Annex 1.5
Detail on our CVPs

Northern Powergrid: our business plan for 2023-28

DETAIL ON OUR CVPs

We have built an ambitious plan for 2023-28 and in certain areas we have identified opportunities to deliver additional value to unlock significant and meaningful benefits for our customers

We are proposing four consumer value propositions (CVPs) where we have identified positive net benefits for our customers across four of the five categories allowed by Ofgem. These propositions go beyond the minimum requirements and functions typically undertaken by an energy network company as business as usual.

Our CVPs form part of our overall plan to ensure we lead the drive to decarbonisation in our regions while making the transition as efficient and affordable as possible.

Plan Area	CVP Proposal	Costs	Net consumer Value
Vulnerable Customers	**CVP1: One-stop App solution for vulnerable customers** Our fully digitised 'one-stop solution' app for vulnerable customers will make it easier for customers to access a wide range of services and put energy saving advice at their fingertips. The app will not only enhance the accessibility, speed and convenience for vulnerable customers to interact with us but will also provide direct access to our partner programmes, in particular for fuel poverty and supporting a socially inclusive net zero transition. The app will also free up capacity for a more responsive telephone-based service for those that prefer it or who are digitally excluded.	£1.9m	£3.3m
Distribution System Operator/Major Connections	**CVP2: Open Insights – a self-service analytics toolkit** Our free online platform, Open Insights, will unlock value for our customers on top of our open data platform. It will bring together the tools that our customers and stakeholders need to self-serve energy system data, undertake network planning and get low carbon technologies (LCTs) connected.	£6.7m	£4.7m
Whole Systems	**CVP3: Dynamic voltage optimisation for customer energy efficiency** We will dynamically manage voltage on our system to achieve behind the meter benefits at 30 per cent of domestic properties in 2023-28, increasing to 80 per cent over the project lifetime. Our solution (currently in mid-stages of innovation trials) will improve energy efficiency, delivering an estimated annual average reduction of £20 in customer energy bills and 27kg of carbon emissions per household each year.	£7.9m	£14.5m
	CVP4: Phase 1 rollout of next generation energy system First stage deployment of a blueprint for the next generation energy system, rolling out 30 innovative micro-grid solutions in some of the most remote parts of the network to enhance system resilience.	£6.3m	£7.6m[1]

Table 1: Consumer value propositions in summary

[1] The NPV of the project is shown over a ten year period as the CVP relates to the first stage deployment of a future energy system and so the benefits are reflected over a longer time period.

Our CVPs have received scrutiny from both our Customer Engagement Group (CEG) and Challenge Group (CG).

Over the course of developing our 2023–28 business plan we had regular, in-depth engagement with our CEG. This included a number of interactions on our CVPs and the proposition development process, in particular focused on reflecting stakeholder views. The CEG were initially introduced to our proposals in the wider context of our output area plans through which they evolved (e.g. vulnerable customers, whole systems and DSO/Major connections). Once we had identified our propositions as CVP candidates we ran specific sessions to enable the CEG to review the proposals in detail.

We had direct engagement with the CG on our CVPs and feedback was provided following publication of our draft plan.

We have amended our final proposals in the light of the feedback.

The CEG will provide its views on our CVPs as part of its report on our final business plan. We expect the CG to provide formal feedback within its independent report to Ofgem.

The benefits of our CVPs have been independently modelled to estimate the consumer value in each case. We have used the industry-wide social return on investment (SROI) tool, with our modelling subject to third party review by Sia partners to test consistency across DNOs in their application of the SROI framework.

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How our CVPs support our strategic vision

Our CVPs have been developed through our stakeholder-led planning process and work together to support the overall strategic vision of our business plan.

Vision	Consumer Value Propositions (CVPs)			
We see an opportunity to power our region with sustainable, long term investments that unleash the potential of innovation, digitalisation, our people and collaboration to:	**Vulnerable Customers** CVP1: One stop app solution for vulnerable customers	**DSO/Major Connections** CVP2: Open Insights – a self-service analytics toolkit	**Whole Systems** CVP3: Dynamic voltage optimisation for domestic energy efficiency	**Whole Systems** CVP4: Phase 1 roll-out of next generation energy system
Lead the drive towards decarbonisation	Providing information and access to **support** customers during the **transition to net zero**	Facilitating **connection of low carbon technologies** to our network	Improving customer **energy efficiency** to support a **reduction in carbon emissions**	Encouraging **up-take of LCTs** to support localised, self-sustaining networks
Operate a highly reliable and resilient network	Giving **quick and easy access to network information**	Integrating **historical power cut information** into Open insights to **inform decision making** and be more **transparent**	Creating **additional network capacity** avoiding reinforcement where possible	**Continuous supply** in the event of upstream faults
Delight our customers with outstanding service	Giving customers **greater choice in how to contact us** and access our services	Allowing customers to **self-serve** and **access the network without our input**	**Saving customers money** without requiring them to take action	Customers receive a **better service** with **fewer interruptions**
Provide remarkable value for money	Providing **information** and services so customers can be more **energy efficient** and reduce their bills	Giving customers greater visibility to enable them to **optimise** and **reduce the cost of their connection**	Using **existing technology** to **innovate** and **reduce bills**	Innovation to **support wider sector services** as reliance on electricity increases
Ensure world-class levels of safety and security	Utilising digital technologies while **protecting customer information**	**Securing network data** while making it open and accessible to all	Ensuring the voltage on the network remain within **safe and secure limits**	**Increasing resilience** to physical and cyber events
Be a force for good throughout our region and beyond	Optimising use of digital technologies to **improve accessibility** of our services to vulnerable customers	**Promoting competition** as data and services become available without our input being required	Providing a **industry-wide solution** that uses smart meters to deliver **lower bills** and improve **energy efficiency**	Promoting **community projects** to create localised mutual support

CVP1 - Vulnerability: One-stop App solution for vulnerable customers

Our fully digitised 'one-stop solution' app for vulnerable customers will make it easier for customers to access a wide range of services and put energy saving advice at their fingertips. The app will not only enhance the accessibility, speed and convenience for vulnerable customers to interact with us but will also provide direct access to our partner programmes, in particular for fuel poverty and supporting a socially inclusive net zero transition. The app will also free up capacity for a more responsive telephone-based service for those that prefer it or who are digitally excluded.

What is our App and what will it do?

The pandemic has changed the way we shop, bank and engage with organisations with continued increase in confidence in the use of digital platforms. For example, the banking industry has seen particular success and it is predicted that by 2023 that 72% of all UK adults will use mobile banking apps[2].

In response to specific feedback through our stakeholder engagement we will develop an application that will allow customers to:

- **Access live network information:** Utilising our existing web tool for power cut reporting, customers will be able to input their postcode to view any incidents affecting their property, both planned and unplanned, the start time, reason, status and expected finish. If a power cut isn't showing then they will be able to report a power cut in their area. Customers will be able to receive updates on when the power is to be restored.
- **Communicate with our contact centre:** Customers will be able to use our live chat function to speak to our contact centre team. Additionally there will be a link to call direct from the application or text.
- **Access our partner programmes through self-referral:** Customers will be able to self-refer and access our wider support programmes for affordability/fuel poverty and the transition to net zero.
- **Access information to achieve savings from switching suppliers:** Customers will be able to compare energy costs across suppliers to switch to more efficient tariffs. We will look to partner with a price comparison site to show the information in the application e.g. Citizens Advice
- **Access energy efficiency advice to achieve savings:** Customers will be able to access information to enable them to make better decisions on energy efficiency.
- **Maintain their personal data:** Customers will be able to update their records should their personal information or needs change. This will support our data cleanse process and accuracy of our PSM. Where customers opt to receive notifications they will be notified once every two years to confirm and update their details.
- **Receive notifications –** We will continue to engage with our customers utilising the app and push notifications to update them on new services, support programmes, energy efficiency and seasonal preparedness.

Our application will be designed to overcome potential barriers vulnerable customers may experience when communicating with us. The application will support a range of communication needs including:

- **Hard of hearing:** Information will be provided in text for customers to read and navigate through to the services and/or information they require. A toolbar function will allow customers to customise their view.
- **Hard of sight:** The application will have a read-aloud function and customers will be able to use voice controlled personal assistants on their smart phones to help them to find information.
- **Language barriers:** We are planning to align the app with 'Recite Me' which offers language in around 100 languages. This will support customers in finding information in their native language. For those who have basic English capabilities the text function will make it easier for them to absorb information at a slower pace, either through accessing information on the application or through use of the live chat function. If their language is not included in our translation service on the application they will be able to extract information to translate online.

[2] Research conducted by Consolidated Analysis Center, Incorporated (CACI) predicted that by 2023 72% of the adult population would be banking via a phone application

- **Wider mental health difficulties**: Customers will have another channel to source information other than speaking to an agent which can make some people feel uncomfortable as they'd prefer to communicate remotely
- **Accessibility standard** – We will work with the Digital Accessibility Centre (DAC) to ensure that the accessibility of our applications meets the standard requirements. The DAC works with the Government, banks, and TV and Media organisations.

The application will be available to download on Apple and Android as well as via a web-based application that is available to all mobile devices natively in browsers.

We recognise that the application may not be the best solution for all customers, we continue to widen the number of channels available for customers to contact us as part of our customer service strategy (see the customer service section of our plan) with the application providing a channel in addition to our dedicated PSM phone line for vulnerable customers who cannot or do not want to engage via digital channels.

The app will initially be developed for use by PSM customers. We will ensure that the required security measures associated with GDPR and holding special category data for vulnerable customers are in place. We recognise that there are customers who experience transient vulnerabilities and customers beyond the PSM that would be able to benefit from the services offered and we will look to expand the app to all customers in the 2023-28 period.

How will we roll it out in the 2023-28 period?

Vulnerable customers registered as a Priority Services Members currently have access to a direct dial number to speak to a Priority Services team. During 2023–28 this service will remain in place where customers can choose their preferred contact channel including telephone, e-mail or chat. We have a dedicated PSM team who make proactive outbound contacts to vulnerable customers, this team along with all contact centre colleagues are being upskilled to offer wider energy efficiency advice and signposting to partner programmes and information.

From 2023–24 we will develop the software for the application in-house using agile methodology, drawing on our framework of suppliers to provide specialist knowledge and capabilities where required.

The target go-live for the app is 2024 (i.e. the start of the second regulatory year of the period). At this point customers will be able to download the application and access its services. We will promote the awareness of the application through both our interactions with vulnerable customers, through our partners and external campaigns to encourage download and use. Regular notifications will be provided (where a customer opts to receive these) to ensure PSM customers continue to be engaged with the application. This will include updates to services, data cleanse reminders and notifications on how to prepare for weather related events and we will look to personalise the application.

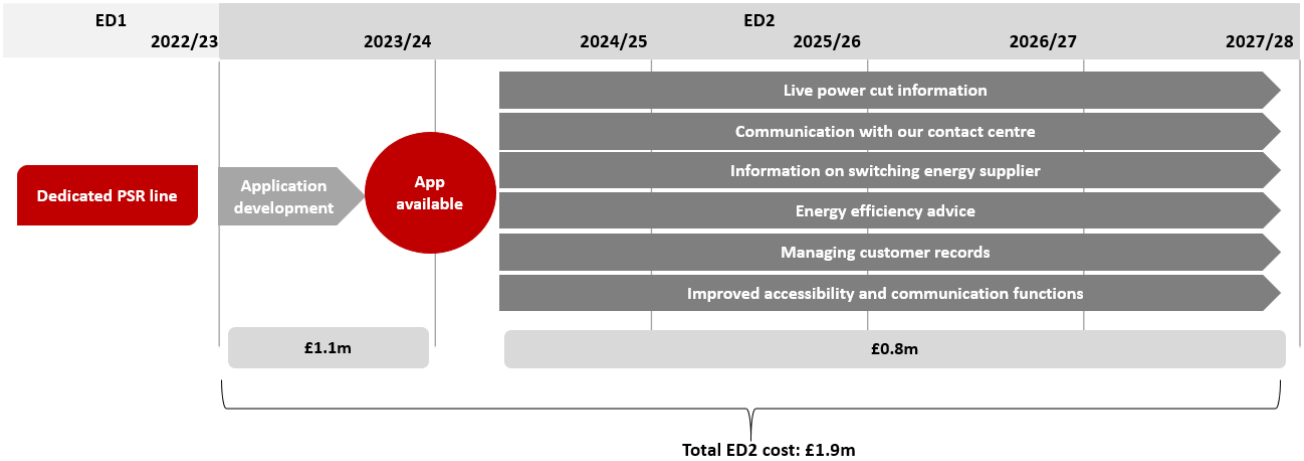

Figure 1: Timeline for delivery

Who will we collaborate with to deliver this?

As part of the application development and service delivery we will collaborate with a number of different organisations to ensure a joined-up approach.

As part of our development of the concept we have engaged with Monzo, an application based mobile bank who have been particularly successful in delivering their services through an application, winning the Competition and Markets Authority (CMA) best bank for overall service quality and online and mobile banking services. Through this engagement we have sought to understand how we can ensure our application is developed as a service our customers value. As part of the application development we will continue to engage with Monzo and other banking organisations to learn from their success as we develop our app solution and adopt innovative ways to engage with customers. This will ensure we minimise the number of customers deleting the app.

As part of the development of the content for the application we will engage and co-create with vulnerable customers and organisations who support people with vulnerabilities to ensure we properly reflect their needs. We will also partner with organisations who have had success with applications including those specifically designed for vulnerable customers e.g. The Royal Institute of Blind People (RNIB) and The Royal Institute of Deaf People (RNID), taking an agile approach using partners to test and refine the product throughout its development.

We will work closely with the Chair of our Social Issues and Expert Group to refine the solution based on the lessons learnt from the development of the 'My Utilita App' where up-take by customers[3] outperformed expectations with 50 per cent of customers using the application regularly.

Our partner services will be accessible through our application and customers will be able to self-refer to our programmes. For example, a customer will be able to self-refer onto our fuel poverty support programme (e.g. with Citizens Advice) via their secure referral mechanism which would give them access to our outreach partners who are able to deliver advice and practical solutions to alleviate the effects of fuel poverty. Partners will then utilise localised information and knowledge to enable:

- Support interventions;
- Income maximisation;
- Access to grants and benefits
- Energy efficiency measures and advice; and
- Supplier/tariff switching advice

We will also signal other partners and charities beyond those we hold relationships with, who are able to provide advice and support to vulnerable customers.

How will the App be used and by whom?

The following user personas are presented to demonstrate the potential use-cases for the solution:

Jeff, 40

Jeff is in his 40s, he lives alone in social housing and is hard of hearing, using a hearing aid. He has a number of other health challenges including extreme light sensitivity and multiple personality disorder. Jeff manages household utilities and banking through digital channels and finds his (hearing aid connected) iPhone useful when there is a problem as it is quicker and easier to resolve problems. Jeff was registered onto the PSM through an energy supplier.

How would the application benefit Jeff?

During a recent power cut he took a proactive approach to find out what was going on – unaware of Northern Powergrid's services he phoned the council, EDF and then was directed to Northern Powergrid. Our app would have supported him to track the incident and receive progress updates as well as communicate with the contact centre through a much more direct and simpler process. While he is a member of the PSM he wasn't aware of the

[3] Utilitia has around 800,000 customers with over 90% falling within Ofgem's vulnerability risk factor categories

services he receives as a result of this and through the app he would receive regular updates from Northern Powergrid informing and reminding him of the PSM services he is entitled to receive.

The Singhs, 10 – 80+

The Singhs rent a local-authority terraced house with the grandma aged 80+, parents 45-55 and two children 10-15. The household has low income and Mrs Singh is on Universal credit with the family struggling to pay the bills. The Singh's use a lot of gas for heating and cooking. They choose their appliances based on price rather than energy efficiency and use pay-as-you-go meters, paying more than they should. The 15-year old daughter has breathing difficulties and needs a ventilator. They have a moderate tech knowledge and use pay-as-you-go smart phones and have full broadband.

How would the application benefit the Singhs?

The Singh's want to find a cheaper energy supplier but they are not sure how to approach this. They could benefit from access to information and partners who could support them in switching energy suppliers and access information which would enable them to improve their energy efficiency and reduce their energy bills. In the event of a power cut the Singh's would be able to access information to help them understand the length of the power cut and communicate with the Priority Service team to ensure support is in place to keep their daughter's ventilator on supply and ensure other vulnerable members of the family are comfortable.

Aqidah, 40+

Aqidah lives with her husband and four children, originally from Pakistan she speaks little English. She finds communication in English very upsetting and avoids speaking to companies via the telephone having had bad experience of call handlers in the past. She uses online services where possible. While PSM services as a whole lack relevance she would greatly benefit from the translation services.

How would the application benefit the Aqidah?

Aqidah feels very isolated from the community and avoids situations where she has to speak English. The translation services included in the application would allow Aqidah to access information on services in her native language and support her in retrieving relevant information and provide a platform which would make it easier to communicate with an agent of Northern Powergrid as she would be able to use real time written communication instead of speaking over the phone.

Les, 75+

Les has recently been widowed, he lives in a large rural village where he worries about power cuts although he accepts the risk. He uses a gas fire and has an older boiler with general inefficient energy use. Les has low digital skills and no smart phone.

How would the application benefit the Les?

Les would not benefit from the application as he is not inclined to use digital technologies nor does he have the technology to enable him to download. He will however be able to use the direct dial number to speak to our Priority Services team to speak about his individual needs and due to other customers using the application there will be greater capacity within our contact centre.

Distributional impacts on customers

Initial roll-out of the application will focus on customers who are on the PSM and we expect this to be particularly useful to customers who are digitally enabled and those with additional communication needs.

We recognise that this will have a distributional impact on other customer groups.

Firstly we have acknowledged the impacts on the digitally excluded, however our dedicated PSM line will benefit from greater capacity to support those customers who prefer traditional channels.

Secondly we recognise that customers who are not registered on the PSM may benefit from the services offered by the application. We will therefore pursue roll-out to all customers in the remainder of the 2023-28 period.

Stakeholder engagement evidence

Details of engagement undertaken	Insights
Online survey with 6,010 respondents. - 45% of respondents were 65 and over - 54% of respondents were living in vulnerable circumstances with 37% living with a long term physical health condition	**Use of digital technologies:** Of respondents 85% owned a smartphone; 83% used mobile apps and 80% used apps on a daily basis **Support for proposal:** 80% of respondents supported the CVP proposal and wanted to see this included in our business plan with 71% of respondents 'somewhat' or 'very' likely to use the app **Key benefits:** Responses included 'easy access and all in one place' (1,811 responses), 'it will be useful for helping vulnerable customers' (510 responses) and 'live updates' (494 responses) **Additional functionality customers would like to see:** 'live chat function' (104 responses) and 'links to other organisations' (35 responses)
In-depth interviews with five representatives of vulnerable customers with communication issues; 14 customers; and 4 expert groups covering: - Blind/partially sighted - Deaf/hard of hearing - Non English speaking	**Support for proposal:** All respondents were supportive of the idea provided it was supplementary to other lines of communication **Suitability:** Those with communication difficulties, mental health issues and those who are medically dependent would benefit. Representatives wanted to see the app tested across a range of vulnerabilities with most respondents willing to support Northern Powergrid in the development and testing of the application **Key benefits**: Features were significantly skewed towards making the app as accessible as possible to support communication needs
Two focus groups with ten PSM customers	**Use of digital technologies:** Nearly all users regularly used mobile applications **Support for the proposal:** The application received a mean score of 7.5 on a scale of 1 – 10. It was reinforced as key to keep other lines of communication in place. All respondents would use the app in the future **Partnerships:** Respondents didn't want to feel like they were being sold something in relation to partnerships **Additional requirements:** Promotion of the application would be important
Communications research with 17 stakeholders (7 PSM registered) - 7 blind/visually impaired - 5 hearing loss and/or speech impaired - 5 non-English speakers	**Use of digital technologies:** Within the sample there was a spread of technology adoption. More tech savvy consumers appreciated how technology is improving their lives – this was especially the case amongst those with sight loss. Those who were less savvy found a number of barriers to up-take including learning new skills and security **Support for proposal:** Research found that live chat with video and translation/interpreter services were appealing features across segments. Those who were non-English speaking and with hearing loss valued features including subtitled videos, translated services and text services. For those who were partially sighted, voice recognition provided benefits. None of the segments saw benefit with an online Q&A tool.
Wider industry engagement - Monzo (desktop review) - Virgin Money	**Concept development:** Both Monzo and Virgin Money have had experience in developing an application where customers can access their services. Engagement with these parties has led to us gaining an understanding of how we can ensure that the services we offer to customers are designed to be both useful and accessible to customers. We will continue to engage with both Monzo and Virgin Money as well as any other suitable providers as we develop the application to leverage their experience.
Expert Stakeholder Engagement – Social Issues Expert Group (SEIG) – 10 members; and Future Fairness Panel – 12 members	**Industry experience:** We have monthly meetings with our SEIG who review our plans for vulnerable customers in order to stress test and challenge these as well as input into their development which has been the case with our application development. The chair of our SEIG is Derek Lickorish who is a non-Exec chairman at Utilita Energy and has had experience with launching an application to support their customers. 90%

	of Utilita's customer base falls within Ofgem's vulnerability risk factor categories and application up-take on a regular basis was 50%. Furthermore, during 2020, 71% of customers utilised the emergency credit function. These findings have been used to support up-take assumptions for our application.

Table 2: Stakeholder engagement summary

Benchmarking

We are not aware of other distribution network operators (DNOs) having an application to specifically target vulnerable customers, although other utility services do offer applications for their customers. The difference between our proposal and the 'My Utilita' application and those offered by the banking industry is that they are not designed specifically to serve vulnerable customers.

The applications that are currently available are designed to deliver the core function of the business with additional services wrapped into the overall package. Our proposal is unique as we are designing an application with the purpose of delivering wider benefits to support vulnerable customers in accessing relevant information and services to make our support services more accessible and easier to access.

Costs

The majority of the investment will be delivered in 2023/24 as part of the software development. This is underpinned by some of our wider Digitalisation Strategy and Action Plan (DSAP) initiatives including DD1, the journey to open data and DD8, enabling customers to self-serve.

There will also be ongoing annual costs of £180k as the app is maintained with continuous improvement and development to keep it up-to-date and relevant. People costs relate to in-house project costs for the app in the first year of the period.

The specific costs[4] relating to the CVP are shown below:

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
IT (£k)						
Digital customer journeys	140	-	-	-	-	**140**
Social listening platform	150	-	-	-	-	**150**
AI powered chat platforms	140	-	-	-	-	**140**
Access to open data platform	120	-	-	-	-	**120**
Customer service data analytics platform	550	-	-	-	-	**550**
People (£k)						
In-house project development	-	200	200	200	200	800
Total	**1,100**	**200**	**200**	**200**	**200**	**1,900**

Table 3: Vulnerable customer application costs

These costs are in addition to our baseline vulnerability propositions and are wholly related to the delivery of the CVP application.

The development of the application is such that only minor modifications will be required to enable wider future roll-out beyond vulnerable customers.

[4] Costs including RPEs

Monetised customer valuation and methodology

The Net Present Value (NPV) of the application over the 2023-28 period has been calculated to be £3.3m based on a Social Return on Investment (SROI) of £2.00 for every pound spent.

The application will be targeted at all PSM customers, of which we currently hold ca. 900,000 members. In order to model the value we have to be able to quantify the usage of the application with evidenced assumptions forming the basis for our valuation:

- We hold phone numbers and/or e-mail addresses for 572k vulnerable customers on our PSM.
- We have conservatively applied the results from the findings from the online survey to estimate up-take of the application – 71% of customers were 'somewhat' or 'likely' to download the app i.e. 406k customers
- Assuming 25% of this population do not download the application we estimate uptake at 305k customers, which we round down to 300k
- We have taken the assumption that 75,000 customers will download the application per annum.
- We have also assumed that 30% of customers who download the application will delete the application each year.

From the services that the application offers we have used the Sia proxy bank to identify the benefits that customers will receive from the app:

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of customers using the app	-	75,000	150,000	225,000	300,000	**300,000**
Number of customers deleting the app	-	(22,500)	(45,000)	(67,500)	(90,000)	**(90,000)**
Total	**-**	**52,500**	**105,000**	**157,500**	**210,000**	**210,000**
Benefits (shown as the present value £,000)						
Reducing stress during an outage (8.5% @ £35[5])	-	205	336	419	468	**1,428**
Average saving from switching supplier (1% @ £250)	-	150	246	306	342	**1,044**
Savings from energy efficiency advice (1% @ £102)	-	59	97	120	134	**410**
Customers feel more in control of their lives (5% @ £82[6])	-	287	472	588	657	**2,004**
Total	-	701	1,151	1,433	1,601	**4,886**
Costs (shown as present value, £'000)						
Total	(941)	(181)	(175)	(168)	(163)	**(1,628)**
Net Present value	**(941)**	**520**	**976**	**1,265**	**1,438**	**3,258**

Table 4: Vulnerable customer application valuation calculation

We have provided a modelling summary of the inputs we have used to calculate the SROI for each CVP. This can be found in our CVP modelling summary annex.

In order to calculate the SROI we have used measures that we have been able to quantify; however, there will be additional value beyond that set out in our calculation.

In order to ensure that the app remains relevant we will continue to engage with stakeholders and conduct industry research to ensure we provide a service that customer's value. Additionally we will complete customer satisfaction surveys incorporating feedback into ongoing improvements. Usage will be monitored through our back office/content management systems and we will be able to track usage through the click rate, monitoring the services customers use on the application.

[5] Research undertaken in 2020
[6] Research undertaken in 2018

Consideration of risk

Risks in delivering the application are fairly low. We have the in-house capabilities and access to relevant partners to be able to deliver the project. Where we do not have the capabilities to deliver any of the functionality described we are positioned to work with partners to ensure the functionality is delivered.

We will ensure compliance with GDPR and ensure processes are in place to protect customer data.

Proposed arrangements for clawback of CVP rewards in the event of non-delivery

In the event of non-delivery we propose that 30 per cent of the CVP reward would be contingent on delivery of the app, with the remaining 70 per cent contingent on uptake (number of vulnerable customer users) proportionate to the forecast used to derive the projected benefits.

Non-delivery of the app would result in the full claw-back of the reward.

Why should NPg deliver this?

As we manage our PSM to ensure alignment across service lines and across channels we consider that it is best the application is managed and delivered in-house. The application is designed to be an additional channel for our customers and to support vulnerable customers who will benefit from a choice of communication requirements. Managing the delivery of the application will ensure that all our services are aligned.

We will use our wide range of partners to ensure that our services are promoted, which will include both traditional channels and the application.

Justification – beyond Ofgem minimum requirements, business as usual and additional value to consumers

Ofgem minimum requirements require us to maintain our Priority Services Membership to ensure that customer details are up-to-date, that we have dedicated lines for vulnerable customers and that information is accessible for a range of communication needs.

Our app goes beyond this as it offers a one-stop-shop for the services we provide for PSM customers, allowing customers to understand what services they can access and making these easy to access. Not only does the platform provide additional choice for customers in how they contact us it gives them greater flexibility and provides a two-way communication tool, which is particularly useful for those with additional communication needs as we make our services more accessible. This is a step change in our customer service offering, going beyond the services we offer as BAU today as the app provides a tool to help us improve and personalise the customer service journey.

Our customers have told us that an app would be a tool that they value in addition to our traditional lines. The app improves the visibility and awareness of the additional services that PSM customers can access as part of their membership. Customers will receive additional value as they have easy access to our partners and support programmes which is particularly beneficial as affordability and the impact of decarbonisation become an increasing concern for vulnerable customers. It is therefore a key tool to support a socially inclusive transition to net zero.

The app provides a communication channel that is valuable to those with additional communication needs as our research has found this to be a barrier for some of our customers and access to our services in additional communication forms will improve their experience and make our services more accessible.

Plan impact

While the app sits within the vulnerability section of our plan there is cross-over with other output areas.

Decarbonisation	EAP	Safety	Reliability	Asset resilience	Climate resilience	Physical and Cyber resilience	Customer Service	Vulnerable customers	Our Communities	Connections	Openness and Transparency
◑	◔		◑				◕	•	◑	◔	

Figure 2: Mapping to plan areas

Further information

Additional information on our CVP is included in our vulnerability strategy.

CVP2 - DSO/Major Connections: Open Insights – a self-service analytics toolkit

Our free online platform, Open Insights, will unlock value for our customers on top of our open data platform. It will bring together the tools that our customers and stakeholders need to self-serve energy system data, undertake network planning and get low carbon technologies (LCTs) connected.

What is Open Insights?

Our vision is to lead the drive towards decarbonisation in our regions. Open Insights will give our customers direct access to the energy network information they need, from connection of LCTs and renewable generation to creating market opportunities in the flexibility market.

To achieve this, Open Insights will be a free online portal for the provision of network data and tools to help a wide variety of customers and stakeholders to navigate and make decisions in relation to the energy network.

As we progress in the decarbonisation transition we will see a new and varied range of stakeholders and customers who will require information from us and our network.

Open data forms a key part of DSO role 1 within Ofgem's Business Plan Guidance; however, simply providing more data isn't useful to many of our stakeholders. While expert stakeholders may have the understanding and knowledge of electrical engineering principles and may be able to process a wide range of data in varying formats this isn't the case for most of our customers. Online tools are crucial for helping our broad range of customers get the best value out of data.

Open Insights will provide the functionality to satisfy a wide variety use cases depending on customers' type and experience. Our portal will allow customers to:

- Become a viewer of the entire Northern Powergrid network, showing asset records and loadings (where available)[7]
- View real-time operational status information;
- Obtain budget estimates for the retrofitting of LCTs (and other demand and generation increases) to existing connections;
- Obtain budget estimates for all new connections of demand and generation (from LV to 132kV); and
- Obtain diversion budget estimates

Open Insights will build on AutoDesign, our award winning tool developed in partnership with EA Technology Limited (EATL) and in conjunction with local authorities and stakeholders. This development built on our network data and the investment we have made in our geospatial asset system to create a easy-to-use low voltage (LV) network design tool to create budget estimates. This online system combines our static low voltage network data with statistical analysis and an estimating tool to provide customers with quick and easy budget estimates for their new connections projects reducing the time it takes to understand the costs and timescales for small connections from (up to) ten days to just ten minutes.

Open Insights will expand on this and complement our wider connections customer service offerings, providing more self-serve tools to speed up the optioneering process and reduce costs for customers.

We will aim to align the customer experience for Open Insights to familiar and existing service levels for products and services where customers self-serve their requirements, for example comparison sites that quickly compare many options. To ensure that the portal is relevant to stakeholders and that data requirements and priorities are fed into the development of the tool, we plan to develop a data user panel. This will consist of a range of stakeholders including academics, consultants and local authorities as panel members.

Open Insights will be promoted through our ongoing stakeholder engagement programme, supplemented by bespoke sessions on the Open Insights programme development.

[7] This will include raw data as well as curated data from our analytics engines. See section eight of our Digitalisation Strategy Action Plan (DSAP) for more information on our customer insight and interaction portal

How will we roll it out in the 2023-28 period?

Our AutoDesign tool is currently capable of providing budget estimates for low voltage connections, however during the remainder of the regulatory period we are planning to expand the tool to provide firm quotations up to 55kVA.

We also currently provide a range of data on our website including our long term development statements (LTDS), heat maps and embedded capacity registers (ECRs).

During 2023-28 the AutoDesign tool will be further developed as part of Open Insights. We have broken down the delivery of Open Insights into seven functional packages with each enabling additional layers of functionality:

Ref.	Deliverable	Target date
1	Allow the creation of budget estimates for the retrofitting of LCTs (and other demand increases) to existing connections	2023/24
2	Enable viewing of the entire Northern Powergrid network, showing asset records and loadings (where available)	2024/25
3	Provide visibility of real time operational status information	2024/25
4	A dedicated platform for ICP/IDNOs to self-serve demand connections at low voltage (i.e. non-contestable costs), further minimising connections input service requirements	2025/26
5	Allow the creation of budget estimates for all new LV demand and generation connections	2025/26
6	Allow the creation of budget estimates for all new HV/EHV demand and generation connections	2026/27
7	Allow the creation of diversion budget estimates	2026/27

Table 5: Open Insights functional packages

The value of the tool for customers will increase as functionality is incrementally added over the 2023–28 period.

At all voltages the tool will become a route into the connections process, so that multiple requests are not required to initiate a project. For example, the majority of domestic customers will use the tool to connect a charge point for their Electric Vehicle (EV) to their existing connection i.e. a retro-fit. A large generation customer could make a more informed choice about how and where to connect to determine the optimum point of connection and the optimum export size. Once they are satisfied with the budget cost which is generated they can convert this enquiry into a full quotation request, without having to submit duplicate information – requiring only the additional detailed information which is required to ensure a connection offer can be prepared.

The tool will encourage development of a smarter and more flexible energy system, with aggregators being able to identify potential market opportunities and whole system optioneering by enabling comparison between distribution and transmission costs. Above a certain threshold the system will suggest a transmission application may be more suitable and link to the DSO/TO connections portal to initiate a transmission connection enquiry.

AutoDesign has been developed through a comprehensive stakeholder engagement programme which has led to the creation of a tool that has been shaped by our customers. We are leaders in the industry in offering self-service budget quotations at LV in this way. We are therefore uniquely placed to build on this in developing our Open Insights portal.

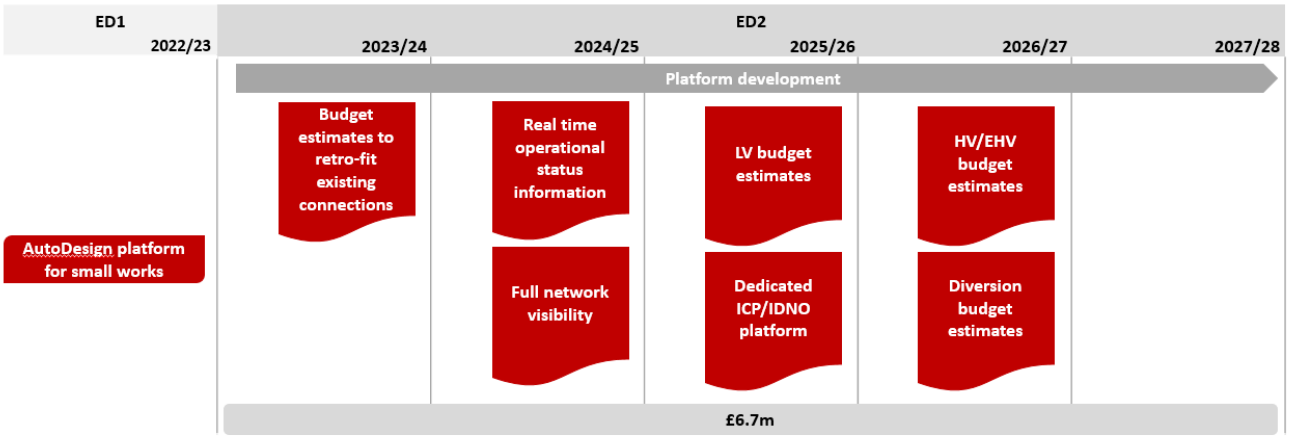

Figure 3: Timeline for delivery

How will Open Insights bring together our existing data offerings?

Heat Maps

Heat maps link to functional package two (shown in table 2 above) and show asset loadings and ratings. At present our demand and generation availability heat maps display the traffic light status of our network for Grid Supply Points (GSP), Supply Points (SP) and primary substations. These are coloured based on their suitability of accepting a fixed capacity of demand or generation. The RAG colour scheme symbolises the likely timescales and cost of a new connection. Whilst this is useful for initial optioneering, it isn't a live system - it only gives the point of connection RAG rating and doesn't allow the user to change the demand or generation they are wishing to connect from the pre-defined capacity figure.

We therefore plan to build on the user defined heat maps at LV which are created in our AutoDesign tool. We will pursue the following incremental improvements:

- Providing substation, feeder level and customer centric heat maps
- Providing heat maps consistently from LV to 132kV
- Allowing customers to use demand 'sliders' to optimise the size of demand or generation requested to determine the most efficient use of the assets including 'nudge' suggestions from the system to encourage this behaviour
- Automatically updating heat maps aligned in line with our core systems
- Assessing fault-level contribution for typical generation types
- ICP Point of Connection self-serve functionality

Safedig

Our Safedig system currently sits in a separate portal on our website, allowing contractors and other utilities to view and print our geographic records. This acts as an enabler to functional package two to give a view of the entire Northern Powergrid network. As Open Insights will be based on a geographic system showing our asset records we intend to integrate our Safedig system into the wider portal. This will provide our customers with a more user-friendly experience.

Outage information

We already publish outage information on our website; however it is currently not integrated into our heat maps or AutoDesign. We propose to integrate it into the Open Insights portal, delivered as part of functional work package three to show real time operational status information.

We currently publish power cut maps on our website and we are looking to build the information we already store to allow for customers to view the historical performance of the network. This will allow future connections customers to look at the impact of security of supply arrangements in regard to frequency and duration.

Open and transparent decision-making

We are also proposing to publish the results of our network investment decisions alongside our existing 'investments in your area' map. This will help stakeholders to see what solutions were considered and why the proposed investments were ultimately chosen. There will be an option for customers to feedback their thoughts to both shape our future decisions and help customers understand the rationale for decisions taken.

How could Open Insights lay the foundation for further data developments?

Whilst we intend to build on the momentum from our AutoDesign roll-out for Open Insights, we appreciate the longer term direction of travel may include digital twins in several forms such as an ENA model, a utilities model, augmented reality systems or urban planning models. There is a common enabler for these further integrations in the form of Application Programming Interfaces (APIs). These APIs will allow the data to be used by third party systems and will be key to unlocking best value from the data. We also see this being an exciting 'known unknown' whereby developers and entrepreneurs may combine our data with other data sets for purposes we hadn't envisaged. We've already started to see this with volunteer-based open infrastructure maps showing worldwide telecoms and electricity infrastructure and grid level energy generation/consumption for profit services which link land use data with electricity infrastructure data.

Our network data will be accessible in CIM format to allow for stakeholders such as the ESO and IDNOs to incorporate it into their network models (see initiative 3.4 within our Whole Systems plans).

Who will we collaborate with to deliver this?

Throughout the development of AutoDesign we have been working with EATL as development partners from the beginning of the project leveraging their experience in system analysis tools and customer facing solutions. As we develop Open insights we will look to collaborate with relevant organisations where their experience can add value to the tool. We have not yet selected the most suitable partners.

Once this has been delivered, Open Insights will also support wider industry work. The ENA are in the process of developing a full National Energy System Map, which will include network assets, generators and energy intensive users. The ENA are looking to pull together network data from all of Britain's electricity and gas network operators. As Open Insights will have open data readily available in a common format, published on our website, we will be able to support the ENA in our contribution to the National Energy System map.

Additionally, the Centre for Digital Britain (CDBB) is a partnership between the Department for Business, Energy & Industrial Strategy (BEIS) and the University of Cambridge which seeks to deliver a smart digital economy for infrastructure and construction, to transform the UK construction industry's approach to how future social and economic infrastructure is planned, built and maintained. They are seeking to work towards a 'digital built Britain' to enable improvements in existing infrastructure. Our Open Insights would enable delivering of the CDBB agenda.

Open Insights also has some cross-over with Ofgem's reforms to the Long term Development Statement (LTDS). Stakeholders have supported reforms to the LTDS to substantially improve network data provisions and Ofgem expect proactive co-operation across working group participants and delivery partners. We recognise that there is some overlap between Open Insights and LTDS, for example interactive heat maps, however our Open Insights proposition is far wider in scope by virtue of the range of tools it will offer whilst at the same time enabling future regulatory developments such as the enhanced LTDS.

How will the tookit be used and by whom?

The Open Insights tool will support the transition to decarbonisation, with the tool being used for a wide range of stakeholders for different purposes.

Domestic customer - 'Green George', 25 – 30

The following user persona is presented to demonstrate a use-case for the toolkit for a domestic customer. George is a young, single professional with no mortgage or dependents. He is big on technology, making the most of his high-speed broadband. The environment is very important to him and influences many of his choices.

How will Open Insights benefit George?

George is looking to get a heat pump installed and purchase an electric vehicle. He has a connection to his property and is looking to get this retro-fitted to support connection of these LCTs. The tool will allow him to go online to cost the connection as well as the timescale so he can build this into both his budget and timeline requirements.

For some customers the load to their property may be limited and so adoption of LCTs may require reinforcement to the network which has both cost and time implications. Open Insights will show the options available to customers; including the cost and time scale for reinforcement or the option to limit their load to avoid reinforcement costs. Where customers choose to limit their load they would have to consider the timing of their electricity requirements however this offers a more cost effective solution.

Local Authorities

Local Authorities are critical in supporting net zero by 2050. Although direct emissions from Local Authorities may be low they have a strong influence over emissions in their regions through their policies and partnerships. Around three quarters of our region's local authorities have declared climate emergencies – with around 60 per cent having their own net zero targets sooner than 2050 with some as early as 2030 which will increase the pace of decarbonisation.

Open Insights will support Local Authorities in their planning process as they plan their path and initiatives to support their local area to decarbonise. With visibility of the network they will be able to identify suitable locations to support the necessary load growth required. For example:

- Infrastructure for charging electric vehicles – Local Authorities will be able to identify the most cost efficient and viable location, with capacity requirements being an important consideration in supporting the public transport sector to decarbonise.
- Planning of new buildings - where they stipulate that renewable generation is a requirement for new developments
- Strategic planning for key initiatives

Providers of low carbon technologies

As LCTs become more commonplace, new and existing businesses will be offering LCTs to market. Some of the most common, particularly for the domestic market, will be car dealerships and heat pump providers. There will also be a growth in LCT installers.

The majority of the customers of these companies will be purchasing LCTs for the first time, and they are likely to need support during the process. In the first instance this will be provided from the organisation they are purchasing the technology from. Although domestic customers will have the tool available to them to find out the viability of their existing connection (i.e. whether it can be retro-fitted or whether a new connection is required and the cost), many customers will feel more comfortable doing this with someone they feel is an expert in this area as part of the purchase process. Car dealerships will be able to use our Open Insights tool to input the customers' postcode and provide them with the information they require to connect the charging infrastructure so the full cost picture can be evaluated prior to purchase.

Generators / Community Energy Groups

As the energy system becomes increasingly decentralised we will continue to see an increase in the number of generators wishing to connect to the network. This includes solar and wind farms for the purposes of commercial energy supply as well as community energy groups looking to locally manage their energy network with connection of small-scale generation projects.

With enhanced visibility of the network through Open Insights, generators will be able to assess what can be connected, where and at what cost. This will allow them to plan the optimum connection point, identifying the best location to suit the type of generation and plan for the associated costs.

Aggregators

A key objective for the 2023-28 period is supporting the development of flexibility markets. We recognise that some of the data we hold could unlock the potential for more flexibility as it could help identify where flexibility may be of use to the local network to avoid reinforcement.

Provision of data showing our asset ratings and their utilisation in apparent power and energy terms will allow potential providers to assess the suitability of flexibility (in terms of both magnitude and direction) enabling them to better assess existing and future market opportunities. The platform will allow aggregators to obtain a forward view or forecast of where flexibility could be required, giving them a target area where they can identify participants to sign-up to flexibility services. With customers signed-up to their services in advance it will enable aggregators to move more quickly than if we were to send a flexibility request. For example an aggregator could prioritise signing up several communities for flexibility services where the future likelihood of a local constraint has been identified as a potential market opportunity. The platform will also facilitate peer-to-peer trading by highlighting the network constraints between connected parties.

As new local energy markets are created over time and we anticipate that data provided through Open Insights will become even more valuable.

Independent distribution network operators / independent connection providers (IDNOs/ICPs)

We aim to promote fair and open competition in connections so customers have choice in who delivers their connection.

IDNOs and ICPs will benefit from greater autonomy in network and business planning through Open Insights They will be able to access more input services for themselves using real-time data, further removing the requirement for them to interface with Northern Powergrid. IDNOs and ICPs will have access to the same planning tools as our own design engineers giving them the option to self-serve their requirements with the data allowing them to take more technical decisions themselves. For example, where an IDNO contracts to build an electricity network to serve a housing estate and they appoint an ICP, they will be able to access and plan the network requirements, feasibility and associated costs. This will improve their business planning as they are able to access the information at the point at which they need it and factor this into the contract with their customer without requiring input from us.

Vulnerable customers

The net zero transition provides an opportunity for vulnerable customers to benefit from LCTs to improve their energy efficiency, become participators in the energy system and adopt technologies which reduce costs over time. This is however a complex area and one that vulnerable customers can find difficult to understand and engage with.

The tool will facilitate better support for vulnerable customers as partners and agencies will be able to access the information required to support vulnerable customers they are assisting on their path to decarbonisation and connection of LCTs.

Other stakeholder and use cases

Other stakeholders will benefit from Open Insights including academics, entrepreneurs, tech companies and government bodies who have an opportunity to develop additional functionality and use of the data to suit their own purposes.

We will open up APIs so that external organisations can overlay the data available on Open Insights into their existing systems to find new use cases. Similarly to how a train times and status information can be drawn into Google maps, Open Insights could feed into a wider national energy system map to support local authority deployment and investment strategies.

These open APIs are how we will support wider national agendas such as the National Energy System Map and digital built Britain.

Distributional impacts on customers

In the first instance we expect LCT installers, ICPs, IDNOs, consultants and local authorities to be the primary beneficiaries of the tool to support growth of their current needs. They are familiar, to varying levels of extent, with the data they require and the services Northern Powergrid provides.

We expect domestic and vulnerable customers to be later adopters of the tool as LCT take-up becomes more widespread. In the interim, usage by retailers and service providers will likely correlate to domestic and vulnerable customer use as they will play a role in using the tool on their consumers' behalf.

Stakeholder engagement evidence

Details of engagement	Insights
Incentive on Connections Engagement, 2019-20 – 76 stakeholders across Local Authorities, consultants, installers and other interested parties	**Summary of engagement:** We engaged with stakeholders - in particular Local Authorities and their consultants - to develop AutoDesign. We tested how users were using AutoDesign and we ran a co-creation workshop to understand details of the types of connections the tool was being used for, so stakeholders could input into the development of the tool. This included a dedicated session for ICPs and IDNOs where they provided feedback on how they would like us to develop the tool to suit their future use. We heard: – Network visibility and data are key – ICPs need access to the same tools and information as our engineers; and – AutoDesign should be developed to enable ICPs to determine points of connection
Incentive on Connections Engagement, 2020-21 – c. 6,600 stakeholders	**Insights:** During a further co-creation workshop with regular AutoDesign users and key stakeholders from a range of different disciplines including EV installers, the Highways Agency, Local Authority representatives, consultants and ICPs we found that most were using AutoDesign as an optioneering tool and saw benefits in being able to self-serve and perform their own upfront assessments. Users told us they wanted to see the tool developed to include the following functionality: – Capability to optioneer and map multiple scenarios – Ability to use AutoDesign for new generation connections and to make modifications to existing connections – Local Authorities specifically wanted the tool to be able to drive forward their decarbonisation plans and specifically, whether it could be used assess the feasibility of retrofitting heat pumps in existing domestic and social housing properties. The insights we received informed our thinking on future use cases for AutoDesign and shaped development of the tool Open Insights tool.
Online bilateral meetings – 5 aggregators – March 2021 - present	**Summary of engagement:** Our flexibility services related stakeholder engagement with aggregators and energy technology providers has identified a number of common themes that would be of use to them regarding the provision of data to markets and other stakeholders: – Visibility of network data: Processes that enable quick and easy understanding of the situation on different areas our network provide increased opportunities for interested parties to understand the likely profile of network need and adjust their plans accordingly – Early visibility: In order to take advantage of market opportunities and utilise customer assets where they have been given control, early visibility of opportunities is important to allow for appropriate planning and preparation – Flexible data formats: As aggregators tend to have larger portfolios and technical capability they have indicated a preference for flexible, accessible data formats to allow them to manipulate the data to suit their requirements **Consideration for development:** Insights from these engagements have informed development of the tool, considering the products and services that would be of use to support market development
Citizens Panel, 45 respondents (Domestic, 36 and SME, 9) – Including 21 hard to reach and 5 seldom heard	**Support for the proposal:** For the most part, consumers felt that the open data platform is a good idea and could see the value. They felt that it would fill the existing gap in free, independent advice around decarbonisation and could provide a unique experience for the customer. One consumer suggested that the platform could be signposted on EPC

	reports to increase awareness and usage of the platform. **Consideration for development:** Northern Powergrid would need to promote the platform as many customers have limited knowledge of the company prior to joining the panel. The platform should also remain independent and should not be used as an advertising opportunity or to recommend specific suppliers.
Online focus Groups, 20 (Major connections customers) – Consultants, contractors, Local authorities, generators and ICPs	**Support:** Stakeholders were encouraging of future improvements to the AutoDesign tool. Automated processes for LCTs were valued, however the option for human interaction should also be available. **Future development:** Stakeholders gave active suggestions of how the heat map tool should be developed, with stakeholders looking for the tool to support flexible decision making and support for the transition to EVs and electrification of heat.

Table 6: Stakeholder engagement summary

As with AutoDesign our stakeholder engagement will ensure that stakeholders are able to feed into the development of the tool to ensure that the data remains relevant and that the data provided is stakeholder-led.

Benchmarking

National Grid provide 'ConnectNow', a suite of tools that help customers to research and manage connections to the electricity transmission system in England and Wales.

Our Open Insights toolkit will expand on this functionality:

- showing real time load/dynamic capacity;
- highlighting flexibility opportunities; and
- providing the option for customers to accept quotations up to 210 kilovolt-amps (kVA), which equates to the electricity required for a small/medium housing estate.

National Grid's tool uses static data to create budget estimates for connections onto transmission system assets from 33kV tertiary windings to 400kV. Open Insights will use probabilistic assessments to provide enhanced accuracy.

We are not aware of DNOs currently having LV heat maps showing the same level of granularity as our proposals.

The ENA is working to streamline the connection process for EVs and heat pumps with customers being able to register the connection of EVs and charge points online. Our solution is complementary to this process and the application soon to be launched by the ENA. The 'Identify' application will enable installers to see network data to assess individual applications including technical information, capacity and power quality data. However this application will not be suitable for all LCTs. Open Insights provides an alternative channel for customers who can't be served through the Identify app requiring a wider scope of network data, with enhanced tools and systems. Customers who can serve through the Identify app will also be able to serve through Open Insights.

Costs

We have included £6.7m in our baseline costs[8] relating to Open Insights within our DSO Strategy. The costs are underpinned by a number of Data and Digitalisation activities including DD1 enabling our customers to self-serve and DD8 enabling customers to self-serve. Further information can be found in our DSAP annex.

The apportioned costs relevant to the Open Insights CVP are shown below:

Year	2023/24	2024/25	2025/26	2026/27	2027/28	Total
IT (£'000)						
System integration to provide open data	460	460	460	460	460	**2,300**
Connection of eAM spatial data to data platforms	80	80	80	80	80	**400**
Implementation of cloud data	95	95	95	95	95	**475**

[8] Including RPEs

Deployment of hybrid cloud data platform	90	90	90	90	90	**450**
Development of AutoDesign capability for all connection quotations	455	455	455	455	455	**2,275**
People (£'000)						
Internal resources to support Open Insights delivery	160	160	160	160	160	**800**
Total	**1,330**	**1,330**	**1,330**	**1,330**	**1,330**	**6,700**

Table 7: Open Insights costs

Monetised customer valuation and methodology

We estimate that Open Insights will deliver an NPV of £4.7m based on a SROI of £0.81. This has been calculated using the measurable benefits in relation to major connections:

1. **Avoided Connection Offer Expenses (COE):** The fees avoided by major connections customers in relation to an application for a connection
2. **Avoided designer costs:** This relates to the reduction in costs relating to time saved in design work for each enquiry

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of applications p.a. – avoided Connection Offer Expenses						
ECGS1A <1MVA	256	359	471	593	831	2,510
ECGS3A	-	-	2,350	3,436	5,444	11,230
SLC15 1A LV	-	-	479	553	634	1,666
ECGS1B 1MVA+	-	-	-	70	99	169
ECDGS1A <1MVA	-	-	20	25	35	80
ECDGS1B 1MVA+	-	-	-	98	137	235
ECDGS3A	-	-	54	68	95	217
SLC15 1B LV demand	-	-	9	10	11	30
Total number of applications	**256**	**359**	**3,383**	**4,853**	**7,286**	**16,137**
Benefit - Avoided Connection Offer Expenses (shown as present value, £'000)						
ECGS1A <1MVA @ £240	61	83	106	128	174	552
ECGS3A @ £660	-	-	1,448	2,045	3,131	6,624
SLC15 1A LV @ £610	-	-	273	304	337	914
ECGS1B 1MVA+ @ £300	-	-	-	19	26	45
ECDGS1A <1MVA @ £300	-	-	6	7	9	22
ECDGS1B 1MVA+ @ £440	-	-	-	39	53	91
ECDGS3A @ £840	-	-	42	52	70	163
SLC15 1B LV demand @ £610	-	-	5	6	6	16
Benefit - Avoided designer costs (shown as present value, £'000)						
4hrs designer time @ £155.80	37	50	455	630	911	2,083
Total gross financial benefits	**98**	**133**	**2,335**	**3,230**	**4,717**	**10,510**
Costs (shown as present value, £'000)						
Total	(1,245)	(1,200)	(1,157)	(1,116)	(1,076)	(5,795)
Net Present Value	**(1,147)**	**(1,067)**	**(1,178)**	**2,114**	**3,641**	**4,715**

Table 8: Open Insights valuation calculation

Note: In the table above the cost savings (value) has been discounted to reflect the time value for money. We have assumed usage at an annual growth rate of 5% in up-take of connections at all types of guaranteed standard of the applications, based on forecasted growth in connections over the 2023 – 28 period. We have overlaid our planning scenario for connections of EVs and assumed that heat pumps will be connected through existing connections.

We have provided a modelling summary of the inputs we have used to calculate the SROI for each CVP. This can be found in our CVP modelling summary annex.

We propose that the tool will deliver additional value as the data will be used by a variety of stakeholders for a range of purposes and while we have detailed some of the expected use cases we cannot accurately estimate some of the potential benefits. In many cases we do not know with certainty:

- What data will be used;
- Who will use the data;
- The purpose of the data when being used; and
- The downstream benefits the data will bring.

For example, the tool will promote competition, not only across IDNOs and ICPs who are given greater flexibility in the services they can offer but also creation of market opportunities for market aggregators and other commercial entities with an interest in LCTs. We have not sought to estimate the substantial value could deliver for customers.

Our CVP valuation therefore represents only a small part of the functionality of the tool and therefore gives a prudent valuation of the benefits that will be delivered.

Consideration of risk

This is a transformational programme of work, integrating systems together. The following risks have been identified and will need to be managed during implementation:

- **Project delivery:** We intend to monitor and manage standard delivery risks associated with costs and schedule as we progress through the project to achieve the targeted deliverables.
- **Delivery capabilities:** It is highly likely that delivery will be through a combination of external parties and our own skilled resource. We adopted this approach with AutoDesign, using EATL as development partners who provided a blend of data and digitalisation specialists, engineers and analysts to support our own internal engineers and project team in delivering solutions. Where we do not have the necessary in-house skills we will use external resources to mitigate this risk.
- **External developments:** Wider industry developments in relation to open data may require us to adapt aspects of our programme. We will keep this under continual review.
- **Impact of Access SCR:** The impact of Access SCR is uncertain. On one hand the removal of price signals to connecting customers could increase usage of the tool to support in better understanding lead times for connecting to our network. However customers may also be less price sensitive which would act in the opposite direction.

Proposed arrangements for clawback of CVP rewards in the event of non-delivery

- We propose claw-back of CVP rewards in the event of non-delivery of any of the functional packages.
- Each of the seven bundled packages of user functionality deliver distinct customer benefits as we build up to the full solution.
- Each of the work packages are weighted for the purposes of clawback based on the functionality each work product enables:

Functional package	Proposed claw-back
1. Allow the creation of budget estimates for the retrofitting of LCTs (and other demand increases) to existing connections	15%
2. Enable viewing of the entire Northern Powergrid network, showing asset records and loadings (where available)	15%
3. Provide visibility of real time operational status information	15%
4. A dedicated platform for ICP/IDNOs to self-serve demand connections at low voltage (i.e. non-contestable costs), further minimising connections input service requirements	15%
5. Allow the creation of budget estimates for all new LV demand and generation connections	12.5%
6. Allow the creation of budget estimates for all new HV/EHV demand and generation connections	12.5%
7. Allow the creation of diversion budget estimates	15%

Table 9: Open Insights functional packages

Why should NPg deliver this?

We are best placed to deliver this service to customers because of the data we hold that can drive value for our customers and stakeholders. In delivering Open Insights in the way we are proposing, APIs will unlock the ability for other parties to make use of our data in the wider energy system.

Our development of AutoDesign has provided rich stakeholder engagement where users of the tool have fed back directly into the development of Open Insights.

We will work with partners to deliver the solution and ensure we have the right capabilities to be successful. We have not yet identified delivery partners, however we will select appropriate partners that will add value in the development of the tool.

We will continue to engage our stakeholders so they can feedback into the development to ensure it continues to be a tool that is driven by our customers' needs.

Justification – beyond Ofgem minimum requirements, business as usual and additional value to consumers

While open data is a key part of DSO role 1, Open Insights delivers beyond the minimum requirements and business as usual as we are providing:

- access to enhanced tools that customers/stakeholders require to self-serve data and their network requirements.
- a single portal for customers where the data is brought together in one place.

Open Insights will enable customers to extract maximum value from our data and provides a scalable solution to support the connection of more LCTs to our network.

A core requirement of Ofgem's DSO role 1 is that open data is user friendly. We know that simply publishing more data in varying formats to satisfy individual requirements will not unlock the value that having co-ordinated data sets provides. Our existing data products are primarily used by expert stakeholders who have a good grasp of engineering principles. Open Insights exceeds minimum requirements in providing the value adding tools that will allow more customers to understand and self-serve their data requirements. Our experience with AutoDesign since its launch in quarter one 2020 has shown that providing tools to customers helps them to explore and optimise the size and location of their new connections which is a crucial enabler for decarbonisation.

Plan impact

Open Insights predominately sits within our DSO and Major Connections plans however it also delivers a number of cross-cutting benefits across other areas of our plan as shown below.

Decarbonisation	EAP	Safety	Reliability	Asset resilience	Climate resilience	Physical and Cyber resilience	Customer Service	Vulnerable customers	Our Communities	Connections	Openness and Transparency
●	◔		◕		◕		◕		◔	●	◕

Figure 4: Mapping to plan areas

Further information

Further information on this proposition can be found in our DSO Strategy.

CVP3 - Whole Systems: Dynamic voltage optimisation for domestic energy efficiency

We will dynamically manage voltage on our system to achieve behind the meter benefits at 30 per cent of domestic properties in 2023-28, increasing to 80 per cent over the project lifetime. Our solution (currently in mid-stages of innovation trials) will improve energy efficiency delivering an estimated annual average reduction of £20 in customer energy bills and 27kg of carbon emissions per household each year.

What is voltage optimisation?

Smart meters can provide near real time voltage information for locations across the network. We have analysed network voltage for the smart meters on our network and have identified that customers typically receive a voltage of 240V or higher. Numerous trials have demonstrated that a reduction in voltage from 240V to a value between 220V and 230V reduces energy consumption. A typical (conservative) relationship is recognised that each one per cent of voltage reduction should provide a one per cent energy consumption reduction[9].

Whilst we always aim to achieve voltage compliance (i.e. voltage within the statutory[10] limits of 216.2 V to 253.0 V), through smart technology and data analytics we are able to provide additional value to our customers by providing optimised voltages on our network. Based on the typical 240V provided today, we anticipate that on average we could reduce this to 230V, which would represent a four per cent reduction in voltage, and therefore an estimated four per cent consumption reduction for our customers.

How will we roll it out in the 2023-28 period?

Our Boston Spa energy efficiency trial (BEET) innovation project is currently piloting the use of smart meter data in near real-time to dynamically optimise HV and LV network voltage to improve customer energy efficiency. The project consists of three phases, of which we are currently in phase two:

- **Phase one**, which is now complete, proved that existing methods of voltage control available to us are not suitable for voltage optimisation and therefore a new approach was required
- **Phase two** is allowing us to integrate smart grid and smart meter systems to develop capability to undertake and implement a new voltage optimisation technique within a trial area in and around Boston Spa
- **Phase three** will see us explore whether this new technique can be implemented alongside other services, such as frequency response. Our voltage optimisation initiative is not a balancing service - it solely focusses on energy efficiency, and we are looking to understand and avoid any potential conflict with balancing services (e.g. CLASS[11] services)

Near-real-time data from smart meters will be used to optimise network voltage. This requires investment in the Information Technology (IT) and Operational Technology (OT) systems that connect to the smart meter gateway, together with a central system that analyses this data to determine optimum voltage for each primary substation. In addition, we will need to upgrade our systems that ultimately pass the optimal voltage target to the primary substations. The majority of these upgrades are being implemented during the 2015-23 period (as part of our smart grid enablers programme), therefore our incremental investment in the 2023-28 period to deliver voltage optimisation is focussed on the system that will analyse the data and its integration with our other systems.

Subject to successful trials in the remainder of 2015-23 (including the validation of customer benefits via statistical analysis), we plan to rapidly ramp up deployment to target roll-out of the technology and capability.

[9] See our literature review at: https://www.northernpowergrid.com/asset/0/document/5985.pdf

[10] Statutory voltage limits are defined in the Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR)

[11] Customer Load Active System Services (CLASS); where distribution system assets are used to actively adjust customer load to provide balancing services. Our DSO Strategy (specifically deliverable DSO4.3) provides further information regarding the potential conflict between CLASS and voltage optimisation, and our proposal to prioritise voltage optimisation given the significant benefits to customers of doing so.

Our rollout strategy is to do it as quickly as possible, for as many customers as possible. Voltage optimisation offers a solution to provide an offset to the affects felt from recent energy price increases. We will therefore be looking to maximise the impact of energy efficiency and financial benefits where they will be felt most. All other things being equal, we will target areas with high proportions of fuel poor customers as a priority using our social indicator mapping.

With our solution deployed we estimate that customers could receive an average reduction in their energy bills of around £20 per annum (for an average domestic bill) as well as 27kg[12] of lower carbon emissions annually per household per year.

These estimated benefits are based on the assumption that each one per cent of voltage reduction yields a one per cent energy consumption reduction. There are several important pieces of evidence to support this assumption, detailed within our literature review undertaken as part of BEET[13], with the most notable being Smart Street. ENW's Smart Street project confirmed from two years of trials that there is typically a one to one relationship as described. Other evidence in our literature review identified a higher benefit than this (typically 50% higher), however, we have aligned our assumptions to ENW's Smart Street conclusions. We believe that this provides a conservative estimate, based on a robust trial undertaken that provided a similar level of voltage optimisation to that of our proposal. As a result, it is appropriate to leverage and apply the learnings from Smart Street to voltage optimisation.

It is important to differentiate between a short-term (less than half an hour) energy consumption reduction and the long-term (more than half an hour) energy consumption reduction achieved from the application of reduced voltage. The application of lower voltages to reduce energy consumption is known as conservation voltage reduction (CVR) and is utilised today principally as a tool for balancing supply and demand during times of system stress to ensure frequency stability, and is detailed in Grid Code Operating Code 6 (OC6). The application of voltage reduction for the purpose of providing a demand reduction in this way is generally a short-term application, and has been quantified as part of ENWL's CLASS project. CLASS concluded that the short-term relationship between voltage and consumption is that a 1 per cent voltage reduction generally provides a 1.3 per cent demand reduction. Over the long term, this relationship reduces to only a 1 per cent demand reduction as concluded by ENWL's Smart Street project.

Over the life of the project we will seek to implement this technology at all of our substations, however it is likely there will be technical reasons why this cannot be achieved, such as insufficient tapping range available on our transformers to provide the required voltage. We have therefore assumed final deployment will reach 80% of customers. To support customers served by substations where we are unable to implement the technology we will explore other NIA funded innovation projects that in particular target cost savings for fuel-poor customers.

We are targeting our roll-out programme commencing in the third year of the 2023-2028 period (i.e. 2025/26) following completion of our innovation trials. If possible we will seek to accelerate roll-out.

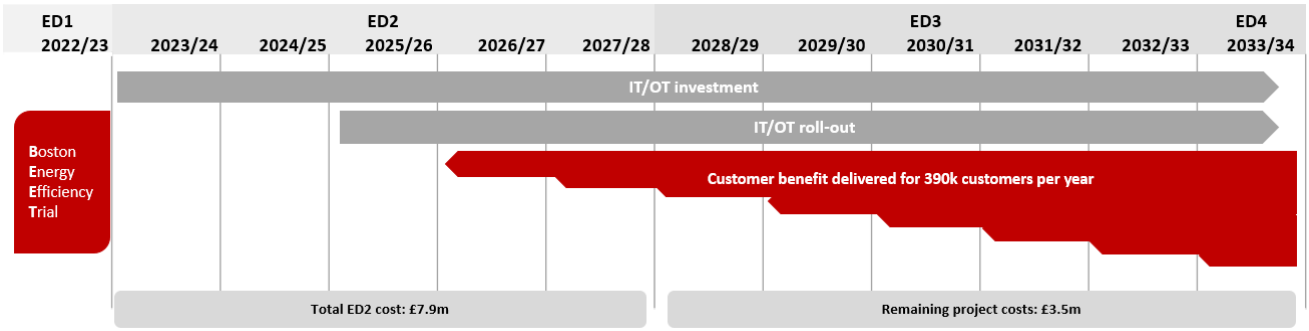

Figure 5: Timeline for delivery

[12] The carbon intensity factor has been calculated using the 2023 - 28 carbon intensity factor for the relevant years, however we note that the saving is dependent on the actual carbon intensity factor in the year voltage optimisation is delivered

[13] See our literature review at: https://www.northernpowergrid.com/asset/0/document/5985.pdf

Who will we collaborate with to deliver this?

The development of BEET involves collaboration with a range of stakeholders. As part of the BEET trial we continue to work closely with members of the Boston Spa local community and surrounding areas, particularly with Keith Jackson, who came up with the idea and is an active participant in the progress of voltage optimisation.

The trial has required collaboration with a number of other organisations in the development and provision of the technology. This includes:

- Fundamentals: A UK and Australian based power systems technology specialist, have helped to design the BEET box
- Siemens: together with the Northern Powergrid smart meter team have helped to create the BEET-Box's smart meter interface
- General Electric: responsible for overseeing the network management system interface with the BEET-Box
- Sheffield University: will provide statistical analysis of closed loop testing results, together with formulating a process for ensuring the on-going benefits can be quantified using statistical techniques

We plan to undertake further customer and stakeholder engagement as part of BEET to understand and account for the benefits and any potential negative impacts such as the potential impact on slower operation of resistive loads such as kettles and electric heaters. Continual engagement and responding to customer feedback will mean we can optimise our rollout strategy for voltage optimisation in the 2023-2028 period and respond to and mitigate concerns as they arise.

In particular we will also work with organisations that represent vulnerable and fuel-poor customers to ensure that we maximise benefits for fuel-poor customers as quickly as possible and mitigate any issues. As an example, we plan to work with Green Doctor to understand, quantify and formulate any necessary mitigation plans (if required) for customers dependent on resistive electric heating[14]. Whilst we do not envisage any issues for such customers we will remain open-minded and responsive to any concerns.

Following successful completion of the trial we will share learnings from the trial with fellow DNOs with the aim of enabling them to deliver benefits more widely at a national level.

How will customers benefit from voltage optimisation?

The following user personas are presented to demonstrate how customers will benefit from the estimated savings provided by voltage optimisation:

Dan, 32

Dan suffers from MS and has some physical disabilities. He lives independently, with help from a carer. Due to his health issues he can only apply for low-skilled, short-term, insecure jobs so he is mainly unemployed. He is getting a pre-payment smart meter fitted during the 2023–28 period.

What benefits will voltage optimisation bring?

As money is tight a £20 reduction in annual energy bills will ease some of Dan's financial pressure; for example he currently can't afford leisure activities. He feels he has no control over his daily life and is embarrassed to ask for help; voltage optimisation will mean that Dan benefits from a reduction in energy bills through behind the meter improvements with no action required on his part. As Dan is using a pre-paid smart meter, which can be up to £200 more expensive than the cheapest direct debit tariff, voltage optimisation has the potential to deliver larger cost savings than would be delivered to a typical customer which will help Dan to off-set some of the pressure on his bills.

Contemporary couple, 30–40

With relatively high disposable income and no children this couple lead a busy social life. When shopping they look for value and their concern for the environment is often supporting their choices. They are early adopters of technology which influences the way they use energy as

[14] It should be noted that we have considered the findings from ENW who found that no customers in their research trials reported any perceived quality of supply issues – this is discussed further in our 'consideration of risks' section

they adapt to the latest advances – in appliances and heating and storage systems – to control their consumption and bills.

What benefits will voltage optimisation bring?

The contemporary couple may not feel the benefit of an annual £20 reduction in their energy bills, however they want to control their energy consumption in order to protect the environment and so are pleased that behind the meter improvements will result in a 27kg carbon saving per annum. As they look to transition to a heat pump in their home and connect a charger for their new electric vehicle, the voltage optimisation programme will mean that there is greater capacity on the network where the process is made easier as less reinforcement is required to resolve voltage bottlenecks.

Distributional impacts on customers

The estimated benefits of voltage optimisation will be delivered to domestic and business customers served by primary substations in the programme.

All other things being equal we will phase the programme to maximise benefits for fuel poor customers using our social indicator mapping.

We expect to be able to roll-out the project to 80% of customers with 20% of customers not able to benefit from voltage optimisation. Within the 20% of customers who do not benefit a proportion of these will be fuel-poor customers. We plan to pursue innovation trails to explore energy saving benefits in these areas during 2023-28.

Stakeholder engagement evidence

Details of engagement	Insights
Boston Spa Community	Keith Jackson, a Boston Spa resident who initiated voltage optimisation has been a key stakeholder in the trial since Northern Powergrid became involved. Throughout the trial we have been engaging the community involved and Keith Jackson is a customer representative on the Northern Powergrid Stakeholder Panel. Keith launched a petition in early 2021 to bring in legislation to ensure that Ofgem measure voltage optimisation across all UK power networks to ensure the industry takes action.
2020 Innovation festival, ~40 technical stakeholders including other DNOs 2020 ENIC conference, ~30 technical stakeholders 2021 ENIC conference, ~20 technical stakeholders	**Support:** Stakeholders were very interested in the idea. During the 2021 ENIC conference when asked "would you want your local DNO to rollout voltage optimisation"; over 80% voted yes, with the remaining votes being 'not sure' or 'no'. **Challenge:** Benefits stated are based on existing load types. Future load growth will be attributable to EVs and heat pumps which may not benefit from voltage optimisation as the charging equipment contains power electronics which converts the mains AC voltage into a DC voltage as the battery requires. **NPg response:** We have therefore based the benefits and value to customers on the current electricity usage levels, i.e. we have not included future load growth as we recognise that these technologies will not benefit. As part of the project we will undertake a statistical analysis to monitor the benefit of voltage optimisation into the future.
Citizens Panel, 45 respondents (Domestic, 36 and SME, 9) – Including 21 hard to reach and 5 seldom heard	**Support:** Overall this was considered to be a good idea as it could contribute to reduced energy consumption, benefit the environment and reduce costs. Consumers liked that fact that this made use of existing technology (smart meters). SMEs particularly liked the cost saving opportunities and the fact that equipment would be replaced less frequently. Customers were generally happy to participate in a trial with some customers actively querying if a trial would be taking place near them.

	Concerns: The logistical roll-out of the programme was raised as a concern when not every household has a smart meter. There was also concern that energy suppliers would not pass the saving onto customers **NPg response:** We do not require 100% of customers to have a smart meter for the programme to be successful, as we can still gain a good understanding of the voltage requirements with the majority of customers owning a smart meter. We have accounted for this in the make-up of the algorithm as part of our work with Sheffield University.

Table 10: Stakeholder engagement summary

Benchmarks

Electricity North West (ENW) have a 'Smart Street' project that has also been proposed as a Consumer Value Proposition in the 2023-28 period. This is similar in its delivery to our voltage optimisation programme however uses different technology which requires significantly higher asset investment. ENW will be installing new equipment at every secondary substation where they plan to roll-out the programme. This results in the costs being significantly higher and the solution less scalable as a technician is required to physically attend each substation to install the equipment. Our approach is data heavy and leverages our existing smart grid programme; we are able to use existing assets coupled with new sources of data to bring about benefits with much lower levels of investment.

In its draft business plan, ENW set out its plan to roll-out Smart Street to 64,000 customers costing £18m in the 2015-23, period. During 2023-28 it plans to extend this to a further 250,000 customers with a £78m investment programme[15] (i.e. about £300 per customer, to provide benefits of up to £60 per annum).

In comparison our approach will cost around £3.50 per customer and is estimated to save on average around £20 per customer per annum. This is based on rollout to 117,000 customers by 2028, and the eventual roll-out to 3,120,000 customers by 2033 at a cost of £7.9m during the 2023–28 period and a further £3.5m[16] during the 2028-2033 period. The savings quoted are the estimated typical value, based on current average domestic consumption, rather than a potential upper bound for the theoretical high case. Equating the benefit to cost ratio at face value[17], our voltage optimisation initiative could provide nearly 30 times the benefit to cost ratio of Smart Street.

Costs

We will invest £7.9m[18] during the 2023-28 period to deliver our programme. Our investment mainly relates to the cost of modifying our information technology (IT) and operational technology (OT) systems to enable the mass collation of data and installing new servers to carry out the data analytics required for the voltage optimisation. The initiative will require five FTEs who will undertake power system studies and analysis of smart meter data to enable rollout at each site as well as completing the enabling works to ensure the IT, OT and smart grid enablers installed are configured. Once the infrastructure costs have been incurred and the solution is up and running, we anticipate that the costs beyond the 2023-28 period will be £0.8m per annum until the penultimate year of the project.

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
IT/OT (£'000)						
Infrastructure for voltage optimisation 'engine' and associated algorithm development	180	1,140	840	-	-	**2,160**
Infrastructure upgrades for systems to which the voltage optimisation engine interfaces	100	1,100	1,100	-	-	**2,300**
Systems integration and testing	-	-	300	-	-	**300**
Continuous improvement and on-going support	-	-	-	250	250	**500**

[15] See ENW's business plan which can be found at: https://www.enwl.co.uk/globalassets/about-us/regulatory-information/riio2/july-2021-submission/draft-plan/draft-business-plan-2023-2028.pdf
[16] Including RPEs using the 2023 – 28 rate
[17] Voltage optimisation per customer annual benefit to total cost ratio of £20 / £3.5 (=5.7), vs. Smart Street's £60 / £300 (=0.2)
[18] Including RPEs

People (£'000)						
5 FTE resource	500	500	500	560	560	**2,620**
Total	**780**	**2,740**	**2,740**	**810**	**810**	**7,880**

Table 11: Voltage optimisation costs

No specific costs are defined for stakeholder engagement activity although it will play an important role in the roll-out. Our current BEET project includes a significant programme of stakeholder engagement activity, which will seek to promote the voltage optimisation within the trial area, engaging with over 15,000 customers and other stakeholders. This provides the community with a platform to ask questions, raise concerns, and provide their thoughts. The BEET project will therefore provide the bulk of the customer and stakeholder engagement ahead of roll-out. On-going stakeholder engagement through 2023–28 will focus on ensuring our customers and stakeholders have a voice, and will be embedded into our broader customer and stakeholder engagement strategy, including our comprehensive engagement with vulnerable customers.

There may also be costs associated with the customer service aspects of voltage optimisation, where customers may have queries on the project. We expect these to be minimal and routinely handled through our customer contact centre in most cases.

These costs are included within our baseline totex and are aligned to our Whole Systems Strategy.

Monetised customer valuation and methodology

Subject to a successful outcome from our innovation trials, we are planning to commence roll-out of the technology during 2025/26, with benefits assumed to commence one year after the technology is in place to provide a conservative estimate. Whilst we expect customers to benefit immediately following rollout, we have only quantify each full year of savings in our estimate of benefits. We plan to deliver the first customer benefit to 10 per cent of customers in 2026/27, with a further 10 per cent each year up to 80 per cent of the network.

Period	Reg year	Rollout (cumulative)		Benefitting (cumulative)	
		% of customers	# of customers	% of customers	# of customers
ED2	2023/24	0%	0	0%	0
	2024/25	0%	0	0%	0
	2025/26	10%	390,000	0%	0
	2026/27	20%	780,000	10%	390,000
	2027/28	30%	1,170,000	20%	780,000
ED3	2028/29	40%	1,560,000	30%	1,170,000
	2029/30	50%	1,950,000	40%	1,560,000
	2030/31	60%	2,340,000	50%	1,950,000
	2031/32	70%	2,730,000	60%	2,340,000
	2032/33	80%	3,120,000	70%	2,730,000
ED4	2033/34	80%	3,120,000	80%	3,120,000

Table 12: Voltage optimisation roll-out plan

We forecast that voltage optimisation will deliver £14.5m of customer benefits in the 2023-28 period (based on SROI of £2.11), £168.0m of benefits by 2033 and £213.8m over the full life of the project. A sensitivity analysis assuming the benefit is only half of that assumed would provide a whole life NPV of £101.9m which would still represent significant value to customers demonstrating that this initiative presents a low-regret option that is in our customers' interests to progress. The decision to progress is dependent on the successful completion of BEET, including validation of the benefits and overall value to customers.

The benefits have been calculated based on the reduction in customer energy bills and the cost of the reduction in carbon emissions:

1. **Reduction in customer energy bills**
   - Assumes a four per cent voltage reduction yields a four per cent consumption reduction;
   - Typical domestic consumption of 2,900 kWh p.a.;
   - 116 kWh p.a. energy consumption reduction per customer;

- Applying a typical unit rate of 17p/kWh, the per customer benefit per year is approximately £20; and
- A rollout rate of 10% of our customer base p.a. equates to 390,000 customers p.a. with benefits accumulating as the rollout continues and more customers receive voltage optimisation.
- The calculation assumes we maintain the reduction in energy bills at current levels of loads to ensure we have not included benefits from efficiency measures from devices with power electronics

2. **Reduction in carbon emissions**
   - Assumes a 116 kWh p.a. energy consumption reduction will result in 27.4kg fewer carbon emissions per customer based on 0.237kg[19] of CO_2 per kWh;

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Number of customers benefitting from voltage optimisation	-	-	-	390,000	780,000	780,000
Benefits (shown as the present value, £'000)						
Savings from a reduction in customer energy bills[20]	-	-	-	6,815	13,133	19,948
Savings from a reduction in carbon emissions	-	-	-	466	938	1,404
Total	**-**	**-**	**-**	**7,281**	**14,071**	**21,352**
Costs (shown as present value, £'000)						
Total	(724)	(2,455)	(2,367)	(674)	(650)	(6,870)
Net Present value	**(724)**	**(2,455)**	**(2,367)**	**6,607**	**13,421**	**14,482**

Table 13: Voltage optimisation valuation calculation

We have assumed a zero drop off rate in our modelling as financial benefits will remain once the technology is installed onto the network, and that the increased penetration of power electronic based loads will not benefit, and the benefit will therefore only be 'felt' for existing load types. The carbon reduction benefit rate will drop off as overall carbon intensity decreases over time, however as we have only modelled financial benefits this does not cause a drop off in the benefits shown. In order to adopt a prudent approach, we have modelled the benefits based on the energy efficiency achieved from existing load levels, i.e. not factoring in increased loads from future up-take of LCTs.

In addition to the modelled benefits there are further benefits that we have not been able to accurately quantify for our SROI calculation. As the majority of appliances in use today are manufactured for a nominal of 230 V, voltage optimisation should generally result in more efficient appliances as well as increasing their lifespan as there is a reduction in electrical stress placed on equipment. Voltage optimisation will also give way to additional capacity to connect and improved network operability due to the identification and mitigation of voltage and thermal issues on the network.

Benefits are projected to continue beyond 2028 and over the course of the project, and we estimate it will deliver the following NPV:

Regulatory Period	Customer Value delivered
2023 – 28	20% of customers benefitting from voltage optimisation, delivering a NPV of £14.5m
2028 – 33	70% of customers benefitting from voltage optimisation, delivering a NPV of £168.0m
2033 - beyond	Maximum projected roll-out achieved covering 80 per cent of the network, delivering a NPV of £213.8m

Once the technology is installed it will continue to deliver voltage optimisation into customers' homes. The above figures assume today's levels of load and do not factor in potential further benefits that will be seen as electricity usage increases.

We have provided a modelling summary of the inputs we have used to calculate the SROI for each CVP which can be found in our CVP modelling summary annex.

[19] Taking the 2023 carbon intensity factor from the Ofgem CBA template
[20] Note that the savings from carbon emissions has been deducted from the financial savings to remove double counting

Consideration of risks

There are a number of risks that we will manage as part of our voltage optimisation programme:

- **Outcome of innovation trials:** Whilst we remain optimistic on the outcome of our BEET innovation trials, given the complexity of the project risks remain around the proving the final technology solution. We have phased the delivery of our programme to start in 2025/26 to provide contingency for mitigating any issues that may arise as the project completes.
- **Smart meter system performance:** The performance of the telecommunications network that supports the smart meter system in the North has not yet proven its ability to support the rollout of voltage optimisation. There is a risk that the performance may preclude the widespread collection of near real-time voltage data. We are collaborating with relevant stakeholders (principally Arqiva, the Data Communications Company and other DNOs) to understand and seek a resolution. We will test and validate performance and potential mitigations as part of BEET. Mitigation of this risk may include the targeting of a smaller population of smart meters for voltage readings, and the utilisation of real-time voltage measurements from LV monitors.
- **Quality of supply:** We will ensure we review quality of supply as part of the project, including exploring opportunities to use alternative approaches for demand reduction at primary substations. We will ensure that a sufficient 'safety margin' is applied to ensure on-going voltage compliance, which will be determined as part of BEET. In addition, the ability for compliance with our obligations under Grid Code OC6 (to be able to provide demand reduction during times of system stress) will be impacted by the application of year-round voltage optimisation, and therefore we will assess how we will continue to provide security of supply obligations to ESO as part of BEET and ahead of rollout of voltage optimisation.
- **Appliance performance**: The majority of appliances in use today are manufactured for a nominal voltage of 230V and so reduced voltage delivered will result in more efficient appliances through reducing the electrical stress on components. Resistive devices however may have a negative performance impact as a reduction in voltage will take longer for these appliances to reach the desired outcome, for example:
    - An electric space heater (using a resistive heating element) that operates at 2 kW at a voltage of 240 V, which needs to operate for four hours of the day to provide the required warmth will take four hours and 21 minutes to provide the necessary warmth at 230 V as it operates at 1.84kW. As vulnerable customers are more likely to rely on electric heaters the risk of insufficient warmth provided by space heating is to be investigated further and we are preparing an action plan to understand and quantify the risk in more detail, to determine if any mitigation is required. Ensuring customers are not adversely impacted by voltage optimisation (linked to quality of supply above) is key to our plans to roll-out the solution. ENW's extensive customer research demonstrated that the use of Street Smart voltage optimisation reduction techniques did not cause any detriment to customers' perception of quality of supply[21]. Our proposed voltage optimisation initiative will result in similar voltages for our customers to that of Smart Street, and therefore we consider this risk to be minimal. We will however, continue to closely monitor these risks, and will progress work to understand and quantify risks (specifically relating to electric heating) and determine any action plans. This will include working closely with our partners who support vulnerable customers.
- **Impact on competition:** We do not see an impact on competition as this is not a balancing service. Reduced consumption will impact energy suppliers however supports in delivering value for money for customers and delivering lower emissions.

Proposed arrangements for clawback of CVP rewards in the event of non-delivery

In the event of non-delivery we propose that any rewards are clawed back on a pro-rata basis on the proportion of customers for whom the solution is not delivered compared to the projection used to calculate the reward.

Why should NPg deliver this?

We are uniquely positioned to deliver this service as we own the equipment that controls the voltage delivered as well as the network infrastructure. No other market provider would be able to deliver voltage optimisation in this way. Through

[21] Source: Engaged Customer Panel Post-Trial Customer Impact Report; https://www.enwl.co.uk/globalassets/innovation/smart-street/smart-street-key-docs/ecp-final-report-april-2018.pdf

our existing innovation activities and investments in network infrastructure we are able to deliver this new service offering using existing technology in a smarter way to deliver energy efficiency to support the wider environmental agenda as well as providing excellent value for money for our customers.

As we regularly engage our vulnerable customers and have many partnerships with organisations that support vulnerable customers this also enables us to use our role to maximise benefits for fuel poor customers.

Consideration of alternative options

We considered the following alternatives to voltage optimisation:

- Static voltage optimisation: We could reduce voltage by a fixed amount. We trialled this as part of BEET phase one and this was shown not to be suitable given the voltage drop variations across each day, week and year across the network;
- Simple dynamic voltage optimisation: Another alternative is to use techniques such as load drop compensation. This has also been trialled as part of our CLNR innovation project and as part of the BEET project. It was found that whilst the method can optimise for prevailing network loading conditions, it cannot optimise for prevailing network configuration conditions. The conclusion of the studies was that it was not suitable for the BEET trial network (given the significance of network outages and the impact on voltages), and that a smarter method was required that could better optimise for network configuration conditions. This method is also resource intensive and provides only a fraction of the benefits when compared to the smarter (proposed) dynamic voltage optimisation using real-time smart meter voltage data. We will retain this method in our toolkit for:
    - Application at supply points to facilitate rollout of the proposed voltage optimisation method (i.e. to 'free-up' taps at primary substations), and
    - In areas that may be unable to benefit from the proposed method in a timely manner or at all. It is, however, not suitable for wide-spread deployment.
- Widespread voltage regulation equipment roll-out: This would include equipment such as voltage regulators, reactive power compensation equipment (statcoms, shunt-reactors, etc), and secondary substation transformers with on-load tap-changing (OLTC) capability. For sufficiently widespread rollout on a given primary substation network, this would enable control of voltage for local segments of the network (hundreds of customers), rather than the primary level (thousands of customers). This would the resolve the shortcomings of alternative 1 and 2 shown above, but would require significant capital costs, whilst also not being scalable as quickly and cheaply as our proposed solution. We already utilise these methods at present when required to do so for voltage compliance purposes, and ENWL have proposed this method as part of their rollout of 'Smart Street'. As this method provides a lower benefit to cost ratio than our proposed solution (roughly 30 times lower), we are therefore not seeking to utilise this method during the 2023-28 period.
    - We will however consider this method where there are specific localised issues that could impact the roll-out of our proposed solution and which could be alleviated by investment in voltage regulation equipment. The benefit of this alternative would then be twofold:
        i. it would enable rollout of 'voltage optimisation' to the difficult to implement sections of the networks, and
        ii. it would enable more aggressive voltage optimisation as a result of de-coupling the localised areas from the wider network.
    - We will therefore be undertaking detailed analyses during the 2023-28 period to determine the optimal investment required in voltage regulation equipment to support our overall vision of voltage optimisation for all customers (i.e. beyond the 80% set out in our proposals) and to maximise the benefits of areas with voltage optimisation implemented.
- Other alternatives could include the widespread replacement of sections of our network (to minimise voltage drops), however we acknowledge that wide-spread conductor replacements are not feasible nor economical alternatives and were therefore discounted from our considerations.

Justification – beyond Ofgem minimum requirements, business as usual and additional value to consumers

Providing dynamic voltage optimisation for the purpose of behind-the-meter efficiency improvements exceeds DNO minimum requirements as set out by Ofgem and goes beyond business as usual for an electricity distributor.

Our proposal harnesses new sets of data in an innovative manner that will bring customer benefits through a reduction in energy bills as well as environmental benefits through a reduction in emissions due to energy efficiency measures.

The reduction in energy bills estimated will contribute to offsetting increasing energy bills for our customers. As we are largely able to utilise existing assets and the required incremental investment is relatively low, our proposals are expected to provide good value for customers as the estimated benefits far outweigh the investment, in particular for fuel poor customers where the benefit will be felt more.

Plan impact

Voltage optimisation brings benefits beyond the Whole Systems section of our plan:

Decarbonisation	EAP	Safety	Reliability	Asset resilience	Climate resilience	Physical and Cyber resilience	Customer Service	Vulnerable customers	Our Communities	Connections	Openness and Transparency
●	◕						◔	◕	◔	◔	

Figure 6: Mapping to plan areas

Further information

Further information on this proposition can be found within our Whole Systems annex.

CVP4 - Whole Systems: Phase 1 rollout of the next generation energy system

First stage deployment of a blueprint for the next generation energy system, rolling out 30 innovative micro-grid solutions in some of the most remote parts of the network to enhance system resilience.

What are microgrids?

Microgrids are local energy grids on the LV network that operate normally while connected to the wider grid but have the capability to disconnect and operate autonomously when an outage occurs on the HV network. In a world of electric heat and electric powered cars, exceptional events will become unacceptable and so microgrids could serve to minimise these occurrences even when HV and EHV lines go down, keeping LV systems live.

Our vision for the decarbonised and decentralised energy system of the future could see a series of nested microgrids, with significant amounts of generation and storage at the point of use (potentially behind the meter). Microgrids will allow for an energy system that can be balanced within the home, and then within local communities to minimise the need for wider network reinforcement while delivering significant improvements in resilience for consumers.

Microgrids not only offer a solution to address reliability issues particularly sub-three minute outages (which automation does not address), but also security of supply issues in sparse networks[22] which will grow as decarbonisation drives higher system loading. Microgrids maintain customers' supplies and energy resources such as solar generation at times when they would otherwise be unavailable due to network outages. They facilitate and incentivise peer-to-peer trading to balance within microgrids. As microgrids develop there will be clear incentives to balance energy locally, creating a rich peer-to-peer market place, supporting the roll out of PV and V2G enabled vehicles (for example farm machinery) alongside electrified heat. Voltage and frequency control could move to the local substation and in general system operation would tend in this direction too.

As well as physical resilience microgrids can offer protection to cyber events allowing self-reliant, compartmentalised energy supply. Attacks or events would therefore be required to hit multiple points to create widespread disruption.

Our proposed roll-out of microgrids represents the first stage deployment of this potentially game-changing solution on the distribution network and provides the opportunity to demonstrate to the industry the blueprint for the next generation of energy systems.

How will we roll them out in the 2023-28 period?

We are currently trialling fixed microgrids as part of our MicroResilience NIA project. Our trials are deploying solutions at two sites both with different needs including a remote village supplied by a single 60km overhead line that is vulnerable to high winds and Newcastle's swing bridge which requires a dedicated power source when it is open. Our work includes development of a resilient LV microgrid solution with the microgrid boundary based on a distribution substation. This is analogous to using a mobile generator to restore the network, with the difference being that the microgrid is "always-on" to meet the group demand immediately after the first circuit outage (whereas a generator solution would only be available in the repair time). There are a number of desktop studies considering the possibilities of resilient microgrid utilising existing networks but we are unaware of any practical demonstrations.

We are about to commence testing of our microgrids after extensive studies into the theory and feasibility. We have built the hardware ready for installation and obtained the necessary planning permissions. To provide the storage capabilities we have placed an order for lithium iron (which currently has a 12–18 month lead time) and we expect to be ready to install and test our first microgrid in Q1 of 2022.

[22] Where these networks are sparse both in terms of the number of customers connected, and the level of network connectivity, in that they do not offer an alternative supply route. Subsequently, an issue that impacts the radial spur will result in customers being off supply until the network is repaired.

During 2023-28 we plan to implement fixed microgrids at 30 distribution substations to support the on-going operation of the LV network in the event of a loss of the infeed from the HV network. Roll-out is planned to commence in 2024 - 25 with completion by March 2028.

We have identified around 25 teed circuits where alternative supplies are not available (i.e. sections of the network with no other interconnection) and where this resilience option would be beneficial in the immediate term. The same teed circuits are expected to experience load growth due to decarbonisation that would require security of supply investment - microgrids will provide a solution to this at a significantly reduced cost compared to traditional methods.

The deployment will seek to encourage LV customer participation in trading energy, storage and other services to maintain the microgrid in balance for extended periods with a view to developing a storm response in addition to short term interruption response. We will seek to ensure that regulatory and legal issues (e.g. responsibility for frequency) are addressed in light of the technical and commercial potential for the technique.

We will ensure that we target those customers who will benefit most from microgrids, improving resilience for customers on vulnerable sections of our network, or vulnerable customers – ideally both.

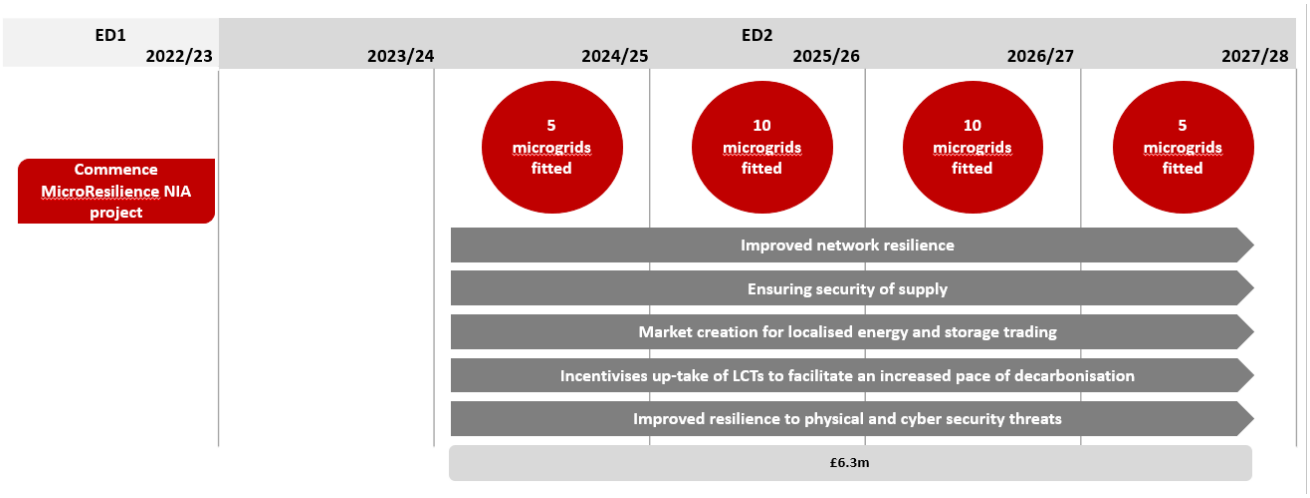

Figure 7: Timeline for delivery

In parallel with our rollout of microgrids in the 2023–28 period we are also undertaking a number of innovation projects and whole system initiatives which will provide a positive build to the technical and commercial capability of microgrids.

- Our Whole Systems initiative WS2.5 will see us explore commercial aspects of microgrid technology to enhance system resilience, particularly third-party energy and storage provision. This initiative proposes to invest £1.5m of NIA funding to carry out work that will involve engaging with stakeholders to explore how third parties can provide energy services to the microgrid. Due to the isolated nature of microgrids, the time when they are providing most value is intrinsically both more useful to local resilience and more complex to achieve. This project is planned to run from shortly after the commencement of the next regulatory period in 2023.
- A second Whole Systems initiative, WS3.3, proposes to address regulatory and market changes that might reduce barriers and create opportunities for microgrid roll-out. Through this project we plan to invest £0.4m of NIA funding to carry out an innovation project to identify and address regulatory and market barriers to microgrid roll-out with the aim of identifying barriers, developing and agreeing solutions and collaborating with relevant stakeholders to implement solutions. The project will start after WS2.5 as the commercial input of the possible market value will allow us to focus on barriers and opportunities where there is value to be released.
- Finally, under initiative WS1.3 we are planning a £1m innovation project with £0.1m NIA funding, seeking to support the concept of peer-to-peer trading and customers who wish to engage in it, addressing commercial and regulatory barriers. Peer-to-peer trading is not a prerequisite for resilient microgrids, nor are microgrids a pre-requisite for peer-to-peer trading, but they do offer a complimentary set of solutions where the whole is greater than the sum of the parts. We will lead the work engaging with Ofgem, BEIS, suppliers, customers and relevant trading platforms (e.g. Elexon) to identify any network-specific barriers to peer-to-peer trading, and options for solutions. The non-prerequisite nature of peer-to-peer trading means this project can run in parallel with the other two from early in the next regulatory period.

Who will we collaborate with to deliver this?

As part of the NIA project we are working with a number of partners as we test the solution. Power electronics are being designed and built by Turbo Power Systems and control systems by Smarter Grid Solutions. In line with Ofgem guidance, we are procuring DNO owned storage to support the microgrids and the contractor for the storage provider will shortly be confirmed.

A number of partners will be involved in the roll-out of our 2023-28 plan in this area. For the parties involved we will engage in collaboration agreements where project partners provide the services or assets that meet the criteria set out within the specifications of the project. This could include maintenance, warranties and indemnities (where applicable).

We will tender each of the components required for the project. Should storage providers see an opportunity to provide storage as a service then we will take this route. Feedback from storage providers at this stage suggests that it is unlikely they will take up this opportunity initially as they see resilience provision as incompatible with trading other stacked services. If this turns out to be the case we would procure the storage directly in the first instance for the 30 microgrids.

As set out above we have planned further innovation projects to explore and develop the potential third party commercial opportunities for energy provision within the microgrid. This might include peer-to-peer trading by customers served by the microgrid, merchant storage or merchant generation sited within the microgrid, or locational flexibility services.

How will customers benefit from microgrids?

The following user personas are presented to demonstrate how customers will benefit from microgrids:

The Singhs, 10 – 80+

The Singhs' daughter requires a ventilator to breathe. Her ventilator requires power to operate however it does have a battery which lasts up to four hours.

How would microgrids benefit the Singhs?

In the event of a power outage the Singhs experience considerable stress if the problem cannot be fixed immediately, due to the daughter's dependence on her ventilator. A microgrid would mean that their local power supply would remain resilient in the event of a power cut and she would remain safe as well as considerably reducing the stress felt by the family in the event of a power cut.

'Green George', 25 – 30

George is a young, single professional with no mortgage or dependents. He is big on technology, making the most of his high-speed broadband. The environment is very important to him and influences many of his choices.

How would microgrids benefit George?

After taking-up an EV and a heat pump, Green George is looking to add solar panels to his roof. A microgrid has recently been fitted on his local network. He is able to store his electricity generation so that he is self-sufficient in his domestic energy consumption. The battery that George has purchased however is too small for the levels of generation from his solar panels in the summer months. Due to the installation of the microgrid to which George's solar generation is connected he is able to provide energy to both the local microgrid and the wider system. Even during an outage George will be able to supply power to his local community, contributing to a mutual support scenario.

Community energy Groups

Microgrids will provide community energy groups with more opportunities to locally control and benefit from generating and managing energy. This will provide greater incentives for projects. Community energy groups will be supported to identify locations suitable for their initiatives where we can support their project with a stable platform for operations as well as making the microgrid more effective for the local community.

Distributional Impacts on customers

Initially our roll-out will benefit only a relatively small number of customers. 30 substations represents 0.1% of our ground-mounted substation population covering c. 1,500 customers (based on ~50 customers per substation). However, if we prove this solution as providing a potential blueprint for the next generation energy system this will unlock substantial benefits for our customers and those connected to other network beyond 2028.

We will look to target installations where they will have the greatest impact, considering vulnerable customers using our social indicator mapping.

Stakeholder engagement evidence

Details of engagement	Insights
Citizens Panel, 45 respondents (Domestic, 36 and SME, 9), May 2021 – Including 21 hard to reach and 5 seldom heard	**Support:** Rural customers were the most supportive of this proposal however other consumers who do not live rurally acknowledged its value (despite this proposal being unlikely to impact them in the short-term) **Challenges:** Some stakeholders felt that 30 microgrids was not enough**.** Some stakeholders also considered this a short term fix and more should be done to invest in more permanent solutions **NPg response:** This does not represent a short-term fix but a long-term solution to improve the resilience of the network. It encourages low carbon technologies as the future of energy supply to not only improve the resilience of the network (which will become increasingly more important as we decarbonise), but also opens up new markets by encouraging localised energy trading
Meeting with North East Local Enterprise Partnership, May 2021 – 3 stakeholders	The LEP were supportive of the CVP - microgrids are a key area of interest for industrial companies in the North East, e.g. local ports and industrial clusters
Community Energy stakeholder Panel, May 2021 – 7 stakeholders	Panellists gave overwhelming support for the proposition and expressed a strong interest in the roll-out

Table 14: Stakeholder engagement summary

Benchmarks

Scottish and Southern Electricity (SSE) are running a project called reliability as a service (RaaS) which aims to maintain and improve reliability for remote and isolated networks. The key difference between microgrids and RaaS is the size of the solution; microgrids are multiple, small-scale installations focused on localised solutions which are relatively straight-forward to implement. RaaS is still in its planning phase and focuses on larger installations with the aim of addressing larger scale issues on the network.

Our approach targets specific areas and therefore can be scaled on an incremental basis.

Costs

An investment of £6.3m[23] is included in our plan over 2023-28 for the deployment of the 30 microgrids. These costs are included in baseline totex and are aligned to our Whole Systems Strategy.

	2023/24	2024/25	2025/26	2026/27	2027/28	Total
IT/OT (£'000)						
Cost of microgrid units	-	500	1,000	1,000	500	**3,000**
Installation costs	-	200	500	500	200	**1,400**
Batteries to support microgrids	-	200	500	500	200	**1,400**
People (£'000)						
Internal resource costs	100	100	100	100	100	**500**
Total	**100**	**1,000**	**2,100**	**2,100**	**1,000**	**6,300**

Table 15: Microgrids costs

[23] Including RPEs

Costs are subject to our current best view and based on the costs incurred as part of our NIA project with assumed economies of scale achieved as part of the project roll-out.

As we roll-out the project we will be required to train our staff and monitor roll-out, these associated costs will be incurred as part of BAU.

We will also undertake ongoing stakeholder engagement as we roll-out the project. Our NIA funding includes costs relating to stakeholder engagement as we test the concept. The stakeholder engagement required as part of microgrid roll-out will relate to engagement with groups who are served by worst performing circuits – an area where we already engage our stakeholders and so will be covered by our business-as-usual stakeholder engagement budget.

Monetised customer valuation and methodology

We estimate that our microgrids solution will deliver a NPV (over ten years) of £7.6m based on an SROI of £1.40.

We have modelled the value of microgrids based on two of the benefits that we have been able to quantify:

1. The financial benefits measured as the value of lost load per microgrid based on substation outage data
2. The avoided network costs of deferred reinforcement as a result of microgrid roll-out

Firstly, using the Value of Lost Load (VoLL) methodology developed by ENW, we have assessed the financial and social impact on customers in respect of an electricity supply interruptions and applied this to each microgrid installation.

- In order to determine a suitable value, the first step of this process was to identify the worst performing substations; where there had been more than 12 outages in three years and the substations served 40 customers or more.
- We then applied the ENW VoLL weighting criteria to the duration of these outages. Typically our rural substations serve 74% domestic customers and 26% SMEs, to which we applied the Rural VoLL (£21,500/MWh and £68,500/MWh respectively) to the adjusted minutes lost methodology to determine the VoLL of each substation over a 5 year period.
- In order to adopt a prudent estimate we used the first quartile range from our data to calculate VoLL to be £8,950[24] per microgrid per year, each with a 20 year life.

Secondly we looked at the reinforcement that would be required to meet the security of supply (P2) requirements as expected load increases in the coming years due to the uptake of LCTs. The basis of this relates to the increased security of supply requirements once a group of demand exceeds 1 MW. Specifically;

- Below 1 MW ‘group demand’, there is no requirement to ensure demand is restored ahead of repair time for a network outage.
- Above 1 MW ‘group demand’, there is a requirement to restore supplies to the portion of demand in excess of 1 MW for a single network outage.

Many of the sections of networks in areas that are worst served are typically rural and have little-to-no interconnection with the wider network. As such, there is no method of restoring supplies during an outage ahead of the repair of the network. Because these sections of networks have demand that is lower than 1 MW, these networks comply with P2 security of supply requirements. As heat and transport decarbonises, the group demand on these networks will increase, which will in turn result in group demands exceeding the 1 MW threshold, and thus triggering more stringent P2 requirements.

Microgrids offer a solution to secure supply within the security of supply standards (by providing restoration for the demand in excess of 1 MW) triggered in future due to load growth. When considered against the counterfactual of network reinforcement, the microgrid solution delivers a net customer benefit. The typical reinforcement cost for this type of network is in the region of £1.5m. Our modelling identified that we could expect 30 microgrids to defer the network reinforcement option for 21 feeders if placed optimally. This takes into account the load growth trajectory, where deferring beyond 2050 will likely defer indefinitely. As a result the avoided reinforcement cost modelled was estimated at £31.5m (i.e. 21 x £1.5m).

[24] Our results showed that across the 14 substations VoLL ranged from £7,428.67 up to £28,354.19, the £8,950 used represents the first quartile within the data

We have modelled the value of microgrids over a ten-year period as this proposal will deliver long term benefits (noting that the counterfactual reinforcements are triggered between 2029 and 2041), therefore the costs and benefits need to be considered over a longer period to reflect the value delivered.

Note: The calculation below shows the value of only the microgrids rolled-out in the 2023-28 period, not future microgrids that will be rolled out beyond 2028.

	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	Total
Number of microgrids on the network	0	5	15	25	30	30	30	30	30	30	30
Benefits (shown as the present value, £'000)											
Savings from deferred reinforcement	-	-	-	-	-	6,056	-	-	5,426	-	11,482
Value of lost load	-	41	119	192	222	215	208	200	194	188	1,578
Total	-	41	119	192	222	6,271	208	200	5,620	188	13,061
Costs (shown as present value, £'000)											
Total	(93)	(896)	(1,814)	(1,832)	(803)	-	-	-	-	-	(5,438)
Net Present value	**(93)**	**(855)**	**(1,695)**	**(1,640)**	**(581)**	**6,271**	**208**	**200**	**5,620**	**188**	**7,623**

Table 16: Microgrids valuation calculation

We have provided a modelling summary of the inputs we have used to calculate the SROI for each CVP. This can be found in our CVP modelling summary annex.

Unquantified value of the blueprint for the future

Microgrids will deliver benefits beyond those that we can quantify or measure today. As we become increasingly dependent on electricity, resilience becomes increasingly important. The internet, which depends on electricity has become a foundation for much of the critical national infrastructure for our nation and so interruptions in supply can cause great inconvenience. Even short interruptions to our supply cause longer interruptions as the equipment that depends upon them needs to re-boot, which can lead to longer interruptions to our daily tasks.

Microgrids will facilitate peer-to-peer trading as customers are incentivised to participate in trading energy, storage and other services to maintain the microgrid in balance. Because the local network remains on more of the time it incentivises local trading between customers and uptake of distributed energy technologies.

Successful demonstration of the microgrids blueprint paves the way to enable roll-out as the standard for rural and an option for urban networks, which will bring future customer benefits, including benefits to vulnerable customers.

Consideration of risks

The following risks have been considered and will be managed in the delivery of the programme:

- **Outcome of innovation trials:** The start of fixed initial installations has been phased from 2024-25 onwards to allow time for assimilation of learning from our MicroResilience innovation project and mobilisation of the roll out. Our plan targets installation of all 30 fixed microgrids over the remaining four years of the price control period to 2028. Subject to successful trials we expect this to be achievable. We will monitor security of supply on our targeted circuits in the period prior to deployment.
- **Availability of storage:** In line with Ofgem guidance we will only use storage for the purpose of enhancing the resilience of the network to deliver a solution where the supply of power remains continuous in the event of an upstream fault as well as serving as an option for security of supply. We will explore market offerings to assist with the operation of microgrids to achieve the most efficient solution. As part of our NIA project we are seeking to demonstrate to the market that resilient microgrids are a viable and necessary solution and thereby create interest in market solutions being offered. At present this market does not exist, and without a demonstration through our NIA project, a demonstrated technical solution is unlikely to develop.
- **Wider supplier availability:** Likely equipment suppliers have been or are being identified in the MicroResilience project, although this will be subject to tender.

Proposed arrangements for clawback of CVP rewards in the event of non-delivery

In the event of non-delivery, we propose a linear pro-rata clawback of any CVP rewards based on the number of micro-grids not delivered during the period against the 30 targeted.

Why should NPg deliver this?

We are uniquely placed to deliver these microgrid solutions as we have the duty to operate the device that keeps the electricity supply flowing. Market participants will be key to successful delivery for example with the opportunity to own the storage devices which support the microgrid.

Currently only NPg and SSE are formally conduct this activity through ongoing NIA projects with relatively high levels of rural network driving the requirement for these solutions. Our focus has been on smaller, localised microgrid solutions whereas SSE have focussed on the HV network.

Justification – beyond Ofgem minimum requirements, business as usual and additional value to consumers

Our proposal has the potential to demonstrate that microgrids are a viable solution across the industry and tests the concept of a step change for electricity distribution. It therefore goes beyond minimum requirements and business-as-usual.

Microgrids provides a solution that goes beyond traditional customer interruptions (CI) and customer minutes lost (CML) to deliver improvements in underlying, customer focused reliability. Minor interruptions in supply can cause services provided by other sectors to experience longer inconveniences, e.g. restarting the broadband connections. Our solution therefore offers a blueprint for improved performance for other sectors who rely on the supply of electricity.

Plan impact

Microgrids is a whole systems CVP however delivers benefits that cut across our plan:

Decarbonisation	EAP	Safety	Reliability	Asset resilience	Climate resilience	Physical and Cyber resilience	Customer Service	Vulnerable customers	Our Communities	Connections	Openness and Transparency
●	◕		◕	◑		◑	◑	◑	◔	◕	◔

Figure 8: Mapping to plan areas

Further information

Further information on this proposition can be found within Whole Systems annex.

Assuring our CVPs: SROI modelling – Sia partner audit results

At draft submission we used the Social Return on Investment (SROI) framework to demonstrate the value of our Consumer Value propositions (CVPs).

In order to ensure we were able to provide Ofgem with assurance that our CVP valuations were independently modelled, we engaged Sia Partners to complete SROI modelling for our CVPs, with the exception of our vulnerable customer application which was modelled by Frontier Economics.

We continued to use this framework and refined our inputs for final submission.

The refinements we have made since draft submission have been completed by Northern Powergrid, to update for timings of costs and/or benefits, underlying assumptions and updating proxy information to align with industry standards.

Ofgem encouraged use of the SROI tool to ensure that the valuation framework was applied consistently across DNOs and so they would be able to compare CVP proposals. Since draft submission, DNOs have been working together as part of a working group to provide Ofgem with additional assurances that the joint approach is delivering consistent approaches.

Sia Partners were chosen by the working group to assess the application of the framework by the DNOs. An audit was completed of the following:

- That the framework has been applied consistently;
- That CVP modelling has used the same up-to-date proxies, applied in the same manner; and
- That CVP modelling is broadly consistent for similar initiatives

The DNO working group were responsible for selecting Sia Partners. We raised a potential issue with independence as Sia completed three of the four valuations of our CVPs. This was considered not to be an issue as the purpose of the audit was to cross-check and calculate valuations *across* DNOs and not to review the actual work undertaken.

As a result of the audit, Sia partners provided us with a set of recommendations to update our CVP modelling and supporting information based on our draft submission, or justify why no changes had been made from their recommendations.

We have set out below how we have responded to the points raised by the audit:

CVP	Sia Recommendation	Norther Powergrid response
CVP 1 – Vulnerable customer application	Consider providing more detailed qualitative information about the baseline situation and how the app will deliver the impact described.	**Addressed:** Additional detail included in 'What is our App and what will it do?', 'How will we roll it out in the 2023-28 period?'. User personas added to demonstrate practical impacts for different customer groups.
	Provide rationale for the 5% deadweight applied to each of the benefits.	**Addressed:** Rationale included in CVP modelling summary annex for each of the benefits we have identified for the application
	Provide evidence or source justifying the assumption that 1% of customers will switch tariffs and reduce energy consumption with the use of the App	**Addressed:** Rationale included in CVP modelling summary annex for each of the benefits we have identified for the application
	Either adjust the values of optimism bias to match the Proxy Bank or provide an explanation as to why different values have been used.	**Addressed:** Justification for the values used for optimism bias have been included in CVP modelling summary annex

CVP 2 – Open Insights	Consider providing more detailed qualitative information about the baseline situation and how the initiative will deliver the impact described.	**Addressed:** Additional detail included in sections 'What is our App and what will it do?' and 'How will we roll it out in the 2023-28 period?'. User personas added to demonstrate practical impacts for different customer groups.
	Provide evidence on where the population estimates came from, and why they are reasonable, and ensure the percentage uptake and the number of major connections are consistent across the model and the final business plan.	**Addressed:** For each type of major connections customer we have profiled the projected use of the tool by connection type, based on the forecasted increase in connection requests in the 2023–28 period. The projected up-take of AutoDesign has then been then applied to each connection type to determine the value. Details of these assumptions can be found in CVP modelling summary annex. We also updated the connection types since draft submission and since the Sia audit to more accurately capture the availability of the tool, relevant to each of the connection types that will benefit.
CVP3 – Voltage Optimisation	Consider providing more detailed qualitative information about the baseline situation and how the initiative will deliver the impact described.	**Addressed:** This is included in sections 'What is our App and what will it do?' and 'How will we roll it out in the 2023-28 period?' . User personas added to demonstrate practical impacts for different customer groups.
	Explain the two-year lag applied to the model.	**Incorrect understanding:** This has been interpreted incorrectly – there is a one year lag, which is in fact a part year lag. When modelling the value we have looked only to measure a full year of benefit and not part years. This is explained in more detail in section 'How will we roll it out in the 2023-28 period?' within the voltage optimisation CVP section
	Align values presented in the business plan with the values used in the model, namely the targeted number of substations.	**Addressed:** To enhance and simplify the presentation, rollout metrics are now shown as customer numbers (not substations).
	Provide evidence on the efficiency of the voltage optimisation model over time to justify no drop off throughout ED2.	**Addressed:** Once the technology has been roll-out onto the network it will continue year on year to deliver the modelled financial savings with material no drop off expected over the course of the next 10 years. The carbon benefit will drop off as the carbon intensity factor falls, however given that we have not claimed any benefit in relation to this then this does not impact our drop off assumption.
	NPg has reduced the overall benefit claimed (by subtracting carbon benefits from the financial benefits). While this is an ultra-conservative approach, we recommend adding this value back in (as both benefits can be fully measured) to align with other DNOs.	**No change made:** We maintain this position. As the carbon benefit is already factored into the financial saving[25], we do not propose to double count the benefits. The quoted financial savings are therefore based on unit energy costs (inclusive of carbon pricing), and we separately quote the carbon benefits in terms of volume of carbon.
		Addressed: Ofgem has updated their CBA

[25] Specifically, the unit energy costs borne by our customers include emission trading costs (i.e. the traded cost of carbon) already.

	When estimating the value of reduced carbon emissions, consider using most recent values from Ofgem's CBA spreadsheet (v5.0) for the carbon price.	template since the modelling was completed for draft submission and so an outdated version had been used. The most recent value from the Ofgem CBA has been used for final submission. The difference was immaterial.
CVP 4 - Microgrids	Consider providing more detailed qualitative information about the baseline situation and how the initiative will deliver the impact described.	**Addressed:** This is included in sections 'What is our App and what will it do?' and 'How will we roll it out in the 2023-28 period?'. User personas added to demonstrate practical impacts for different customer groups
	Provide details on how the microgrid numbers translate into customers benefitting.	**Addressed:** This is included in section 'Distributional impacts on customers'. Approximately 50 customers per secondary substation.

Table 17: Sia partners audit recommendations

Sia partners will be providing an external assurance letter, signed by Sia Partners providing detail and assurance of the modelling within each DNOs CVPs.

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