stakeholder engagement to local community groups which have a closer relationship with customers in their neighbourhoods. These groups can be influential in engaging the wider public and generating greater social engagement, as was demonstrated in our Power Saver Challenge project.

Our innovation strategy follows our general stakeholder engagement principles which ensure that we consult the right stakeholders, in the right way, at the right time, on the right issues. We follow internationally recognised best practice in stakeholder engagement – the AA1000 Account Ability Principles Standard (AA1000APS). The principles of this standard are inclusivity, materiality and responsiveness, each of which forms the fundamental basis of our engagement approach. Using this framework, we are committed to identifying our stakeholders, identifying the issues that they care about and engaging with them on these issues to make improvements to what we do and how we do it.

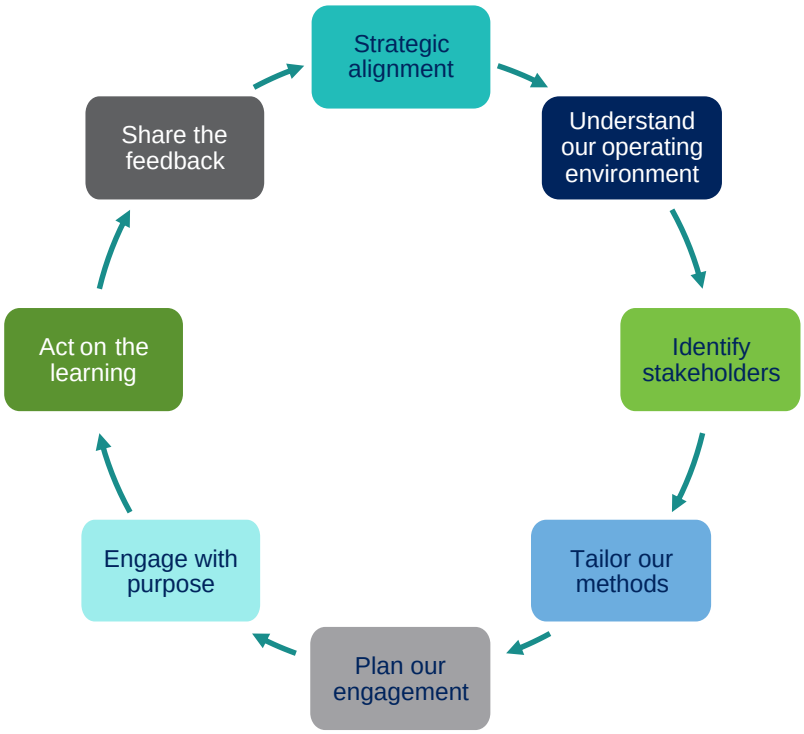
Our long-term investment in engaged customer panels enables us to articulate complex network issues to our stakeholders, simply and clearly. We use our strategic innovation supply chain partnerships to generate a range of solutions to future problems and robustly test these before deployment.

We know from ongoing stakeholder engagement, including the significant work that went into developing our business plan for the current price control (RIIO-ED1), that our stakeholders require us to deliver a network that is:

- Reliable
- Affordable
- Sustainable
- Delivered with excellent customer service.

Our business plan and innovation strategy are underpinned by these fundamental stakeholder aims.

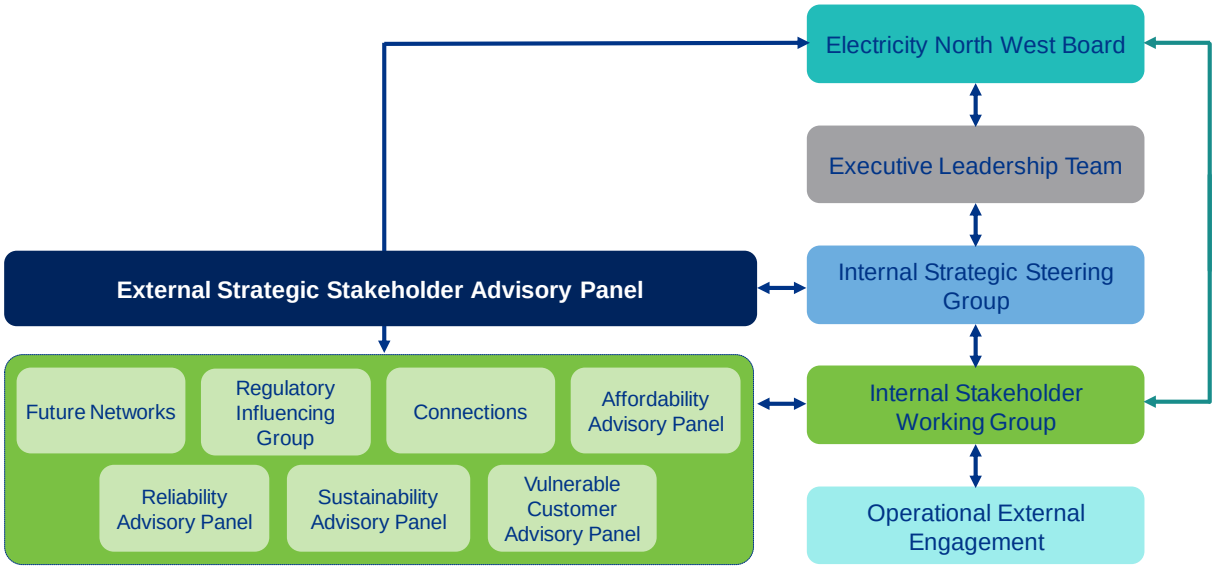
Figure 5: Our stakeholder engagement strategy



Over the last 12 months, our current strategy has been enhanced and is more embedded in the business, allowing for more effective engagements and integration of stakeholder feedback. Our stakeholder engagement programme is driven by our board, led by our CEO, owned by our senior management and delivered by all colleagues across the business.

We want to ensure that there are robust internal processes that capture the input we receive from our engagements. The structure below demonstrates how all input is fed up to the appropriate level, with our CEO being ultimately responsible.

Figure 6: Stakeholder engagement governance



4.2 Engaging with customers on innovation projects

By exploiting the learning from our previous projects, we have developed a range of traditional and innovative customer engagement techniques to educate customers about:

- The role of Electricity North West and its position as a DNO in the energy sector
- The potential impact of decarbonisation and the reasons why our network has to change to accommodate the anticipated increase in demand for electricity.

We continuously evaluate our customer engagement techniques and test new strategies to ensure we get the maximum benefit from engagement. We are also focused on making our customer engagement activities as effective as possible to reach the widest audience in affected communities. We ensure that all relevant customer sectors are represented in our consultation processes. This strategy remains central to the successful delivery of our innovation projects.

The design of our future innovation strategies will continue to fully exploit opportunities to engage with customers and investigate their understanding, experience and opinions of concepts. This approach will guarantee that we remain focused on our customers and continue to adapt our network in a manner that meets their needs.

4.3 Engaging with other partners on innovation projects

We will continue to hold regular bilateral meetings with our major innovation partners.

At these meetings we discuss our overall innovation portfolio and areas where our partners may be able to provide support, as well as any individual projects they are involved in. Our partners provide the technology solutions to our customers' needs. We have carefully established long-term strategic relationships with our partners which allow a sustainable programme of innovation to deliver exceptional value for customers. The nature of our relationship is a true partnership with a significant proportion of our projects being initiated or

guided by our partners. To enable our partners to contribute we spend a significant amount of time explaining our customers' needs and exploring how they can be met.

Figure 7: Our major partners

4.4 Delivering for customers

We have a proven track record of delivering smart grid solutions which have targeted key issues affecting our customers and network. Effective engagement with our customers, key stakeholders, project partners and academic partners has been essential in the delivery of a range of innovative technical and commercial solutions, which maximise the use of existing assets and provide customers with greater choice.

Our innovation process starts with our dedicated bid team who take all of our research and engagement and clearly identify the innovation work needed. Our bid process involves senior managers from across our business and ensures projects are highly targeted and linked to real problems that when solved will deliver genuine value.

Within our innovation team we have a dedicated and expert customer engagement team. Their work is absolutely essential to the success of our projects. Their work on customer engagement is highly developed allowing deep understanding of customer needs and preferences. Their work allows us to tailor our plans to meet the particular needs of the customers we are engaging with. We have a demonstrable track record for our stakeholder engagement in our innovation projects and the learning from each project is taken forward to the next one and the plans adapted based on customer feedback.

Our innovation work is supported by an experienced multi-disciplinary technical team. Their expertise is shared with our wider business by regular rotation of our best engineers. Rotation of these engineers allows innovation projects to be embedded into business as usual.

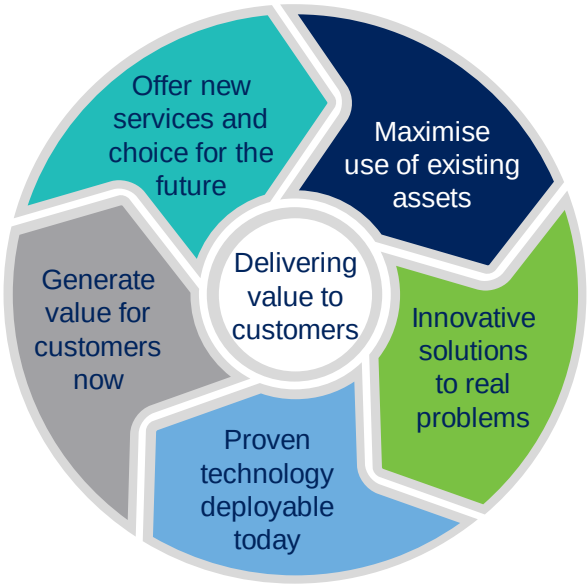
It is important that we deliver the innovation we have promised at the price we have estimated. To do this we have established a dedicated project management team who have significant experience in the delivery of complex innovation projects and programmes. Our team has a proven record in ensuring we deliver the best value for money for our customers.

Finally our engineering standards team is closely aligned to our innovation team. They help guide our strategy and ensure that our innovations are embedded into business as usual. This last stage in the innovation journey is often overlooked but we are proud of our track record in implementing our projects.

Our innovation strategy builds on our previous success but our focus remains on our customers' future needs. Each project is simply a stepping stone to delivering those needs.

5 OUR STRATEGY

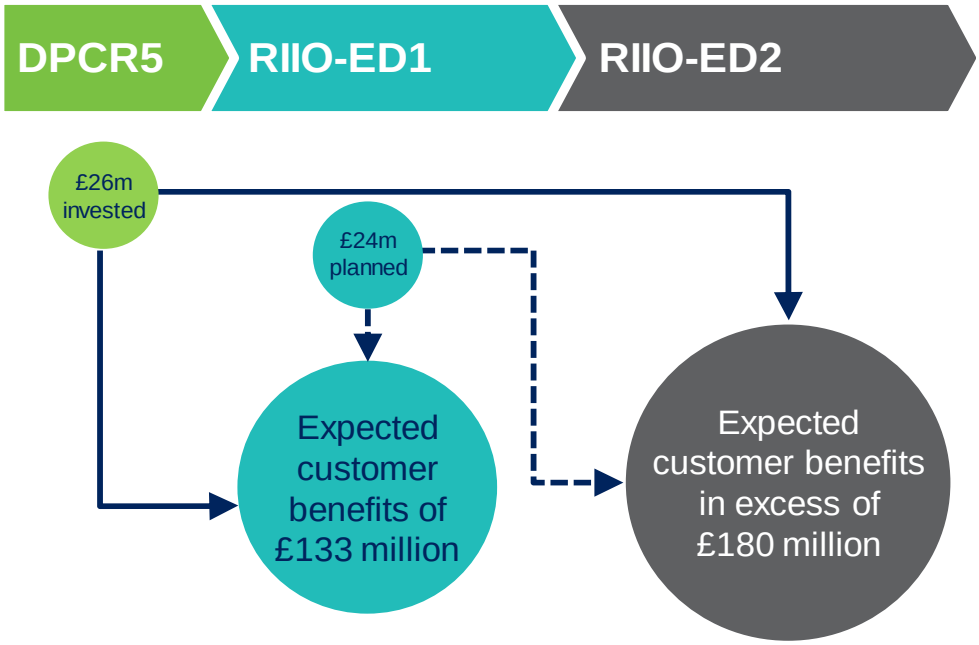
Figure 8: Our innovation strategy



5.1 Why innovate?

Innovation is key to the success of our organisation. We seek to innovate continuously across our business activities to ensure that we not only meet our obligations to our customers but also respond to their evolving needs and expectations. We are the leading network operator in innovation, providing flexible services at affordable prices. We have a well established track record for innovation and we will continue to build on this as we move forward. The world is changing as are our customers' needs. The challenges and opportunities ahead are exciting but significant. We need to innovate to successfully meet these challenges and take advantage of the opportunities presented. Figure 9 below shows the return on investment from DPCR5 through to RIIO-ED2.

Figure 9: Efficiencies gained from innovation



5.2 Innovation principles

Our continuous improvement journey is led by the needs of our customers. Our approach to innovation is underpinned by the following three guiding principles:

- We aim to understand and respond to the changing needs of customers
- We seek collaboration with partner organisations to work together to find innovative solutions to common problems
- We involve customers in our innovation work, ensuring that potential innovative solutions deliver customer benefits.

We will not commit our customers' money to a project until we validate that the technology is likely to be economically viable and that the problem can be resolved within the timescale of our business plan. This ensures that we focus on the projects most likely to deliver real value to customers in the near to medium term.

While we support technology that has a longer development cycle, we do this through collaboration with other DNOs, for instance via our work with the ENA.

It is clear that the value gained from collaborative work on smart grids and smart meters is complementary to our own work.

5.3 Innovation lifecycle

Figure 10: Innovation lifecycle

5.3.1 Idea generation

Innovative ideas can come from diverse sources. We publish the challenges and opportunities as we understand them and use and refine these for discussion in our engagement with internal and external stakeholders.

We then consider all ideas put forward, assessing them against our innovation strategy and business plans.

5.3.2 Alignment to innovation strategy

A project will not be taken forward into the scoping phase unless there is clear value for customers. To assess the value we develop an appropriate cost benefit analysis for all projects.

In addition to assessing the financial benefit for customers the idea must also demonstrate a clear link to our innovation strategy by delivering at least one of our innovation themes, described in Section 6 of this document.

5.3.3 Scoping of the project

The idea is then developed into a project, which describes the aims, objectives and expected outcomes. This allows us to develop an understanding of potential partners and costs.

5.3.4 Partnering

Following initial scoping we will seek appropriate partners for the project. If the idea has come from an external stakeholder, that stakeholder is the most obvious choice for partner. For internally generated ideas we will consider issuing an invitation to partner via an open tendering process. Once a potential partner has been identified we will discuss and iterate the scope with them to further focus on value and cost.

5.3.5 Delivery

The project will then enter the formal delivery phase. The delivery of a project can vary greatly depending on its scope. Early on in the delivery phase we engage with the wider business to ensure that the scope includes all elements required to support the transfer to business as usual and value realisation.

5.3.6 Learning and dissemination

The sharing of learning from our innovation work is essential. The way in which much of our innovation is funded requires us to share learning to avoid unnecessary duplication and to allow others to benefit from our work. We work hard to do this well and we are always seeking new ways in which this can be improved. At appropriate times during the delivery phase we will disseminate any learning to internal and external stakeholders. The mechanism for this is detailed in section 5.6.

5.3.7 Transfer to business as usual

Following its successful completion, a project is transferred to business as usual. This is a critical point in the innovation life cycle but is a process that starts at the beginning of the life cycle. We ensure that business as usual considerations are factored into the scoping of a project as this will ease its ultimate transition. This transition process could involve new specifications and policies, new business processes and training.

5.4 Collaboration

Collaboration is fundamental in facilitating the successful transformation of an energy system. This collaboration should include electricity network operators and other energy sectors such as gas and transport.

We will continue to collaborate with other network operators through industry forums such as the Collaborative Energy Portfolio run by the ENA. Where appropriate we will collaborate directly with other network operators where this adds value.

5.5 Transfer to business as usual (BAU)

Managing the transition of an innovative solution, device, technology or new operating arrangement into BAU is perhaps the most important stage in delivering benefits to customers. This phase generally represents the final stage of a project’s time line and is the culmination of its successful outcome.

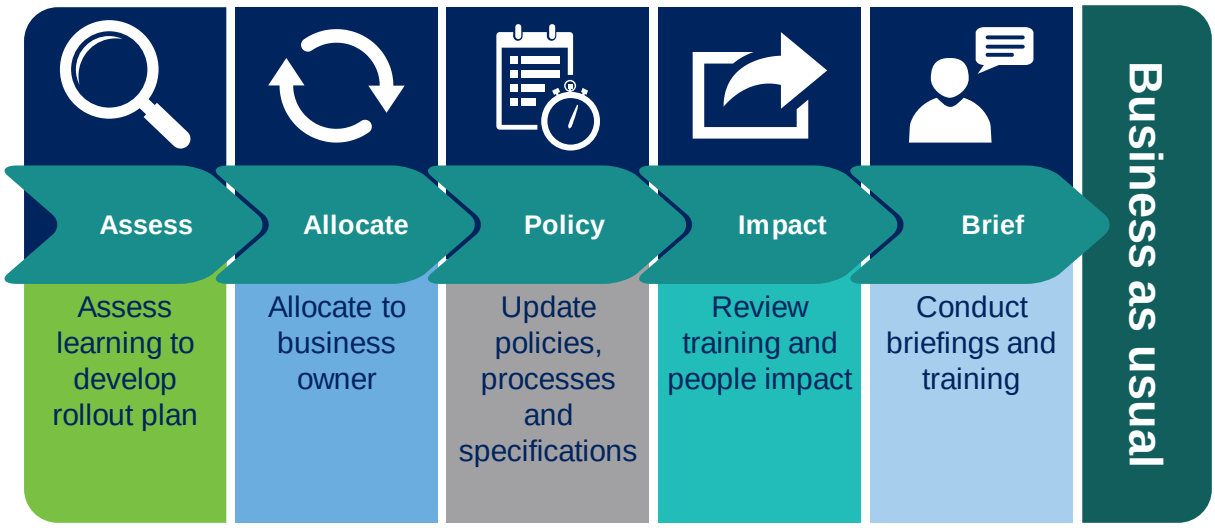
The ability to transition the innovation to BAU is an important consideration when innovation investment opportunities are assessed. We recognise that some projects are aimed at

informing our understanding and learning and in such instances BAU transition normally involves updates to business processes, procedures and specifications. The BAU assessment also considers the technology risk, the development time line and our ability to support the developers in a meaningful manner before embarking on a project.

To ensure the successful transition to BAU, we select innovation investments that are assessed as having a good chance of delivering value for customers. We focus on challenges that have been identified in our business plan and use innovation to address these issues. We use a cost benefit analysis approach to ensure that best value projects are taken forward.

We have developed an initiative-tracking process which enables us to take innovation and other business initiatives into BAU. There are five key stages to the process involving representatives from across the business as demonstrated in Figure 11 below.

Figure 11: Transition to business as usual



5.6 Knowledge transfer

We are committed to delivering our innovation strategy, approach and project findings through a variety of dissemination methods to suit a range of audiences.

A number of audiences have been identified as key stakeholders for learning derived from our innovation projects. These consist of various industry groups and include but are not limited to Ofgem, BEIS, wider government agencies, UK DNOs, the ENA, academic institutions, Association of Electricity Producers (AEP), Citizens Advice and the Smart Energy Demand Coalition (SEDC). The primary interests of these stakeholders are:

- New network design and operating standards
- System configurations
- Demand and generation response agreements
- Associated customer impacts.

Other local groups are consulted, as appropriate to the project, including local planning authorities, local enterprise partnerships, councillors, business leaders, chambers of commerce, charitable organisations and various policy makers.

As well as the external stakeholders we disseminate learning internally with a focus on the new business processes and policies required for BAU adoption.

Dissemination activities are embedded into the management of all projects which reflect the diverse needs and interests of each stakeholder group. Dissemination activities include:

- E-newsletters to advise customers and industry stakeholders of progress
- Internal newsletters to ensure our wider business is kept fully informed
- Advertorials in appropriate industry magazines
- Webinars to provide an opportunity for two-way engagement
- Dissemination events to share learning with key stakeholder.

We work with universities on many of our projects and the students involved will publish and present papers on our behalf in internal publications and at associated conferences. Innovation projects can produce a lot of monitoring data, which we make available either directly on our website or on request.

Our overriding principles are to maintain an open and transparent approach, ensure that information is easily accessible and that our dissemination methods match our audience's needs.

We take a proactive approach in knowledge dissemination throughout the development and delivery of our projects, sharing learning at the annual Low Carbon Networks and Innovation (LCNI) conference, our own annual learning event and at many other industry conferences. Further knowledge transfer is delivered through our industry engagements at the ENA and the many working groups that comprise their technical and commercial portfolio.

To ensure our stakeholders receive a balanced view of our learning, our project partners, suppliers and sometimes our trial customers participate in our dissemination events. We attend supplier trade conferences to explain our work and regularly hold briefings with local companies on particular techniques or technologies. Our website is the repository for sharing information, learning and knowledge derived from our innovation projects.

As well as holding events, learning can be shared through technology transfer. A good example of this is the product development of the Bidoyng Smart Fuse which is now widely used by other DNOs as a fault management device.

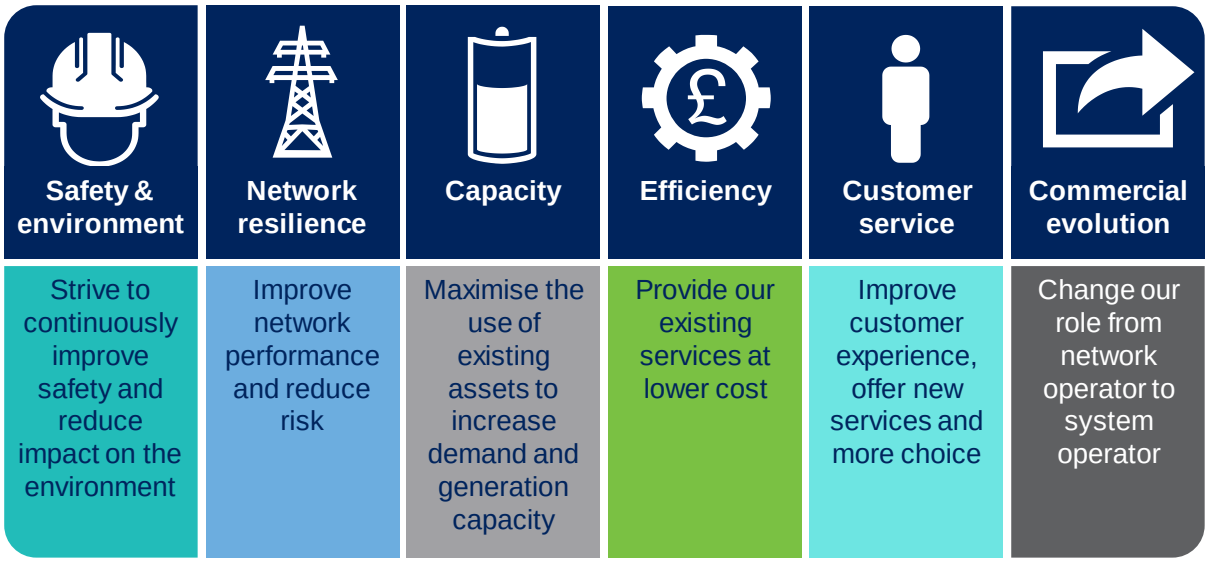
5.7 Future strategy development

Our innovation strategy and the associated innovation programme are approved annually by our executive leadership team. The portfolio of innovation projects is continuously under review. Our innovation strategy is updated annually and made available on our website.

6 INNOVATION THEMES

To ensure we have a balanced portfolio of projects and are thus using our innovation resources to achieve the best overall outcomes for our customers, we have identified a number of key innovation themes which relate to these challenges and to our business plan. Each of our projects is designed to support one or more of these themes.

Figure 12: Key innovation themes



7 OUR RESPONSE

In responding to the challenges and opportunities of a low carbon future, we have developed a range of projects, some of which have been completed and a number of which are currently in flight. The following charts summarise our portfolio and the areas we propose to investigate in the next few years. More detail on our completed or in-flight projects can be found in the summary sheets which follow the charts.

8 OUR PROJECTS

8.1 Completed projects

Project	Funding							Timescales
Capacity to Customers	LCNF 2		✓	✓		✓	✓	Business as usual
CLASS	LCNF 2		✓	✓	✓		✓	Business as usual
Smart Street	LCNF 2		✓	✓	✓	✓		Complete
The Bidoyng Smart Fuse	LCNF 1	✓	✓	✓	✓	✓		Business as usual
Fault Current Active Management	LCNF 1	✓	✓		✓	✓		Complete
Voltage Management on LV Busbars	LCNF 1			✓	✓			Complete
Low Voltage Integrated Automation	LCNF 1			✓	✓			Complete
LV Protection and Communications	LCNF 1	✓	✓	✓	✓	✓		Business as usual
Low Voltage Network Solutions	LCNF 1		✓	✓	✓	✓		Business as usual
ENWL001: Demand Scenarios with Electric Heat & Commercial Capacity Options	NIA		✓	✓	✓		✓	Business as usual
ENWL002: Distribution Asset Thermal Modelling	NIA			✓	✓			Complete

Project	Funding							Timescales
ENWL003: P2/6 Rewrite	NIA		✓					Complete
ENWL005: Asset Risk Optimisation	NIA	✓	✓		✓			Business as usual
ENWL007: Reliable Low Cost Earth Fault Detection for Radial OHL Systems	NIA	✓	✓		✓	✓		Business as usual
ENWL008: ATLAS	NIA		✓	✓	✓			Business as usual
ENWL012: Investigation of Switchgear Ratings	NIA	✓	✓	✓	✓			Complete
ENWL016: Future Network Modelling Functions	NIA			✓	✓			Complete
Oil Regeneration	IFI				✓			Business as usual
Load Allocation	IFI		✓	✓		✓		Business as usual
Next Generation LV Board Design	IFI	✓	✓		✓	✓		Business as usual
Fault Support Centre	IFI	✓	✓		✓	✓		Business as usual
Changing Standards	IFI			✓	✓	✓		Complete
Power Saver Challenge	na			✓	✓	✓		Complete

LCNF 2 – Second Tier Low Carbon Networks Fund, LCNF 1 – First Tier Low Carbon Networks Fund, NIA – Network Innovation Allowance, IFI – Innovation Funding Incentive

8.2 In-flight projects

Project	Funding							Timescales											
								2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Respond	LCNF 2	✓	✓		✓	✓	✓				■	■	■	■					
Celsius	NIC			✓	✓							■	■	■	■	■			
ENWL004: Combined Online Transformer Monitoring	NIA				✓					■	■	■	■	■	■				
ENWL006: Sentinel	NIA	✓	✓		✓	✓					■	■	■	■	■				
ENWL009: Cable Health Assessment	NIA	✓	✓		✓						■	■	■	■	■				
ENWL010: Value of Lost Load	NIA				✓	✓					■	■	■	■					
ENWL011: Enhanced Voltage Control	NIA		✓		✓	✓					■	■	■	■	■				
ENWL013: Detection of Islands	NIA	✓			✓	✓						■	■	■					
ENWL014: Optimisation of Oil Regeneration	NIA				✓	✓						■	■	■	■	■	■	■	
ENWL015: Tapchanger Monitoring	NIA	✓			✓							■	■	■	■	■			
ENWL017: Electricity and Heat	NIA			✓	✓	✓						■	■	■	■				
ENWL018: Avatar	NIA				✓	✓						■	■	■	■				
Smart Metering	na		✓	✓	✓	✓	✓				■	■	■	■	■	■			

LCNF 2 – Second Tier Low Carbon Networks Fund, NIC – Network Innovation Competition, NIA – Network Innovation Allowance, IFI – Innovation Funding Incentive

8.3 Areas for future investigation

Area							Timescales											
							2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cutouts	✓	✓		✓									■	■				
Tree Cutting	✓	✓		✓									■	■				
Creosote	✓												■	■				
Losses	✓		✓	✓									■	■				
Condition Measurements	✓	✓		✓									■	■				
Condition Models	✓	✓		✓									■	■	■			
Network Models		✓	✓	✓	✓								■	■	■			
Network Reliability	✓	✓		✓	✓									■	■	■	■	
Cost Benefit Analysis	✓	✓	✓	✓	✓	✓								■	■	■	■	
Customer Service Improvement					✓	✓								■	■	■	■	■
Control Room Automation	✓	✓		✓	✓	✓								■	■	■	■	■
Connections			✓	✓	✓										■	■	■	■

Capacity to Customers

Second Tier LCN Fund

C_2C combines new technology with innovative commercial contracts to increase the amount of electricity we can transmit through our existing network.

Benefits

- Rapidly deployable
- Reinforcement deferral
- Develops new DR market
- Cost deferral
- Carbon reduction (CO_2)

Investment £10.8 million

Financial benefits £108m in deferred reinforcement 2015-2023

Timeline

Project partners

Impact Research, nationalgrid, GE, PB Parsons Brinckerhoff, University of Strathclyde, Manchester 1824 The University of Manchester, npower, flexitricity, Business As Usual

Contact: cara.blockley@enwl.co.uk

www.enwl.co.uk/c2c

Back to completed projects

Customer Load Active System Services

Second Tier LCN Fund

The aim of the CLASS project was to demonstrate that electricity demand can be managed by controlling voltage without any discernible impacts on customers.

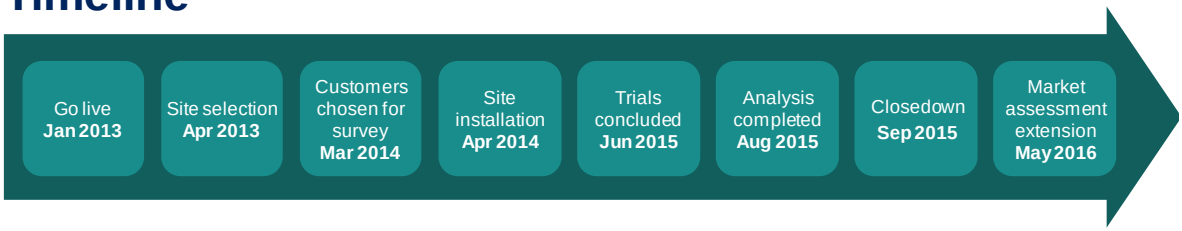
Benefits

- Reinforcement deferral
- Proves voltage demand relationship
- Allows participation in ancillary services market
- Carbon reduction
- Customers do not notice voltage changes

Investment £9 million

Financial benefits £2.8m deferred reinforcement £50m pa in ancillary services GB-wide

Timeline



Project partners

nationalgrid, SIEMENS, Impact Research, PB PARSONS BRINCKERHOFF, MANCHESTER 1824 The University of Manchester, Chiltern Power

BUSINESS AS USUAL

Contact: tony.mcentee@enwl.co.uk

www.enwl.co.uk/class

Back to completed projects

Smart Street

Second Tier LCN Fund

This project combines innovative technology with existing assets to make networks and appliances perform more efficiently.

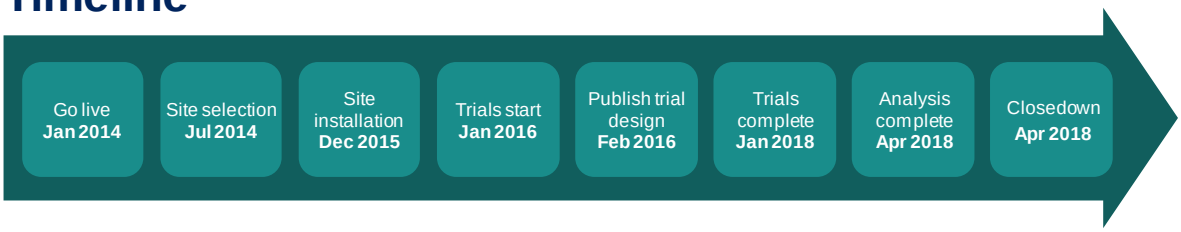
Benefits

- Reinforcement deferral
- Faster LCT uptake
- Easily deployable
- Lower bills for customers
- Carbon reduction (CO_2)

Investment £11.5 million

Financial benefits Up to £8.6 billion over 25 years across GB

Timeline



Project partners

tnei enterprise with energy
SIEMENS
TyndallManchester Climate Change Research
Impact Research
KELVATEK
MANCHESTER 1824 The University of Manchester
Queen's University Belfast

Contact: ben.ingham@enwl.co.uk

www.enwl.co.uk/smartstreet

Back to completed projects

Respond

Second Tier LCN Fund

Respond is the first UK demonstration of an active fault level management solution that avoids traditional network reinforcement.

Safety & Environment | Network Resilience | Capacity | Efficiency | Customer Service | Commercial Evolution

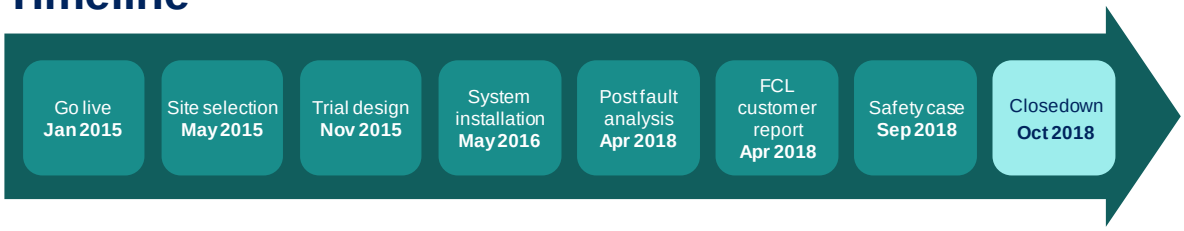
Benefits

- Reinforcement deferral
- Faster LCT uptake
- More choice for customers
- Develops new FL response market
- Creates capacity

Investment £5.5 million

Financial benefits Up to £2.3bn to GB by 2050

Timeline



Project partners

Schneider Electric, KELVATEK, ENER-G, WSP, ABB, Impact Research, United Utilities, ade

Contact: ben.ingham@enwl.co.uk

www.enwl.co.uk/respond

Back to in-flight projects

Celsius

NIC

This project will deliver a co-ordinated approach to managing the temperature of electrical assets in distribution substations. It will release additional capacity, reduce long-term costs for customers and avoid early asset replacement.

Safety & Environment | Network Resilience | **Capacity** | Efficiency | Customer Service | Commercial Evolution

Benefits

- Reinforcement deferral
- Faster LCT uptake
- Improved knowledge of distribution assets
- Easily deployable
- Creates capacity

Investment £5.5 million

Financial benefits Up to £583m across GB by 2050

Timeline

- Go live **Jan 2016**
- Monitoring installation **Mar 2017**
- Monitoring trial **Mar 2018**
- Retrofit cooling installation **Jun 2018**
- Thermal ratings tool stage 1 **Oct 2018**
- Cooling trial **Jun 2019**
- Thermal ratings tool stage 2 **Jan 2020**
- Closedown **Mar 2020**

Project partners

RICARDO-AEA | ASH CREATIVE WIRELESS ELECTRONICS | Impact Research | UK Power Networks Delivering your electricity

Contact: delroy.ainsworth@enwl.co.uk

www.enwl.co.uk/celsius

Back to in-flight projects

The Bidoyng Smart Fuse

First Tier LCN Fund

This project deployed smart fuses across the network (previously developed under an IFI project) to reduce the restoration time for low voltage transient faults to less than three minutes, which previously required a site visit.

Benefits

- Allows wide-scale deployment
- Reduction in CMLs
- Improved customer service
- Improved LV network visibility
- Easily adopted by other DNOs

Previous project

Fuse Restorer IFI Project

Follow on project

Fault Support Centre IFI Project

Start: **Jan 2014**
End: **March 2015**

Project partners

KELVATEK

Durham University

BUSINESS AS USUAL

www.enwl.co.uk/smartfuse

Back to completed projects

Fault Current Active Management

First Tier LCN Fund

This project investigated the innovative use of existing protection assets as an alternative to traditional methods and included an independent risk assessment of the use of existing and new assets for fault current management.

Benefits

- Faster LCT uptake
- Improved management of existing assets
- Reinforcement deferral
- Active network management
- Improves fault level management

Where next?

RESPOND

Timescales

Start: **Jan 2016**

End: **Oct 2018**

Project partners

SIEMENS

ABS Consulting

ABB

EPS

www.enwl.co.uk/fcam

Back to completed projects

Voltage Management on LV Busbars

First Tier LCN Fund

This project explored the potential to use alternative technical solutions for controlling voltage on LV networks, to help manage increased load and generation by installing power quality filters, Power Perfectors, distribution transformers with on load tap changers and LV capacitors. The findings were used by the University of Manchester to model the effects of deploying this technology on our future LV network and will help us identify and assess the benefits of deploying the technology on the network.

Benefits

- Faster LCT uptake
- Creates capacity
- Reinforcement deferral
- Improves voltages
- Easily deployable

Where next?

SMART STREET

Timescales

Start: **Jan 2014**

End: **Apr 2018**

Project partners

power Perfector
energy saving like no other

ABB

MANCHESTER 1824
The University of Manchester

MR

www.enwl.co.uk/lvbusbars

Back to completed projects

Low Voltage Integrated Automation

First Tier LCN Fund

This project developed and trialled an integrated solution and novel application of automated voltage control of LV networks by combining existing and new equipment such as LV monitoring at mid end points of feeders, distribution transformers with on load tap changers and substation controllers. The control solution delivered regulation of network voltages based on both local and remote real time measurements.

Benefits

- Faster LCT uptake
- Reinforcement deferral
- Improved LV network visibility
- Improved voltages
- First steps to LV network control

Where next?

SMART STREET

Timescales

Start: **Jan 2014**

End: **Apr 2018**

Project partners

GRIDKEY UNLOCKING THE SMART GRID

Smart solutions. Strong relationships.

MANCHESTER 1824 The University of Manchester

www.enwl.co.uk/lovia

Back to completed projects

LV Protection and Communications

First Tier LCN Fund

This project involved the development of sophisticated LV protection algorithms to cater for faults in both radial and meshed configurations as well as coping with the changing loads associated with LCTs. The project also developed improved links to allow us to communicate directly with the WEEZAP devices and modify the protection remotely.

Benefits

- Allows wide-scale deployment
- LV network control
- Improved LV network visibility
- Improve customer service
- Easily adopted by other DNOs

Previous project

WEEZAP IFI Project

Follow on project

SMART STREET

Start: **Jan 2014**
End: **Apr 2018**

Project partners

KELVATEK

BUSINESS AS USUAL

www.enwl.co.uk/lvpac

Back to completed projects

Low Voltage Network Solutions

First Tier LCN Fund

This project installed monitoring equipment on the LV network and the data was analysed by the University of Manchester to provide better understanding of what capacity is available on the network to accommodate LCTs. The findings from this project helped us to develop policies to monitor and manage our network in the future.

Benefits

- First wide scale monitoring of LV networks
- First model of real LV networks
- Creates capacity
- Faster LCT uptake
- Defined specification for future LV monitoring

Previous project

Load Allocation IFI Project

Follow on project

SMART STREET

Start: **Jan 2014**
End: **Apr 2018**

Project partners

GRIDKEY UNLOCKING THE SMART GRID

nortech

MANCHESTER 1824 The University of Manchester

BUSINESS AS USUAL

www.enwl.co.uk/lvns

Back to completed projects

ENWL001: Demand Scenarios

NIA

This project demonstrated better technical approaches to estimate future peak load by distribution network asset and analysed commercial solutions to capacity problems based on the improved scenarios.

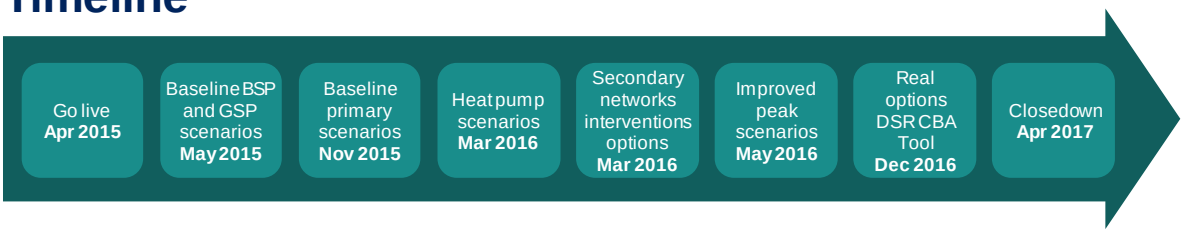
Benefits

- Reinforcement deferral
- Utilises DSR market
- Better targeted investment
- Improved demand forecasting
- Carbon reduction

Investment £320,000

Financial benefits Part of enabling a 20% reduction in load related expenditure in RIIO-ED1

Timeline



Project partners

DELTA Energy & Environment

BUSINESS AS USUAL

Contact: christos.kaloudas@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL002: Distribution Asset Thermal Modelling

NIA

This project delivered a model which will provide greater understanding of the thermal behaviour exhibited by distribution assets.

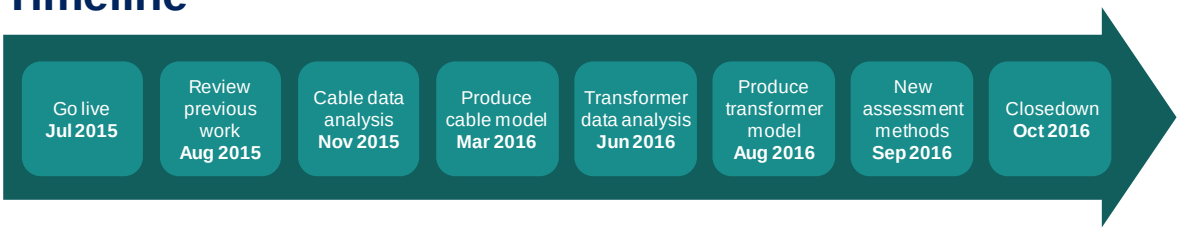
Benefits

- Creates capacity
- Reinforcement deferral
- Improved knowledge of distribution assets
- Better targeted investment
- Better management of ageing assets

Investment £260,000

Financial benefits N/A as research project

Timeline



Project partners

The University of Manchester

Contact: geraldine.paterson@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL003: Review of P2/6

NIA

Working with the other GB DNOs, Electricity North West led a comprehensive review of Engineering Recommendation P2 in relation to customer and system requirements and the long-term development of networks.

Safety & Environment | **Network Resilience** | Capacity | Efficiency | Customer Service | Commercial Evolution

Benefits

- Improved investment plans
- Improved national standard
- Copes with future energy needs
- Meets peak demand obligations
- Cost effective

Investment — **£38,000 (total project £650,000)**

Financial benefits — **N/A as update of national document**

Timeline

- Go live **Jan 2015**
- P2/6 assessment **Mar 2015**
- Options report **Apr 2015**
- Stakeholder engagement **Jun 2015**
- Final recommend-ations **Mar 2016**
- Phase 1 complete **Apr 2016**
- Phase 2 start **May 2016**
- Closedown **Jul 2017**

Project partners

sse, gtc ...leading utility networks, Western Power Distribution, nationalgrid, Northern Powergrid, SCOTTISHPOWER, Northern Ireland Electricity, UK Power Networks Delivering your electricity

Contact: dan.randles@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL004: Combined Online Transformer Monitoring NIA

We are already monitoring and assessing the condition of six transformers. The data from these transformers will be further validated and calibrated using a new dashboard/decision tool which we will develop and which will help explore the optimum life of a transformer.

Safety & Environment | Network Resilience | Capacity | **Efficiency** | Customer Service | Commercial Evolution

Benefits

- Asset replacement deferral
- Improved management of existing assets
- Detects deterioration early and gives more accurate HI
- Improved investment plans
- Easily deployable

Investment £650,000

Financial benefits £8.5m in RIIO-ED1 through replacement deferral

Timeline

- Go live **Sep 2014**
- Monitoring installation **Apr 2015**
- Data analysis **Sep 2015**
- Decision tool **Apr 2016**
- Business processes **Sep 2016**
- Data analysis **Mar 2019**
- Data validation **Sep 2019**
- Closedown **Sep 2022**

Project partners

The University of Manchester

CAMLIN POWER

Contact: paul.marshall@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL005: Asset Risk Optimisation

NIA

This project enhanced our knowledge of the issues around optimising programmes of work and investigated the impact of investment decisions on different asset types.

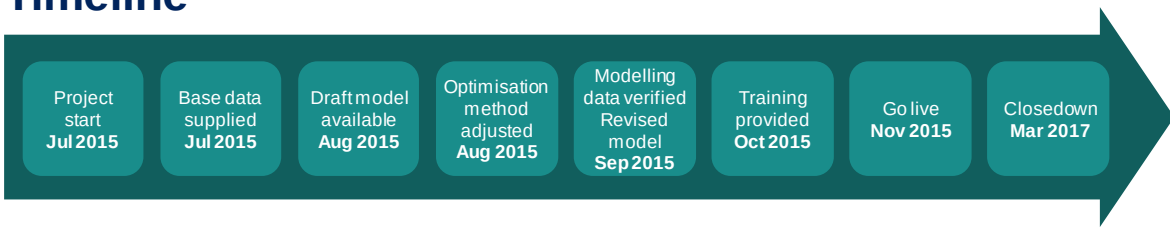
Benefits

- Optimisation of programmes of work
- More efficient programme delivery
- Methodology tailored to investment portfolio
- Project outputs are scalable
- Savings easily demonstrated

Investment £100,000

Financial benefits Up to £2.1m in RIIO-ED1 via better targeting of poorly performing assets

Timeline



Project partners

SEAMS

BUSINESS AS USUAL

Contact: bob.wells@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL006: Sentinel

NIA

The project will trial new fault location techniques on overhead networks. By developing novel fault location sensors which enable earlier detection and response to broken or damaged conductors, this project will improve the quality of supply for customers and improve safety on the network.

Benefits

- More precise fault location
- Detects emerging faults
- Detects high impedance faults
- Reduction in CMLs
- Real time condition monitoring

Investment £4 million

Financial benefits £5m per annum in reduced fault costs

Timeline

Project partners

KELVATEK

Contact: kieran.bailey@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL007: Reliable Low Cost Earth Fault Detection NIA

This project examined the way network operators respond to faults by providing fault passage information to control engineers in real time via SCADA.

Benefits

- Faster fault location
- Reliable fault detection on rural networks
- Easily deployable
- Reduction in CMLs
- Improved customer service

Investment £350,000

Financial benefits £1m per annum in reduced fault costs

Timeline

Project partners

nortech

BUSINESS AS USUAL

Contact: daniel.harber@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL008: ATLAS

NIA

This project has delivered the methodology, prototypes and specifications for tools to analyse load and generation, forecast active and reactive power demand and generation half-hourly through year, using scenarios and to provide indicative capacity assessments.

Safety & Environment | Network Resilience | Capacity | Efficiency | Customer Service | Commercial Evolution

Benefits

- Reinforcement deferral
- Utilises DSR market
- Better targeted investment
- Improved demand forecasting
- Improved reporting to Ofgem and National Grid

Investment £360,000

Financial benefits Efficient decisions on ~£100m/year of load-related expenditure in RIIO-ED1/ED2

Timeline

- Go live **Nov 2015**
- Automatic load data processing method **Jun 2016**
- High-level forecast method **Jun 2016**
- Initial active power scenario tool **Dec 2016**
- Initial reactive power scenario tool **Apr 2017**
- Prototype G&P forecast and tool **May 2017**
- Functional specs for BAU approaches **Nov 2017**
- Closedown report **Jul 2018**

Project partners

elementenergy

BUSINESS AS USUAL

Contact: christos.kaloudas@enwl.co.uk

www.enwl.co.uk/atlas

Back to completed projects

ENWL009: Cable Health Assessment - Low Voltage NIA

This project will develop the technology, data processing, support services, BAU operating model and condition based risk management (CBRM) modelling required to give network operators the ability to assign health indices to low voltage cables and associated networks.

Safety & Environment | Network Resilience | Capacity | Efficiency | Customer Service | Commercial Evolution

Benefits

- Low cost
- Easily deployable
- Improved CBRM models
- Better targeted investment
- Health indices for cables

Investment £2.75 million

Financial benefits 25% reduction in LV faults resulting in a saving of £3.5m annually

Timeline

- Go live **Nov 2015**
- Sensor specification **Aug 2016**
- Sensor development **May 2018**
- Live trials **Oct 2018**
- Trial data analysis **Jan 2019**
- Develop assessment models **Feb 2019**
- Develop cable management processes **Apr 2019**
- Closedown **Nov 2019**

Project partners

KELVATEK

Contact: kieran.bailey@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL010: Value of Lost Load (VoLL) NIA

Understanding VoLL will become more important in determining network investment as customers become more reliant on electricity. Through a programme of customer engagement this project will deliver a comprehensive understanding of VoLL.

Benefits

- Credible assessment of VoLL by key customer segments
- Improved strategies to mitigate impact of lost load
- More efficient investment decisions
- Targeted customer compensation strategies
- Transferrable to other DNOs

Investment £687,000

Financial benefits ~£100m in societal benefits from more appropriate VoLL values

Timeline

Project partners

Impact Research

Contact: kate.quigley@enwl.co.uk

www.enwl.co.uk/voll

Back to in-flight projects

ENWL011: Enhanced Voltage Control

NIA

The project will review voltage control settings to allow faster connection of generators to enable us to offer voltage managed connection contracts.

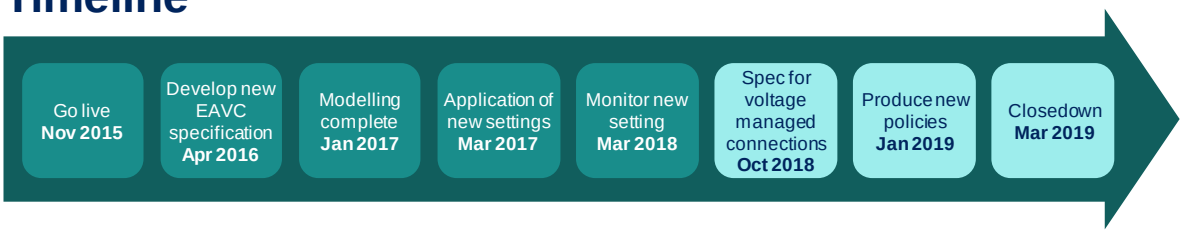
Benefits

- Reinforcement deferral
- Facilitates connection of LCTs
- Alternative connections for generators
- Offers voltage managed contracts
- Carbon reduction (CO_2)

Investment £200,000

Financial benefits Reduced connection costs for generators

Timeline



Project partners

FUNDAMENTALS

Contact: geraldine.paterson@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL012: Investigation of Switchgear Ratings

NIA

This project developed a short circuit (fault withstand) performance envelope for a range of the more commonly used distribution switchgear variants. This will allow tailored replacement decisions based on the actual fault levels and the actual equipment capability.

Benefits

- Improved investment decisions
- Revised switchgear ratings
- Fault level at substation
- More efficient replacement programme
- Transferrable to other DNOs

Investment £300,000

Financial benefits £1-10m over RIIO-ED1 depending on test results and deferred reinforcement

Timeline

Project partners

Contact: matthew.kayes@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL013: Detection and Prevention of Islands NIA

The project will investigate the use of SCADA and ADMS functionality to detect and then fragment islands formed on the distribution network.

Benefits

- Reliable detection of islands
- Economic solution
- Easily deployable
- Facilitates generation connections
- Carbon reduction

Investment £200,000

Financial benefits N/A as research project

Timeline

Project partners

Contact: geraldine.paterson@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL014: Optimisation of Oil Regeneration

NIA

The project will carry out field trials using condition monitoring equipment at 13 mid-life transformer sites. Analysis of the data provided will enable us to optimise the oil regeneration process and identify the optimum point at which oil regeneration can be used in the life cycle of a transformer.

Safety & Environment | Network Resilience | Capacity | **Efficiency** | Customer Service | Commercial Evolution

Benefits

- Defines optimum oil regeneration point
- Improved management of existing assets
- Early detection of deterioration
- Improved investment plans
- Easily deployable

Investment £1.5 million

Financial benefits £15m in RIIO-ED2 by extending transformer life via oil regeneration

Timeline

- Go live **Feb 2016**
- Specify oil regeneration unit **Apr 2016**
- Procure oil regeneration unit **Aug 2017**
- Regenerate oil at sites **Sep 2017**
- Monitor transformers **Feb 2021**
- Analyse monitoring data **Dec 2021**
- Validation of data **Feb 2022**
- Closedown **Feb 2022**

Project partners

CAMLIN POWER

Contact: ben.ingham@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL015: Tapchanger Monitoring

NIA

This project will develop, bring to pre-production and trial an accurate online tapchanger condition monitoring system to identify when intervention is required for repair, maintenance or replacement of tapchangers.

Safety & Environment | Network Resilience | Capacity | **Efficiency** | Customer Service | Commercial Evolution

Benefits

- Improved knowledge of tapchanger condition
- Improved operator safety
- Improved timing of Interventions
- Targeted investment plans
- Accurate probability of failure

Investment £1.5 million

Financial benefits £2m a year by not replacing assets

Timeline

- Go live **Feb 2016**
- Specify monitoring system **May 2016**
- Produce monitoring system **Dec 2016**
- Install monitoring systems **Aug 2017**
- Monitor tapchangers **Aug 2019**
- Analyse data **Dec 2019**
- Produce procedures **Jan 2020**
- Closedown **Feb 2020**

Project partners

CAMLIN POWER

Contact: ben.ingham@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL016: Future Network Modelling Functions

NIA

This project carried out research to better understand the forward requirements for system modelling, the expected functionality of tools, and the associated data and system architectures.

Benefits

- Improved LV network visibility
- Improved investment plans
- Releases network capacity
- Improved LCT impact assessment
- More efficient network reinforcement decisions

Investment £125,000

Financial benefits N/A as research project

Timeline

Project partners

CGI

Contact: dan.randles@enwl.co.uk

www.enwl.co.uk/nia

Back to completed projects

ENWL017: Electricity and Heat

NIA

This project will investigate the feasibility of utilising the heat currently wasted to both improve overall energy efficiency (reducing electrical demand) and allow the electrical demand to be managed.

Safety & Environment | Network Resilience | Capacity | Efficiency | Customer Service | Commercial Evolution

Benefits

- Releases network capacity
- Promotes energy efficiency
- Lower bills for customers
- Reinforcement deferral
- Improved customer engagement

Investment £545,000

Financial benefits N/A as research project

Timeline

- Go live **Mar 2016**
- Feasibility study complete **Oct 2016**
- Design new system **Mar 2017**
- Factory build complete **Dec 2017**
- Site installation **May 2018**
- Commission system **Jun 2018**
- Monitor installation **Aug 2018**
- Closedown **Mar 2019**

Project partners

FUTUREBAY LTD

Contact: cara.blockley@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

ENWL018: Avatar

NIA

The project will quantify how customers' attitudes, behaviours, needs and expectations are likely to change in the future. This will deliver a blueprint for the implementation of bespoke customer service solutions and begin the evolution of DNO customer service strategy.

Benefits

- Creation of a customer service blueprint
- Improved investment plans
- Inform optimal communication with customers
- Improved methods of disseminating information
- Easily adopted by other DNOs

Investment £750,000

Financial benefits Potential reduction of 50 FTEs (annual savings of £150,000k)

Timeline

Project partners

Impact Research · DXC.technology · Schneider Electric

Contact: geraldine.paterson@enwl.co.uk

www.enwl.co.uk/nia

Back to in-flight projects

Oil Regeneration

IFI

This project investigated transformer oil regeneration as an alternative transformer management option. The technique offered the greatest opportunity to improve the transformer's health index and thereby extended the operational life of the transformer.

Safety & Environment | Network Resilience | Capacity | **Efficiency** | Customer Service | Commercial Evolution

Benefits

- Asset replacement deferral
- Asset life extension
- Improved health indices
- Risk management
- Easily adopted by other DNOs

Investment £157,000

Financial benefits Around £32m savings from deferred transformer replacement in RIIO-ED1

Timeline

Project go live	Literature review	Define procedure	Regenerate transformers	Install analysis equipment	Post regeneration analysis	Document production	Closedown
Nov 2011	Feb 2012	May 2012	Nov 2013	Dec 2013	Nov 2014	Dec 2014	Dec 2014

Project partners

MANCHESTER 1824 The University of Manchester

BUSINESS AS USUAL

Contact: paul.marshall@enwl.co.uk

www.enwl.co.uk/ifi

Back to completed projects

Load Allocation

IFI

Load Allocation produced a software tool which takes in data from many sources to estimate loadings on HV circuits and distribution transformers every half hour. This feeds into an 'automatic restoration system' to reconfigure the network after a fault.

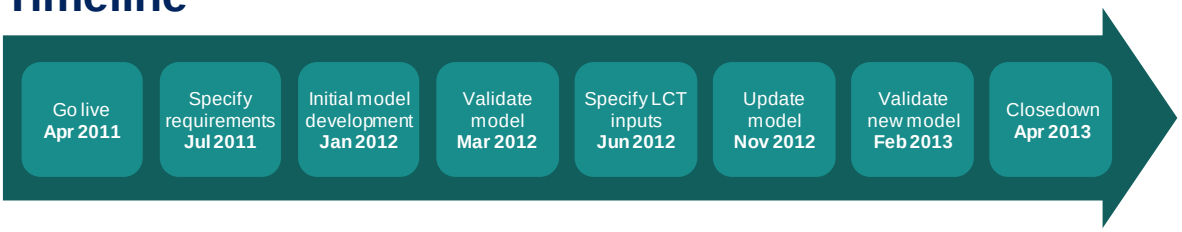
Benefits

- Improved HV and LV loading assessment
- Better understanding of today's capacity
- Improved LCT impact assessment
- Better understanding of future capacity
- Targeted investment plans

Investment £400,000

Financial benefits £1.6m in DPCR5 and RIIO-ED1 in deferred reinforcement and reduced CMLs

Timeline



Project partners

BUSINESS AS USUAL

Contact: christos.kaloudas@enwl.co.uk

www.enwl.co.uk/ifi

Back to completed projects

Next Generation LV Board Design

IFI

This project developed two products for use on the LV system – the LV circuit breaker and the LV link box switch. Using these products allows better control of the LV network.

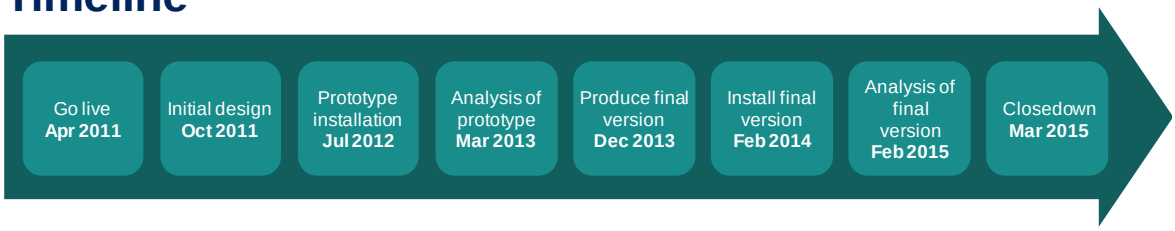
Benefits

- Alternative and more effective network configurations
- Improved fault restoration times
- Reinforcement deferral
- Improved LV network visibility
- Real time control of demand and voltage

Investment £1.2 million

Financial benefits £100,000pa for 20 years from improved CMLs and release of additional capacity

Timeline



Project partners

KELVATEK EPS

BUSINESS AS USUAL

Contact: geraldine.paterson@enwl.co.uk

www.enwl.co.uk/ifi

Back to completed projects

Fault Support Centre

IFI

A fault support centre (FSC), set up by Kelvatek, actively analyses data from equipment installed on our LV network to provide fault location details.

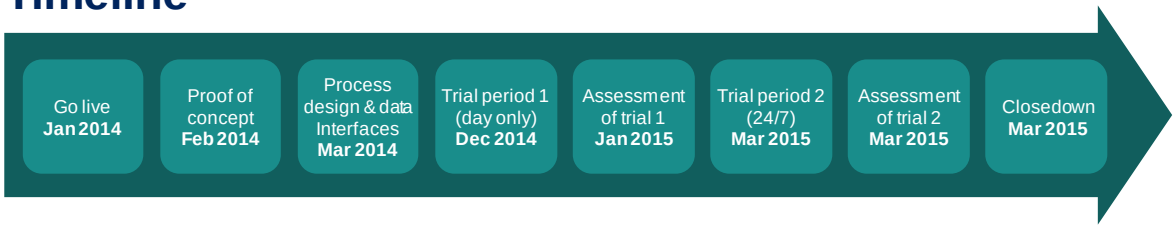
Benefits

- Faster fault location and repair
- Reduction in CMLs
- Improved customer service
- Identification of overloaded circuits
- Identification of network with poor health

Investment £389,824

Financial benefits £1.5m pa cost reduction from managing LV transient faults across the network

Timeline



Project partners

KELVATEK

BUSINESS AS USUAL

Contact: david.talbot@enwl.co.uk

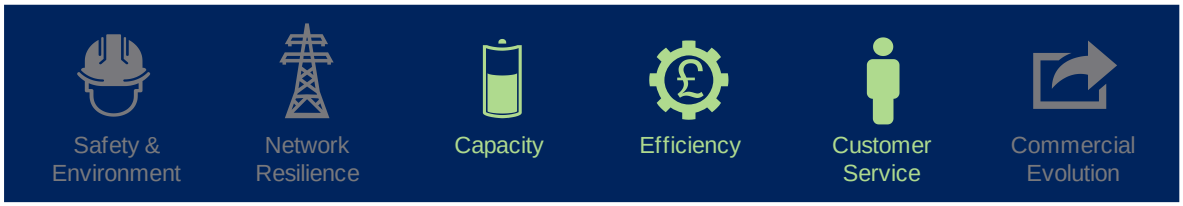
www.enwl.co.uk/ifi

Back to completed projects

Changing Standards

IFI

The first significant piece of customer research that sought to determine if customers are sensitive to the provision of an electricity supply at or near to the extremes of statutory voltage limits.



Benefits

- Reduced voltage complaints
- Reduced reinforcement
- Proposes new statutory limits
- Creates capacity
- Carbon reduction

Investment £385,521

Financial benefits N/A as research project

Timeline

Project partners

Impact Research

Contact: tracey.kennelly@enwl.co.uk

www.enwl.co.uk/ifi

Back to completed projects

Power Saver Challenge

BAU

This pioneering community engagement project deployed a proactive demand reduction programme within a community to address a network capacity issue.

Safety & Environment | Network Resilience | Capacity | Efficiency | Customer Service | Commercial Evolution

Benefits

- Releases network capacity
- Improved customer engagement
- Promotes energy efficiency
- Lower bills for customers
- Reinforcement deferral

Investment £596,000

Financial benefits Demand reduction of 201MW and social benefits

Timeline

- Go live **Nov 2013**
- Baseline load survey **Nov 2013 - Mar 2014**
- Community engagement & events **Apr 2014**
- Customer challenge phase **Nov 2014 - Mar 2015**
- Monitor load (challenge phase) **Nov 2014 - Mar 2015**
- Award of prizes **Mar 2015**
- Post rewards monitoring **Nov 2015 - Mar 2016**
- Closedown **Mar 2016**

Project partners

Stockport Homes Transforming Lives; Stockport Metropolitan Borough Council; Impact Research; NEA Action for Warm Homes

Contact: innovation@enwl.co.uk

www.enwl.co.uk/powersaverchallenge

Back to completed projects

Smart Metering

Price control allowance

Smart meters are the next generation of a gas and electricity meter being installed by energy suppliers in every home in England, Scotland, and Wales We need to prepare for smart meters to be able to benefit from the data they will provide in the future. This project will prepare our business for the transition to smart meters.

Benefits

- Detailed bills giving accurate consumption and charges
- Faster fault restoration
- Functionality to confirm if customer has power
- Granular customer loading data
- More efficient network reinforcement decisions

Investment £18 million

Financial benefits >£20 million across RIIO-ED1/ED2

Timeline

Project partners

DXC.technology

Contact: jane.eccleston@enwl.co.uk

www.enwl.co.uk/smartmeters

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