electricity north west

Bringing energy to your door

# Our Innovation Strategy

**30 June 2019**

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# VERSION HISTORY

| Version | Date | Author | Status | Comments |
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| 0.1 | 17 January 2017 | Geraldine Bryson | First draft | |
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# OUR INNOVATION STRATEGY

Welcome to our innovation strategy which builds on our earlier work and is a significant part of our commitment to our 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. A key part of the UK's journey to zero carbon is the revolution of our electricity industry – the way electricity is generated, stored, transported and traded.

As the region's network operator, it's our responsibility to lead the way in this transformation. Through investment and innovation in energy infrastructure, we will help the North West to decarbonise and pave the way for the growth of renewable energy.

In this document we explain why we innovate, how we ensure we deliver value for our customers and how we will support our region to meet our zero carbon target by 2038.

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

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

I hope you find this document accessible and informative. Please let me know what you think of our strategy and how we can improve it.

**Paul Turner**
Innovation Manager
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.

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

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

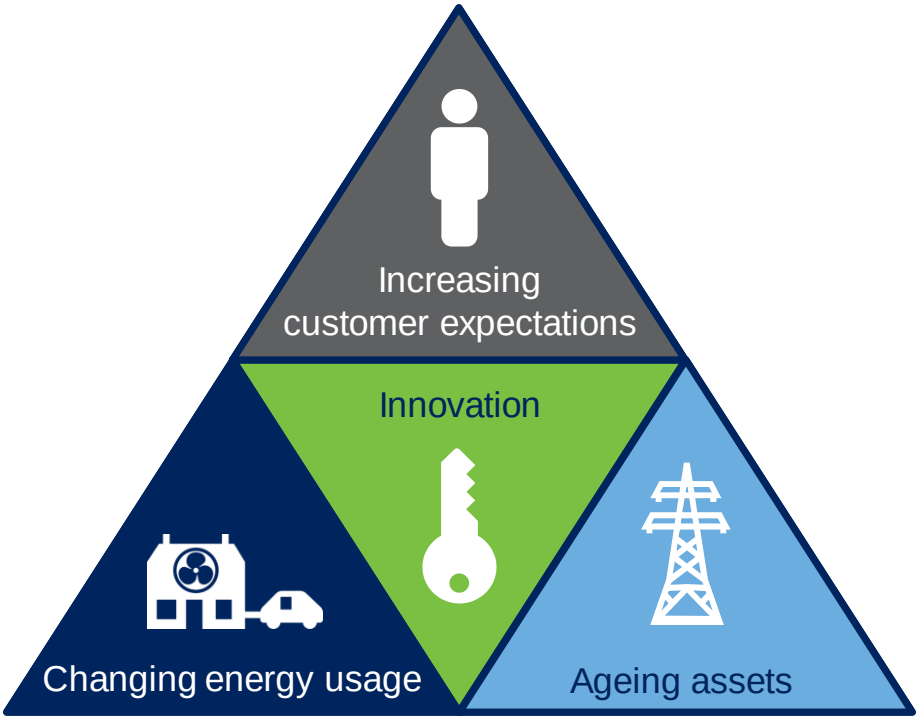
- New technologies
- New business and commercial models
- An appropriately supportive regulatory framework with associated incentives.

# 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, renewable heat and electric vehicles (EVs). 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.

*Forecasting*

To ensure we can plan for and deliver our customers' future needs we have developed more sophisticated methods of demand forecasting. These allow us to plan with our key stakeholders and help us mitigate the risks associated with the uncertainty in low carbon technology uptake. The new 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.

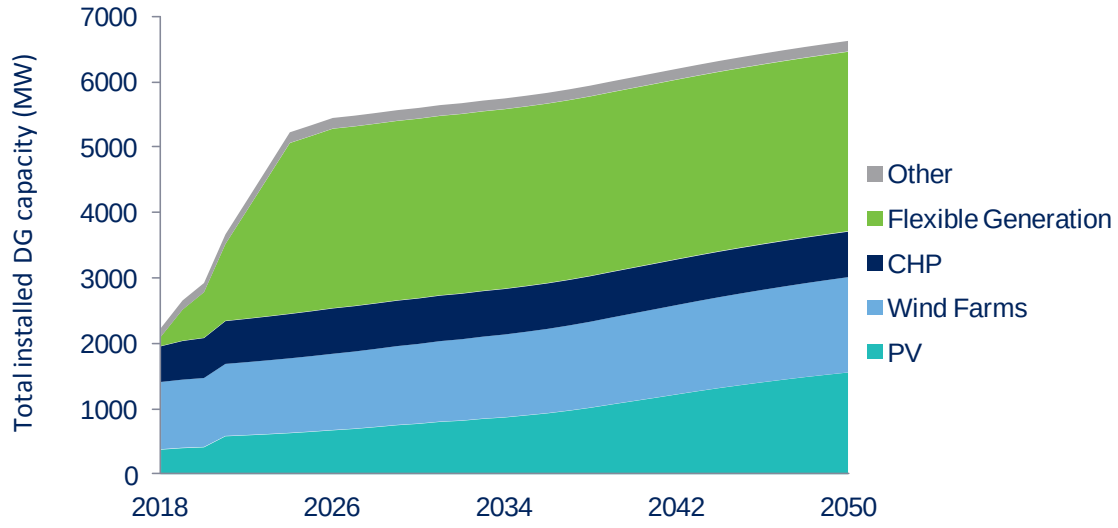
Our work in this area has led to the development of our forecasting scenarios for electricity demand and generation. They are based on differing underlying assumptions on financial and policy conditions to explore future electricity usage within our region. Our five future scenarios – 'Active Economy', 'Slow Progression', 'Green Ambition', 'Focus on Efficiency' and 'Central Outlook' are used in some of the forecast data below. For more information please refer to our Distribution Future Electricity Scenarios.

*Generation*

One of the key challenges for DNOs is the connection of low carbon distributed generation (DG) in volumes sufficient to meet carbon targets. Our network already has DG with installed capacity equal to over 50% of our maximum demand. 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.

Figure 2 shows the predicted future increase in different types of DG capacity. The numbers of flexible generators (gas/diesel fuelled) are expected to rise steeply in the next five years as part of planned developments. In the longer-term, we expect less use of combined heat and power as policies for decarbonisation and the reduced cost for renewables deter their use. Conversely, the use of wind and photovoltaic (PV) generation is expected to continue increasing as part of the transition to low carbon energy sources.

*Figure 2: Future installed DG capacity across the North West*



*Demand*

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

However, we expect that future renewable heat incentives coupled with falling prices for technologies, such as heat pumps (HPs), will result in high customer adoption, similar to the uptake of solar PV following the introduction of the feed-in tariff in 2011. This will lead to substantial additional demand.

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

*Figure 3: Daily domestic demand profile over time*

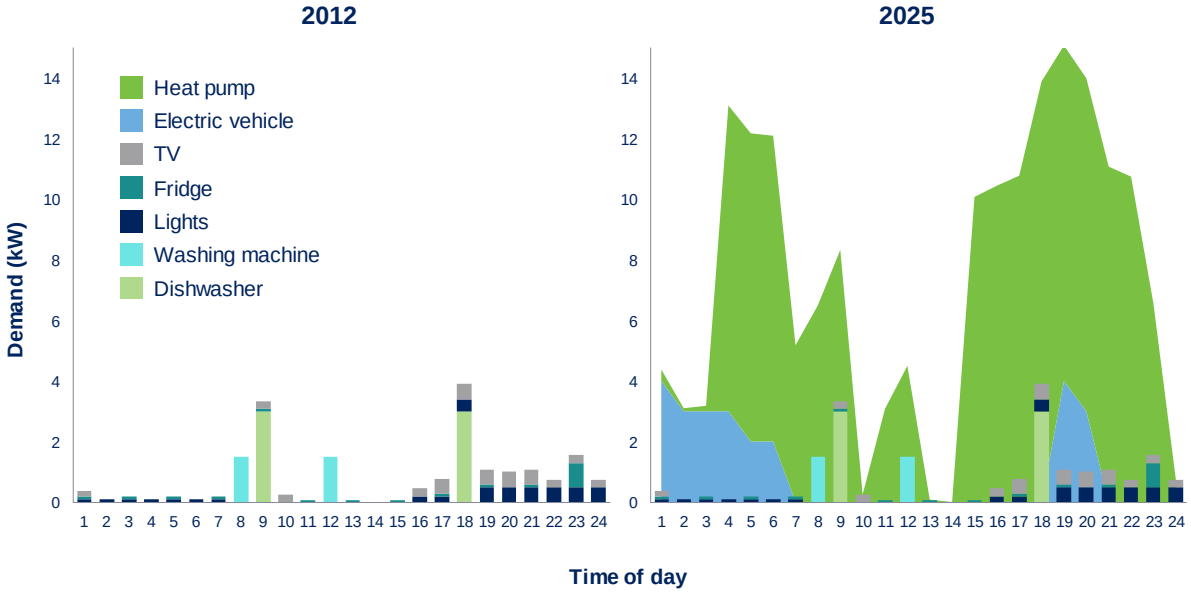



Figure 4 shows the future EV volumes for our five forecasting scenarios.

*Figure 4: Future volumes of electric vehicles (pure EVs and plug-ins) in the North West*

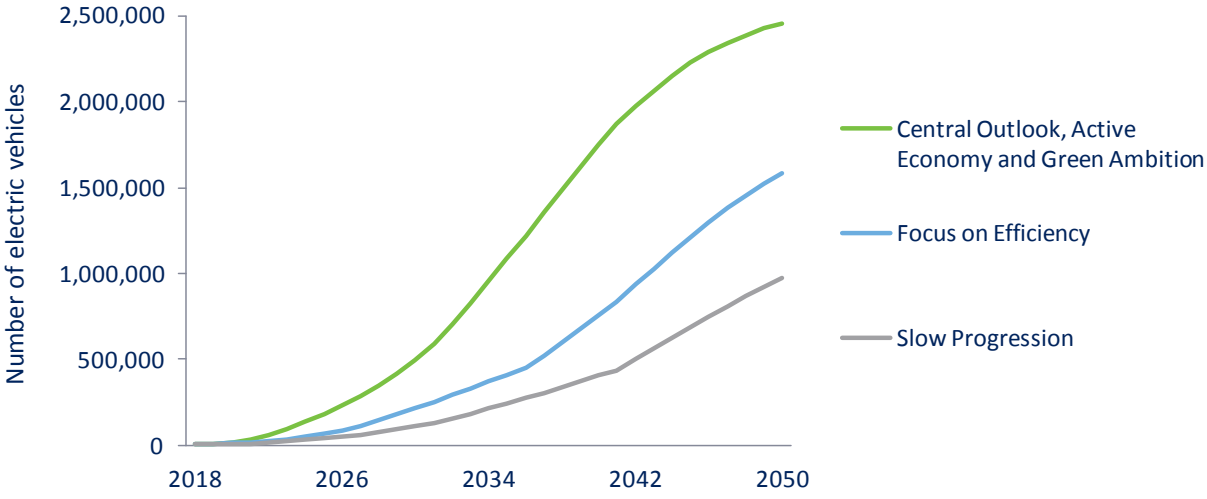
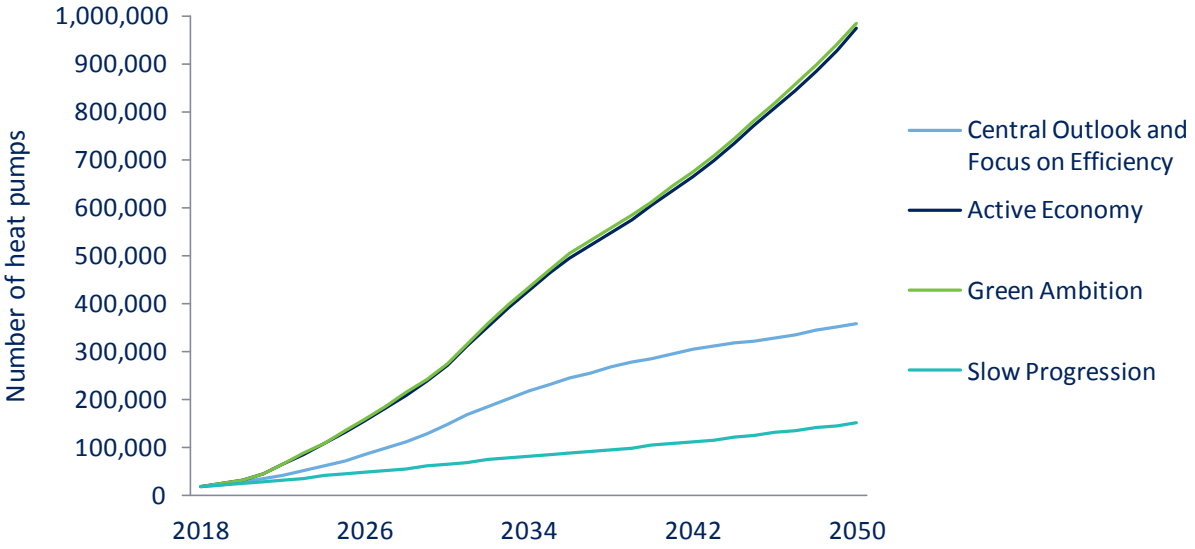


Figure 5 shows the future trends in HP volumes across our five scenarios.

*Figure 5: Future volumes of heat pumps in the North West of England*




## 2.2 Increasing customer expectations

The adoption of low carbon technologies described above means that we are starting to see an acceleration in the number of customers who derive their heat and transport energy needs from electricity networks.

Our research has demonstrated that due to this increased dependence on electricity, a reliable supply is becoming even more critical. We therefore need to develop our investment strategies and redefine existing passive networks, to meet evolving needs and expectations.

We are adapting our networks to accommodate these needs and have developed intelligent tools to forecast projected demand and generation, based on local information and conditions to prepare for the differing future electrical needs of customers across our region. This approach will provide greater flexibility to connect additional demand, generation and storage more quickly, cheaply and efficiently.

In recent years we have seen how climate change has resulted in more extreme weather events, which put a severe strain on electricity infrastructure. However, our research tells us that with increasing reliance on electricity, customers will not accept protracted outages. Delivering even higher reliability levels from an ageing asset base will require innovation in active network management, energy management, active automation systems, fault detection and repair technologies.

Mobile connectivity and social media platforms have significantly changed the way that our customers communicate and this has raised their expectations, meaning they expect access to instantaneous information about network outages. Our research also tells us that customers have an expectation of support to mitigate the impact of outages and believe that we have a social and moral obligation to provide enhanced services for certain customer groups.

By working with a broad range of relevant stakeholders and organisations at the cutting edge of customer service, we are improving our social programme and developing innovative solutions to improve our services and the way we 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 these expectations.

Our research to understand the value that different customer segments place on supply reliability has established that the current GB model, which underpins investment decisions, significantly undervalues the needs of certain customer groups, while others are over represented. This could drive potentially inappropriate investments.

We are therefore working closely with our customers and stakeholders to understand their views on the consequences of adopting an alternative model. This will help us to better understand the relative value of proactive investment, aimed at preventing or minimising the severity of interruptions, versus the ability to mitigate the impact by deploying various support mechanisms to manage the consequence of network faults.

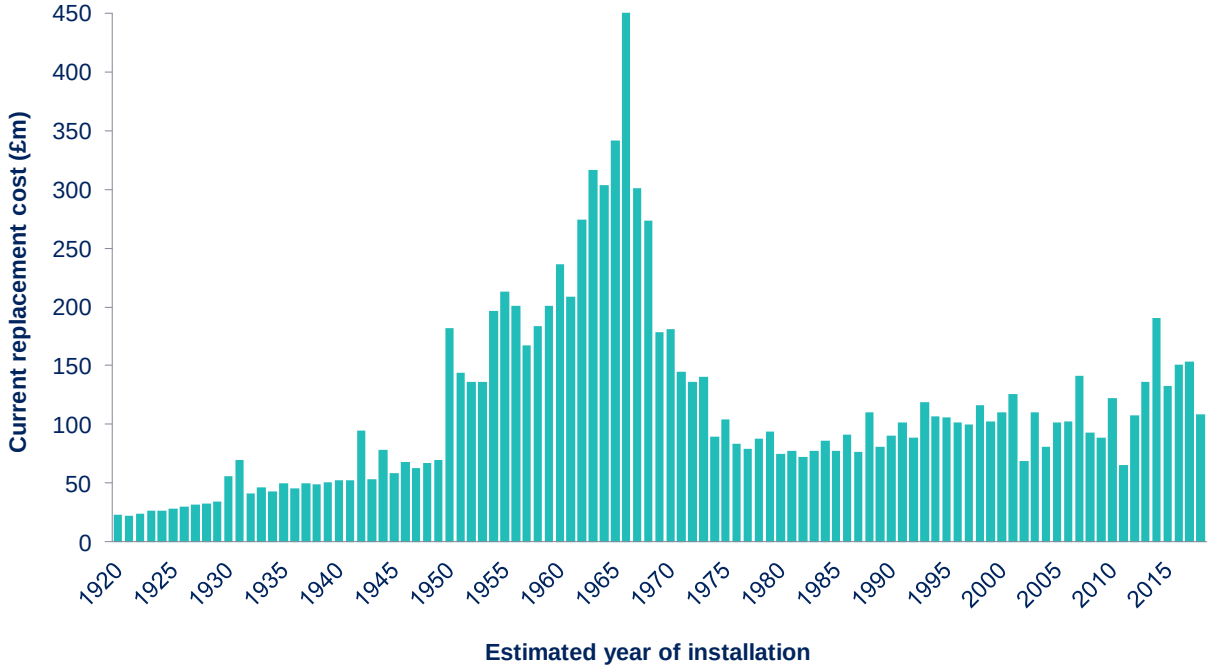
Engagement with key industry stakeholders will determine how a more disaggregated model, more representative of customers' needs and expectations, might be incorporated into the regulatory framework and most practicably implemented across GB. This learning will determine the type and level of future investments that we will make in our network to manage our customers' 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 6, 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 6: Age profile shown as estimated cost of replacement, 1920 – 2018*




## 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 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. 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.

We will continue to offer flexible services – 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 believe that the 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.

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

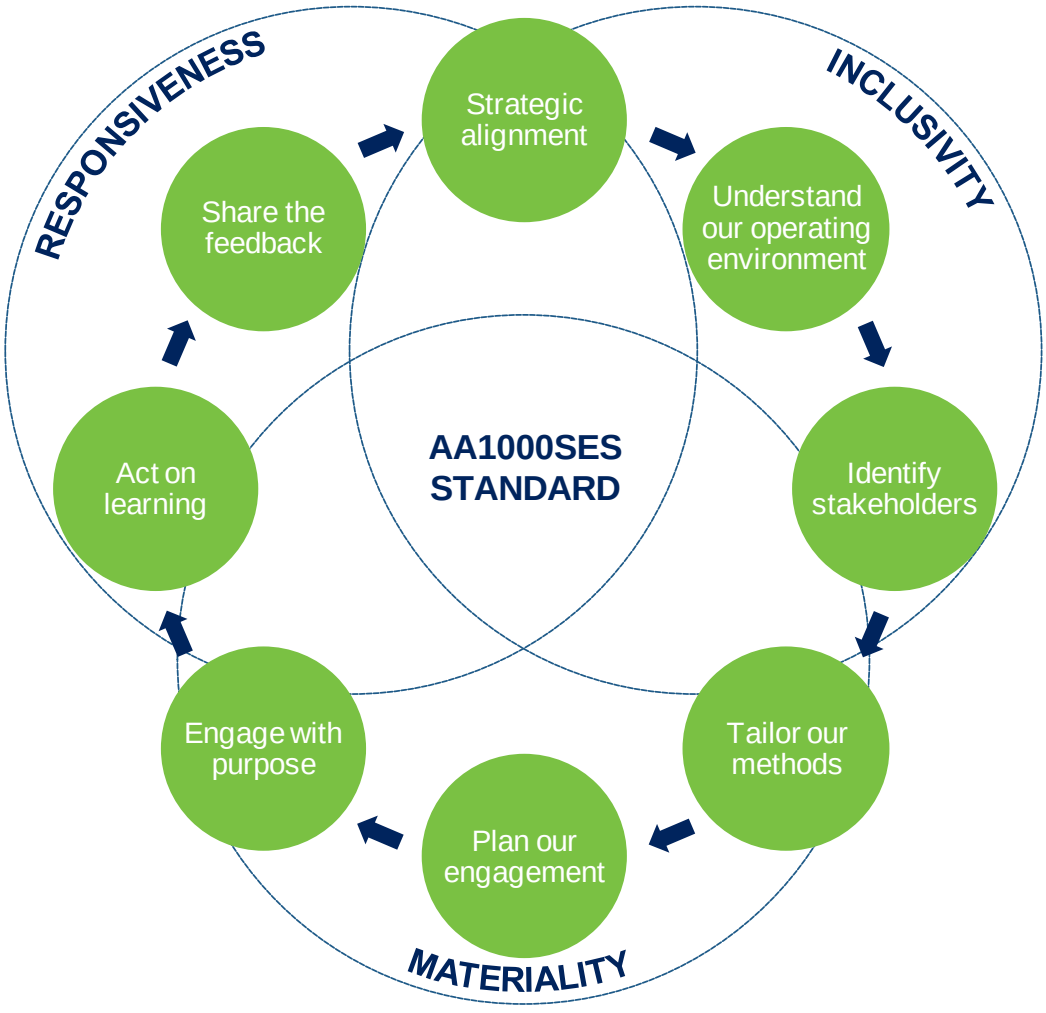
key industry stakeholders including the Energy Networks Association (ENA), other DNOs, energy suppliers, National Grid, equipment suppliers and manufacturers.

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 Stakeholder Engagement Standard (AA1000SES). 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.

*Figure 7: Our stakeholder engagement strategy*



## 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 8: 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.

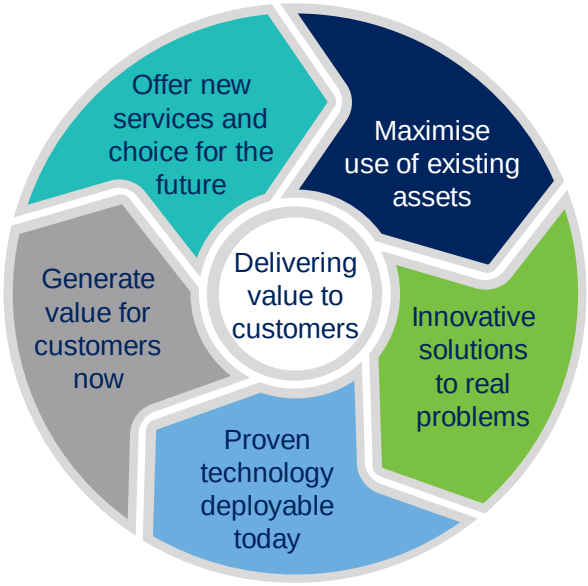
It is important that we deliver the innovation we have promised at the price we have estimated. To do this we have established a dedicated project management team who have significant experience in the delivery of complex innovation projects and programmes. Our team has a proven record in ensuring we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

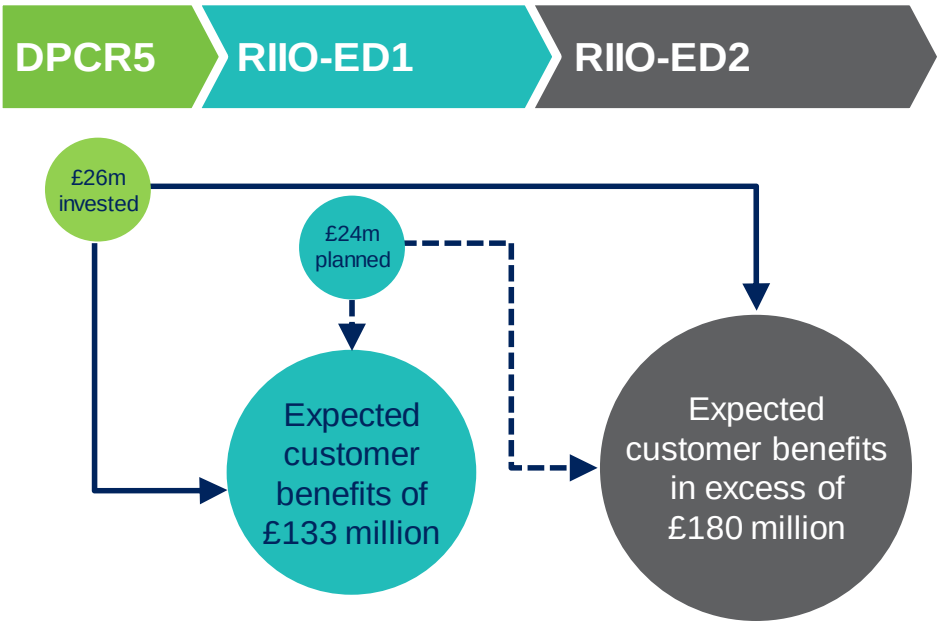
*Figure 9: Our innovation strategy*




## 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 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 10 below shows the return on investment from DPCR5 through to RIIO-ED2.

*Figure 10: 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 is complementary to our own work.

## 5.3 Innovation lifecycle

*Figure 11: 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)

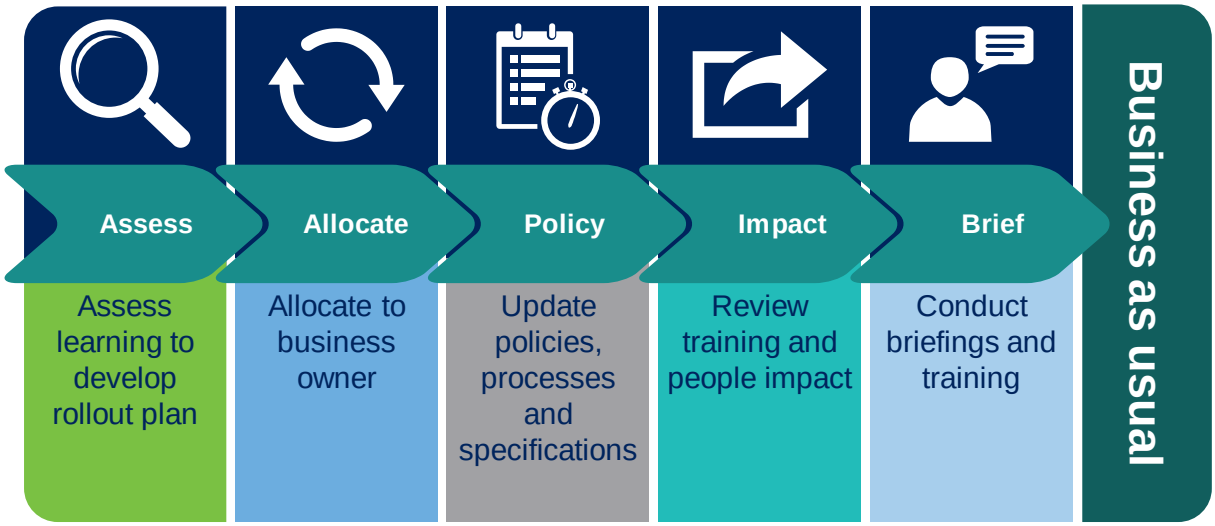
Managing the transition of an innovative solution, device, technology or new operating arrangement into BAU is perhaps the most important stage in delivering benefits to customers. This phase generally represents the final stage of a project's time line and is the culmination of its successful outcome.

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 12 below.

*Figure 12: 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
- Press releases to communicate our progress to local media
- 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.

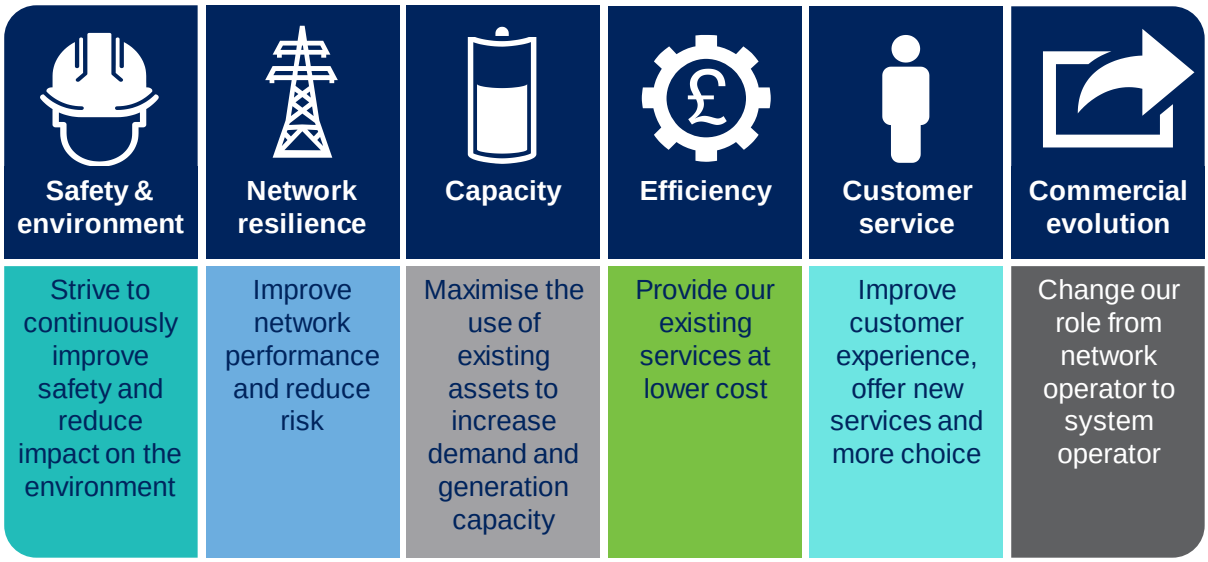
### 5.7 Future strategy development

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 13: 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. 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 In-flight projects

| Project | Funding | | | | | | | Timescales | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Celsius | NIC | | | ✓ | ✓ | | | | | | | ■ | ■ | ■ | ■ | ■ | | | |
| ENWL004: Combined Online Transformer Monitoring | NIA | | | | ✓ | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| ENWL006: Sentinel | NIA | ✓ | ✓ | | ✓ | ✓ | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| ENWL009: Cable Health Assessment | 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 | | | | ✓ | ✓ | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | |

| Project | Funding | | | | | | | Timescales | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| ENWL019: Interface | NIA | | | ✓ | ✓ | ✓ | ✓ | | | | | | | ■ | ■ | ■ | ■ | | |
| ENWL020: Artificial Intelligence & Machine Learning | NIA | | ✓ | ✓ | ✓ | ✓ | | | | | | | | ■ | ■ | ■ | ■ | | |
| ENWL021: VoLL 2 | NIA | | | | ✓ | ✓ | | | | | | | | ■ | ■ | ■ | | | |
| ENWL022: Reflect | NIA | | ✓ | ✓ | ✓ | | | | | | | | | | ■ | ■ | ■ | | |
| ENWL023: Intelligent Network Meshing Switch | NIA | | ✓ | ✓ | ✓ | ✓ | | | | | | | | | ■ | ■ | | | |
| Smart Metering | na | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | |

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

## 8.2 Completed projects

| Project | Funding | | | | | | | Timescales |
|---|---|---|---|---|---|---|---|---|
| Capacity to Customers | LCNF 2 | | ✓ | ✓ | | ✓ | ✓ | Business as usual |
| CLASS | LCNF 2 | | ✓ | ✓ | ✓ | | ✓ | Business as usual |
| Smart Street | LCNF 2 | | ✓ | ✓ | ✓ | ✓ | | Complete |
| Respond | 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 |
| ENWL003: P2/6 Rewrite | NIA | | ✓ | | | | | Complete |

| Project | Funding | | | | | | | Timescales |
|---|---|---|---|---|---|---|---|---|
| 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 |
| ENWL010: Value of Lost Load | NIA | | | | ✓ | ✓ | | Complete |
| 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*

# 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 go live | Trial area announced | Customer survey | Contract terms | Technology installation | Trials go live | Trials complete | Closedown |
|---|---|---|---|---|---|---|---|
| Jan 2012 | Jul 2012 | Aug 2012 | Dec 2012 | Mar 2013 | Apr 2013 | Sep 2014 | Dec 2014 |

## Project partners

Impact Research, nationalgrid, GE, PB Parsons Brinckerhoff, University of Strathclyde, The University of Manchester, npower, flexitricity



**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.

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

## 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

- Go live **Jan 2013**
- Site selection **Apr 2013**
- Customers chosen for survey **Mar 2014**
- Site installation **Apr 2014**
- Trials concluded **Jun 2015**
- Analysis completed **Aug 2015**
- Closedown **Sep 2015**
- Market assessment extension **May 2016**

## Project partners

GE, National Grid, Siemens, Impact Research, Parsons Brinckerhoff, 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.

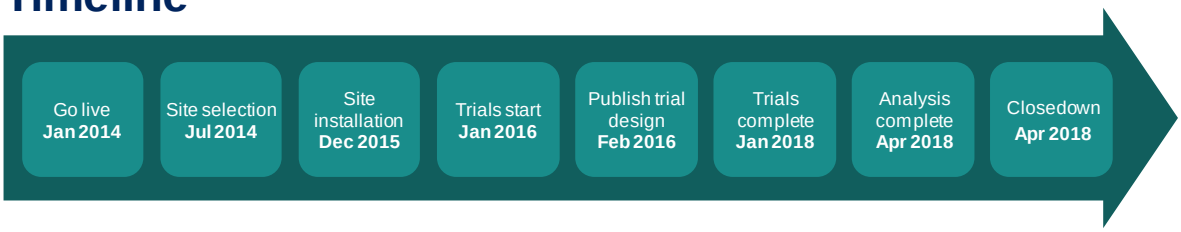

## Benefits

- 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

- Go live **Jan 2015**
- Site selection **May 2015**
- Trial design **Nov 2015**
- System installation **May 2016**
- Post fault analysis **Apr 2018**
- FCL customer report **Apr 2018**
- Safety case **Sep 2018**
- Closedown **Oct 2018**

## 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 completed 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.

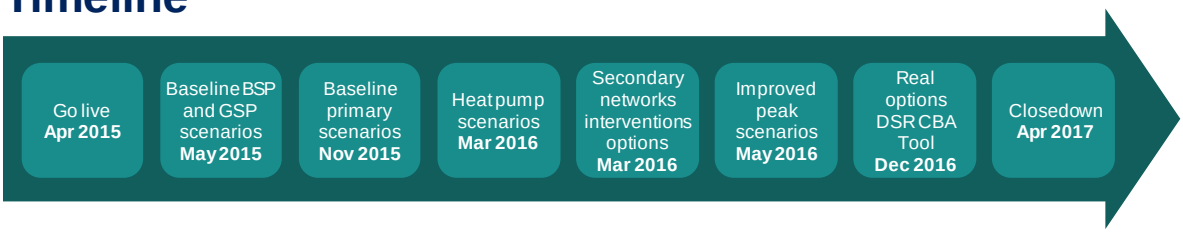

## Benefits

- 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.

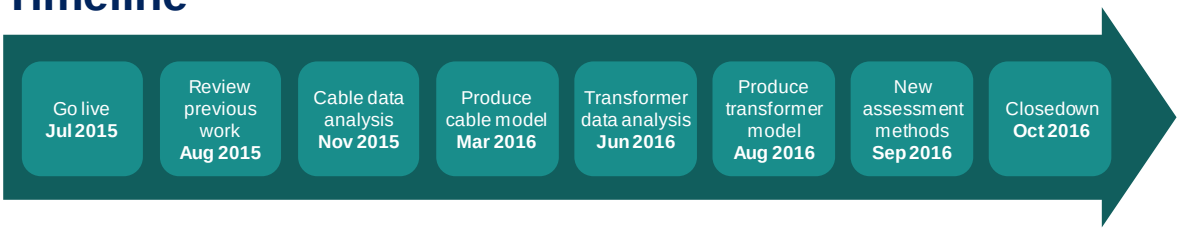

## Benefits

- 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.


### 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


## 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 **Jun 2020**
- Data validation **Sep 2020**
- Closedown **Sep 2022**

## Project partners

The University of Manchester

CAMLIN POWER

**Contact: ben.ingham@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.

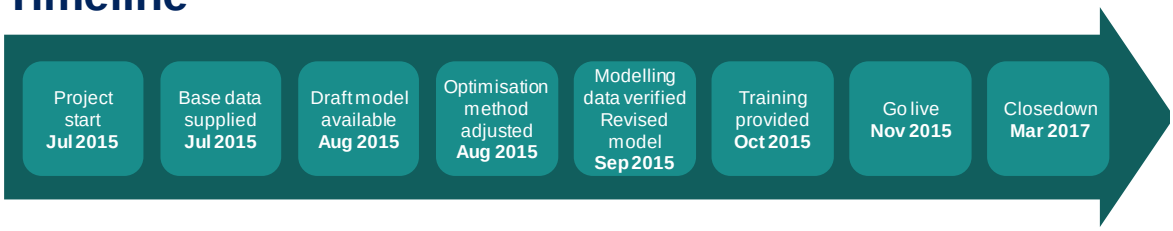

## Benefits

- 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.

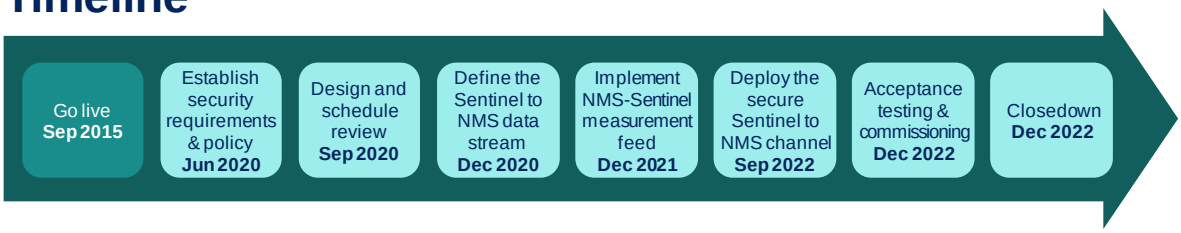

## Benefits

- 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.


## 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


## 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.


## 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


## 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: tracey.kennelly@enwl.co.uk**

**www.enwl.co.uk/voll**

Back to completed 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.

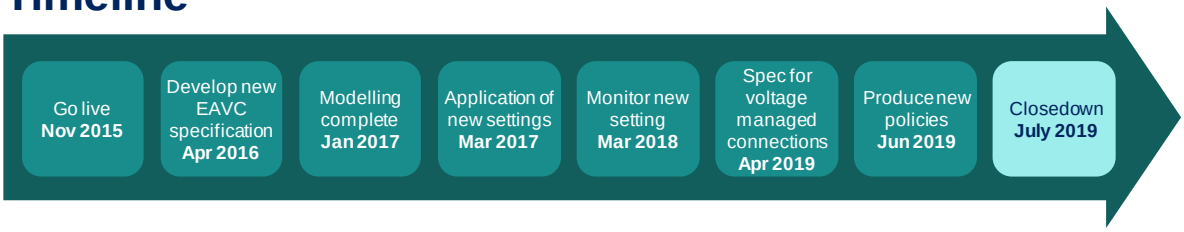

## Benefits

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

**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.

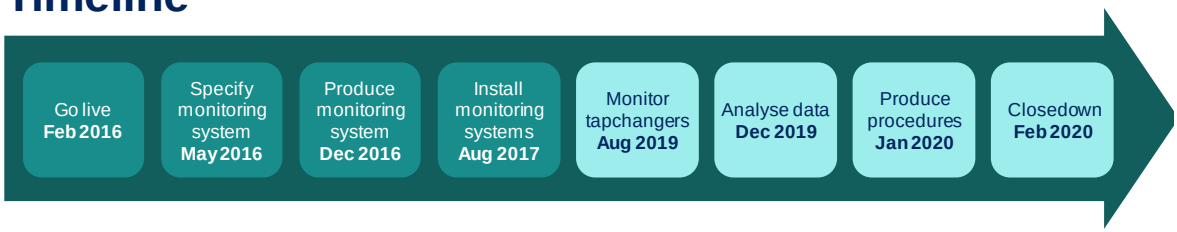

## Benefits

- 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




## 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 **Jul 2019**

## Project partners

FUTUREBAY LTD

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**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

## ENWL019: Interface

NIA

This project will investigate the feasibility of connecting multiple communications devices, required by the increased use of low carbon technologies, into the same communications interface using varying protocols and communications mediums while maintaining data security.


### Benefits

- Economic solution
- Improved management of existing assets
- Allows wide scale deployment
- Low cost
- Facilitates LCT connections

**Investment** £1,000,000

**Financial benefits** £40k per substation

### Timeline


### Project partners

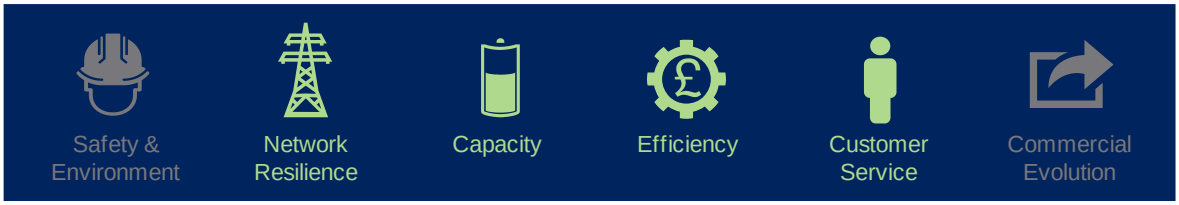
**Contact: geraldine.paterson@enwl.co.uk**

**www.enwl.co.uk/nia**

Back to in-flight projects

# ENWL020: Artificial Intelligence & Machine Learning NIA

This project will investigate whether modern techniques such as machine learning and artificial intelligence could assist with the interrogation of the large amounts of data generated as a result of the growing numbers of intelligent devices installed on the network.



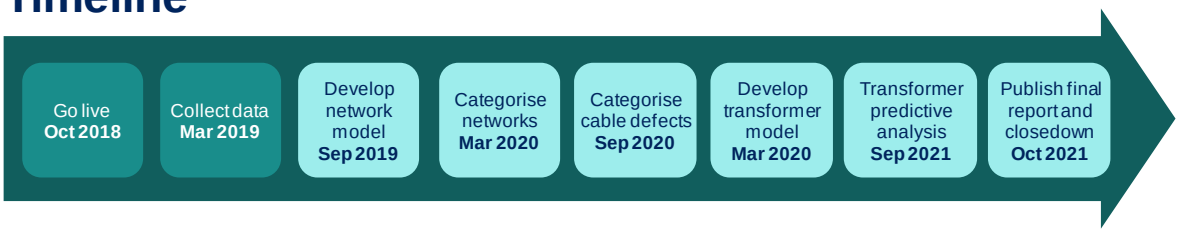

## Benefits

- Improved management of existing assets
- Better understanding of today's capacity
- Improved customer service
- More efficient network reinforcement decisions
- Improved investment plans

**Investment** £825,000

**Financial benefits** N/A as this is a research project

## Timeline




## Project partners

KELVATEK

**Contact: geraldine.paterson@enwl.co.uk**

**www.enwl.co.uk/nia**

Back to in-flight projects

# ENWL021: Value of Lost Load (VoLL) 2

NIA

Following an extensive study to understand the value that customers place on their electricity supply as part of the VoLL project, we will carry out further detailed analysis under VoLL 2 which will help move towards the practical implementation of a differentiated 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** £400,000

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

## Timeline

- Go live **Nov 2018**
- Additional customer survey report **Feb 2019**
- Literature review/ research approach **May 2019**
- Complete analysis & model build **Aug 2019**
- Final customer survey **Oct 2019**
- Strategic analysis – recommen-dations **Oct 2019**
- Publish findings **Dec 2019**
- Closedown **May 2020**

## Project partners

Impact Research

**Contact: tracey.kennelly@enwl.co.uk**

**www.enwl.co.uk/voll2**

Back to in-flight projects

## ENWL022: Reflect

NIA

This project will produce prototype tools and methodologies that can be used by DNOs to improve the electricity demand forecasting for e-vehicle charging by reflecting the regional uncertainties around slow and ultra fast e-vehicle charging.

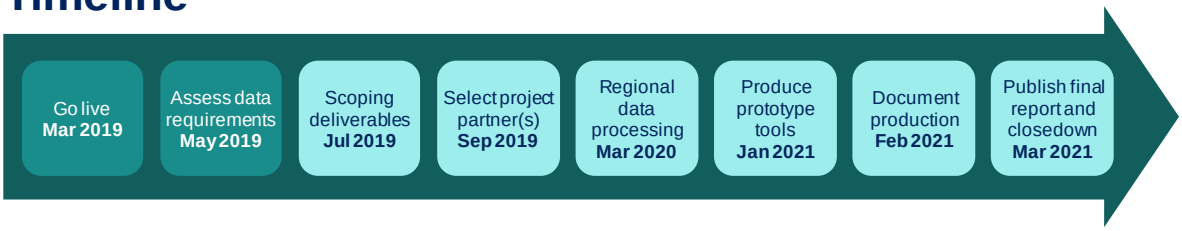

### Benefits

- Improved LCT impact assessment
- Improved network investment
- Targeted investment plans
- Risk averse load related interventions
- Easily adopted by other DNOs

**Investment** £192,500

**Financial benefits** Ensure efficient spend for regional network reinforcement in RIIO-ED2 and beyond

## Timeline




## Project partners

**Contact: christos.kaloudas@enwl.co.uk**

**www.enwl.co.uk/nia**

Back to in-flight projects

# ENWL023: Intelligent Network Meshing Switch

NIA

This project will develop an alternative switching device to mesh low voltage networks, which will overcome the technical issues identified in previous projects, and which can be applied to the entire GB network.


## Benefits

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

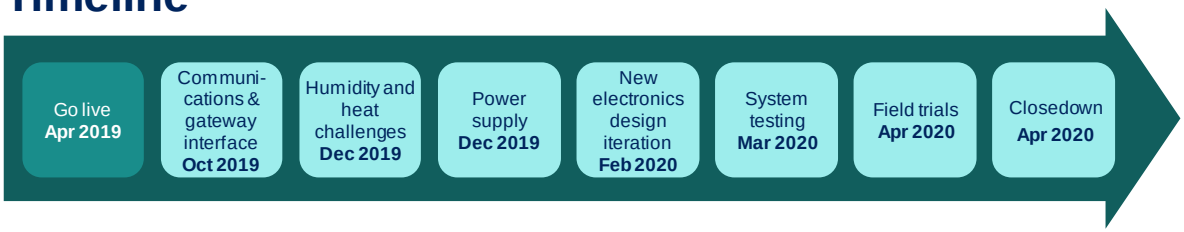
**Investment**

**£1.87 million**

**Financial benefits**

**Up to £20.76 million over 25 years across GB**

## Timeline




## Project partners

KELVATEK

**Contact: innovation@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.

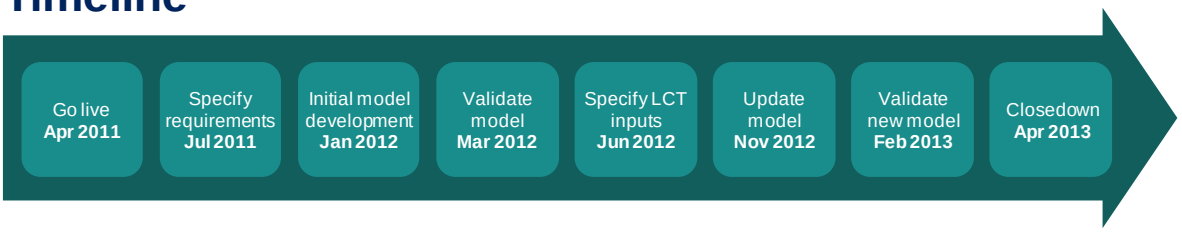

## Benefits

- 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.

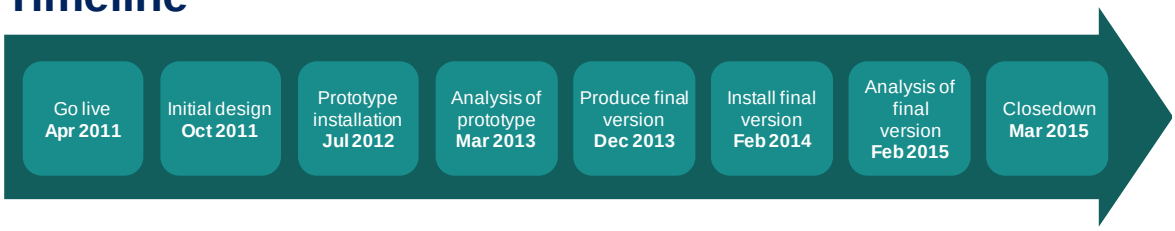

## Benefits

- 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.

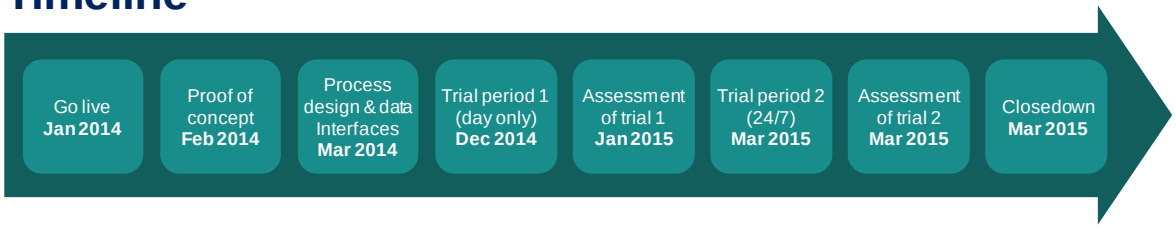

## Benefits

- 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**

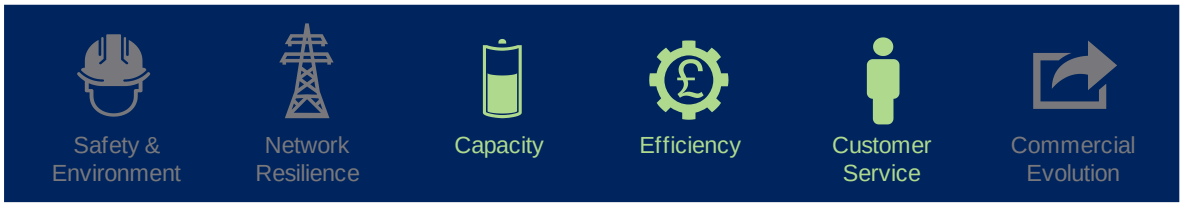
**www.enwl.co.uk/ifi**

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 ($CO_2$)

**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.

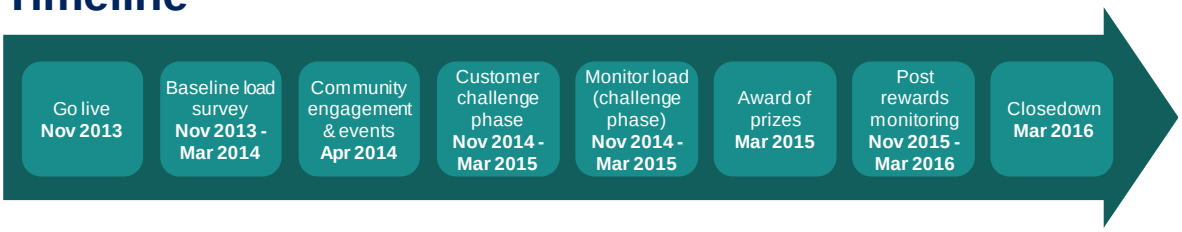

## Benefits

- 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




## 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

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**www.enwl.co.uk/smartmeters**

Back to in-flight projects