

Appendix 07.01.00 Our Consumer Value Proposition Calculation



Introduction

We describe the process that we have followed to calculate our Consumer Value Proposition (CVP) in Section 7.1 of Chapter 7 of our Business Plan. We also provide a summary table of the elements that make up our CVP. This document provides a more comprehensive view of the make up of our CVP.

Our Consumer Value Proposition ('CVP')

Our CVP includes the commitments we are making in respect of supporting local communities, ongoing engagement and building trust through our community fund and transparent business operation. It doesn't include the value of societal benefits delivered through our mains replacement or other capital investment work, despite the importance that our customers attach to safety and network reliability (it is their number one priority) on safety and network reliability. We have excluded the additional value created through these activities as they are absolutely core to our operation. Excluding this value, the total monetary value of our CVP over RIIO-2 is £825m. The cost to achieve this benefit is £236m, determining a net present value benefit of £537m. This is based on our calculations of the social return on investment delivered (£404m) and more traditional cost benefit analysis (£421m) using customers' willingness to pay value.

Our CEG have robustly challenged the process by which we have engaged in the development of our business plan commitments and at times over the ambition level implied by our commitments. In October they reviewed our latest full draft Plan and our approach to defining our CVP in far more detail. We subsequently received feedback, questions and a degree of challenge in relation to our CVP, which we have built into our final Plan and this appendix. In some cases our CEG challenged our classification of items into the CVP and in a number of cases we have removed from the overall calculation. We have included a list of items that were in our October CVP calculation but have now been removed later in this appendix.

Determining Output Commitments that represent our CVP

We have followed a two-stage process in determining which aspects of our Plan make up part of our CVP. Firstly we have used the Business Plan Guidance set out in June and again in September to classify the area of additional value that is provided by aspects of our plan. Ofgem have set out nine categories or examples against which additional value can be demonstrated and throughout our CVP we have been clear which of these categories / examples are satisfied by each aspect of the plan.

The nine categories / examples set out in the Business Plan Guidance documents are:

1. Service quality levels that are higher than existing levels and delivered at the same or lower cost.
2. Bespoke outputs in aspects of service provision that are not currently reflected in the existing framework of outputs.
3. Commitments for stakeholder engagement, which could take the form of bespoke outputs, likely to result in measurable positive outcomes for consumers.
4. Well-justified initiatives in the environmental action plan to reduce the environmental impacts of the network that will result in measurable outcomes that are valued by consumers.
5. Uncertainty mechanisms that highlight risks to consumers of which ofgem would not otherwise have been aware.
6. An innovation strategy likely to drive forward energy system thinking and address consumer vulnerability.
7. Whole system approaches likely to drive forward the industry – including proposals for data sharing.

8. Strategies and implementation plans likely to deliver positive impacts for consumers in vulnerable situations, including use of the consumer vulnerability use it or lose it allowance in gas distribution.
9. The company's commitment to an above-bau approach to sharing information and data with relevant parties to facilitate greater whole system coordination

The second stage assesses the aspects of the plan that we identified through stage 1 against the following criteria, which we believe demonstrate true additional value being provided to consumers, hence being part of our CVP:

- It must be significantly beyond minimum standards or any licence condition
- It must represent significant additional value from that provided by similar initiatives in RIIO-1
- It must offer significantly more value to consumers than is typically offered by other similar organisations
- It must be valued by consumers
- It must be quantifiable, measurable and progress against it reportable (or just reportable for qualitative benefits)

The majority of our CVP is represented by output commitments that we have built into our Plan, but also takes into account other deliverables such as our innovation strategy, approach to competition, how we are proposing to manage uncertainties and ongoing engagement activities. As detailed in the Enhanced Engagement chapter we have followed a robust process to establishing these commitments with customers, stakeholders, our employees, shareholders and have completed robust benchmarking across multiple sectors to test them.

Measuring Our CVP

We have used two different methodologies to calculate our total CVP, recognising the different types of benefit that are delivered to customers, stakeholders and our communities through our Plan. Our primary methodology is to calculate the Social Return On Investment (CVP). Where it is possible to establish this measure, we believe that this represents the most accurate, fairest and most comparable measure of CVP. Each of the assumptions we have used to determine the SROI are clearly listed and it would be relatively easy for another organisation to apply our methodology to develop make a similar calculation. We believe that using a measure that can easily be understood, transferred and compared makes our CVP more meaningful and transparent to for our customers and stakeholders.

Where it has not been possible to determine a SROI value, we have taken the results from our willingness to pay analysis (completed as part of our enhanced engagement programme) to determine a simple cost-benefit assessment. Where we could use either approach, we have used the SROI for the reasons stated above, even though the willingness to pay values are higher in all cases.

We could apply a third method by monetising the customer benefit of our proposed bespoke uncertainty mechanisms. These have been designed to protect customers from the exposure of potentially avoidable costs. We have calculated the value for these and have included them in a separate table below, although they are not included in our headline number of £825m. If we did include the CVP associated with UMs, the total CVP would be £1.03bn.

In each of our detailed CVP calculation annexes (at the end of this appendix).

What is the SROI?

Social Return on Investment (SROI) is a method for measuring value that is not commonly reflected in traditional Cost-Benefit Analyses (CBA). It includes environmental benefits (e.g. a reduction in CO₂ emissions), health benefits (e.g. a reduction in hospital visits) and financial benefits to customers (e.g. a reduction in future household energy bills).

It assigns a monetary value to the positive 'externalities' (i.e. impact) enjoyed by society which are not directly quantifiable when using a traditional CBA method. Therefore, the SROI method allows us to consistently measure and demonstrate the value of its projects in full.

We undertook our SROI calculations based on facts and figures presented in each of our Output Cases. They have used these alongside clearly referenced assumptions, where possible using HM Treasury data to allow our CVP values to be compared with others'. All of these assumptions have been detailed, along with the mathematics to calculate a SROI value in separate CVP calculation documents which are included in this appendix as annexes.

We introduced the use of an excel-based SROI tool that was custom-built with support from Sia Partners in 2018. The tool considers the following inputs:

- Reach (how many people will be affected by a given initiative)
- Financial costs (the cost to Cadent to deliver a given initiative)
- Financial benefits
- Social benefits

It then demonstrates the net benefit created for customers for each pound spent on an initiative, factoring in HM Treasury Green Book criteria.

To date, the SROI tool has been used to assess the value that will be created by Cadent's CVP projects over RIIO-2 and RIIO-3. This has allowed for the comparison of the costs and benefits (social and financial) of each project in a structured manner, permitting for informed and data-driven decisions to be made on which projects create the most value for customers.

Use of the tool has allowed Cadent to measure and plan in order to maximise the value it delivers to customers and society as a whole. The SROI also demonstrates how Cadent consciously delivers the largest possible value for the smallest possible cost to its customer base.

Our Willingness to Pay Cost-benefit-analysis model

The results of the WTP research allow us to estimate the benefit our commitments deliver to customers compared to their cost. The primary source of this information is the 'triangulated' valuation report from our WTP programme that was supported by NERA. It incorporates the results of:

- A benefit transfer (BT) report, using desk-based research
- A targeted benefit transfer study, focusing on estimating the economic value of extending the gas network to new customers
- A broad stated preference (SP) study, using survey techniques asking customers to make hypothetical trade-offs between changes in their gas bills and changes in services
- A revealed preference (RP) study focused on surveying customers about their experiences of actual gas supply interruptions

To estimate a social benefit for our commitments, we have multiplied the valuation of each level of service improvement by the number of customers. Domestic and non-domestic benefits are added together to provide an overall benefit.

Our CVP Calculation

Commitment	Deliverable	Total Cost	Total SROI Benefit	Total WTP Benefit	Total NPV / Net Benefit	Benefit description	OFGEM Category / Example
CO Awareness and Safety Plan	Total CO Plan delivered	£34.0m	£59.4m		£22.5m, increasing to £68.6m in RIIO-3	<ul style="list-style-type: none"> Avoided CO-related A&E visits Avoided CO-related hospital admissions Avoided cost of time off work due to injury Avoided CO-related deaths Avoided cost of ambulance calls Energy bill savings Reduced risk of appliance causing injury and death Avoided cost of time off work due to injury 	2,3,7,8,9
	Educate 200,000 people	£2.1m	£1m		-£0.9m, increasing to £0.4m in RIIO-3		
	Issue 3 million alarms	£22.3m	£17.4m		-£5.1m, increasing to £5.4m in RIIO-3		
	CO Interventions – service, repair and replace	£8.6m	£41.0m		£28.5m		
Fuel Poverty Plan	Total Fuel Poverty Plan Delivered	£32.6m	£102.2m		£61.3m	<ul style="list-style-type: none"> Avoided respiratory health problems Avoided GP consultations Avoided ambulance calls Avoided hospital admissions (short stay) Avoided deaths Reduced CO2 emissions 	1,2,3,7,8,9
	Provide 25k customers with advice	£3.8m	£58.2m		£48.1m		
	5,000 additional tailored interventions	£28.8m	£44.0m		£13.2m		
	New cross-industry funding arrangement in place	Non-quantifiable in monetary terms during RIIO-2					
Going beyond the meter	Never leaving a customer vulnerable without gas	£2.7m	£19.8m		£15.0m	<ul style="list-style-type: none"> Enhanced welfare Working with charity partnerships to offer services upstream of the meter 	1,2,3,8
PSR	2 million conversations	£7.8m	£8.5m		£0.6m	<ul style="list-style-type: none"> Raised awareness of additional services 	1,2,8

	to raise awareness of the PSR					<ul style="list-style-type: none"> Improved service based on additional awareness 	
Carbon Neutrality	Reduce carbon footprint from 64,000 to 0 tonnes	£55.6m	£13.4m		-£36.3m	<ul style="list-style-type: none"> Reduction in CO2 Emissions 	2,4
Our People's Emissions	Reduce employees' emissions by 5000 tonnes PA	£1m	£5.6m		£4.1m		
Off-grid communities	Connect 189 properties	£2.3m	£7.3		£4.4m	<ul style="list-style-type: none"> Reduction in fuel costs for communities Reduction in CO2 emissions (NPV benefit of switching to natural gas, measured by reduction in societal cost of fuel per customer – average of urban + rural) 	2,3,4,6,7,8
Theft of Gas	Tackling the theft of gas	£0m	£1.5m		£1.3m	<ul style="list-style-type: none"> Amount returned to customers each year Unquantifiable social and environmental benefits 	2,4,8
Community Fund	1.25% of post-tax profits to community fund	£0	£31.2m		£27.2m	<ul style="list-style-type: none"> Funds provided directly to communities @ a 1:1 ratio. We expect this to be a very conservative assumption. In reality we expect at least a 2:1 ratio of benefit delivered to costs invested 	1,2,3,4,6,8
Time bound appointments	Offer 2-hour and 4-hour timeslots for all customers	£0		£123m	£109.1m	<ul style="list-style-type: none"> Improved customer convenience Less wasted time 	2,3,6,8

						<ul style="list-style-type: none"> Reduced impact on business revenue 	
Personalising welfare facilities	Offer personalised welfare provisions for all customers in vulnerable situations	£16.3m		152.5m	£120.8m	<ul style="list-style-type: none"> Enhanced welfare to reduce impact of interruptions 	1,2,3,8
Entry capacity enablement	Reinforcement triggered by customer agreement	£83.8m		£145.8m	£51.9m	<ul style="list-style-type: none"> Charging and access review facilitated through an uncertainty mechanism to change the current arrangements 	2,3,4,6,7,9
Delivering efficiency through the plan from our innovation strategy, competition Strategy and transformation	See deliverables explained within the Innovation, Competition and Costs and Efficiencies chapters	£0	£155m		£155m	<ul style="list-style-type: none"> The combination of these three strategic initiatives will deliver efficiencies in period of £159m 	6,7,8
Total		£236.1m	£403.8m	£421.3m	£536.8m Rising to £722.5 in RIIO-3		

*The figures quoted above are total undiscounted benefits and a net present value for RIIO-2. These will not exactly match the figures in data table 5.18, which are gross present values in line with Ofgem's instructions for the table.

Other, non-quantifiable in monetary terms aspects of our CVP

Commitment	Description	Benefit (CVP)	Ofgem Category / Example
Ongoing Stakeholder Engagement	10 core commitments defined within the Stakeholder Engagement Strategy	This is essential to the delivery of all of our output commitments but in itself the benefits are very difficult to accurately quantify	2,3,6,7,8
Network related whole system thinking	Series of deliverables defined within the Whole System Thinking chapter	Related to the following outputs: <ul style="list-style-type: none"> • Connection standardisation • Optimising capacity between transmission and distribution 	7,8
Establishing and raising the bar	Defined measures for all services with customer segmentation where relevant, including a defined stakeholder measure	Established benchmarks for all of our services with improving service levels delivered over RII02	1,2,3,8
Enhanced connections service to customers	<ul style="list-style-type: none"> • 15 minute quote generation • 3-day to site visit 	<ul style="list-style-type: none"> • Easier to achieve a gas connection • High levels of customer satisfaction • More convenient and tailored service standards 	2,6,8
Minimising disruption	<ul style="list-style-type: none"> • Minimising roadworks through coordination with others and better communication • Enhanced reinstatement time commitment 	A significant priority area for customers. We believe that we will be able to quantify this through additional research into the cost per unit of disruption, but have not been able to establish a robust measure prior to our Plan submission	1,2,8
Creating a thriving environment for our people	<ul style="list-style-type: none"> • 10 commitments defined within our Trust Charter – see Chapter 7 – Our Commitments 	<ul style="list-style-type: none"> • Improved employee engagement • More females in senior positions • More senior managers from BAME backgrounds • Higher levels of capability across organisation • Lower turnover 	2
MOBs – suite of enhancements	<ul style="list-style-type: none"> • Reduced interruptions, ongoing engagement, building response plans and enhanced welfare services 	<ul style="list-style-type: none"> • Lack of availability of statistically sound data to quantify the WTP benefits • Reduced interruption volume and duration • Enhanced service levels 	1,2,3,8

Items included in our October CVP calculation that are not in our final CVP

Commitment	Description	Value	Rational for removing
6,250 free gas connections	Benefit based on willingness to pay analysis completed on our behalf by NERA	£116m	Whilst there is a considerable level of willingness to pay and a SROI for the delivery of this commitment, we agree with our CEG that as this is a continuation of an existing scheme of work, this should not be included in our CVP total
Volunteering	Based on the value added from 60% of employees volunteering for 1-day	£0.4m	Whilst 60% is typically higher than we note with other organisations, we agree with our CEG that this is core to our operation
Matched Giving	We offer every employee up to £400 of matched giving each year	£0.2m-£10m	We have not found any other organisation offering such high values (up £400 per employee per year), but we agree with our CEG that this is core to our operation
Charitable partnership	Currently Alzheimer's – we commit to at least £100k per year	£0.5m	We agree with our CEG that this is standard practice for many organisations
Zero waste	Not much more than today	£2.1m	Whilst a positive SROI was calculated, we are mainly committing to continue with good practice operated in RIIO-1
Non-MOBs Interruptions	Reducing the average duration of interruptions (with the exception of London MOB's which is included in our CVP)	Not quantified	We will be significantly improving the average interruption duration in RIIO-2, although in many cases this will put us on par or slightly ahead of other GDNs

Calculating a CVP related to our approach to managing uncertainty

We have identified a number of bespoke uncertainty mechanisms to protect customers from the exposure of additional costs that we cannot quantify with high certainty. The details of each of these bespoke UMs is contained in chapter 10 of our Plan. Whilst the Ofgem business plan guidance document suggests that “uncertainty mechanisms that highlight risks to consumers of which ofgem would not otherwise have been aware” is an example that could constitute a CVP in business plans, we have separated this aspect out of our headline figure because it is difficult to truly monetise in a consistent manner.

The value of an uncertainty mechanism to customers does not obviously lend itself to be monetised in the same way of some of outputs commitments where we have calculated a social return on investment or have clear willingness to pay data. Hence at this stage we have not included a precise monetisation in our proposition. One way the value could be calculated is to look at the value that might otherwise have needed to be forecast

into the base expenditure plan that may not have been subsequently needed if the uncertainty did not arise, For example, you could take the wither the low medium or high case estimates of the uncertainty and mutilpy this by the totoex incentive sharing factor that the customer would be faced with (e.g., 60%). This would give a range of potential values but given that this is not as robust a method as SROI or wiliness to pay, we have separated this out in our summary of the CVP and quoted an indicative range.

This is shown in the table below:

Description	Uncertainty	Mean Cost	CVP
Connections: Providing new connections at the request of customers. Supporting infrastructure growth	Uncertainty: Volume is influenced by macroeconomic factors, and future heat policy. We have assumed a minimum level in our baseline totex but there is a range of potential outcomes	£33.6m	£20.2m
Diversions: Undertaking diversions to support development and maintain network safety that are not paid for by the requestee.	Uncertainty: Volume is influenced by macroeconomic factors and site access with a number of large infrastructure scheme impacting our networks such as HS2 and Heathrow work.	£20.6m	£12.4m
Reinforcements: Undertaking general and specific reinforcements, and capacity upgrades. Maintaining the resilience of our network and delivering capacity	Uncertainty: Volume is influenced by macroeconomic factors, and future heat policy.	£62.0m	£37.2m
Obligations with respect to MOB: The Hackitt review of building regulations could drive new or further work across our MOB: assets in response to policy changes. This will be in the area of maintaining safety and network resilience	Uncertainty: The scope of requirements that may be introduced through new policy are currently unknown but could make fundamental changes to the high rise building management and requirements for our assets.	£15.2m	£9.1m
Traffic collision protection: We may be required to further Intervene across our governor assets to install traffic collision protection. Maintaining safety of our people, customers and assets.	Uncertainty: The volume will be determined by future identified risk levels which are subject to further work to assess and through HSE policy.	£15.2m	£9.1m
Pipes above safety threshold: Replacing high risk pipes above a safety threshold that are not part of the existing Iron Main Risk Replacement Programme. Maintaining network safety	Uncertainty: Volume determined by future asset health, which is challenging to forecast as dynamic	£136.2m	£81.7m
High Pressure Valves: Intervening across the HP valve population. Maintain asset safety and operability.	Uncertainty: Volume determined by future asset health, which is challenging to forecast	£21.5m	£12.9m
Lowestoft project: Interventions to address historic network health issues at Lowestoft Harbour. Maintaining safety and network resilience	Uncertainty: Optioneering still underway to conclude on the most appropriate solution. This is an atypical scheme with underwater assets and complexity	£23.7m	£14.2m
Entry charging and access review: Reviewing charging policy to	Uncertainty: A charging regime change may increase demand for entry	£83.8m	£50.3m

encourage greater connections of clean gas. This will support environmental benefits through reduced carbon impacts	connections, triggering the need for reinforcement work, volume and timing uncertain		
Total		£411.8m	£247.1m

Engaging with customers and stakeholders to define our CVP

Each of the items making up our CVP relates back to either an Output Case or a key strategy within Business Plan. In all cases, we have embarked on a comprehensive engagement process with customers, stakeholders, and where relevant our employees to develop these Output Case or strategies. The engagement has helped us to define the output commitments we have made, the options that we have assessed and ultimately the final proposals that we have made. The details of how we have engaged, who we have engaged with, the insights and feedback received and how we've used this to define our proposals can be seen in our Output Case summaries in Chapter 7 and in far greater detail in our individual Output Case appendices.

For each part of our plan we have engaged with expert stakeholders. For example, in defining the output commitments that fall under our Customer Vulnerability Strategy, we engaged with Citizens Advice, National Energy Action and over 20 organisations who support customers with a variety of additional needs. For those output commitments that fall under our Environmental Action Plan, we engaged with expert organisations such as Sustainability First, Green Peace and Green Alliance. These engagements helped us in informing where aspects of our plan have gone beyond minimum or core business standards. We used this insight when assessing each item of our CVP against the five criteria that we have set.

For several of the line items in our CVP, we used customers' willingness to pay analysis to determine the values. It was through this engagement phase (phase four of our six phase enhanced engagement programme) that we identified the value that customers allocate to the delivery of these outputs.

As we engaged so thoroughly with customers and stakeholder to define the Output Cases (and relevant strategies) in our Plan, we did not re-engage with them to play back how we calculated our CVP values. The CVP is a complex topic to engage on – it is not something that customers or stakeholders easily understand, and we would only have been asking them the same questions as we did in developing the Output Cases and strategies in the first place.

Annex – Detailed CVP Calculation Documents

Page 12 - CO Education

Page 23 – CO Alarm Provision

Page 38 – CO Interventions

Page 55 – Non Gas Fuel Poor Interventions

Page 66 – Energy Efficiency and Income Advice

Page 79 – Carbon Neutral

Page 89 – Employee Emissions

Page 99 – Off-grid communities

Page 111 – Theft of Gas

Page 120 – PSR

Page 130 – Going beyond to never leave a customer vulnerable without gas

Page 141 – CVP calculations based on Willingness to Pay Analysis

Cost-Benefit Analysis of Cadent's CO Education Initiative

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 11

Initiative Overview

Initiative name

CO Education Initiative

Initiative description

Carbon monoxide (CO) is a largely undetectable poisonous gas that is produced when carbon-based fuels are improperly burned. Its release may occur when an appliance has not been fitted correctly, has been poorly maintained or if a vent or chimney is blocked. CO inhalation can result in death or other serious health problems.

Increasing public awareness of the risks surrounding CO could lead to a dramatic reduction in the number of incidents that are associated with it. As a result, Cadent has pledged to promote CO awareness as a central part of our RIIO-GD2 business plan.

As part of this, we will provide CO education to our customers. In this appendix, we analyse our final option for 200,00 people of those most at risk to be provided with CO education

Initiative beneficiaries

The main beneficiaries of the CO Education sessions are the people who attend them, and their families. This will lead to increased safety in their homes due to heightened awareness of the dangers of CO. This will include current and future customers, including those in vulnerable situations.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance. This is described for all aspects of our CVP in Appendix 07.01.00.

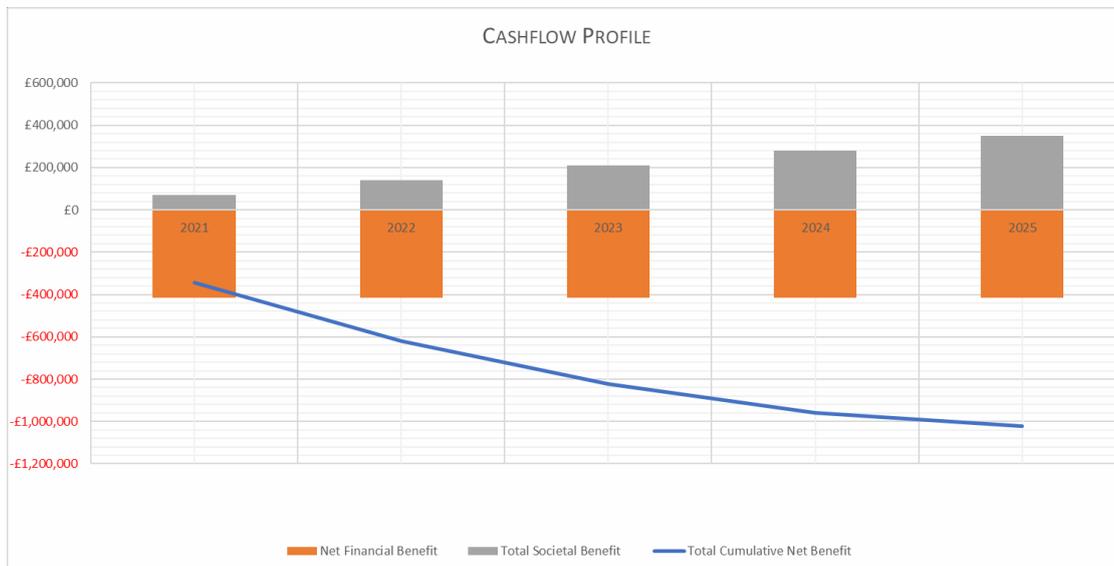
Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	Our bespoke measure in RIIO-1 was far lower and allowed for various methods of education. This proposal is for quality face-to-face education to be delivered using proven approaches developed and tested in RIIO-1
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	CO awareness is quite common, but face-to-face educational approaches are rare and we could not find any examples close to the scale that we are proposing
It must be valued by consumers	Yes	See evidence base in the Output Case document
It must be quantifiable, measurable and progress against it reportable	Yes	SROI used and progress will be reported annually

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	CO Education
RIIO-2 costs	£2,070,680.00
RIIO-2 benefits	£1,047,327.94
RIIO-2 NPV	-£912,362.00
RIIO-2 net benefit per £ spent	-£0.50

Cashflow Profile



Residual benefits

	CO Education
Total NPV (incl. benefits realised in RIIO-GD3)	£414,795.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £1,745,546,56.
- This would increase the total NPV of this project to £414,795.

Summary of Proxies and Probabilities

List of all costs and benefits associated with CO education, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	CO Education	Per person	£10.35	The cost to Cadent per person educated.	n/a	n/a	n/a
Social benefits	Avoided CO-related A&E visit	Event	£134.00	The average cost of outpatient attendances in the UK (2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00575%	Cadent calculation (see pages 7-8).
	Avoided CO-related hospital admission (long-term stay)	Event	£3,026.00	The average cost of a non-elective inpatient stay (long stay) in the UK (2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00027%	Cadent calculation (see page 8).
	Cost of time off work due to injury	Event	£233.76	The annual cost to Great Britain (2016/2017) of taking time off work due to injury, divided by the population (2017).	Cadent calculation (see pages 8-9).	0.00027%	Cadent calculation (see pages 8-9).
	Avoided CO-related death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.00004%	Cadent calculation (see page 9).
	Avoided ambulance call	Event	£250.00	The average cost of an ambulance call (see, treat and convey) in England (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00575%	Cadent calculation (see pages 9-10).

Financial Cost - Benefit Analysis

Financial Costs

The estimated cost to Cadent to educate those most at risk to the dangers of CO is £10.35 per person educated. These costs, and therefore the number of customers who receive advice on an annual basis are spread evenly over GD2.

Educate 200,000 people

Cadent will incur a financial cost of £2,900,000 for this initiative.

	Name	2021	2022	2023	2024	2025
Financial costs	Provision of CO Alarms	£414,136.00	£414,136.00	£414,136.00	£414,136.00	£414,136.00
	Total financial costs per year	£414,136.00	£414,136.00	£414,136.00	£414,136.00	£414,136.00

- The current cost for Cadent to provide CO education to 200,000 customers is £2,070,680 over a 5-year period.
- This equates to an annual cost of £414,136.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of educating 200,000 people about the dangers of CO. In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is 0% because the expected benefits will not decrease over time. It is important to note that in addition to the probability of the benefit being delivered itself (which is detailed in this section), an additional probability of 80% has been applied to each success rate. This figure was provided by Cadent – it reflects the expected retention rate of class attendees.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided CO-related A&E visit	0%	0%	0.00575%	£134.00	£740.12	£1,480.23	£2,220.35	£2,960.46	£3,700.58
	Avoided CO-related hospital admission (long-term stay)	0%	0%	0.00027%	£3,026.00	£791.21	£1,582.42	£2,373.63	£3,164.84	£3,956.05
	Cost of time off work due to injury	0%	0%	0.00027%	£233.76	£61.12	£122.24	£183.36	£244.49	£305.61
	Avoided CO-related death	0%	0%	0.00004%	£1,897,129.00	£66,848.60	£133,697.20	£200,545.81	£267,394.41	£334,243.01
	Avoided ambulance call	0%	0%	0.00575%	£250.00	£1,380.81	£2,761.62	£4,142.44	£5,523.25	£6,904.06
Total social benefits per year						£69,821.86	£139,643.72	£209,465.59	£279,287.45	£ 349,109.31

Avoided CO-related A&E visit

- On average, 4,000 people are admitted to Accidents & Emergency (A&E) each year in England due to CO poisoning.¹
- The estimated population of England is 55,619,430.²
- The percentage of the English population that may be admitted to A&E due to CO poisoning on an annual basis is equal to $(4,000 / 55,619,430) * 100 = 0.00719\%$.
- If this initiative applied to the entire population of England, then the 4,000 / 55,619,430 people who are admitted to the A&E on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO education will only benefit the attendees and their households (96,000 people per year), this proportion must be applied to the sample in question. The 80% retention rate of class attendees must also be applied – this alters the success rate to $0.00719 * 0.8 = 0.00575\%$ as indicated on the social benefits table.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related A&E visit to $96,000 * (4,000 / 55,619,430) * 80\% = 5.523$ people.
- The average cost of an A&E visit is £134.00.³ This equates to a social benefit in year one of $5.523 * 134 = £740.12$.
- The value grows cumulatively each year as an additional 96,000 people are educated per annum over GD2 and because the social benefits provided by heightened CO awareness are continuous.

Avoided CO-related hospital admission (long-term stay)

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.⁴
- The estimated population of England & Wales is 58,744,595.⁵
- The percentage of the England & Wales population that may be hospitalised due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) * 100 = 0.00034\%$.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO education will only benefit the attendees and their households (96,000 people per year), this proportion must be applied to the sample in question. The 80% retention rate of class attendees must also be applied – this alters the success rate to $0.00034 * 0.8 = 0.00027\%$ as indicated on the social benefits table.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $96,000 * (200 / 58,744,595) * 80\% = 0.261$ people.
- The average cost of a long-term hospital stay is £3,026.⁶ This equates to a social benefit in year one of $0.261 * 3,026 = £791.21$.
- The value grows cumulatively each year as an additional 96,000 people are educated per annum over GD2 and because the social benefits provided by heightened CO awareness are continuous.

¹https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

²[https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland\(2017figure\)](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland(2017figure))

³<https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁴https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

⁵[https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland\(2017figure\)](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland(2017figure))

⁶<https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

Cost of time-off work due to injury

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.⁷
- The estimated population of England & Wales is 58,744,595.⁸
- The percentage of the England & Wales population that may be forced to take time-off work due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) * 100 = 0.00034\%$.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO education will only benefit the attendees and their households (96,000 people per year), this proportion must be applied to the sample in question. The 80% retention rate of class attendees must also be applied – this alters the success rate to $0.00034 * 0.8 = 0.00027\%$ as indicated on the social benefits table.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone time-off work due to injury to $96,000 * (200 / 58,744,595) * 80\% = 0.261$ people.
- The annual cost to Great Britain (2016/2017) of taking time-off work due to injury is £15,000,000,000.⁹ The estimated population of Great Britain is 64,169,400 (2017).¹⁰ This equates to an average cost of time-off work due to injury per person of £233.76.
- Therefore, the social benefit in year one is equal to $0.261 * 233.76 = £61.12$.
- The value grows cumulatively each year as an additional 96,000 people are educated per annum over GD2 and because the social benefits provided by heightened CO awareness are continuous.

Avoided CO-related death

- On average, 30.3 UK deaths on an annual basis are caused by CO poisoning.¹¹
- The estimated population of the UK is 66,040,200.¹²
- The percentage of the UK population that may experience a CO-related death on an annual basis is equal to $(30.3 / 66,040,200) * 100 = 0.00005\%$.
- If this initiative applied to the entire population of the UK, then the 30.3 / 66,040,000 people who die from CO poisoning on an annual basis would be expected to benefit from this initiative.
- However, as the CO education will only benefit the attendees and their households (96,000 people per year), this proportion must be applied to the sample in question. The 80% retention rate of class attendees must also be applied – this alters the success rate to $0.00005 * 0.8 = 0.00004\%$ as indicated on the social benefits table.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone death due to CO poisoning of $96,000 * (30.3 / 66,040,200) * 80\% = 0.035$ people.
- The value of a prevented fatality in the UK is £1,897,129.¹³ This equates to a social benefit in year one of $0.035 * 1,897,129 = £66,848.60$.
- The value grows cumulatively each year as an additional 96,000 people are educated per annum over GD2 and because the social benefits provided by heightened CO awareness are continuous.

⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

⁸ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalescotlandandnorthireland> (2017 figure)

⁹ <http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf>

¹⁰ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/gbpop/pop>

¹¹ <http://www.co-gassafety.co.uk/wp-content/uploads/2019/01/Statistics-sheet-presspack-Jan-2019-18.01.19.pdf>

¹² <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

¹³ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

Avoided ambulance call

- We have assumed that 100% of patients who are taken to A&E due to CO poisoning are transported by ambulance. Without sufficient CO awareness, many of the initial symptoms (headache and dizziness, weakness, loss of memory) of CO poisoning would not typically inhibit a response to visit the Emergency Room. However, once the symptoms become more severe (fainting, unconsciousness), it is fair to assume that in the vast majority of cases an ambulance would be called – a potential patient suffering from severe exposure to CO would not be able to transport themselves to the A&E, and their carers would want to bring them to medical attention as soon as possible.
- Therefore, we assume that because on average 4,000 people are admitted to A&E each year in England due to CO poisoning, 4,000 people are transported to A&E in England each year via ambulance due to CO poisoning. As a result, this social benefit shares an equivalent success rate to that of an avoided CO-related A&E visit = 0.00719%.
- If this initiative applied to the entire population of England, then the 4,000 / 55,619,430 people who transported via ambulance to the A&E on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO education will only benefit the attendees and their households (96,000 people per year), this proportion must be applied to the sample in question. The 80% retention rate of class attendees must also be applied – this alters the success rate to $0.00719 * 0.8 = 0.00575\%$ as indicated on the social benefits table.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related ambulance trip to $96,000 * (4,000 / 55,619,430) * 80\% = 5.523$ people.
- The average cost of an ambulance call (see, treat and convey) is £250.¹⁴ This equates to a social benefit in year one of $5.523 * 250 = £1,380.81$.
- The value grows cumulatively each year as an additional 96,000 people are educated per annum over GD2 and because the social benefits provided by heightened CO awareness are continuous.

¹⁴ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

List of General Assumptions and Limitations

Assumption 1

- 80% of the class attendees will retain the information, apply it and share it with their immediate family members (household level).

Assumption 2

- The average household size in the UK is 2.4.¹⁵

Assumption 3

- There are no financial benefits, i.e. foregone costs to customers associated with this initiative.

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

¹⁵ <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2016>

Cost-Benefit Analysis of Cadent's CO Alarm Provision

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 11

Initiative Overview

Initiative name

CO Alarm Provision

Initiative description

Carbon monoxide (CO) is a largely undetectable poisonous gas that is produced when carbon-based fuels are improperly burned. Its release may occur when an appliance has not been fitted correctly, has been poorly maintained or if a vent or chimney is blocked. CO inhalation can result in death or other serious health problems.

Increasing public awareness of the risks surrounding CO could lead to a dramatic reduction in the number of incidents that are associated with it. As a result, Cadent has pledged to promote CO awareness as a central part of our RIIO-GD2 business plan.

As part of this, we will issue CO alarms to our customers. In this appendix, we have analysed the final option for providing 3 million alarms

Initiative beneficiaries

The primary beneficiaries of the CO Alarm initiative are the households who will receive a CO alarm. This will lead to increased safety in their homes and reduced instances of CO-related health problems. This benefit will mainly be provided to households, but will be enjoyed by all customers, including those in vulnerable situations and future customers (because of their shelf life).

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance. This is described for all aspects of our CVP in Appendix 07.01.00.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	Our bespoke measure in RIIO-1 aimed to deliver 120,000 alarms and we will deliver c150,000. Our analysis shows that by providing 3,000,000 alarms to customers without one presently will reduce the average % of households in our areas with an alarm from c.50% to closer to 80%
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	We could not find any examples of organisations providing this service at such as scale
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI measurement of value and we will report on progress each year

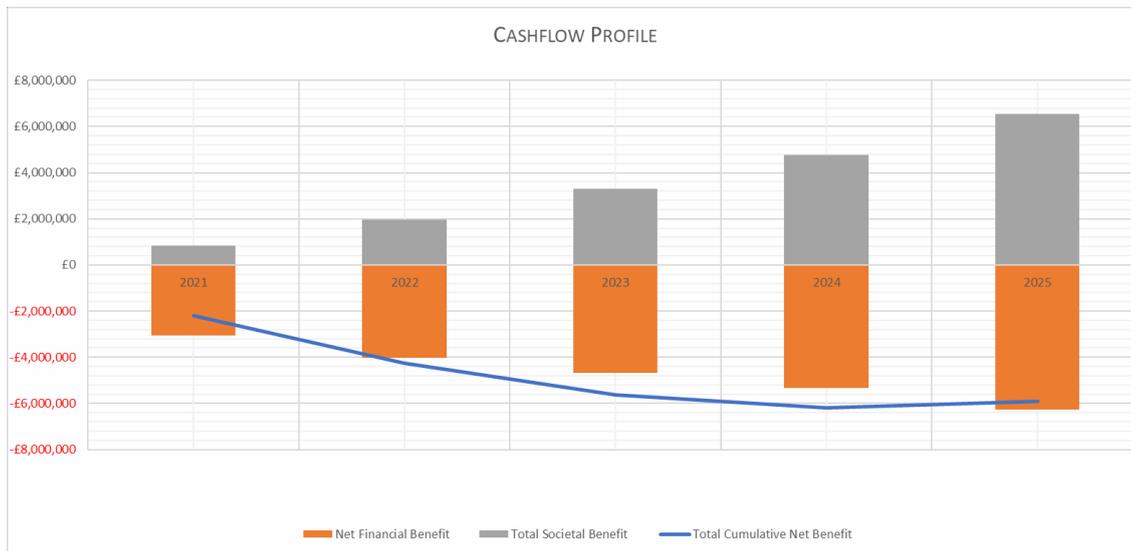
Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	CO Alarms
RIIO-2 costs	£23,330,000.00
RIIO-2 benefits	£17,433,646.29
RIIO-2 NPV	-£5,110,480.00
RIIO-2 net benefit per £ spent	-£0.25

Cashflow Profile

Issue 3 million alarms



Residual benefits

	CO Alarms
Total NPV (incl. benefits realised in RIIO-GD3)	£5,359,472.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £13,091,599.22.
- This would increase the total NPV of this project to £5,359,472.

Summary of Proxies and Probabilities

List of all costs and benefits associated with issuing CO Alarms, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	CO Alarms	Alarm	£7.64	The cost to Cadent per CO alarm.	n/a	n/a	n/a
	Partner costs	Annual costs	£82,000.00	The cost to Cadent per year of support providing CO alarms	n/a	n/a	n/a
Social benefits	Avoided CO-related A&E visit	Event	£134.00	The average cost of outpatient attendances in the UK (2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00719%	Cadent calculation (see pages 7-8).
	Avoided CO-related hospital admission (long-term stay)	Event	£3,026.00	The average cost of a non-elective inpatient stay (long stay) in the UK (2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00034%	Cadent calculation (see page 8).
	Cost of time off work due to injury	Event	£233.76	The annual cost to Great Britain (2016/2017) of taking time off work due to injury, divided by the population (2017).	Cadent calculation (see pages 7-8).	0.00034%	Cadent calculation (see pages 8-9).
	Avoided CO-related death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.00005%	Cadent calculation (see page 9).
	Avoided ambulance call	Event	£250.00	The average cost of an ambulance call (see, treat and convey) in England (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/serVICES.pdf	0.00719%	Cadent calculation (see pages 9-10).

Financial Cost - Benefit Analysis

Financial Costs

The estimated cost to Cadent to provide CO alarms is £7.64 per alarm. There is also an annual cost related to the Partners Cadent will use to deliver the alarms.

Issue 3 million alarms

Cadent will incur a financial cost of £23,330,000.00 for this initiative.

	Name	2021	2022	2023	2024	2025
Financial costs	Provision of CO Alarms	£2,979,600.00	£3,934,600.00	£4,584,000.00	£5,233,400.00	£6,188,400.00
	Partner costs	£82,000.00	£82,000.00	£82,000.00	£82,000.00	£82,000.00
Total financial costs per year		£3,061,600.00	£4,016,600.00	£4,666,000.00	£5,315,400.00	£6,270,400.00

- The current cost to Cadent per CO alarm is £7.64.
- There will be 390,000 alarms issued in the first year, increasing to 515,000, 600,000, 685,000 and 810,000 over the subsequent years.
- The Partner cost is flat at £82,000 each year.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of issuing 3 million alarms. In all cases, attribution is 0%. This is because all the alarms will be provided by Cadent. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided CO-related A&E visit	0%	0%	0.00719%	£134	£9,020.16	£20,931.39	£34,808.56	£50,651.65	£69,385.82
	Avoided CO-related hospital admission (long-term stay)	0%	0%	0.00034%	£3,026	£9,642.88	£22,376.43	£37,211.63	£54,148.49	£74,176.02
	Cost of time off work due to injury	0%	0%	0.00034%	£233.76	£744.92	£1,728.59	£2,874.62	£4,183.00	£5,730.13
	Avoided CO-related death	0%	0%	0.00005%	£1,897,129	£814,717.34	£1,890,562.03	£3,143,973.33	£4,574,951.22	£6,267,056.47
	Avoided ambulance call	0%	0%	0.00719%	£250	£16,828.65	£39,051.10	£64,941.33	£94,499.35	£129,451.16
Total social benefits per year						£850,953.95	£1,974,649.55	£3,283,809.47	£4,778,433.71	£6,545,799.61

Avoided CO-related A&E visit

- On average, 4,000 people are admitted to Accidents & Emergency (A&E) each year in England due to CO poisoning.¹⁶
- The estimated population of England is 55,619,430.¹⁷
- The percentage of the English population that may be admitted to A&E due to CO poisoning on an annual basis is equal to $(4,000 / 55,619,430) * 100 = 0.00719\%$ as indicated on the social benefits table.

¹⁶https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

¹⁷<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland> (2017 figure)

- If this initiative applied to the entire population of England, then the 4,000 / 55,619,430 people who are admitted to the A&E on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO alarms issued will only benefit the households they are issued to (390,000 households in the first year, *2.4 people per household = 936,000), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related A&E visit to $936,000 * (4,000 / 55,619,430) = 67.314$ people.
- The average cost of an A&E visit is £134.00.¹⁸ This equates to a social benefit in year one of $67.314 * £134.00 = £9,020.16$.
- The value grows cumulatively each year as it affects additional people per annum and because the social benefits provided by CO alarms are lasting.

Avoided CO-related hospital admission (long-term stay)

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.¹⁹
- The estimated population of England & Wales is 58,744,595.²⁰
- The percentage of the England & Wales population that may be hospitalised due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) * 100 = 0.00034\%$ as indicated on the social benefits table.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO alarms issued will only benefit the households they are issued to (390,000 households in the first year, *2.4 people per household = 936,000), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $936,000 * (200 / 58,744,595) = 3.186$ people.
- The average cost of a long-term hospital stay is £3,026.²¹ This equates to a social benefit in year one of $3.186 * £3,026.00 = £9,642.88$.
- The value grows cumulatively each year as it affects additional people per annum and because the social benefits provided by CO alarms are lasting.

Cost of time-off work due to injury

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.²²
- The estimated population of England & Wales is 58,744,595.²³
- The percentage of the England & Wales population that may be forced to take time-off work due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) * 100 = 0.00034\%$ as indicated in the social benefits table.

¹⁸ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

¹⁹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

²⁰ [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalescotlandandnortthernireland\(2017figure\)](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalescotlandandnortthernireland(2017figure))

²¹ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

²² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

²³ [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalescotlandandnortthernireland\(2017figure\)](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalescotlandandnortthernireland(2017figure))

- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO alarms issued will only benefit the households they are issued to (390,000 households in the first year, *2.4 people per household = 936,000), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone time-off work due to injury to $936,000 * (200 / 58,744,595) = 3.186$ people.
- The annual cost to Great Britain (2016/2017) of taking time-off work due to injury is £15,000,000,000.²⁴ The estimated population of Great Britain is 64,169,400 (2017).²⁵ This equates to an average cost of time-off work due to injury per person of £233.76.
- Therefore, the social benefit in year one is equal to $3.186 * 233.76 = £744.92$.
- The value grows cumulatively each year as it affects additional people per annum and because the social benefits provided by CO alarms are lasting.

Avoided CO-related death

- On average, 30.3 UK deaths on an annual basis are caused by CO poisoning.²⁶
- The estimated population of the UK is 66,040,200.²⁷
- The percentage of the UK population that may experience a CO-related death on an annual basis is equal to $(30.3 / 66,040,200) * 100 = 0.00005\%$ as indicated in the social benefits table.
- If this initiative applied to the entire population of the UK, then the 30.3 / 66,040,000 people who die from CO poisoning on an annual basis would be expected to benefit from this initiative.
- However, as the CO alarms issued will only benefit the households they are issued to (390,000 households in the first year, *2.4 people per household = 936,000), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone death due to CO poisoning of $936,000 * (30.3 / 66,040,200) = 0.429$ people.
- The value of a prevented fatality in the UK is £1,897,129.²⁸ This equates to a social benefit in year one of $0.429 * 1,897,129 = £814,717.34$.
- The value grows cumulatively each year as it affects additional people per annum and because the social benefits provided by CO alarms are lasting.

Avoided ambulance call

- We have assumed that 100% of patients who are taken to A&E due to CO poisoning are transported by ambulance. Without sufficient CO awareness, many of the initial symptoms (headache and dizziness, weakness, loss of memory) of CO poisoning would not typically inhibit a response to visit the Emergency Room. However, once the symptoms become more severe (fainting, unconsciousness), it is fair to assume that in the vast majority of cases an ambulance would be called – a potential patient suffering from severe exposure to CO would not be able to transport themselves to the A&E, and their carers would want to bring them to medical attention as soon as possible.

²⁴ <http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf>

²⁵ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/gbpop/pop>

²⁶ <http://www.co-gassafety.co.uk/wp-content/uploads/2019/01/Statistics-sheet-presspack-Jan-2019-18.01.19.pdf>

²⁷ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

²⁸ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

- Therefore, we assume that because on average 4,000 people are admitted to A&E each year in England due to CO poisoning, 4,000 people are transported to A&E in England each year via ambulance due to CO poisoning. As a result, this social benefit shares an equivalent success rate to that of an avoided CO-related A&E visit = 0.00719% as indicated on the social benefits table.
- If this initiative applied to the entire population of England, then the 4,000 / 55,619,430 people who transported via ambulance to the A&E on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as the CO alarms issued will only benefit the households they are issued to (390,000 households in the first year, *2.4 people per household = 936,000), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related ambulance trip to $936,000 * (4,000 / 55,619,430) = 67.314$ people.
- The average cost of an ambulance call (see, treat and convey) is £250.²⁹ This equates to a social benefit in year one of $67.314 * 250 = £16,828.65$
- The value grows cumulatively each year as it affects additional people per annum and because the social benefits provided by CO alarms are lasting.

²⁹ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

List of General Assumptions and Limitations

Assumption 1

- The number of CO alarms (based on options) will be issued.

Assumption 2

- Each household from where the class attendees reside either 1) do not have a CO alarm, or 2) will reap the full benefits from having an additional one installed.

Assumption 3

- Each alarm that is provided will be installed in their homes. Therefore, it is assumed that all of the people that this initiative reaches take action.

Assumption 4

- The average household size in the UK is 2.4.³⁰

Assumption 5

- There are no financial benefits, i.e. foregone costs to customers associated with this initiative.

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

³⁰ <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2016>

Cost-Benefit Analysis of Cadent's CO Interventions

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 6

Financial Cost-Benefit Analysis – 8

Social Benefit Analysis – 10

List of General Assumptions and Limitations – 18

Initiative Overview

Initiative name

CO Interventions (service, repair and replace appliances)

Initiative description

Carbon monoxide (CO) is a largely undetectable poisonous gas that is produced when carbon-based fuels are improperly burned. Its release may occur when an appliance has not been fitted correctly, has been poorly maintained or if a vent or chimney is blocked. CO inhalation can result in death or other serious health problems.

Increasing public awareness of the risks surrounding CO could lead to a dramatic reduction in the number of incidents that are associated with it. As a result, Cadent has pledged to promote CO awareness as a central part of our RIIO-GD2 business plan.

As part of this, we have set a target to complete 15,000 CO interventions over RIIO-GD2. A theoretical breakdown of this number is as follows (used for modelling purposes):

- 1) Service 10,500 CO emitting appliances
- 2) Repair 6,750 CO emitting appliances
- 3) Replace 4,500 CO emitting appliances

First, appliances will be serviced after which it will be determined whether they require repair or replacement. The figures above do not sum to 15,000 because they include instances of double counting (e.g. a service and a repair).

Initiative beneficiaries

The main beneficiaries of this initiative are the inhabitants of the households from which CO emitting gas appliances will be repaired. This service will be provided to customers who are unlikely to otherwise pay for this solution themselves, i.e. customers in vulnerable situations, especially those living in fuel poverty. This will lead to increased safety in their homes and reduced instances of CO-related health issues. They will also benefit from the upgrade of their gas appliances.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance. This is described for all aspects of our CVP in Appendix 07.01.00.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	This is truly new ground for GDNs, representing a significant enhancement to service levels. Repairs will be coordinated and delivered through a partnership with recognised charities and Gas Safe Registered organisations. This will allow for independent and qualified 'means' testing to identify those most at need to receive this additional service
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	No examples found at any real scale - a similar trial noted for SGN, but not related to CO awareness
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and we will report against progress annually

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

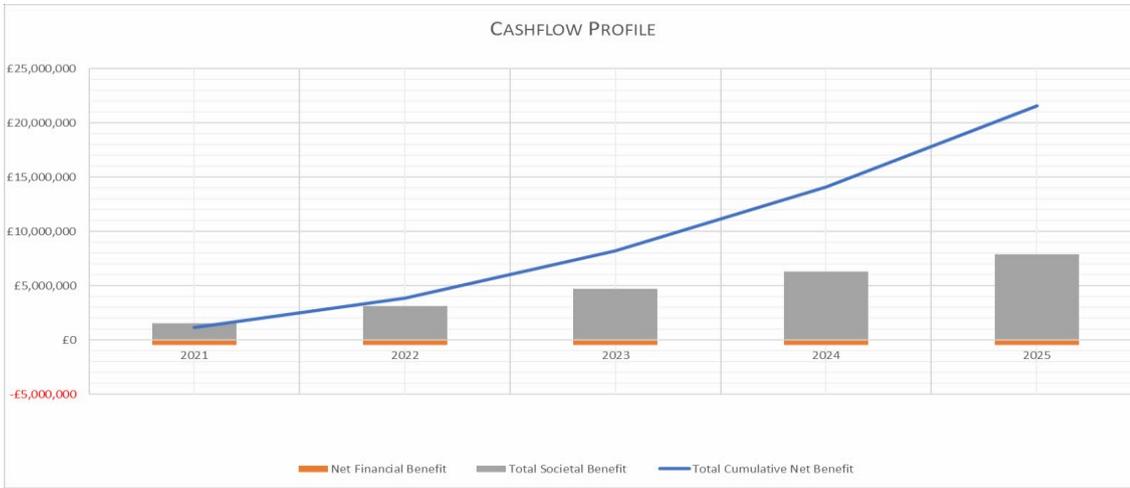
	Service	Repair	Replace	Total
RIIO-2 costs	£1,047,858.33	£2,127,258.33	£5,423,508.33	£8,598,624.99
RIIO-2 benefits	£ -	£23,726,642.74	£17,240,611.89	£40,967,254.63
RIIO-2 NPV	-£929,318.00	£19,047,673.00	£10,401,619.00	£28,519,974.00
RIIO-2 net benefit per £ spent	-£1.00	£10.10	£2.16	£11.26

Cashflow Profile

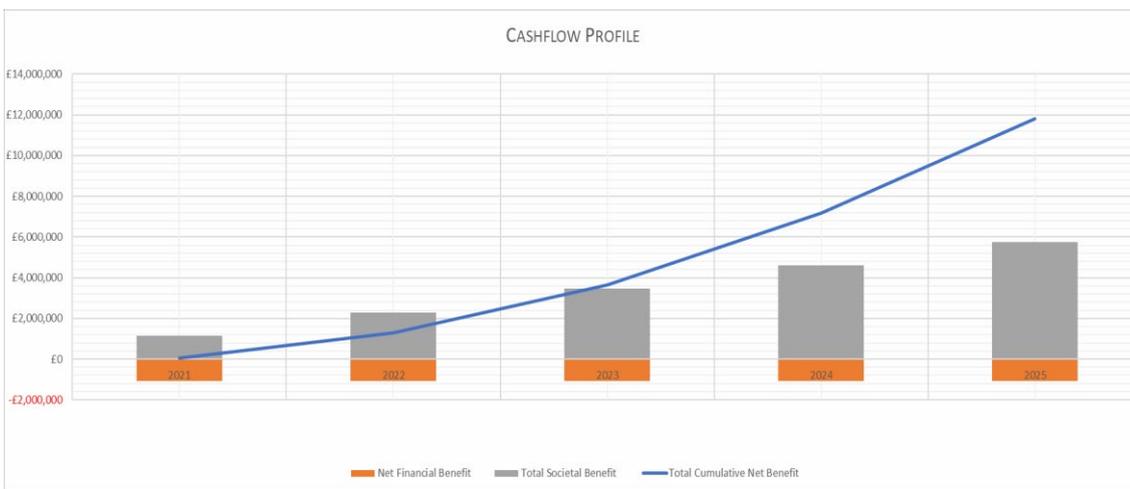
Service 10,500 appliances



Repair 6,750 appliances



Replace 4,500 appliances



Residual benefits

	Service	Repair	Replace	Total
Total NPV (incl. benefits realised in RIIO-GD3)	n/a	£31,487,599.00	£32,248,652.00	£62,806,933.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £15,817,761.83 (Repair), £28,734,353.15 (Replace) and £44,552,114.98 (Total).
- This would increase the total NPV of this project to £31,487,599.00 (Repair), £32,248,652.00 (Replace) and £62,806,933.00 (Total).

Summary of Proxies and Probabilities

List of all costs and benefits associated with CO interventions as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Service appliances	Per annum	£209,571.67	The annual cost to Cadent to service appliances.	n/a	n/a	n/a
	Repair appliances	Per annum	£425,451.67	The annual cost to Cadent to repair appliances.	n/a	n/a	n/a
	Replace appliances	Per annum	£1,084,701.67	The annual cost to Cadent to replace appliances.	n/a	n/a	n/a

Social benefits	Avoided CO-related death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.00005%	Cadent calculation (see pages 10-11 and 14-15).
	Avoided CO-related hospital admission (long-term stay)	Event	£3,026.00	The average cost of a non-elective inpatient stay (long stay) in the UK (2018).	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	0.00034%	Cadent calculation (see pages 11 and 15).
	Cost of time off work due to CO-related injury	Event	£233.76	The annual cost to Great Britain (2016/2017) of taking time off work due to injury, divided by the population (2017).	Cadent calculation (see pages 12 and 15-16).	0.00034%	Cadent calculation (see pages 12 and 15-16).
	Comfortable and warm homes reduce the likelihood of illness	Event	£37.00	The average cost of a consultation with a GP (2017).	https://www.pssru.ac.uk/pub/uc/uc2017/community-based-health-care-staff.pdf	Cadent calculation (see pages 12 and 16).	Cadent calculation (see pages 12 and 16).
	Comfortable and warm homes reduce the likelihood of excess winter death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	Cadent calculation (see pages 12-13 and 16-17).	Cadent calculation (see pages 12-13 and 16-17).
	Energy bill savings	Per annum	£136.00	Average energy bill savings from replacing a boiler (2018).	Cadent calculation (see pages 13 and 17).	Cadent calculation (see pages 13 and 17).	Cadent calculation (see pages 13 and 17).

Financial Cost - Benefit Analysis

Financial Costs

Service 10,500 appliances

Cadent will incur a financial cost of £1,047,858.00 for servicing 10,500 appliances.

	Name	2021	2022	2023	2024	2025
Financial costs	Servicing	£162,120.00	£162,120.00	£162,120.00	£162,120.00	£162,120.00
	Additional costs (engineer time, training, literature)	£47,451.67	£47,451.67	£47,451.67	£47,451.67	£47,451.67
Total financial costs per year		£209,571.67	£209,571.67	£209,571.67	£209,571.67	£209,571.67

Repair 6,750 appliances

Cadent will incur a financial cost of £2,127,258.33 for repairing 6,750 appliances.

	Name	2021	2022	2023	2024	2025
Financial costs	Repairs	£378,000.00	£378,000.00	£378,000.00	£378,000.00	£378,000.00
	Additional costs (engineer time, training, literature)	£47,451.67	£47,451.67	£47,451.67	£47,451.67	£47,451.67
Total financial costs per year		£425,451.67	£425,451.67	£425,451.67	£425,451.67	£425,451.67

Replace 4,500 appliances

Cadent will incur a financial cost of £5,423,508.33 for replacing 4,500 appliances.

	Name	2021	2022	2023	2024	2025
Financial costs	Replacement	£1,037,250.00	£1,037,250.00	£1,037,250.00	£1,037,250.00	£1,037,250.00
	Additional costs (engineer time, training, literature)	£47,451.67	£47,451.67	£47,451.67	£47,451.67	£47,451.67
Total financial costs per year		£1,084,701.67	£1,084,701.67	£1,084,701.67	£1,084,701.67	£1,084,701.67

Social Benefit Analysis – Repair 6,750 appliances

Below are the stated social benefits delivered as a result of repairing 6,750 CO emitting appliances; covering benefits related to both reduced CO exposure and the repair of gas appliances for vulnerable and/or fuel poor households. In all cases, attribution is 0%. This is because all of the appliances will be repaired by Cadent. Drop off is 0% because the expected benefits are not expected to decrease over time (see Assumption 2 on page 18 for an explanation towards how this has been addressed).

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided CO-related death	0%	0%	0.00005%	£1,897,129.00	£2,820.18	£5,640.35	£8,460.53	£11,280.70	£14,100.88
	Avoided CO-related hospital admission (long-term stay)	0%	0%	0.00034%	£3,026.00	£33.38	£66.76	£100.14	£133.52	£166.90
	Cost of time off work due to CO-related injury	0%	0%	0.00034%	£233.76	£2.58	£5.16	£7.74	£10.31	£12.89
	Comfortable and warm homes reduce the likelihood of illness	0%	0%	15.2%	£37.00	£18,221.76	£36,443.52	£54,665.28	£72,887.04	£91,108.80
	Comfortable and warm homes reduce the likelihood of excess winter death	0%	0%	0.023%	£1,897,129.00	£1,413,818.29	£2,827,636.58	£4,241,454.87	£5,655,273.16	£7,069,091.45
	Energy bill savings	0%	0%	80%	£136.00	£146,880.00	£293,760.00	£440,640.00	£587,520.00	£734,400.00
Total social benefits per year						£1,581,776.18	£3,163,552.37	£4,745,328.55	£6,327,104.73	£7,908,880.91

Avoided CO-related death

- Faulty gas devices could cause serious injury, for example by putting the householder at risk of exposure for a high concentration of carbon monoxide (CO).³¹
- We assume that the repair of gas appliances will eliminate any risk of carbon monoxide poisoning for five years post-repair (see Assumption 2 on page 18).
- On average, 30.3 UK deaths on an annual basis are caused by CO poisoning.³²
- The estimated population of the UK is 66,040,200.³³
- The percentage of the UK population that may experience a CO-related death on an annual basis is equal to $(30.3 / 66,040,200) = 0.00005\%$ as indicated in the social benefits table.
- If this initiative applied to the entire population of the UK, then the 30.3 / 66,040,200 people who die from CO poisoning on an annual basis would be expected to benefit from this initiative.
- However, as the initiative will only benefit the customers in the households that receive a repair (6,750 households, or 1,350 households per annum), this proportion must be applied to the sample in question.
- Assuming the average size of a household is 2.4 people³⁴, we would expect the initiative to impact 1,350 households * 2.4 people = 3,240 people in year one.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone deaths due to CO poisoning of $3,240 * (30.3 / 66,040,200) = 0.0015$ people.
- The value of a prevented fatality in the UK is £1,897,129.00.³⁵ This equates to a social benefit in year one of $0.0015 \text{ people} * £1,897,129.00 = £2,820.18$.
- The value of the initiative grows cumulatively until year five as it affects an additional 3,240 people per annum and because the benefits associated with the repair of CO emitting appliances are continuous.

Avoided CO-related hospital admission (long-term stay)

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.³⁶
- The estimated population of England & Wales is 58,744,595.³⁷
- The percentage of the England & Wales population that may be hospitalised due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) = 0.00034\%$ as indicated on the social benefits table.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as this initiative will only benefit the residents of the households that receive a repair (3,240 people in year one), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $3,240 * (200 / 58,744,595) = 0.011$ people.
- The average cost of a long-term hospital stay is £3,026.00.³⁸ This equates to a social benefit in year one of $0.011 * £3,026.00 = £33.38$.
- The value of the initiative grows cumulatively until year five as it affects an additional 3,240 people per annum and because the benefits associated with the repair of CO emitting appliances are continuous.

³¹ <http://www.hse.gov.uk/GAS/domestic/uc1gasfinal.pdf>

³² <http://www.co-gassafety.co.uk/wp-content/uploads/2019/01/Statistics-sheet-presspack-Jan-2019-18.01.19.pdf>

³³ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

³⁴ See Assumption 3 (page 18)

³⁵ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

³⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

³⁷ [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnort](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland) (2017 figure)

³⁸ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

Cost of time-off work due to CO-related injury

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.³⁹
- The estimated population of England & Wales is 58,744,595.⁴⁰
- The percentage of the England & Wales population that may be forced to take time-off work due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) = 0.00034\%$ as indicated in the social benefits table.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as this initiative will only benefit the residents of the households that receive a repair (3,240 people in year one), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $3,240 * (200 / 58,744,595) = 0.011$ people.
- The annual cost to Great Britain (2016/2017) of taking time-off work due to injury is £15,000,000,000.⁴¹ The estimated population of Great Britain is 64,169,400 (2017).⁴² This equates to an average cost of time-off work due to injury per person of £233.76.
- Therefore, the social benefit in year one is equal to $0.011 * 233.76 = £2.58$.
- The value of the initiative grows cumulatively until year five as it affects an additional 3,240 people per annum and because the benefits associated with the repair of CO emitting appliances are continuous.

Comfortable and warm homes reduce the likelihood of illness

- Studies have shown that visits to GP's for respiratory tract infections increase by up to 19% for every one degree drop in mean temperature below 5°C in homes.⁴³ We assume that the success rate is 19%, that is, without the initiative the customers would experience *at least* a 19% higher risk of respiratory tract infections requiring *at least* one visit to their GP.
- This benefit has been applied to the 80% of this sample that will have a boiler repaired.
- Therefore, in year one, this initiative can expect to yield this benefit in the form of a reduced risk of illness to $19\% * 80\% * 3,240$ people = 492.48 fewer visits to the GP in year one.
- The average cost of a GP consultation lasting 9.22 minutes is £37.00.⁴⁴ This equates to a social benefit in year one of 492.48 avoided visits * £37.00 = £18,221.76.
- The value of the initiative grows cumulatively until year five as it affects an additional 80% of 3,240 people per annum and because the benefits associated with the repair of CO emitting appliances are continuous.

Comfortable and warm homes reduce the likelihood of excess winter death

- More people die in the winter than in the summer in England & Wales. In 2017/2018, 16,890 excess winter deaths in the UK were attributed to cold housing conditions.⁴⁵
- The estimated population of England & Wales is 58,744,595.⁴⁶
- The likelihood of an excess winter death in England & Wales is therefore $16,890 / 58,744,595 = 0.02875\%$
- This benefit has been applied to the 80% of this sample that will have a boiler repaired.

³⁹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

⁴⁰ [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnort](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland) (2017 figure)

⁴¹ <http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf>

⁴² <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/gbpop/pop>

⁴³ https://fingertips.phe.org.uk/documents/Fuel_poverty_health_inequalities.pdf (2014)

⁴⁴ <https://www.pssru.ac.uk/pub/uc/uc2017/community-based-health-care-staff.pdf> (2017)

⁴⁵ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

⁴⁶ [https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnort](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland) (2017 figure)

- In year one, this initiative will yield a benefit in the form of avoided winter deaths to 3,240 * 0.02875% * 80% = 0.745 people.
- The value of a prevented fatality in the UK is £1,897,129.⁴⁷ This equates to a social benefit in year one of 0.745 people * £1,897,129.00 = £1,413,818.29.
- The value of the initiative grows cumulatively until year five as it affects an additional 80% of 3,240 people per annum and because the benefits associated with the repair of CO emitting appliances are continuous.

Energy bill savings

- All customers that have a boiler repair (80%) as part of this initiative will realise energy savings as a result of using more efficient appliances. As such, we expect the success rate to be 80%.
- The amount of energy bill savings depends on the appliances replaced, their efficiency, and the housing type (e.g. flat, house, etc). We assume that the population has an even distribution of housing types.
- We also assume (for the sake of this social benefit) that the population has an even distribution of their boiler efficiency ratings and will replace a boiler as part of the initiative.
- On average, assuming an even distribution of housing types and boiler efficiency ratings, the amount of annual energy bill savings from replacing a boiler is £136.00.⁴⁸
- This benefit has been applied once per household instead of on a per person basis because each household is responsible for one energy bill.
- Therefore, for customers impacted by the initiative in year one, we would expect a benefit of 1,350 households * 80% * £136.00 savings = £146,880.00.
- The value of the initiative grows cumulatively until year five as it affects an additional 80% of 1,350 households per annum and because the projected bill savings of £136.00 are realised on an annual basis.

⁴⁷ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

⁴⁸ <https://www.energysavingtrust.org.uk/home-energy-efficiency/boiler-replacement>

Social Benefit Analysis – Replace 4,500 appliances

Below are the stated social benefits delivered as a result of replacing 4,500 CO emitting appliances; covering benefits related to both reduced CO exposure and the repair of gas appliances for vulnerable and/or fuel poor households. In all cases, attribution is 0%. This is because all of the appliances will be repaired by Cadent. Drop off is 0% because the expected benefits are not expected to decrease over time. (see Assumption 1 on page 18 for an explanation towards how this has been addressed).

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided CO-related death	0%	0%	0.00005%	£1,897,129.00	£1,880.12	£3,760.23	£5,640.35	£7,520.47	£9,400.58
	Avoided CO-related hospital admission (long-term stay)	0%	0%	0.00034%	£3,026.00	£22.25	£44.51	£66.76	£89.01	£111.26
	Cost of time off work due to CO-related injury	0%	0%	0.00034%	£233.76	£1.72	£3.44	£5.16	£6.88	£8.60
	Comfortable and warm homes reduce the likelihood of illness	0%	0%	17.1%	£37.00	£13,666.32	£27,332.64	£40,998.96	£54,665.28	£68,331.60
	Comfortable and warm homes reduce the likelihood of excess winter death	0%	0%	0.02588%	£1,897,129.00	£1,060,363.72	£2,120,727.43	£3,181,091.15	£4,241,454.87	£5,301,818.59
	Energy bill savings	0%	0%	60%	£136.00	£73,440.00	£146,880.00	£220,320.00	£293,760.00	£367,200.00
Total social benefits per year						£1,149,374.13	£2,298,748.25	£3,448,122.38	£4,597,496.50	£5,746,870.63

Avoided CO-related death

- Faulty gas devices could cause serious injury, for example by putting the householder at risk of exposure for a high concentration of carbon monoxide (CO).⁴⁹
- We assume that the replacement of gas appliances will eliminate any risk of carbon monoxide poisoning for the period in question (see Assumption 1 on page 18).
- On average, 30.3 UK deaths on an annual basis are caused by CO poisoning.⁵⁰
- The estimated population of the UK is 66,040,200.⁵¹
- The percentage of the UK population that may experience a CO-related death on an annual basis is equal to $(30.3 / 66,040,200) = 0.00005\%$ as indicated in the social benefits table.
- If this initiative applied to the entire population of the UK, then the 30.3 / 66,040,200 people who die from CO poisoning on an annual basis would be expected to benefit from this initiative.
- However, as the initiative will only benefit the customers in the households participating (4,500 households, or 900 households per annum), this proportion must be applied to the sample in question.
- Assuming the average size of a household is 2.4 people⁵², we would expect the initiative to impact 900 households * 2.4 people = 2,160 people in year one.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of foregone deaths due to CO poisoning of $2,160 * (30.3 / 66,040,200) = 0.0009$ people.
- The value of a prevented fatality in the UK is £1,897,129.00.⁵³ This equates to a social benefit in year one of $0.0009 \text{ people} * £1,897,129.00 = £1,880.12$.
- The value of the initiative grows cumulatively as it affects an additional 2,160 people per annum and because the benefits associated with the replacement of CO emitting appliances are continuous.

Avoided CO-related hospital admission (long-term stay)

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.⁵⁴
- The estimated population of England & Wales is 58,744,595.⁵⁵
- The percentage of the England & Wales population that may be hospitalised due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) = 0.00034\%$ as indicated on the social benefits table.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as this initiative will only benefit the residents of the households that receive a replacement appliance (2,160 people in year one), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $2,160 * (200 / 58,744,595) = 0.0074$ people.
- The average cost of a long-term hospital stay is £3,026.00.⁵⁶ This equates to a social benefit in year one of $0.0074 * £3,026.00 = £22.25$.
- The value of the initiative grows cumulatively as it affects an additional 2,160 people per annum and because the benefits associated with the replacement of CO emitting appliances are continuous.

⁴⁹ <http://www.hse.gov.uk/GAS/domestic/uc1gasfinal.pdf>

⁵⁰ <http://www.co-gassafety.co.uk/wp-content/uploads/2019/01/Statistics-sheet-presspack-Jan-2019-18.01.19.pdf>

⁵¹ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

⁵² See Assumption 3 (page 18)

⁵³ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

⁵⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

⁵⁵ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland> (2017 figure)

⁵⁶ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

Cost of time-off work due to CO-related injury

- On average, 200 people are hospitalised in England & Wales each year due to CO poisoning.⁵⁷
- The estimated population of England & Wales is 58,744,595.⁵⁸
- The percentage of the England & Wales population that may be forced to take time-off work due to CO poisoning on an annual basis is equal to $(200 / 58,744,595) = 0.00034\%$ as indicated in the social benefits table.
- If this initiative applied to the entire population of England & Wales, then the 200 / 58,744,595 people who are hospitalised on an annual basis due to CO poisoning would be expected to benefit from this initiative.
- However, as this initiative will only benefit the residents of the households that receive a replacement appliance (2,160 people in year one), this proportion must be applied to the sample in question.
- Therefore, in year one, this initiative can expect to yield a benefit in the form of a foregone CO-related hospitalisation to $2,160 * (200 / 58,744,595) = 0.00074$ people.
- The annual cost to Great Britain (2016/2017) of taking time-off work due to injury is £15,000,000,000.⁵⁹ The estimated population of Great Britain is 64,169,400 (2017).⁶⁰ This equates to an average cost of time-off work due to injury per person of £233.76.
- Therefore, the social benefit in year one is equal to $0.00074 * 233.76 = £1.72$.
- The value of the initiative grows cumulatively as it affects an additional 2,160 people per annum and because the benefits associated with the replacement of CO emitting appliances are continuous.

Comfortable and warm homes reduce the likelihood of illness

- Studies have shown that visits to GP's for respiratory tract infections increase by up to 19% for every one degree drop in mean temperature below 5°C in homes.⁶¹ We assume that the success rate is 19%, that is, without the initiative the customers would experience *at least* a 19% higher risk of respiratory tract infections requiring *at least* one visit to their GP.
- This benefit has been applied to the 90% of this sample that will receive a boiler or fire emitting appliance replacement.
- Therefore, in year one, this initiative can expect to yield this benefit in the form of a reduced risk of illness to $19\% * 90\% * 2,160$ people = 369.36 fewer visits to the GP in year one.
- The average cost of a GP consultation lasting 9.22 minutes is £37.00.⁶² This equates to a social benefit in year one of 369.36 avoided visits * £37.00 = £13,666.32.
- The value of the initiative grows cumulatively as it affects an additional 90% of 2,160 people per annum and because the benefits associated with the replacement of CO emitting appliances are continuous.

Comfortable and warm homes reduce the likelihood of excess winter death

- More people die in the winter than in the summer in England & Wales. In 2017/2018, 16,890 excess winter deaths in the UK were attributed to cold housing conditions.⁶³
- The estimated population of England & Wales is 58,744,595.⁶⁴
- The likelihood of an excess winter death in England & Wales is therefore $16,890 / 58,744,595 = 0.02875\%$
- This benefit has been applied to the 90% of this sample that will receive a boiler or fire emitting appliance replacement.

⁵⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260211/Carbon_Monoxide_Letter_2013_FinalforPub.pdf

⁵⁸ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnortthernireland> (2017 figure)

⁵⁹ <http://www.hse.gov.uk/statistics/pdf/cost-to-britain.pdf>

⁶⁰ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/gbpop/pop>

⁶¹ https://fingertips.phe.org.uk/documents/Fuel_poverty_health_inequalities.pdf (2014)

⁶² <https://www.pssru.ac.uk/pub/uc/uc2017/community-based-health-care-staff.pdf> (2017)

⁶³ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

⁶⁴ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnortthernireland> (2017 figure)

- In year one, this initiative will yield a benefit in the form of avoided winter deaths to 2,160 * 0.02875% * 90% = 0.5589 people.
- The value of a prevented fatality in the UK is £1,897,129.⁶⁵ This equates to a social benefit in year one of 0.5589 people * £1,897,129.00 = £1,060,363.72.
- The value of the initiative grows cumulatively as it affects an additional 90% of 2,160 people per annum and because the benefits associated with the replacement of CO emitting appliances are continuous.

Energy bill savings

- All customers that receive a boiler replacement (60%) as part of this initiative will realise energy savings as a result of using more efficient appliances. As such, we expect the success rate to be 60%.
- The amount of energy bill savings depends on the appliances replaced, their efficiency, and the housing type (e.g. flat, house, etc). We assume that the population has an even distribution of housing types.
- We also assume (for the sake of this social benefit) that the population has an even distribution of their boiler efficiency ratings and will replace a boiler as part of the initiative.
- On average, assuming an even distribution of housing types and boiler efficiency ratings, the amount of annual energy bill savings from replacing a boiler is £136.00.⁶⁶
- This benefit has been applied once per household instead of on a per person basis because each household is responsible for one energy bill.
- Therefore, for customers impacted by the initiative in year one, we would expect a benefit of 900 households * 60% £136.00 savings = £73,440.00.
- The value of the initiative grows cumulatively until year five as it affects an additional 60% of 900 households per annum and because the projected bill savings of £136.00 are realised on an annual basis.

⁶⁵ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

⁶⁶ <https://www.energysavingtrust.org.uk/home-energy-efficiency/boiler-replacement>

List of General Assumptions and Limitations

Assumption 1

- The life expectancy of a boiler is 10-15 years.⁶⁷
- Based on this, we have taken the conservative assumption that the 4,500 appliances that will be replaced are fully effective for all of RIIO-GD2 and RIIO-GD3.

Assumption 2

- We have assumed that when an appliance is repaired, it extends its lifetime by five years (half of if it were to be replaced).
- Therefore, the 6,750 appliances that will be repaired are each fully effective for five years post-repair.

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

⁶⁷ <https://www.help-link.co.uk/advice-centre/how-long-do-boilers-last/>

Cost-Benefit Analysis of Cadent's Delivery of Non- gas Interventions

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 10

Initiative Overview

Initiative name

Non-gas Interventions

Initiative description

A household is fuel poor if its income is below the poverty line (considering energy costs) and its energy costs are higher than is typical for their household type. Approximately 1.5 million customers who experience fuel poverty reside within Cadent's networks. In the most severely affected area, there are 1 in 5 customers living in fuel poverty. Therefore, the company has a duty to tackle affordability and reduce fuel poverty.

On the back of this, Cadent proposes to deliver 5,000 in-house interventions to fuel poor customers. These include the provision of first-time central heating, roof insulation, cavity wall insulation, replacement windows, draft proofing, PV cells and electric storage heaters.

Initiative beneficiaries

The primary beneficiaries of this initiative are the 5,000 fuel poor customers who receive non-gas interventions, as well as their households.

Fuel poor customers will benefit from a reduction in their annual energy bills as a result of receiving energy efficiency retrofits in their homes, while their households will experience health benefits associated with residing in suitably heated dwellings.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance. This is described for all aspects of our CVP in Appendix 07.01.00.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	The existing FPNES scheme offers customers in fuel poverty the opportunity of a free connection to the gas network. Our customers and expert stakeholders in the space of fuel poverty have explained the limitations of this scheme in truly taking households out of fuel poverty. Despite alternative funding arrangements in place to support customers to get central heating and pay bills, these are not joined up and customers very often find themselves unable to coordinate all activities necessary. This proposal provides far greater benefits to customers by tailoring the solution to their needs
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	The tailored aspect of this proposal is quite unique, although various funded support arrangements with less flexibility (e.g. ECO and FPNES) do exist
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and we will update on progress annually

Findings of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Non-gas Interventions
RIIO-GD2 costs	£28,787,070.00
RIIO-GD2 benefits	£44,012,133.04
RIIO-GD2 NPV	£13,217,494
RIIO-GD2 net benefit per £ spent	£0.52

Cashflow Profile



Residual benefits

	Non-gas Interventions
Total NPV (incl. benefits realised in RIIO-GD3)	£68,726,153

- We expect benefits to continue into RIIO-GD3 at no extra cost to Cadent, which would result in additional benefits of £73,353,555.
- This would increase the total NPV of this project to £68,726,153.

Summary of Proxies and Probabilities

List of all costs and benefits associated with the delivery of non-gas interventions as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Non-gas interventions	Per intervention	£5757.41	The estimated cost per intervention.	Figure provided by Cadent.	n/a	n/a
Financial benefits	Average annual energy bill saving	Per household	£290.00	Improvements in energy efficiency have saved the average UK household £290 per year since 2008.	https://www.theccc.org.uk/publication/energy-prices-and-bills-report-2017/	100%	It is assumed that all households that receive non-gas interventions will realise this financial benefit.
Social benefits	Avoided GP consultation	Event	£37.00	The average cost of a consultation with an NHS GP (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	122.661%	Cadent calculation (see pages 7-8)
	Avoided ambulance call	Event	£250.00	The average cost of an NHS ambulance call (see, treat and convey) (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	0.205%	Cadent calculation (see page 8).
	Avoided hospital admission (short stay)	Event	£626.00	The average cost of an NHS non-elective inpatient stay (short stay) (2017/2018)	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	0.205%	Cadent calculation (see page 8).
	Avoided death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.026%	Cadent calculation (see page 8).
	Reduced likelihood of mental distress	Annual	£1,423.38	The annual cost to society of mental health issues (2018), divided by the UK population (2017).	Cadent calculation (see pages 8-9).	40%	Cadent calculation (see pages 8-9).

Financial Cost-Benefit Analysis

Financial Costs – Non-gas Interventions

The estimated cost to Cadent per non-gas intervention is £5,757.41. It is assumed the number of customers who receive non-gas interventions on an annual basis is spread evenly over RIIO-GD2.

	Name	2021	2022	2023	2024	2025
Financial costs	Non-gas interventions	£5,757,414.00	£5,757,414.00	£5,757,414.00	£5,757,414.00	£5,757,414.00
	Total financial costs per year	£5,757,414.00	£5,757,414.00	£5,757,414.00	£5,757,414.00	£5,757,414.00

- The estimated cost to Cadent for non-gas interventions is £5,757.41 per customer.
- Cadent will provide 5,000 non-gas interventions to fuel poor customers over RIIO-GD2.
- It is assumed that a uniform number of fuel poor customers will receive non-gas interventions on an annual basis over RIIO-GD2.
- Therefore, 1,000 customers will receive a non-gas intervention per year between 2021-2025 at an annual cost of £5,757.41 * 1,000 customers = £5,757,414.00.

Financial Benefits – Non-gas Interventions

Per the Committee on Climate Change, improvements in energy efficiency have saved the average UK household £290.00 per year since 2008.⁶⁸ It is assumed that each of the 5,000 households that will receive non-gas interventions will realise this financial benefit.

	Name	2021	2022	2023	2024	2025
Financial benefits	Average annual energy bill saving	£290,000.00	£580,000.00	£870,000.00	£1,160,000.00	£1,450,000.00
	Total financial benefits per year	£290,000.00	£580,000.00	£870,000.00	£1,160,000.00	£1,450,000.00

- It is assumed that an equal number of fuel-poor customers will receive non-gas interventions on an annual basis over RIIO-GD2, all of which will realise an annual energy bill saving of £290.00 from energy efficiency improvements in their homes.
- This will equate to 1,000 customers per annum * £290.00 = £290,000.00 in 2021.
- The value will grow cumulatively each year as an additional 1,000 customers are provided with non-gas interventions throughout RIIO-GD2.

⁶⁸ https://www.google.com/search?q=committee+on+climate+change&rtz=1C1CHBF_en-GBGB815GB816&oq=committee+on+&aqs=chrome.1.69i57j0i3j69i60j69i61.2181j1j7&sourceid=chrome&ie=UTF-8

Social Benefit Analysis

Below are the stated social benefits delivered as a result of the provision of 5,000 non-gas interventions to fuel poor customers.

In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided GP consultation	0%	0%	122.661%	£37.00	£108,922.97	£217,845.94	£326,768.90	£435,691.87	£544,614.84
	Avoided ambulance call	0%	0%	0.205%	£250.00	£1,227.62	£2,455.23	£3,682.85	£4,910.46	£6,138.08
	Avoided hospital admission (short stay)	0%	0%	0.205%	£626.00	£3,073.95	£6,147.90	£9,221.85	£12,295.80	£15,369.75
	Avoided death	0%	0%	0.026%	£1,897,129.00	£1,164,472.87	£2,328,945.74	£3,493,418.61	£4,657,891.47	£5,822,364.34
	Reduced likelihood of mental distress	0%	0%	40%	£1,423.38	£1,366,444.80	£2,732,889.60	£4,099,334.40	£5,465,779.20	£6,832,224.00
Total social benefits per year						£2,644,142.20	£5,288,284.41	£7,932,426.61	£10,576,568.81	£13,220,711.01

Avoided GP consultation

- There are an estimated 300,000,000 GP consultations in the UK on an annual basis.⁶⁹
- The estimated population of the UK is 66,040,200.⁷⁰
- Therefore, on average there are $300,000,000 / 66,040,200 = 4.543$ consultations per person on an annual basis.
- The total number of GP visits by those who will receive non-gas interventions on an annual basis is therefore $2,400 * 4.543 = 10,903.2$.

⁶⁹ <https://www.england.nhs.uk/five-year-forward-view/next-steps-on-the-nhs-five-year-forward-view/primary-care/>

⁷⁰ ²⁸ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

- Warmer homes decrease GP visits by 27%.⁷¹
- This equates to a reduction of 2,943.864 GP visits per year, or a success rate of $(2,943.864 / 2,400) = 122.661\%$.
- The average cost of a GP consultation is £37.00.⁷²
- This equates to a benefit of $122.661\% * 2,400 * £37.00 = £108,922.97$ in 2021.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum.

Avoided ambulance call

- For each excess UK winter death, there is estimated to be 8 emergency admissions each winter.⁷³
- In 2017/2018, there were 16,890 excess winter deaths in the UK attributable to cold housing conditions.⁷⁴
- Based on these figures, there are $8 * 16,890 = 135,120$ ambulance calls are attributable to cold homes and poor insulation on an annual basis.
- Therefore, the probability of someone in the UK having to call an ambulance due to a fuel poverty-related issue is $135,120 / 66,040,200 = 0.205\%$ as indicated on the social benefits table.
- The average cost of an ambulance call (see, treat and convey) is £250.⁷⁵
- This equates to a benefit of $0.205\% * 2,400 * £250.00 = £1,227.62$ in 2021.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum.

Avoided hospital admission (short stay)

- The same success rate as above has been applied, as it is assumed that all people who are taken to hospital for an emergency admission would have to be treated and have a short stay in hospital.
- The estimated cost for a non-elective inpatient short stay is £626.00.⁷⁶
- This equates to a benefit of $0.205\% * 2,400 * £626.00 = £3,073.95$.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum.

Avoided death

- In 2017/2018, 16,890 excess winter deaths in the UK were attributed to cold housing conditions.⁷⁷
- The probability of saving once excess winter death in the UK as a result of receiving a non-gas intervention is therefore $(16,890 / 66,040,200) = 0.026\%$
- This equates to a benefit of $0.026\% * 2,400 * £1,897,129.00 = £1,164,472.87$.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum.

Reduced likelihood of mental distress

- Studies have shown that customers in receipt of heating and insulation improvements are 40% less likely to report a high level of psychological distress.⁷⁸
- This initiative is expected to apply to 1,000 households each year (2,400 people).

⁷¹ https://fullfact.org/sites/fullfact.org/files/2012/11/AgeUK_health_and_winter_warmth_factsheet_dec_09.pdf

⁷² <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁷³ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates>

⁷⁴ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

⁷⁵ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁷⁶ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁷⁷ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

⁷⁸ <https://www4.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/warm-front-health-impact-eval.pdf> (page 19)

- Therefore, in year one, this initiative can expect to yield this benefit in the form of a reduced risk of mental distress to 40% * 2,400 people = 960 people.
- The total direct and indirect costs of mental health in the UK was £94 billion in 2015.⁷⁹
- The UK population is approximately 66,040,200 people.⁸⁰
- Therefore, the annual cost per person of mental health is £94 billion / 66,040,200 = £1,423.38.
- This equates to a social benefit in year one of 960 people with reduced distress * £1,423.38 = £1,366,444.80.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum.

List of General Assumptions and Limitations

Assumption 1

- The cost to achieve this initiative been spread evenly throughout RIIO-GD2, along with the number of people who will be reached.

Limitation 1

- The annual bill impact on Cadent customers has not been considered as the bill impact methodology is to be updated as the plan is developed further.

Limitation 2

- The calculations do not account for inflation or changes in purchasing power.

Limitation 3

- The manual calculations (based on the figures listed in the **social benefits section**) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

⁷⁹ https://read.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-europe-2018_health_glance_eur-2018-en#page30

⁸⁰ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

Cost-Benefit Analysis of Cadent's Delivery of Income and Energy Efficiency Advice

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 10

Initiative Overview

Initiative name

Income and Energy Efficiency Advice

Initiative description

Cadent proposes to deliver income and energy efficiency advice to fuel poor customers as part of a wide-ranging initiative of tackling affordability and fuel poverty. This will have the effect of improving energy efficiency in the homes of the customers who receive this education.

25,250 customers will be offered advice over RIIO-GD2 at a total cost of £3,801,340.

Initiative beneficiaries

The primary beneficiaries of this initiative are the fuel poor customers who are provided with income and energy efficiency advice, as well as their households.

The benefits associated with this initiative are based on the assertion that fuel poor customers who receive and apply this advice will recognise and address potential energy efficiency risks in their homes, mitigate them and improve overall energy efficiency.

These customers and their households will experience health benefits associated with residing in warmer and safer homes.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance. This is described for all aspects of our CVP in Appendix 07.01.00.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	There is no measure of this in RIIO-1 for any GDN. We have provided advice through the FPNES but at a far smaller scale and without the whole system thinking approach to household requirements. 25,000 is a significant number, especially as our proposal requires us to actively target those in fuel poverty, requiring investment in data and analysis to do this. Conversations will be delivered by trained surveyors
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	No examples found that are directly comparable with this service
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and progress will be reported on each year

Findings of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Income and Energy Efficiency Advice
RIIO-2 costs	£3,801,340.00
RIIO-2 benefits	£58,161,131.61
RIIO-2 NPV	£48,050,847.00
RIIO-2 net benefit per £ spent	£14.25

Cashflow Profile



Residual benefits

	Income and Energy Advice
Total NPV (incl. benefits realised in RIIO-GD3)	£95,973,005.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £62,315,498.15.
- This would increase the total NPV of this project to £95,973,005.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with the delivery of income and energy efficiency advice as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Cost of advice	Per annum	£760,268.00	The cost of providing income and energy efficiency advice per annum, as estimated by Cadent.	n/a	n/a	n/a
Social benefits	Avoided respiratory health problem	Per customer	£123.33	The annual cost of prescription-based asthma treatment.	https://www.asthma.org.uk/about/media/facts-and-statistics/ https://www.asthma.org.uk/about/media/news/asthma-uk-study-1.1bn/	1.664%	Cadent calculation (see page 8).
	Avoided GP consultation	Event	£37.00	The average cost of a consultation with an NHS GP (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	78.498%	Cadent calculation (see page 8).
	Avoided ambulance call	Event	£250.00	The average cost of an NHS ambulance call (see, treat and convey) (2017/2018).	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	0.131%	Cadent calculation (see pages 8-9).
	Avoided hospital admission (short stay)	Event	£626.00	The average cost of an NHS non-elective inpatient stay (short stay) (2017/2018)	https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf	0.131%	Cadent calculation (see page 9).
	Avoided death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.016%	Cadent calculation (see page 9).

Financial Cost-Benefit Analysis

Financial Costs

The estimated cost to Cadent to provide income and energy efficiency advice is £3,801,340.00 over RIIO-GD2.

	Name	2021	2022	2023	2024	2025
Financial costs	Cost of advice	£760,268.00	£760,268.00	£760,268.00	£760,268.00	£760,268.00
	Total financial costs per year	£760,268.00	£760,268.00	£760,268.00	£760,268.00	£760,268.00

- Cadent will provide 5,050 customers with income and energy advice per annum at an annual cost of £760,268.00.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of delivering income and energy efficiency advice to 25,250 customers. In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is set 0%, although a diminishing retention rate has been factored into these calculations (see explanation beneath the social benefits table below).

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Avoided respiratory health problem	0%	0%	1.664%	£123.33	£24,872.80	£49,745.60	£72,131.12	£92,029.36	£109,440.32
	Avoided GP consultation	0%	0%	78.498%	£37.00	£352,014.77	£704,029.54	£1,020,842.83	£1,302,454.65	£1,548,864.99
	Avoided ambulance call	0%	0%	0.131%	£250.00	£3,967.65	£7,935.31	£11,506.20	£14,680.32	£17,457.68
	Avoided hospital admission (short stay)	0%	0%	0.131%	£626.00	£9,935.01	£19,870.01	£28,811.52	£36,759.53	£43,714.03
	Avoided death	0%	0%	0.016%	£1,897,129.00	£3,763,576.31	£7,527,152.62	£10,914,371.30	£13,925,232.35	£16,559,735.77
Total social benefits per year						£4,154,366.54	£8,308,733.09	£12,047,662.98	£15,371,156.21	£18,279,212.79

The retention rate of education/advice over time is dependent upon a number of individual characteristics. These are difficult to quantify and apply to a group of people. However, in the context of these calculations, it is important to consider this factor. We have done so in the following ways – in addition to the probability of the benefit being delivered itself, an additional probability of 64% has been applied to each success rate (it has been estimated that 64% of households take action after receiving energy saving advice).⁸¹ We have also assumed each person who receives this advice will retain 100% of the information for two years, after which the individual retention rate will decrease by

⁸¹ https://www.policyconnect.org.uk/sites/site_pc/files/report/734/fieldreportdownload/warmergreenerreport.pdf

10% per annum. This has been factored into the annual reach via the model and applies to the social benefits starting in year three of the initiative.

Avoided respiratory health problem

- Residing in damp or mouldy dwellings as a result of poor insulation directly contributes to an average of 2.6% of a population developing health problems related to asthma.⁸²
- Providing energy training to customers results in them being able to better identify energy efficiency issues in their homes, therefore minimising potential health risks.
- As previously stated, 64% of households take action after receiving energy saving advice. We have assumed this reduces to 1.664% of a given population developing health problems related to asthma (64% of 2.6%) after receiving energy efficiency advice.
- The estimated annual cost of long-term prescription treatment for asthma in the UK is £123.33 per individual.⁸³
- Cadent will deliver income and energy efficiency advice to 5,050 in year one.
- However, the social benefits associated with this initiative have been extrapolated to the inhabitants of the households of those who receive this advice.
- Per the Office for National Statistics, the average household size in the UK is 2.4 people.⁸⁴
- Therefore, $5,050 * 2.4 = 12,120$ people will benefit from this initiative in year one.
- 1.664% of the sample will forego the annual cost of a long-term prescription treatment for asthma.
- This equates to a benefit of $1.664\% * 12,120 \text{ people} * £123.33 = £24,872.80$ in year one.
- This figure will grow uniformly each year, less the annual decrease in retention rates starting in year three.

Avoided GP consultation

- There are an estimated 300,000,000 GP consultations in the UK on an annual basis.⁸⁵
- The estimated population of the UK is 66,040,200.⁸⁶
- Therefore, on average there are $300,000,000 / 66,040,200 = 4.543$ consultations per person on an annual basis.
- The total number of GP visits by those who receive income and energy efficiency advice in year one is therefore $12,120 * 4.543 = 55,057.374$.
- Warmer homes decrease GP visits by 27%.⁸⁷
- This equates to a reduction of 14,865.491 GP visits in year one, or a success rate of $(14,865.491 / 55,057.374) = 27.00\%$.
- However, as 64% of people apply this advice, the success rate is equal to 78.498%.
- The average cost of a GP consultation is £37.00.⁸⁸
- This equates to a benefit of $78.498\% * 12,120 * £37.00 = £352,014.77$ in year one.
- This figure will grow uniformly each year, less the annual decrease in retention rates starting in year three.

Avoided ambulance call

- For each excess UK winter death, there are an estimated eight emergency admissions each winter.⁸⁹
- In 2017/2018, there were 16,890 excess winter deaths in the UK attributable to cold housing conditions.⁹⁰

⁸² [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU\(2016\)595339_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU(2016)595339_EN.pdf)

⁸³ <https://www.asthma.org.uk/about/media/facts-and-statistics/>, <https://www.asthma.org.uk/about/media/news/asthma-uk-study-1.1bn/>

⁸⁴ <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2017>

⁸⁵ <https://www.england.nhs.uk/five-year-forward-view/next-steps-on-the-nhs-five-year-forward-view/primary-care/>

⁸⁶ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

⁸⁷ https://fullfact.org/sites/fullfact.org/files/2012/11/AgeUK_health_and_winter_warmth_factsheet_dec_09.pdf

⁸⁸ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁸⁹ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates>

⁹⁰ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

- Based on these figures, there are $8 * 16,890 = 135,120$ ambulance calls are attributable to cold homes and poor insulation on an annual basis.
- Therefore, the probability of someone in the UK having to call an ambulance due to a fuel poverty related issue is $135,120 / 66,040,200 = 0.2\%$, 64% of which is equal to a success rate of 0.13% for this sample.
- The average cost of an ambulance call (see, treat and convey) is £250.⁹¹
- This equates to a benefit of $0.13\% * 12,120 * £250.00 = £3,967.65$ in year one.
- This figure will grow uniformly each year, less the annual decrease in retention rates starting in year three.

Avoided hospital admission (short stay)

- The same success rate as above has been applied, as it is assumed that all people who are taken to hospital for an emergency admission would have to be treated and have a short stay in hospital.
- The estimated cost for a non-elective inpatient short stay is £626.00.⁹²
- This equates to a benefit of $0.13\% * 12,120 * £626.00 = £9,935.01$.
- This figure will grow uniformly each year, less the annual decrease in retention rates starting in year three.

Avoided death

- In 2017/2018, 16,890 excess winter deaths in the UK were attributed to cold housing conditions.⁹³
- The probability of saving once excess winter death in the UK as a result of energy efficiency training is therefore $(16,890 / 66,040,200) = 0.026\%$
- However, as 64% of people apply this advice, the success rate is equal to 0.016%.
- The value of a prevented fatality in the UK is £1,897,129.⁹⁴
- This equates to a benefit of $0.017\% * 12,120 * £1,897,129.00 = £3,763,576.31$.
- This figure will grow uniformly each year, less the annual decrease in retention rates starting in year three.

⁹¹ <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁹² <https://www.pssru.ac.uk/pub/uc/uc2018/services.pdf>

⁹³ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

⁹⁴ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

List of General Assumptions and Limitations

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Cost-Benefit Analysis of Cadent's Carbon Neutral Operation Initiative

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 8

Initiative Overview

Initiative name

Carbon Neutral Operation

Initiative description

Cadent will reduce its carbon footprint from a baseline of 61,750 tonnes to 0 tonnes over RIIO-GD2. This will be completed via a number of initiatives including the following – purchasing renewable energy for offices and depots, increased usage of own use gas, replacing first responder vehicles in London with EVs and deploying EV charging points at all offices and depots.

Initiative beneficiaries

The primary beneficiary of Cadent transitioning to a carbon-neutral operation is the general public who will benefit from the creation of a cleaner environment associated with a reduction in carbon emissions.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem’s business plan guidance.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	There is no regulatory standard in place to govern this.
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	There was no measure in place during RIIO-1, although we have taken steps to significantly reduce our carbon footprint, such as subsidising low CO company cars and using greater proportions of green gas to fuel our buildings. The steps we must take to achieve carbon neutrality represent a considerable cost and large-scale change in how we operate. The introduction of an electric powered fleet for our emergency team will require reworking shifts start locations and how we plan and schedule work. This is just one example of the extent of change required across the organisation to deliver such a shift
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Plans to reduce carbon footprints are very common across responsible businesses. However, we believe that commitment will make Cadent the first carbon neutral first response business in the UK (and potentially the world)
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and we will report progress annually

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Carbon Neutral Operation
RIIO-2 costs	£55,589,508.00
RIIO-2 benefits	£13,353,408.00
RIIO-2 NPV	-£36,310,712.00
RIIO-2 net benefit per £ spent	-£0.75

Cashflow Profile



Residual benefits

	Carbon Neutral Operation
Total NPV (incl. benefits realised in RIIO-GD3)	-£36,310,712.00

- While in theory, the benefits associated with certain aspects of this initiative are expected to continue into RIIO-GD3, this information is not yet available. Therefore, we have not modelled any additional benefits at this time.
- Therefore, the total NPV (including RIIO-GD3) will remain -£36,310,712.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with this initiative, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Cost of scheme	RIO-GD2	£55,589,508.00	The cost to Cadent per year.	Figure provided by Cadent.	n/a	n/a
Social benefits	Non-traded CO2 price	£/tCO2e	£72.00 - £76.80	Per Ofgem, this is the estimated annual non-traded CO2 price over RIO-GD2 (base case). Over this period, the price ranges from a minimum of £72.00 to a maximum of £76.80.	https://www.ofgem.gov.uk/publications-and-updates/rrio-2-final-data-templates-and-associated-instructions-and-guidance	100%	We assume this will be realised for each tonne of CO2e that will not be emitted.

Financial Cost-Benefit Analysis

Financial Costs

Cadent will incur a cost of £55,589,508.00 over RIIO-2 for this initiative.

	Name	2021	2022	2023	2024	2025
Financial costs	CAPEX costs	£4,506,968.00	£4,584,892.00	£15,394,885.00	£15,557,399.00	£15,545,364.00
	Total financial costs per year	£4,506,968.00	£4,584,892.00	£15,394,885.00	£15,557,399.00	£15,545,364.00

- This consists of the cost of purchasing renewable energy for offices and depots, replacing first responder vehicles in London with EV's, deployment of EV charging points at all offices and depots and increased use of PE pipes.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative. In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Non-traded CO2 price	0%	0%	100%	£72.00 - £76.80	£1,351,728.00	£1,480,396.80	£2,534,584.80	£3,244,298.40	£4,742,400.00
Total social benefits per year						£1,351,728.00	£1,480,396.80	£2,534,584.80	£3,244,298.40	£4,742,400.00

Non-traded CO2 Price

- Per Ofgem, the non-traded CO2 price (£/tCO2e) for the regulatory year 2021 is forecasted to equal £72.00.⁹⁵
- In year one, we project a carbon emission saving of 18,774 tCO2e.
- Therefore, we expect a social benefit in year one of 18,774 * £72.00 = £1,351,728.00.
- This will grow cumulatively over RIIO-GD2 as additional carbon emission savings are realised and as the forecasted non-traded CO2 price increases.

⁹⁵ <https://www.ofgem.gov.uk/publications-and-updates/riio-2-final-data-templates-and-associated-instructions-and-guidance>

List of General Assumptions and Limitations

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Cost-Benefit Analysis of Cadent's Employee Emissions Reduction Initiative

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 8

Initiative Overview

Initiative name

Employee Emissions Reduction Initiative

Initiative description

Cadent has committed to spending £1,000,000 over RIIO-GD2 to reduce employees' emissions by 5,000 tonnes per annum. This reduction will be completed by providing information and impartial advice to all and providing a subsidy for EV charge points in peoples' homes.

Initiative beneficiaries

The primary beneficiaries of this initiative are the general public who will benefit from the creation of a cleaner environment associated with a reduction in carbon emissions. All customers, including future customers and those in vulnerable situations will benefit from this initiative.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance.

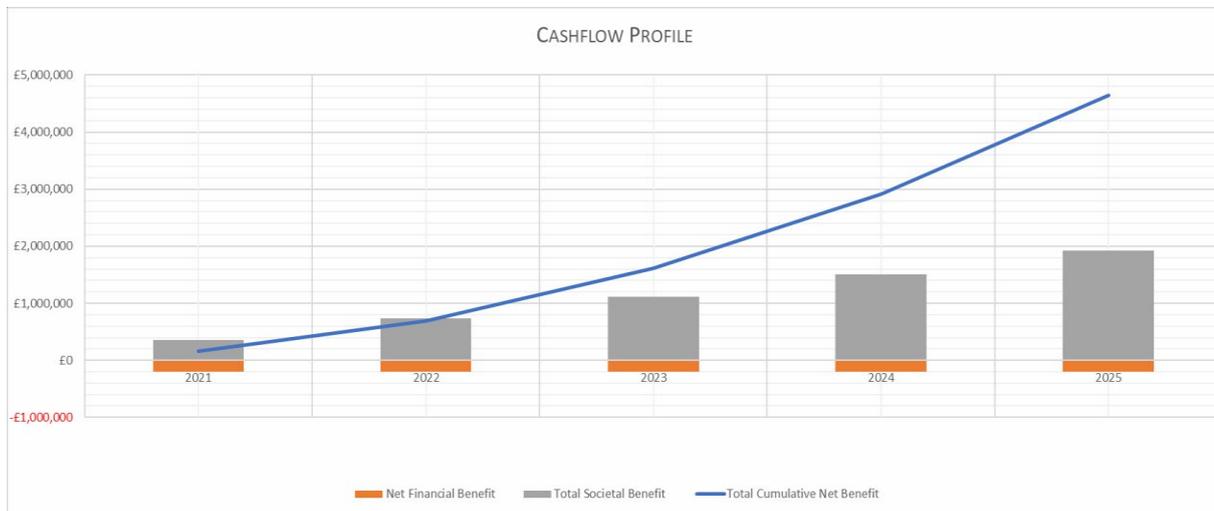
Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No standard in place
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	There was no measure in place for RIIO-1. This represents a significant challenge to provide evidence, incentive and education to all of our employees and put in place a process of monitoring and recording progress. But we cannot respond to the threat of climate change simply in the work place and this initiative goes much further than that
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	It is difficult to benchmark this output and we whilst we have found evidence of schemes elsewhere in organisations, they are typically voluntary in nature and no firm 'regulatory' targets have been established
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and progress will be measured and published annually

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Reduce employees' emissions
RIIO-2 costs	£1,000,000.00
RIIO-2 benefits	£5,640,000.00
RIIO-2 NPV	£4,085,060.00
RIIO-2 net benefit per £ spent	£4.61

Cashflow Profile



Residual benefits

	Reduce employees' emissions
Total NPV (incl. benefits realised in RIIO-GD3)	£4,085,060.00

- While in theory, the benefits associated with certain aspects of this initiative are expected to continue into RIIO-GD3, this information is not yet available. Therefore, we have not modelled any additional benefits at this time.
- Therefore, the total NPV (including RIIO-GD3) will remain £4,085,060.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with this initiative, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	CAPEX costs	RIO-GD2	£1,000,000.00	The cost to Cadent over RIO-GD2.	Figure provided by Cadent.	n/a	n/a
Social benefits	Non-traded CO2 price	£/tCO2e	£72.00 - £76.80	Per Ofgem, this is the estimated annual non-traded CO2 price over RIO-GD2 (base case). Over this period, the price ranges from a minimum of £72.00 to a maximum of £76.80.	https://www.ofgem.gov.uk/publications-and-updates/rrio-2-final-data-templates-and-associated-instructions-and-guidance	100%	We assume this will be realised for each tonne of CO2e that will not be emitted.

Financial Cost-Benefit Analysis

Financial Costs

Cadent will incur a cost of £1,000,000.00 over RIIO-2 for this initiative. It is assumed these costs are spread evenly over RIIO-2.

	Name	2021	2022	2023	2024	2025
Financial costs	CAPEX costs	£200,000.00	£200,000.00	£200,000.00	£200,000.00	£200,000.00
	Total financial costs per year	£200,000.00	£200,000.00	£200,000.00	£200,000.00	£200,000.00

- Cadent will incur £1,000,000.00 in CAPEX costs over RIIO-GD2 for this initiative.
- It is assumed these costs are spread evenly over the period in question, at a cost of £1,000,000.00 / 5 years = £200,000.00 per annum.
- This consists of the cost of providing information and impartial advice to staff and providing a subsidy for EV charging points in peoples' homes.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative. In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Non-traded CO2 price	0%	0%	100%	£72.00 - £76.80	£360,000.00	£732,000.00	£1,116,000.00	£1,512,000.00	£1,920,000.00
Total social benefits per year						£360,000.00	£732,000.00	£1,116,000.00	£1,512,000.00	£1,920,000.00

Non-traded CO2 Price

- Per Ofgem, the non-traded CO2 price (£/tCO2e) for the regulatory year 2021 is forecasted to equal £72.00.⁹⁶
- We project an annual carbon emission saving of 5,000 tCO2e.
- Therefore, we expect a social benefit in year one of 5,000 * £72.00 = £360,000.00.
- This will grow cumulatively over RIIO-GD2 as additional carbon emission savings are realised and as the forecasted non-traded CO2 price increases.

⁹⁶ <https://www.ofgem.gov.uk/publications-and-updates/riio-2-final-data-templates-and-associated-instructions-and-guidance>

List of General Assumptions and Limitations

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Cost-Benefit Analysis of Cadent's Off-Grid Communities Initiative

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 8

List of General Assumptions and Limitations – 9

Initiative Overview

Initiative name

Off-Grid Communities

Initiative description

Cadent is to undergo a trial to connect three communities to natural gas over RIIO-GD2. A total of 349 properties will be connected spread over RIIO-GD2.

Initiative beneficiaries

The primary beneficiaries of this initiative are the residents of the communities who will benefit from a reduction in fuel costs, as well as the general public who will benefit from the creation of a cleaner environment associated with a reduction in carbon emissions.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance.

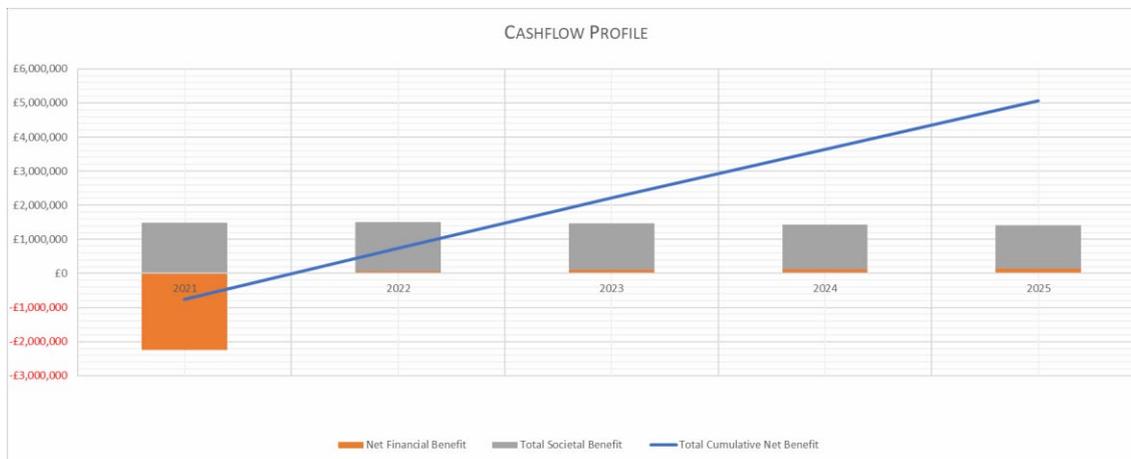
Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No standard in place
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	Given that no connections of off gas grid communities have been made directly to our network during RIIO-1, it is apparent that current measures have not been successful in facilitating community connections.
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Good examples of relevant commitments include incentivising off grid connections in Ireland (Northern and Republic) - this output case is seeking to learn from these successes and offer a benefit in England that is currently not available
It must be valued by consumers	Yes	Yes - see evidence base in Output Case - Many of our stakeholders and customers indicated that they want us to support off gas grid communities, which fits well with the 'whole systems approach' that Ofgem expects in RIIO-2.
It must be quantifiable, measurable and progress against it reportable	Yes	SROI - We asked NERA Economic Consulting to undertake a study into the social benefits of extending the gas network to off gas grid communities. Their study showed that connecting off gas grid communities creates extensive societal benefits in both urban and rural areas, with benefits increasing over time.

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Off-Grid Communities
RIIO-2 costs	£2,282,465.00
RIIO-2 benefits	£7,340,347.00
RIIO-2 NPV	£4,437,352.00
RIIO-2 net benefit per £ spent	£2.02

Cashflow Profile



Residual benefits

	Off-Grid Communities
Total NPV (incl. benefits realised in RIIO-GD3)	£4,957,023.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £717,718.50.
- This would increase the total NPV of this project to £4,957,023.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with this initiative, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	CAPEX and OPEX costs	RIO-GD2	£2,282,465.00	The cost to Cadent over RIO-GD2 to connect 349 properties to natural gas.	Figure provided by Cadent.	n/a	n/a
Financial benefits	Reduction in fuel costs for communities	Annual (per household)	£411.30	The difference in the annual cost of heating an average household with heating oil vs mains gas.	https://www.ofgem.gov.uk/ofgem-publications/145146	n/a	n/a
Social benefits	NPV benefit of switching to natural gas	Per household	£7,871.50	Measured by a reduction in the societal cost (emissions reductions) of fuel £ per customer.	NERA analysis – table provided by Cadent. See table on page 8.	100%	n/a

Financial Cost-Benefit Analysis

Financial Costs

Cadent will incur a cost of £2,282,465.00 over RIIO-2 for this initiative. These costs are incurred in the first year of RIIO-2.

	Name	2021	2022	2023	2024	2025
Financial costs	CAPEX and OPEX costs	£2,282,465.00	£-	£-	£-	£-
	Total financial costs per year	£2,282,465.00	£-	£-	£-	£-

Financial Benefits

	Name	2021	2022	2023	2024	2025
Financial benefits	Reduction in fuel costs for communities	£34,960.50	£66,630.60	£95,010.30	£120,510.90	£143,543.70
	Total financial costs per year	£34,960.50	£66,630.60	£95,010.30	£120,510.90	£143,543.70

- The majority of off-grid communities Cadent envisage connecting to natural gas are likely to use heating oil for fuel.⁹⁷
- As illustrated in *Table 1.1* – by switching to mains gas, the average household will save £1,006.40 - £595.10 = £411.30 per year on their heating bill.
- Therefore, the 85 households that are connected to natural gas in 2021 will yield a total social benefit of £411.30 * 85 = £34,960.50.
- This value will increase accordingly as additional households are connected to natural gas until 2025, from when it will level off at 349 households saving a total of £411.30 * 349 = £143,543.70 on an annual basis.

⁹⁷ See assumption 1 (page xx)

Table 1.1: Cost of heating an average household⁹⁸

Fuel type	Fuel price (£/KWh)	Added standing charge	Fuel prices allowing for appliance efficiency (£/kWh)	Appliance efficiency	Total Heating cost* including standing charge (£/year)
Mains gas	0.036	83.87	0.041	89%	595.1
LPG	0.067	0	0.076	89%	946.6
Heating oil	0.063	0	0.081	78%	1006.4
Wood (Pellets)	0.064	0	0.098	65%	1223.1
Electricity (Economy 7)	0.098	78.4	0.098	100%	1303.4
Coal	0.057	0	0.126	45%	1577.8
Electricity (Standard rates)	0.140	72	0.140	100%	1822.0

⁹⁸ <https://www.ofgem.gov.uk/ofgem-publications/145146>

Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative. In all cases, attribution is 0% because Cadent is not partnering with any groups to deliver this initiative. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	NPV benefit of switching to natural gas	0%	0%	100%	£7,871.50	£1,495,585.00	£1,432,613.00	£1,369,641.00	£1,314,540.50	£1,267,311.50
Total social benefits per year						£1,495,585.00	£1,432,613.00	£1,369,641.00	£1,314,540.50	£1,267,311.50

NPV benefit of switching to natural gas

- Per NERA (*Table 1.2*) the NPV benefit of a customer switching from using oil boilers to natural gas in 2021 is equal to £9,168.00 for urban customers and £6,575.00 for rural customers.⁹⁹
- The average of these values has been used for the proxy for this social benefit = £7,871.50.
- We have assumed that 100% of the customers who are connected to natural gas via this initiative will realise the NPV benefit of switching to natural gas.
- In 2021, 85 properties are to be connected to natural gas for a social benefit of £7,871.50 * 85 = £1,495,585.00.
- This benefit will continue to be realised from 2022-2025 as an additional 264 homes are switched to natural gas over this period (delivered in the following manner; 77 in 2022, 69 in 2023, 62 in 2024, and 56 in 2025).

Table 1.2: NPV Benefit of a Customer Switching from Alternative Fuels to a Natural Gas Boiler in 2021

⁹⁹ See assumption 1 (page 8)

Alternative Technology	NPV Benefit of Switching to Natural Gas in 2021, Measured by Reduction in Societal Cost of Fuel (£/customer)	
	<i>Urban</i>	<i>Rural</i>
Electric storage heater	4,520	4,844
Electric panel	12,744	13,068
Oil boilers	9,168	6,575
Solid fuel (wood, coal, coke)	38,743	18,000
LPG and bottled gas	11,200	11,146
Bio-LPG	10,171	10,432

Source: NERA analysis.

List of General Assumptions and Limitations

Assumption 1

- The majority of off-grid communities Cadent envisage connecting are likely to use heating oil for fuel. As a result, heating oil has been used to calculate the reduction in fuel costs for communities and the cost of oil boilers has been used for the NPV benefit of switching to natural gas calculation.

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Cost-Benefit Analysis of Cadent's Theft of Gas Investigations

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

List of General Assumptions and Limitations – 7

Initiative Overview

Initiative name

Theft of Gas Investigations

Initiative description

Cadent are incentivised to be more proactive in investigating theft of gas. By doing this, it is estimated that £290,000 worth of gas (over and above historical performance) will be returned to customers each year over RIIO-GD2.

Initiative beneficiaries

The primary beneficiaries of this initiative are the customers who will have gas returned to them. They will realise a direct financial benefit as 'stolen' money is returned to them. All customers will benefit from this initiative as a share will be returned through the bill.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standard in place
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	The introduction of this approach to funding GDNs to tackle the theft of gas could benefit customers by as much as £800,000 per year (c. double benefit of RIIO-1)
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	We did not find any directly comparable schemes. However, Scottish Power Energy Networks has an initiative that aims to clarify the benefits of co-joining information from their network monitoring and metering data to identify customers with exceptional trends, detect fraud, facilitate more targeted investigation and identify whether there is nontechnical loss reduction value in widespread network monitoring.
It must be valued by consumers	Yes	Yes - see evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI - Gas theft is an industry wide concern that British Gas estimate costs between £220m and £400m per year . This cost is ultimately paid for by customers.

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Theft of Gas
RIIO-2 costs	£ -
RIIO-2 benefits	£1,450,000.00
RIIO-2 NPV	£1,285,967.00
RIIO-2 net benefit per £ spent	n/a

Cashflow Profile



Residual benefits

	Theft of Gas
Total NPV (incl. benefits realised in RIIO-GD3)	£1,285,967.00

- There are no additional benefits that would continue into RIIO-GD3, therefore the total NPV of this project would remain at £1,285,967.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with this initiative, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Costs	RIO-GD2	£-	We are not passing on any of the costs of investigations to customers.	Information provided by Cadent.	n/a	n/a
Financial benefits	Amount returned to customers (above historical performance)	Annual	£290,000.00	The amount of 'stolen' money returned to customers over and above historical performance. As we already return money to customers due to theft of gas investigations, we are only claiming CVP for the amount over what we typically deliver.	Figure provided by Cadent.	100%	n/a

Financial Cost-Benefit Analysis

Financial Costs

	Name	2021	2022	2023	2024	2025
Financial costs	Costs	£ -	£ -	£ -	£ -	£ -
	Total financial costs per year	£ -	£ -	£ -	£ -	£ -

- At no point will this initiative incur a cost to customers – benefits will be split 60:40 in favour of customers. We will offset costs via our 40% share of the incentive.

Financial Benefits

	Name	2021	2022	2023	2024	2025
Financial benefits	Amount returned to customers (above historical performance)	£290,000.00	£290,000.00	£290,000.00	£290,000.00	£290,000.00
	Total financial costs per year	£290,000.00	£290,000.00	£290,000.00	£290,000.00	£290,000.00

- We expect £1,020,000.00 of 'stolen money' to be saved per annum as a result of this initiative.
- The historical average amount returned to customers through similar initiatives is £730,000.00.
- The amount over and above our historical performance is £290,000.00 – this is the amount of 'stolen money' that will be returned to customers per year over RIIO-GD2 as a result of this initiative.

List of General Assumptions and Limitations

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Limitation 3

- The social and environmental benefits associated with this initiative are unquantifiable at present. This is because there is a lack of data on the physical amount of gas that is recovered.

Cost-Benefit Analysis of Cadent's PSR Awareness Campaign

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis –6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 8

Initiative Overview

Initiative name

PSR Awareness Campaign

Initiative description

Cadent has committed to spending £7,771,341.00 over RIIO-GD2 to raise awareness of the PSR. This objective will be completed through 2 million conversations with customers, during which the benefits of the PSR will be discussed.

Initiative beneficiaries

The primary beneficiaries of this initiative are the eligible customers who will sign up to the PSR as a result of these conversations. They will benefit from free services such as receiving advance notice of planned power cuts, priority support during emergencies and meter reading services.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance.

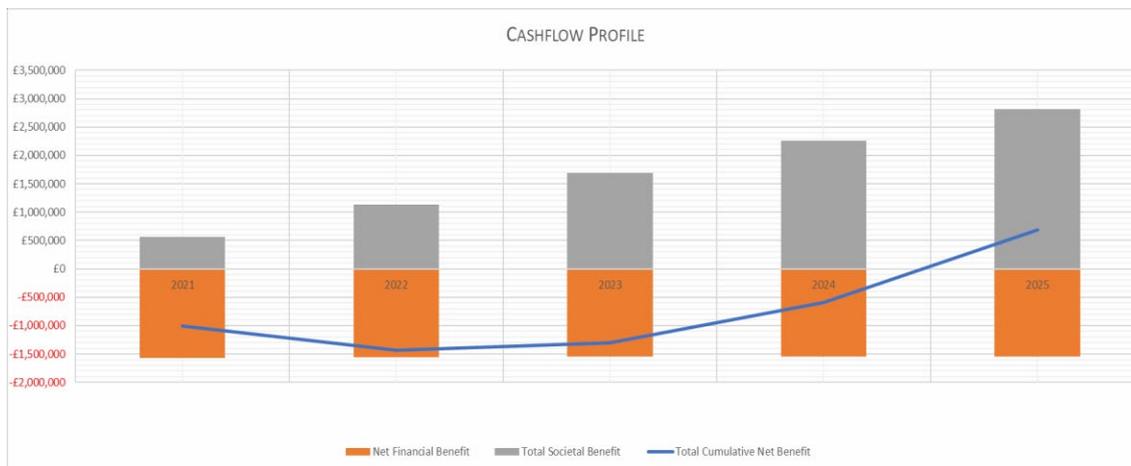
Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	GDNs are required to identify vulnerability amongst their customers
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	There was no formal output for PSR awareness in RIIO-1. During this period, we took the lead role in establishing a cross-industry PSR that allows customers to only register once and receive the benefits from all organisations using the same PSR. In RIIO-1 we have raised awareness through literature, training our employees, billboards and at various customer and stakeholder engagement events. However, our proposal to have 2,000,000 direct conversations to raise awareness is a considerable ramp up and with very limited pass-on of advice, we believe has the possibility to reach c.7,000,000 people during RIIO-2.
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Raising awareness measures or PSR registrations is quite common now across utility businesses. However, not through quality face-to-face conversations delivered through a carefully considered partnership approach at such scale
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI value provided and progress will be reported annually

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	PSR Awareness
RIO-2 costs	£7,771,341.00
RIO-2 benefits	£8,460,000.00
RIO-2 NPV	£569,632.00
RIO-2 net benefit per £ spent	£0.08

Cashflow Profile



Residual benefits

	PSR Awareness
Total NPV (incl. benefits realised in RIIO-GD3)	£11,290,011.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £10,720,379.00.
- This would increase the total NPV of this project to £11,290,011.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with this initiative, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Conversations and partnership costs	RIO-GD2	£7,771,341.00	The cost to cadent to hold PSR conversations over RIO-GD2.	Figure provided by Cadent.	n/a	n/a
Social benefits	Value of vulnerable customers being added to the PSR	Per customer	£2.35	A willingness to pay study found the value of a customer being added on to the PSR at £2.35 per person.	Accent SECV Willingness to Pay research (2019 – DNOs)	60%	A 60% uptake for registrations has been assumed based on previous PSR conversations that have been held by Cadent.

Financial Cost-Benefit Analysis

Financial Costs

Cadent will incur a cost of £3,801,340 over RIIO-2 for this initiative. It is assumed these costs are spread evenly over RIIO-2.

	Name	2021	2022	2023	2024	2025
Financial costs	Conversations and partnership costs	£1,571,393.00	£1,558,335.00	£1,552,203.00	£1,547,593.00	£1,541,816.00
	Total financial costs per year	£760,268.00	£1,571,393.00	£1,558,335.00	£1,552,203.00	£1,547,593.00

Conversations

- Cadent will incur a cost of £7,771,341.00 over RIIO-GD2 to hold PSR conversations.
- These annual costs will be split between the cost of the actual conversations, and the partnerships required to deliver them.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative. In all cases, attribution is 0% - although Cadent is partnering with several organisations to complete this initiative, the money Cadent will spend to set up partnerships leads to the benefit. Drop off is 0% because the expected benefits will not decrease over time.

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
Social benefits	Value of vulnerable customers being added to the PSR	0%	0%	60%	£2.35	£564,000.00	£1,128,000.00	£1,692,000.00	£2,256,000.00	£2,820,000.00
Total social benefits per year						£564,000.00	£1,128,000.00	£1,692,000.00	£2,256,000.00	£2,820,000.00

Value to the customer of being added to PSR

- A willingness to pay study found the net value per customer for PSR services to be £2.35.¹⁰⁰
- A 60% uptake has been assumed based on previous PSR conversations that have been held by Cadent.
- Therefore, 60% of the 2 million people who engage in PSR awareness conversations are expected to sign up to the PSR and subsequently realise this benefit.
- It has been assumed that the 2 million conversations will be spread evenly over RIIO-GD2, at an annual rate of 400,000 conversations.
- In 2021, this equates to a social benefit of 400,000 conversations * 60% uptake * £2.35 = £564,000.00.
- This value will grow cumulatively as additional conversations are held, and because the benefits associated with being added to the PSR are continuous.

¹⁰⁰ Accent SECV research, DNOs 2019, Willingness to Pay

List of General Assumptions and Limitations

Assumption 1

- A 60% uptake for registrations has been assumed based on previous PSR conversations that have been held by Cadent.

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

Cost-Benefit Analysis of Cadent's 'Going Beyond the Meter to Never Leave a Customer Vulnerable Without Gas' Initiative

November 2019

Table of Contents

Initiative Overview – 2

Finding of the Cost-Benefit Analysis – 3

Summary of Proxies and Probabilities – 5

Financial Cost-Benefit Analysis – 6

Social Benefit Analysis – 7

List of General Assumptions and Limitations – 9

Initiative Overview

Initiative name

Going beyond the meter to never leave a customer vulnerable without gas

Initiative description

Customers who are in vulnerable situations have a particular reliance on their gas supply. Therefore, is it beneficial to either find ways to avoid the occurrence of unplanned interruptions in the first place, or to minimise their impact via alternative welfare provisions.

It is our responsibility to restore the gas supply at the customer's meter and to keep them away from the immediate harm of unsafe appliances or gas installations. In order to avoid situations where a customer has no access to gas supply at their appliances it is important that we go beyond to undertake repairs or join up the industry and ensure a customer is never left vulnerable without gas.

On the back of this, we will engage in a proactive programme of customer installation and appliance safety checks for our customers during RIIO-GD2 and make repairs/replacements wherever necessary. This is to be completed in tandem with an NEA pilot to support vulnerable customers with major appliance and installation works, as well as extending the skills of our workforce to enable our employees to undertake repairs for our customers.

In doing so, we will repair or replace 5,000 appliances (1,000 per annum) over RIIO-GD2 that are likely to cause an interruption.

Initiative beneficiaries

The main beneficiaries of this initiative are the inhabitants of the households from which gas appliances will be replaced. They will benefit from residing in more temperate housing conditions with more efficient gas appliances as a result of this initiative.

Why is this part of our CVP?

The table below summarises the assessment that we made against the criteria that we have used to identify aspect of the plan that form part of our CVP. This was part of a two-stage assessment process; the first considered the 9 categories that could be used to identify aspects of the CVP that was provided in Ofgem's business plan guidance.

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No minimum standards or licence conditions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	This is truly new ground for GDNs, representing a significant enhancement to service levels. Interventions will be coordinated and delivered through a partnership with recognised charities and Gas Safe Registered organisations. This will allow for independent and qualified 'means' testing to identify those most at need to receive this additional service
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	No examples found at any real scale
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	SROI and progress will be reported on an annual basis

Finding of the Cost-Benefit Analysis

Net Present Values and Net Benefit per £ spent

	Going Beyond the Meter
RIIO-2 costs	£2,719,835.00
RIIO-2 benefits	£19,760,173.03
RIIO-2 NPV	£15,022,472.00
RIIO-2 net benefit per £ spent	£6.23

Cashflow Profile



Residual benefits

	Going Beyond the Meter
Total NPV (incl. benefits realised in RIIO-GD3)	£40,062,253.00

- We expect benefits to continue into RIIO-GD3 at no extra cost, which would result in additional benefits of £32,933,621.72.
- This would increase the total NPV of this project to £40,062,253.00.

Summary of Proxies and Probabilities

List of all costs and benefits associated with replacing gas appliances, as well as proxies used to monetise social benefits realised.

Where applicable, success rates are listed per item.

	Cost, benefit or proxy	Units	Cost (£)	Description	Source	Success / probability	Source for success / probability
Financial costs	Cost of scheme	Per annum	£543,967.00	The annual cost to Cadent for this initiative.	n/a	n/a	n/a
Social benefits	Comfortable and warm homes reduce the likelihood of illness	Event	£37.00	The average cost of a consultation with a GP (2017).	https://www.pssru.ac.uk/pub/uc/uc2017/community-based-health-care-staff.pdf	19%	https://fingertips.phe.org.uk/documents/Fuel_poverty_health_in_equalities.pdf
	Comfortable and warm homes reduce the likelihood of excess winter death	Event	£1,897,129.00	The value of the prevention of a fatal casualty in Great Britain (2017).	https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents	0.02558%	Cadent calculation (see page 8).
	Energy bill savings	Per annum	£136.00	Average energy bill savings from replacing a boiler (2018).	Cadent calculation (see page 8).	100%	It is assumed that each customer who has their appliance repaired/replaced will realise this benefit.

Financial Cost - Benefit Analysis

Financial Costs

Going Beyond the Meter

Cadent will incur a financial cost of £2,719,835.00 for this initiative.

	Name	2021	2022	2023	2024	2025
Financial costs	Cost of scheme	£543,967.00	£543,967.00	£543,967.00	£543,967.00	£543,967.00
	Total financial costs per year	£543,967.00	£543,967.00	£543,967.00	£543,967.00	£543,967.00

- Cadent will repair/replace 1,000 appliances per annum at an annual cost of £543,967.00.

Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative; covering benefits related to the replacement of gas appliances for vulnerable and/or fuel poor households. In all cases, attribution is 0%. Drop off is 0% because the expected benefits are not expected to decrease over time – this is based on the assumption that the sample will have a boiler repaired/replaced as part of this initiative, the average lifetime of which is up to 10-15 years.¹⁰¹

	Name	Attribution	Drop off	Success	Proxy	2021	2022	2023	2024	2025
akSocial benefits	Comfortable and warm homes reduce the likelihood of illness	0%	0%	19%	£37.00	£16,872.00	£33,744.00	£50,616.00	£67,488.00	£84,360.00
	Comfortable and warm homes reduce the likelihood of excess winter death	0%	0%	0.02558%	£1,897,129.00	£1,164,472.87	£2,328,945.74	£3,493,418.61	£4,657,891.47	£5,822,364.34
	Energy bill savings	0%	0%	100%	£136.00	£136,000.00	£272,000.00	£408,000.00	£544,000.00	£680,000.00
Total social benefits per year						£1,317,344.87	£2,634,689.74	£3,952,034.61	£5,269,379.47	£6,586,724.34

Comfortable and warm homes reduce the likelihood of illness

- Studies have shown that visits to GP's for respiratory tract infections increase by up to 19% for every one degree drop in mean temperature below 5°C in homes.¹⁰² We assume that the success rate is 19%, that is, without the initiative the customers would experience *at least* a 19% higher risk of respiratory tract infections requiring *at least* one visit to their GP.
- Therefore, in year one, this initiative can expect to yield this benefit in the form of a reduced risk of illness to 19% * 2,400 people (this initiative will impact 1,000 households per annum, and the average household size in the UK is 2.4)¹⁰³ = 456 fewer visits to the GP in year one.
- The average cost of a GP consultation lasting 9.22 minutes is £37.00.¹⁰⁴ This equates to a social benefit in year one of 456 avoided visits * £37.00 = £16,872.00.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum and because the benefits associated with repairing/replacing gas appliances are continuous.

¹⁰¹ <https://www.help-link.co.uk/advice-centre/how-long-do-boilers-last/>

¹⁰² https://fingertips.phe.org.uk/documents/Fuel_poverty_health_inequalities.pdf (2014)

¹⁰³ <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2016>

¹⁰⁴ <https://www.pssru.ac.uk/pub/uc/uc2017/community-based-health-care-staff.pdf> (2017)

Comfortable and warm homes reduce the likelihood of excess winter death

- In 2017/2018, 16,890 excess winter deaths in the UK were attributed to cold housing conditions.¹⁰⁵
- The estimated population of the UK is 66,040,200.¹⁰⁶
- The likelihood of an excess winter death in England & Wales is therefore $16,890 / 66,040,200 = 0.02558\%$.
- In year one, this initiative will yield a benefit in the form of avoided winter deaths to $2,400 * 0.02558\% = 0.614$ people.
- The value of a prevented fatality in the UK is £1,897,129.¹⁰⁷ This equates to a social benefit in year one of $0.614 \text{ people} * £1,897,129.00 = £1,164,472.87$.
- The value of the initiative grows cumulatively each year as it affects an additional 2,400 people per annum and because the benefits associated with repairing/replacing gas appliances are continuous.

Energy bill savings

- All customers impacted by the initiative will receive energy savings as a result of using more efficient appliances. As such, we expect the success rate to be 100%.
- The amount of energy bill savings depends on the appliances replaced, their efficiency, and the housing type (e.g. flat, house, etc). We assume that the population has an even distribution of housing types.
- We also assume (for the sake of this social benefit) that the population has an even distribution of their boiler efficiency ratings and will replace a boiler as part of the initiative.
- On average, assuming an even distribution of housing types and boiler efficiency ratings, the amount of annual energy bill savings from replacing a boiler is £136.00.¹⁰⁸
- This benefit has been applied once per household instead of on a per person basis because each household is responsible for one energy bill.
- Therefore, for customers impacted by the initiative in year one, we would expect a benefit of $1,000 \text{ households} * £136.00 \text{ savings} = £136,000.00$.
- The value of the initiative grows cumulatively until year five as it affects an additional 1,000 households per annum and because the projected bill savings of £136.00 are realised on an annual basis.

¹⁰⁵ <https://www.e3g.org/news/media-room/17000-people-in-the-uk-died-last-winter-due-to-cold-housing>

¹⁰⁶ ²⁸ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates> (2017 figure)

¹⁰⁷ <https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents>

¹⁰⁸ <https://www.energysavingtrust.org.uk/home-energy-efficiency/boiler-replacement>

List of General Assumptions and Limitations

Assumption 1

- The average household size in the UK is 2.4.¹⁰⁹

Limitation 1

- The calculations do not account for inflation or changes in purchasing power.

Limitation 2

- The manual calculations (based on the figures listed in the social benefits section) may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

¹⁰⁹ <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2016>

Customer value proposition based on willingness to pay results

Summary

We can value 3 commitments using NERA's triangulated WTP report:

Commitment	Total cost to deliver	Total WTP benefit (undiscounted)	Total WTP benefit (discounted)	5-year NPV	Notes
Time bound appointments	0.0	123.0	109.1	109.1	
Personalising welfare facilities	16.3	152.5	135.2	120.8	
Entry capacity enablement	83.8	145.8	125.0	51.9	All are based on the 'most likely' scenario from the UM described in Appendix 10.00

And a further SROI value can be added for the Cadent foundation:

Commitment	Total cost to deliver	Total WTP benefit (undiscounted)	Total WTP benefit (discounted)	5-year NPV	Notes
Cadent foundation	0.0	31.2	27.2	27.2	

Introduction

We have undertaken willingness to pay research to inform our business plan. The results of this research allow us to estimate the benefit our commitments deliver to customers compared to their cost.

The primary source of this information is NERA’s ‘triangulated’ valuation report, which incorporates the results of:

- A benefit transfer (BT) report, using desk-based research
- A targeted benefit transfer study, focusing on estimating the economic value of extending the gas network to new customers
- A broad stated preference (SP) study, using survey techniques asking customers to make hypothetical trade-offs between changes in their gas bills and changes in services
- A revealed preference (RP) study focused on surveying customers about their experiences of actual gas supply interruptions

Method

To estimate a social benefit for our commitments, we have multiplied the valuation of each level of service improvement by the number of customers.

Domestic and non-domestic benefits are added together to provide an overall benefit.

We have selected a low/medium/high valuation for each output based on other customer and stakeholder feedback.

Time bound appointments

	Offer 2-hour and 4-hour timeslots for all customers
Total costs	£0 (we are not proposing any additional costs for this commitment)
Low/Central/High estimate	Central: Other engagement suggests customer support for time bound appointments, but no other quantitative information to justify a high valuation
Triangulated WTP	Domestic: £2.11 to offer 2-hour slots per year Non-domestic: £12.79 to offer 2-hour slots per year (Note: 4 hour slots are valued as a separate option, to avoid double-counting, this figure only uses the valuation for 2-hour slots)

Total benefit (gross undiscounted)	Domestic: £114.1m Non-domestic: £8.9m Total: £123.0m
Total benefit (gross discounted)	£109.1m
Net present value	£109.m

Why is this part of our CVP

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	GSOPs with expectations regarding appointment booking timescales - within 5 and 10 days
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	There is nothing comparable in RIIO-1. This represents a considerable shift from the licence conditions underpinned by GSOP standards. To deliver this will require investment in our IT across our various services, changes to the way that work is planned, scheduled and dispatched.
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Time bound appointments is relatively common for energy suppliers for work that is easy to plan in advance, such as boiler services. Even then, they are typically offered for 'morning' or 'afternoon' without additional payments. Delivery companies offer 1-hour slots, but these are only confirmed on day usually
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	The benefit has been calculated using NERA's willingness to pay analysis and progress will be reported annually

Personalising welfare facilities

	Offer personalised welfare provisions for all customers in vulnerable situations
Total costs	£16.3m
Low/Central/High estimate	Central: Most qualitative engagement supported the idea of providing welfare facilities. Quantitative results from business options testing were split across each option, so proposing the central case.
Triangulated WTP	Domestic: £2.82 per year to offer welfare facilities to customers believed to be in vulnerable situations Non-domestic: zero willingness to pay in the central case
Total benefit (gross undiscounted)	Domestic: £152.5m Non-domestic: zero Total: £152.5m
Total benefit (gross discounted)	£135.2m
Net benefit	£120.8m

Why is this part of our CVP

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	GSOP3 requires welfare services to be offered to customers in vulnerable situations during supply interruptions
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	During RIIO-1 we have gone way beyond the GSOP standard, especially during major incidents and when supporting customers in MOBs. However, this proposal goes much further still by increasing the number and variety of welfare options available and recognising that vulnerability can be created by an interruption, expanding the scope of those who can benefit from the offering.

It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Welfare offers are quite common. However, we have not found evidence of another organisation providing the degree of tailoring or extent of the offer that we are proposing
It must be valued by consumers	Yes	See evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	The benefit has been calculated using NERA's willingness to pay analysis and progress will be reported annually

Entry capacity enablement

	Reinforcement triggered by customer agreement
Total costs	'Most likely' scenario from the entry uncertainty case equates to £83.8m total costs
Low/Central/High estimate	Central: Engagement insights are generally supportive of using green-gas, although there are no other quantitative insights that would lead us toward either the low or high valuation
Triangulated WTP	Domestic: £6.01 per percent of green gas used in the range of 0.5% to 1%, and £4.95 for 1% - 1.5% Non domestic: £14.5 per percent of green gas used in the range of 0.5% to 1%, and the same for 1%-1.5%
Total benefit (gross undiscounted)	The 'most likely' position from our uncertainty mechanism leads to a 0.9% of the gas on our network being from green sources by the end of RIIO-2. When added to existing connected capacity, this means we are in the range of 0.5% to 1% for years 1,2,3 and 4 of RIIO-2, and then 1%-1.5% for year 5. Domestic: £131.9m Non-domestic: £4.4m Total: £145.8m
Total benefit (gross discounted)	£125.0m
Net benefit	£51.9m

Why is this part of our CVP?

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No standard in place
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	We will establish and utilise a flexible funding regime for entry gas reinforcements, supported by an uncertainty mechanism. This leading initiative will learn from the limitations in RIIO-1
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	We are taking the leading role in this area. It is difficult to benchmark the approach outside of the industry
It must be valued by consumers	Yes	Yes - see evidence base in Output Case
It must be quantifiable, measurable and progress against it reportable	Yes	The benefit has been calculated through the NERA led willingness to pay and we will measure and report progress annually

Cadent foundation

	Donate 1.25% of post-tax profits to our foundation																																
Total costs	£0 (we are not proposing any additional costs for this commitment)																																
Low/Central/High estimate	N/A – we do not have a customer valuation for the foundation but are using the value of the fund. We have not applied a multiplier to this figure.																																
Value of the fund	<table border="1"> <thead> <tr> <th>£'m</th> <th>31-Mar-22</th> <th>31-Mar-23</th> <th>31-Mar-24</th> <th>31-Mar-25</th> <th>31-Mar-26</th> <th>Total</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>Profit after tax</td> <td>523</td> <td>486</td> <td>504</td> <td>494</td> <td>487</td> <td>2,493</td> <td>499</td> </tr> <tr> <td>% to apply</td> <td>1.25%</td> <td>1.25%</td> <td>1.25%</td> <td>1.25%</td> <td>1.25%</td> <td>1.25%</td> <td>1.25%</td> </tr> <tr> <td>Community fund</td> <td>6.5</td> <td>6.1</td> <td>6.3</td> <td>6.2</td> <td>6.1</td> <td>31.2</td> <td>6.2</td> </tr> </tbody> </table>	£'m	31-Mar-22	31-Mar-23	31-Mar-24	31-Mar-25	31-Mar-26	Total	Average	Profit after tax	523	486	504	494	487	2,493	499	% to apply	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	Community fund	6.5	6.1	6.3	6.2	6.1	31.2	6.2
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Community fund	6.5	6.1	6.3	6.2	6.1	31.2	6.2																										
Total benefit (gross undiscounted)	Total amount donated to the fund £31.2m over RIIO-2																																
Total benefit (gross discounted)	£27.7m																																
Net present value	£27.7m																																

Why is this part of our CVP?

Criteria	Assessment	Rationale
It must be significantly beyond minimum standards or any licence condition	Yes	No standard in place
It must represent significant additional value from that provided by similar initiatives in RIIO-1	Yes	We, like other GDNs have not had a fund in place for community investments for most of RIIO-1. We introduced ours at the back end of the period
It must offer significantly more value to consumers than is typically offered by other similar organisations	Yes	Many water companies have committed to a community fund of sorts in their PR19 submissions. However, our fund is unique in the sense of its annual value (the highest) and certainty of pay out (not linked to other performance levels). Benchmarking demonstrates that our fund way beyond upper quartile

It must be valued by consumers	Yes	Customer support is high and stakeholder support is typically even higher, especially from organisations such as Sustainability First and Citizen's Advice
It must be quantifiable, measurable and progress against it reportable	Yes	SROI benefit calculated. In addition, each initiative funded through the scheme will be measured against its relevant business case and the results published through our annual safety and sustainability report