Annex 1.6
CVP Modelling Summary

Northern Powergrid: our business plan for 2023-28

Annex 1.6

CVP modelling summary

We have used the industry-wide Social Return on Investment tool to estimate the consumer value in our Consumer Value Propositions

Annex 1.5 Detail on our CVPs shows the CVPs contained within our plan. When estimating the consumer value of these we have looked to quantify the benefits in order to determine the monetised benefit to consumers using the Social Return on Investment tool. At draft submission the benefits were independently modelled using either Frontier or Sia.

- CVP1: One-stop App solution for vulnerable customers, modelling completed by Frontier;
- CVP2: Self-service analytics toolkit, modelling completed by Sia partners;
- CVP3: Dynamic voltage optimisation for domestic energy efficiency, modelling completed by Sia; and
- CVP4: Phase 1 rollout of next generation energy system, modelling completed by Sia.

Since draft submission as we have refined our propositions we have have altered the data inputs manually to reflect updates to the costs and phasing of benefits. We have therefore updated the valuation summary slides, initially completed by Sia, to reflect these changes, with the exception of the vulnerable customer application where Frontier made the necessary amendments.

Our valuations have been independently audited by Sia partners as part of a wider DNO working group to give Ofgem greater assurance on the consistency of the SROI framework, details can be found in Annex 1.5 Detail on our CVPs.

28 October 2021

VULNERABLE CUSTOMER BENEFITS ESTIMATION

Frontier Economics has been asked to estimate the potential benefits of Northern Powergrid's proposals for vulnerable customers at ED-2, using the Social Value Measurement Framework, developed by SIA Partners. This note summarises the key assumptions we have inputted to the SIA Partners Framework.

Overview of results

Figure 1 summarises the overall results of our estimation alongside the key assumptions.

Figure 1 Overview of results

Category	NPV	Notes
Customer app	£3.3m	This includes: ▪ 75,000 per year downloading the app per year, equivalent to c30% of the c900,000 PSM customers contacted over the four year period[1] ▪ 8.5% of those downloading the app benefiting from a reduction in stress during outages (£35 per customer per year, as estimated by the proxy bank value for 'reducing stress during an outage'). ▪ 5% of those downloading the app benefiting from feeling more in control of their lives (£82 per customer per year as estimated by the proxy bank value 'Customers feel in better control of their lives'). ▪ 1% of those downloading the app benefiting from supplier switching (£250 per customer per year, as estimated by the proxy bank value 'Average savings from switching supplier'[2]). ▪ 1% of those downloading the app making behavioural changes in response to energy efficiency advice (£102 per customer per year, based on Northern PowerGrid's energy efficiency calculations across a range of household interventions). ▪ 30% of customers that download the app will delete it each year.

Note: N/A indicates activities which are currently not costed and therefore cannot be presented in NPV.

Social Value Measurement Framework Modelling

Frontier Economics has used the Social Return on Investment (SROI) model that has been developed by SIA partners. We have not made any changes to this model.

Our role has been to input data into this model, to estimate the benefits of Northern Powergrid's actions to support vulnerable customers.

- Where data is unavailable, we have made assumptions (e.g. on take up and drop off rates). Throughout, we have aimed to make conservative assumptions.
- Assumptions on the 'value' of particular interventions are made based on a set of 'proxies' that have been standardised for use across the DNOs. These set of assumptions are known as the 'proxy bank'. This proxy bank was developed by Sia Partners.
- Included in the model is a function called 'optimism bias' – this is a mechanism where we can reduce the assumptions if we consider them to be overly optimistic. The 'proxy bank' has a recommended optimism bias, although we generally make more conservative assumptions.
- We have set the model to estimate benefits using a price base of 2020/21. We have not made any adjustments to the price base calculations. We have also assumed that all Northern Powergrid cost estimates are in a price base of 2020/21.

[1] i.e., 900,000 customers contacted over 4 years represents 225,000 customers per year, with 75,000 (30%) per year assumed to download the app.

[2] We have revised down the explicit proxy bank value provided in the June 2021 SROI to reflect subsequent change in the value of this benefit provided in the underlying source. This amounts to a decrease in proxy bank value from £350 to £250, driven by changes in market conditions.

- The actual benefits realised from each programme will be driven by its detailed design. All assumptions are therefore highly indicative.

Assumptions

Customer App

This category of benefit relates to the following:

1. Give our vulnerable customers more choice in how they engage with us by creating a fully digitised 'one-stop-solution' by 2024/25 to enable a more accessible, faster and convenient route to contact us and access our services. This will also free up capacity for a more responsive telephone-based service for those who prefer it (VN1.3)
2. Deliver proactive communication during supply interruptions utilising digital channels where we can (VN2.2)

We have taken the conservative approach of estimating the benefits over four years only (beginning in Year 2), on the basis that significant investment may be required on the app after five years, and there are unlikely to be any benefits in the first year, while the app is being developed.

Key assumptions are set out in Figure 2.

Figure 2 Key assumptions: App

Value	Assumption	Sources
Customer numbers	75,000 additional customers per year for four years, for a total of 300,000	There are 936,631 customers on the PSR[3]. Of these, approximately 572,000 are digitally contactable by Northern Powergrid (via email or mobile phone) . An online survey carried out by Northern Powergrid found that 71% of customers would be 'somewhat' or 'very' likely to use the 'all in one' app. We applied this percentage to those customers that are digitally contactable. To be conservative, we assume 25% of those customers won't sign up in reality, leaving a total of around 33% of vulnerable customers downloading the app by the end of ED2. This is just over 76,000 customers a year, we assume slightly less at 75,000. We have also assumed that 30% of those taking up the app delete it each year[4].
Costs	£1,050,000 in year 1 £210,000 in years 2-5 (£1,890,000 in total)	Northern Powergrid, Draft ED2 Business Plan

[3] Based on page 3 of Northern Powergrid's 2019-2020 Stakeholder Engagement and Customer Vulnerability Incentive report, Part 3 on Supporting our Vulnerable Customers.

[4] The 'drop-off rate' represents the annual average rate of attrition throughout a year, which we assume to be 30%based on the following sources:

https://www.statista.com/statistics/892975/highest-uninstall-rate-app-categories/

https://www.businessofapps.com/news/mobile-app-uninstall-rate-after-30-days-is-28-according-to-appsflyer/

https://www.singular.net/blog/app-uninstall-rates-and-coronavirus-lockdown-is-bad-for-retention/

The first two links suggest uninstall rates within the first month are about 25-30%, and the third suggests uninstall rates were 36% over a period of 16 months. So we have used a rough estimate of about 30% of people uninstalling every year.

Value	Assumption	Sources
Reduction in stress during an outage	£35 per person ■ Success (how many will receive benefit): 8.5% ■ Deadweight (what would have occurred anyway): 5% ■ Drop off (% of benefit lost each year): 30% ■ Attribution (what % did NPg contribute?): 100% ■ Optimism bias: 0%	■ Value of benefit in the proxy bank is based on the average cost of a stress management course[5] ■ Success rate: c.10% of PSR customers experienced an outage over 1 hour in 2020/21, based on a figure of 112,844 out of c.1m PSR customers. We assume a 15% reduction in supply interruption (as per business plan assumptions on long term supply interruptions) applied equally across PSR customers. Therefore, 8.5% of PSR customers experience outages in this period. ■ Deadweight: high level assumption ■ Drop off rate assumes a proportion of customers will delete the app each year. ■ Attribution rate assumes NPg was wholly responsible for this effect. ■ Optimism bias: we have adopted the proxy bank suggested value of 0%.,
Savings from switching supplier	£250 per switch, applied to all customers each year, since the customers that realise the benefit from the app in one year will continue to realise the benefits in future years (they will become switching customers) ■ Success (how many will receive benefit): 1% ■ Optimism bias: 5% ■ Deadweight (what would have occurred anyway): 13% ■ Other assumptions as above	■ Value of benefit: based on average savings from switching supplier in 2021[6] (as per underlying source for the proxy bank value for 'Average savings from switching supplier') ■ Success rate: given the aim of the app is not primarily focused on switching, we consider the proportion of customers persuaded to switch from the app to be quite low. We also assume a relatively small number (1%) of customers will switch based on the app[7]. ■ Optimism bias: we have adopted the proxy bank suggested value of 5%. ■ Deadweight: This parameter value reflects the average annual proportion of electricity meter points which switched supplier in 2020. We calculate this at 13%[8]. Given that vulnerable customers may have a lower propensity to switch, we consider this to be a conservative estimate.
Savings from energy efficiency advice	£101.50 p.a. per household that follows advice ■ Success (how many will receive benefit): 1% ■ Deadweight: (what would have occurred anyway): 8% ■ Attribution (what % did NPg contribute?): 100% ■ Optimism bias: 10% ■ Other assumptions as above	■ Value of benefit is based on NPg energy efficiency analysis, specifically focused on behavioural changes (i.e. savings derived from actions that don't require up-front costs). ■ Success: the value of the benefit already accounts for some assumptions around take-up rate of the customer app.assume a relatively small number (1%) of customers will take this advice based on the app[9] ■ Deadweight: BEIS' Household Energy Efficiency Statistics shows that 8% of UK households (c2.3m) have adopted 'ECO scheme' measures as of June 2021. We have therefore taken the deadweight assumption for this benefit to 8%, reflecting the proportion of PSM customers expected to already be adopting similar efficiency measures. Given that vulnerable customers may have a lower propensity to adopt energy efficiency measures, we consider this to be a conservative estimate. ■ Optimism bias: This benefit is not provided for by the proxy bank and we have therefore adopted a conservative high-level assumption.

5 https://www.reed.co.uk/courses/stress-management

6 https://www.energyscanner.com/how-much-can-i-save-by-switching-my-energy-supply/

7 Evidence suggest that 5% of customers signed-up to auto switching services in 2020 (Ofgem, 2020 Consumer Survey). We consider that this represents a customer segment that is both engaged in the market and makes use of digital/online tools. We therefore take 5% to be a reasonable upper-bound on the engagement of customers with a digital app. Our central assumption of 1% uptake is therefore conservative in order to reflect PSR customer's lower propensity to engage in energy markets.

8 Switching data is taken from Ofgem's retail market indicators data portal. Meter point data is taken from BEIS' quarterly updates on smart meter roll-out.

9 Evidence suggest that 5% of customers signed-up to auto switching services in 2020 (Ofgem, 2020 Consumer Survey). We consider that this represents a customer segment that is both engaged in the market and makes use of digital/online tools. We therefore take 5% to be a reasonable upper-bound on the engagement of customers with a digital app. Our central assumption of 1% uptake is therefore conservative in order to reflect PSR customer's lower propensity to engage in energy markets.

Value	Assumption	Sources
Customers feel more in control of their lives	£82 per person ■ Success (how many will receive benefit): 5% ■ Deadweight (what would have occurred anyway): 5% ■ Drop off (% of benefit lost each year): 30% ■ Attribution (what % did NPg contribute?): 100% ■ Optimism bias: 5%	■ Value of benefit comes from the proxy bank and represents the cost of a program designed to increase health and well-being[10]. ■ Stakeholder research suggests that good communication in relation to outages is very important. ■ The proxy bank value is based on 'Cost of a program designed to increase health and well-being in the workplace'. We note that this does not have a direct read across to the benefits of the app, and therefore should be considered a highly indicative estimate of the benefits. ■ Deadweight: high level conservative assumption. ■ Optimism bias: we have adopted the value suggested by the proxy bank.

[10] https://www.pssru.ac.uk/pub/uc/uc2018/sources-of-information.pdf

CVP2: Open Data

Activity: Our free online platform, Open insights, will unlock value for our customers on top of our open data platform. It will bring together the data and tools which customers require to self-serve their needs from the energy network, removing costs and bottlenecks from network planning to accelerate mass low carbon technology (LCT) deployment.

BENEFITS

1. Major Connections

Through new AutoDesign functionality, major connections customers will save money in avoided fees and NPg will save costs in avoided Designer time.

MODEL RESULTS

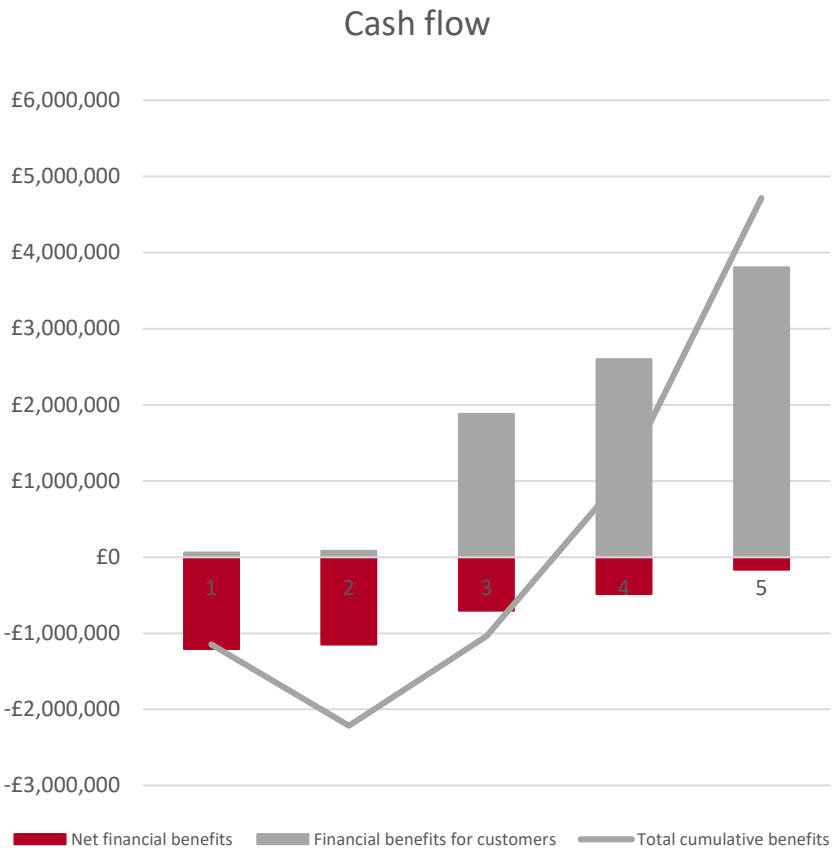
Total Cost = **£6.7m**

Total Gross Present Value = **£10.5m**

Social Return on Investment = **£0.81 for every £ spent**

NPV = £4.7m

5-year



CVP2: Open Data – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Major Connections – Reduced Designer costs	• Each major works connection managed through AutoDesign will save 4 hours of Designer time • Each hour of Designer time costs £38.95 • Designer time saved = 4 hours/connection * £38.95/hour = £155.80 / connection	NPg estimates the following additional use of AutoDesign major works connections for the ED2 period (2023/24 – 2027/28): • ECGS1A <1MVA (256, 359, 471, 593, 831) • ECGS3A (-, -, 2,350, 3,436, 5,444) • SLC15 1A LV (-, -, 479, 553, 634) • ECGS1B 1MVA+ (-, -, -, 70, 99) • ECDGS1A <1MVA (-, -, 20, 25, 35) • ECDGS1B 1MVA+ (-, -, -, 98, 137) • ECDGS3A (-, -, 54, 68, 95) • SLC15 1B LV demand (-, -, 9, 10, 11) This is based on estimated uptake for each major connection type	Northern Powergrid payroll costs

CVP2: Open Data – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Major Connections - Avoided fees cost - ECGS1A <1MVA	• Cost of COE fee is £240 per connection • Assumption is that all major works ECGS1A < 1MVA connections that use AutoDesign will benefit from the saving of the entire fee • Drop-off: 100%	• NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): ECGS1A <1MVA = (256, 359, 471, 593, 831) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees
Major Connections - Avoided fees cost - ECGS3A	• Cost of COE fee is £660 per connection • Assumption is that all major works ECGS3A connections that use AutoDesign connections will benefit from the saving of the entire fee • Drop-off: 100%	• 'NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): ECGS3A = (-, -, 2,350, 3,436, 5,444) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees
Major Connections - Avoided fees cost - SLC15 1A LV	• Cost of COE fee is £610 • Assumption is that all major works SLC15 1A LV connections that use AutoDesign will benefit from the saving of the entire fee • Drop-off: 100%	• NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • SLC15 1A LV = (-, -, 479, 553, 634) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (55%, 60%, 65%, 70%, 80%)	Northern Powergrid CoE fees

CVP2: Open Data – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Major Connections - Avoided fees cost - ECGS1B 1MVA+	• Cost of COE fee is £300 per connection • Assumption is that all major works ECGS1B 1MVA+ connections that use AutoDesign will benefit from the saving of the entire fee • Drop-off: 100%	• NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • ECGS1B 1MVA+ = (-, -, -, 70, 99) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees
Major Connections - Avoided fees cost - ECDGS1A <1MVA	• Cost of COE fee is £300 per connection • Assumption is that all major works ECDGS1A <1MVA connections that use AutoDesign connections will benefit from the saving of the entire fee • Drop-off: 100%	• 'NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • ECDGS1A <1MVA = (-, -, 20, 25, 35) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees
Major Connections - Avoided fees cost - ECDGS1B 1MVA+	• Cost of COE fee is at least £440 • Assumption is that all major works ECDGS1B 1MVA+ connections that use AutoDesign will benefit from the saving of the entire fee • Drop-off: 100%	• NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • ECDGS1B 1MVA+ = (-, -, -, 98, 137) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees

CVP2: Open Data – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Major Connections - Avoided fees cost - ECDGS3A	• Cost of COE fee is £840 per connection • Assumption is that all major works ECDGS3A connections that use AutoDesign will benefit from the saving of the entire fee • Drop-off: 100%	• NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • ECDGS3A = (-, -, 54, 68, 95) • The numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (15%, 20%, 25%, 30%, 40%)	Northern Powergrid CoE fees
Major Connections - Avoided fees cost - SLC15 1B LV demand	• Cost of COE fee is £610 per connection • Assumption is that all major works SLC15 1B LV connections that use AutoDesign connections will benefit from the saving of the entire fee • Drop-off: 100%	• 'NPg estimates the following additional use of AutoDesign (major works) connections for the ED2 period (2023/24 – 2027/28): • SLC15 1B LV = (-, -, 9, 10, 11) • ThiThe numbers above were calculated by estimating a % of AutoDesign uptake for each year and multiplying this by the total number of major connections expected. The % uptake for AutoDesign used was: (55%, 60%, 65%, 70%, 80%)	Northern Powergrid CoE fees

CVP3: Voltage Optimisation

Activity: Optimise network voltage to improve behind-the-meter energy efficiency resulting in reduced bills for customers and reduced carbon emissions

BENEFITS

1. Reduced electricity bills

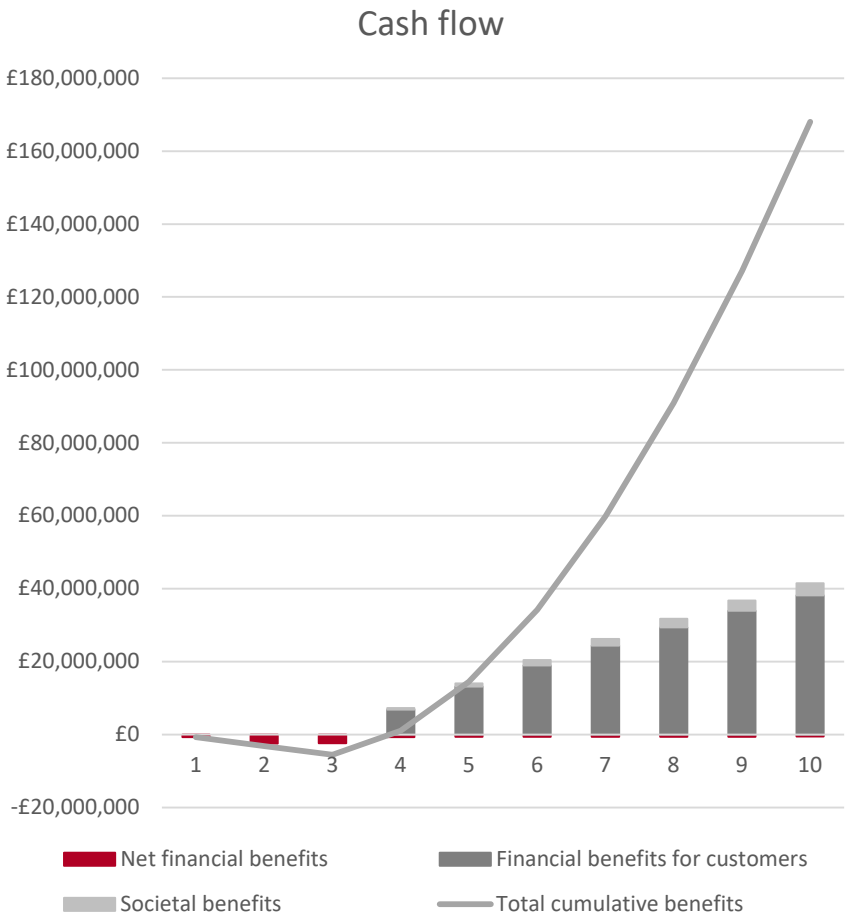
Financial benefit to customers connected to the network due to reduction in consumption equivalent to £20 per customers per year

2. Reduced carbon emissions

Societal benefit due to reduction in consumption. This value was subtracted from the benefit above to avoid double counting

MODEL RESULTS

5-year	10-year
Total Cost = **£7.9m**	Total Cost = **£12.2m**
Total Gross Present Value = **£21.4m**	Total Gross Present Value = **£178.0m**
Social Return on Investment = **£2.11 for every £ spent**	Social Return on Investment = **£16.84 for every £ spent**
NPV = £14.5m	**NPV = £168.0m**



Note the societal benefits (reduced carbon emissions) are deducted from the financial benefits to avoid double counting

CVP3: Voltage optimisation – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Reduced electricity bills*	• Trials for conservation voltage reduction (CVR) show that 1% voltage reduction leads to 1% consumption reduction • Internal NPg data shows that customers receive voltages above 240v. • NPg aims to deliver an optimum of 230v, which equates to a 4% voltage reduction. • 4% voltage reduction would result in a 4% reduction in consumption • Typical consumption values from Ofgem (Profile Class 1 - Medium) = 2,900kWh • Average electricity cost North East = 16.9p/kWh 4% * 2,900 kWh = 116 kWh 116 kWh * 16.9p/kWh = £20 per customer per year	• Based on trials, this saving will apply to all domestic/LV customers that consume energy from the network. • NPg will target 55 substations per year, reaching 438 (80% of all substations) by 2032/33 • Estimate of 7,121 customers per substation 55 * 7,121 =391,655 customers per year 438 * 7,121 = 3.12m customers by 2033/34 • Roll-out of equipment will commence in 2025/26 with a one year lag for the benefit to be realized (first year of benefit is 2026/27)	• CVR reduction estimates: Electricity Northwest, Smart Street, HV and LV Voltage Configuration Optimisation Study (2018) & Northern Powergrid, Boston Spa Energy Efficiency Trial Literature Review (2021) • Average electricity cost: DBEI, Average variable unit costs and fixed costs for electricity for UK regions Annual Data 2020 (2021)

* Reduced carbon emission benefit values were subtracted from this benefit to avoid double counting
** Roll-out profile modelled in most conservative options

CVP3: Voltage optimisation – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Reduced carbon emissions	• Trials for conservation voltage reduction (CVR) show that 1% voltage reduction leads to 1% consumption reduction • Internal NPg data shows that customers receive voltages above 240v. • NPg aims to deliver an optimum of 230v, which equates to a 4% voltage reduction. • 4% voltage reduction would result in a 4% reduction in consumption • 2023 Example: UK Electricity emissions 2023 = 0.237043 CO2e/kWh 4% * 2,900 kWh = 116 kWh reduction in consumption 116 kWh * 0.237043 kgCO2/kWh = 27.4kg CO2e per customer per year • Traded carbon yearly prices used 2023 Example: Traded carbon price (£/t 2020/21 prices) 2024: £43.49/ton 0.0274 t CO2e * £35.67/ton = £1.19 per customer	• Based on trials, this saving will apply to all domestic/LV customers that consume energy from the network. • NPg will target 55 substations per year, reaching 438 (80% of all substations) by 2032 • Estimate of 7,121 customers per substation 55 * 7,121 =391,655 customers per year 438 * 7,121 = 3.12m customers by 20233/34 • Roll-out of equipment will commence in 2025/26 with a one year lag for the benefit to be realized (first year of benefit is 2026/27)	• Traded carbon price: BEIS, Updated short-term traded carbon values used for UK public policy appraisal (2018) • UK Electricity Conversion Factor: Ofgem CBA Template RIIO2

CVP4: Microgrids

Activity: Roll-out microgrid technology to 30 of the most vulnerable LV networks on a fixed basis to improve reliability of service

BENEFITS

1. Avoided costs (Deferred investment)

Due to deferred reinforcement as a result of microgrid roll-out

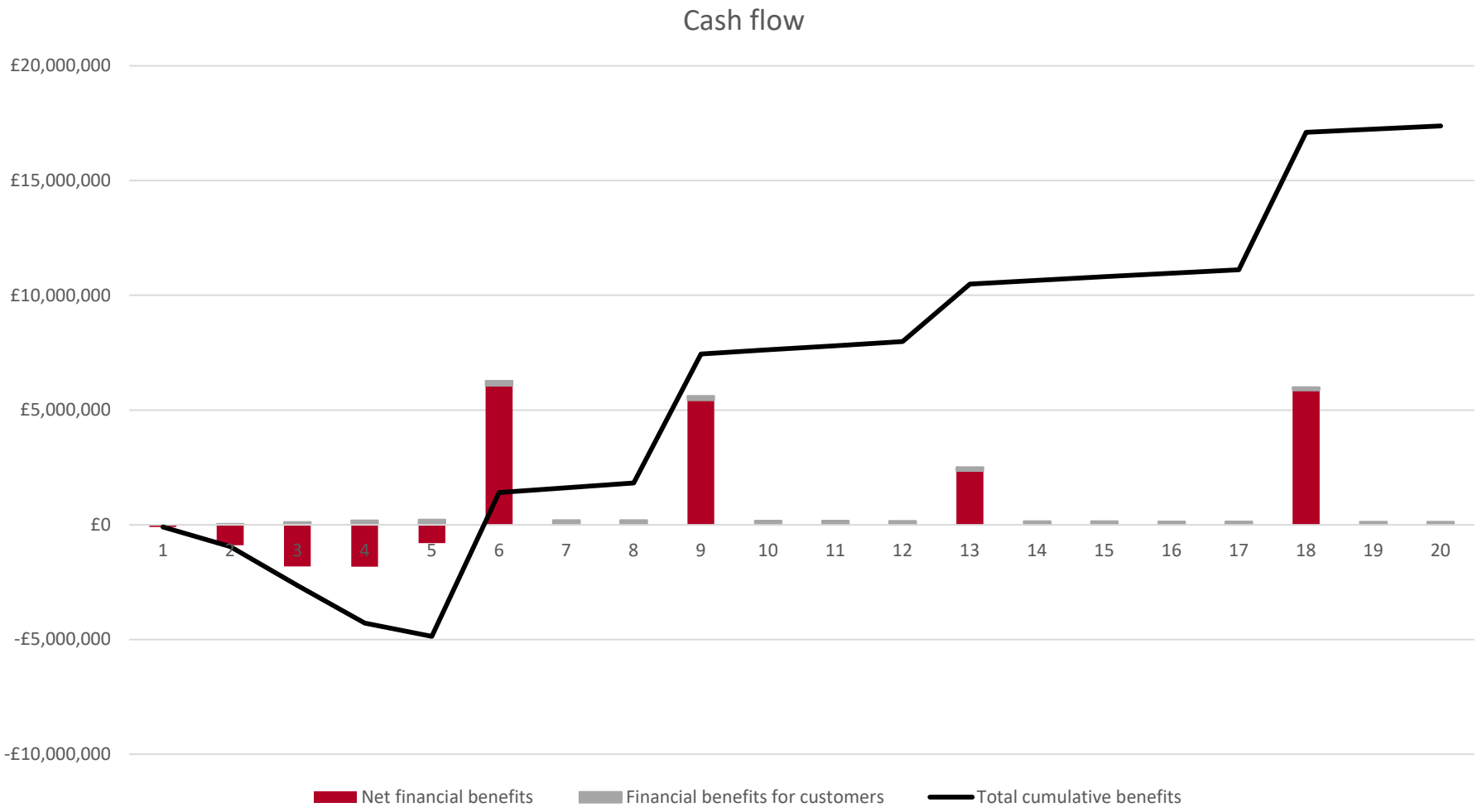
2. Societal benefits to customers (VoLL)

Measured as the Value of Lost Load per microgrid, based on substation outage data

MODEL RESULTS

5-year	10-year	20-year
Total Cost = **£6.3m**	Total Cost = **£6.3m**	Total Cost = **£6.3m**
Total Gross Present Value = **£0.6m**	Total Gross Present Value = **£13.1m**	Total Gross Present Value = **£22.8m**
Social Return on Investment = **-£0.89 for every £ spent**	Social Return on Investment = **£1.40 for every £ spent**	Social Return on Investment = **£3.20 for every £ spent**
NPV = -£4.9m	**NPV = £7.6m**	**NPV = £17.4m**

CVP4: Microgrids – Benefit Calculations



CVP4: Microgrids – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Value of Lost Load	**VoLL values used** •To estimate benefits associated with the Value of Lost Load the methodology and estimates developed by ENW were used to take into consideration customer segments and characteristics •Microgrids will be installed at substations which are entirely in rural locations. Therefore, the rural values for VoLLwere used: Domestic = £21,500/MWh SME = £68,500/MWh •A 74% / 26% split was used for Domestic vs SME customers. •The ENW study also identified that the VoLLincreased as the interruption time increased. •Based on the study estimates, the value increases by the following factors: •1hr or under:1.0 •1 to 6h: 1.0 •6 to 12h: 1.6 •12 to 48h: 1.83 •48hrs and above: 2.29	•Microgrids will be installed at 30 substations •They will be rolled out as follows: Year 1 = 0 Year 2 = 5 Year 3 = 10 Year 4 = 10 Year 5 = 5	VoLLvalues: Electricity North West, NIA ENWL010, Value of Lost Load to Customers Closedown report, A Network Innovation Allowance Project, 31 July 2019

CVP4: Microgrids – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Value of Lost Load – cont.	**VoLLper microgrid** To estimate a VoLLper microgrid the following process was used: •Identify worst served customers (more than 12 outages in 3 years) on substations with 40 customers or more. •Identify the outage frequency and duration for the past 5 years •Obtain an adjusted outage time per substation based on the interruption time factors •Calculate the total VoLLvalue assuming the Domestic/SME split and obtain a yearly average •Based on results across all substations in the sample, we used the 1st quartile value as a conservative estimate, which equals to £8,950.29 per microgrid per year. •This estimate acts a representative example of rural substations, that move in and out of 'worst-served' status over a number ofyears. •We assumed a microgrid lifetime of 20 years.	•Microgrids will be installed at 30 substations •They will be rolled out as follows: Year 1 = 0 Year 2 = 5 Year 3 = 10 Year 4 = 10 Year 5 = 5	VoLLvalues: Electricity North West, NIA ENWL010, Value of Lost Load to Customers Closedown report, A Network Innovation Allowance Project, 31 July 2019

CVP4: Microgids – Benefit Calculations

Benefit	Calculations assumptions	Stakeholders	Sources
Deferred reinforcement	Given current loads of feeders and the increased expected load in coming years due to uptake of LCT, reinforcement would be required to comply with P2 limits •A sample of 26 feeders was analysed where reinforcement may be required before 2050. NPg assessed the timeline of when reinforcement would be required based on the number of customers per feeder and the current and expected loads (without any intervention) •For each feeder an assessment was then made to determine how many microgrids could be installed based on substation customer numbers. It was estimated that 21 microgrids could be installed to defer reinforcement across 21 feeders. •Remaining customer numbers for each feeder (not connected to microgrid) were calculated, and these were used to determine an alternative timeline for reinforcement •The difference between this and the baseline was used to determine avoided costs. An average of £1.5M was used as a cost per reinforcement and this was extrapolated to 30 microgrids as per the expected roll-out.	Microgrids will be installed at 30 substations •They will be rolled out as follows: Year 1 = 0 Year 2 = 5 Year 3 = 10 Year 4 = 10 Year 5 = 5 •Reinforcement costs considered after roll-out is complete	NPg estimates

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