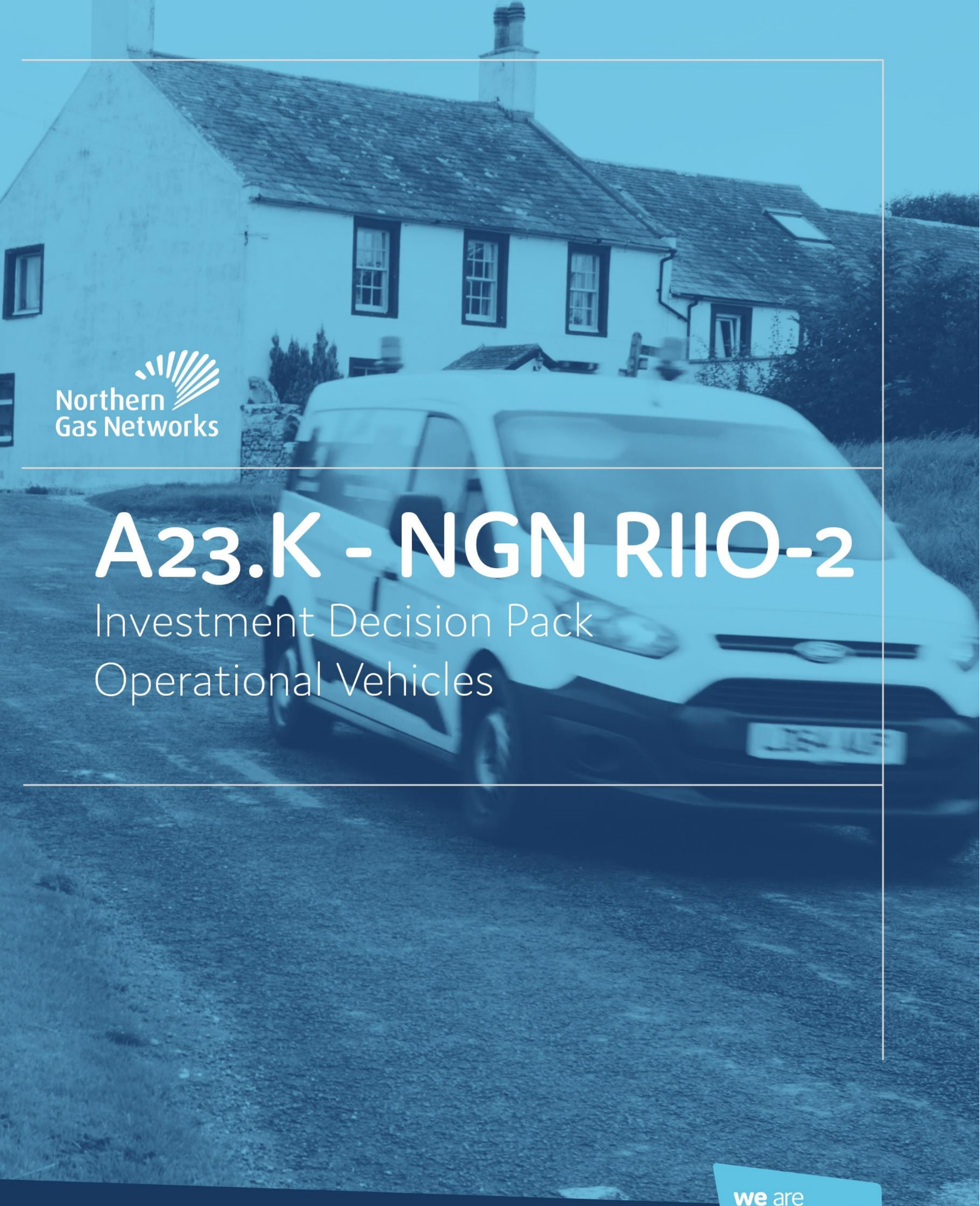


Northern Gas Networks

A23.K - NGN RIIO-2

Investment Decision Pack
Operational Vehicles

we are the network

1. Table of Contents

2. Introduction

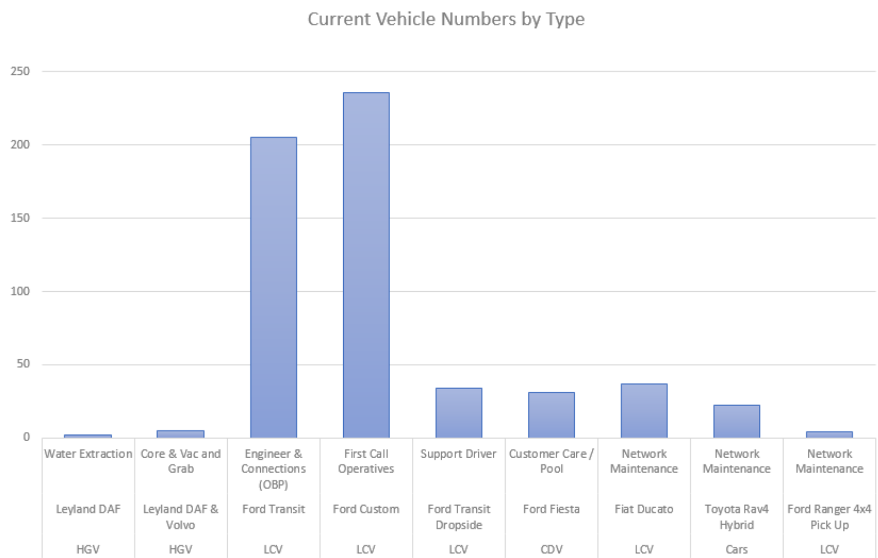
This Engineering Justification paper details our proposals for investment on our Operational Vehicles during RIIO-2 and acts as a narrative to be used in conjunction with the accompanying Cost Benefit Analysis. It explicitly follows Ofgem's guidance and is set out in accordance with the headings therein.

Our Operational Vehicles are a critical part of our business as they allow us to get around our vast network to undertake planned and reactive work and attend gas escapes. The vehicles require ongoing maintenance and repair to ensure the operate efficiently and we must replace them at the point where they become too expensive to run. During RIIO-1 we have replaced vehicles based on age and mileage and we will need to continue to do this in RIIO-2. Our stakeholders have told us that we must be ambitious in reducing our carbon footprint and so we will look at how we can improve our impact on the environment through our vehicle strategy.

This engineering paper aims to outline the justification for our proposed RIIO-2 Operational Vehicle investment, detailing our asset management decision making process during which we analyse risk and value and trade-off between different intervention options. It explains the drivers for investment, the inputs and assumptions used in our Cost Benefit Analysis and how our proposed investment benefits our customers and stakeholders.

3. Equipment Summary

NGN has approximately 600 vehicles within its fleet which is predominantly Ford based and are a combination of Transit, Transit Custom, Transit Dropside, Connect/Courier and Fiesta vans. Included within the fleet we operate seven HGV vehicles such as Water Extraction Tankers, Grab Wagons and Core & Vac. The breakdown by vehicle class is shown in the table below.



Car – A road vehicle with an engine, four wheels and seating for between one and five people and small tools, items and PPE. Our fleet includes Toyota Rav4's which are used in our Operations for Network Maintenance Technicians. These vehicles are All Wheel Drive (AWD) Hybrid, which suits the role of a Network Maintenance Technician to reach urban and farm land areas of our network.

Car Derived Van (CDV) – A goods vehicle which is constructed or adapted as a derivative of a passenger vehicle and which has a maximum laden weight not exceeding 2 tonnes. Generally, from the outside these vehicles will look like the size of a car, but on the inside will look like and function as a van as there will be no rear seats but instead a payload area with floor panel and no rear side windows. Our fleet includes Ford Fiesta CDV and these vehicles are used in Non-Operational roles such as Customer Care Officers and Spare/Pool Vehicles. These vehicles suit these roles as they require little space to carry items to complete letter drops, educational accessories and small equipment such as temporary heaters and hot plates.

Light Commercial Vehicle (LCV) - Is a commercial carrier vehicle with a gross vehicle weight not exceeding 3.5 tonnes. Generally, these vehicles are a panel van varying in size from Short Wheel Base (SWB), Medium Wheel Base (MWB) and Large Wheel Base (LWB). LCVs are created as a compact truck and is optimised to be tough built, have low operating costs, powerful yet fuel efficient engines, and to be utilised in both urban and rural operations. Our fleet includes Ford Courier, Connect, Custom and Transit. These vehicles are primarily used within the Emergency Response Operational roles such First Call Operatives and Emergency Repair as well as planned Connection works and Network Maintenance. These vehicles suit these roles as they require an increased payload to carry and tow tools and equipment to complete emergency and planned works.

Heavy Goods Vehicle (HGV) – Is a large vehicle intended for the transportation of heavy loads, plant and equipment which exceeds 3.5 tonne. Our fleet includes six HGV vehicles consisting of two 7.5 tonne water extraction tanks, two 16 tonne core and vac and two 32 tonne grab tipper wagons placed in strategic locations of our Network to carry out water extractions, pipe repairs and removing soil. The HGV base vehicles suit these roles as they require an increased payload to operate the equipment fitted and carry large amounts of soil.

4. Problem Statement

Why are we doing this work and what happens if we do nothing?

We are responsible for distributing gas to 2.7 million domestic and commercial properties across the North of England. Our network extends south from the Scottish border to South Yorkshire, has coastlines on both the East and West sides of the region and includes major cities and towns like Leeds, Hull, Newcastle, Middlesbrough, and Carlisle. As our network covers a large area of England a robust, efficient and fit for purpose fleet is paramount to:

- Operating and maintaining the gas transportation network safely and efficiently,
- Providing an emergency response service 24/7/365 to reported gas escapes and
- Connecting new customers to our network.

We use a range of vehicle types including AWD Hybrids for our maintenance teams, Fiesta Vans for our customer care teams, Transits for our emergency and repair teams and Drop sides for our Support teams. These vehicles are serviced, maintained and repaired via a network of garage repair facilities across our network. However, over time vehicles deteriorate and become more unreliable, maintenance costs increase and resale value falls. We aim to find the optimum point in a vehicle's lifetime when it most economical to replace it with a more reliable vehicle. This paper details the processes we go through to ensure we are delivering value for money for our customers in the way we manage our vehicle fleet.

The consequences of not investing in our fleet are significant as we would not meet our customer outputs and our 1 & 2 hour response times. Which would see an increase in:

- Health & Safety risk due to unrepaired gas escapes,
- Compliance risk due to not meeting licence obligations,
- Customer risk due to being slower resolving network issues,
- Environmental risk due to older less efficient air polluting vehicles, and
- Financial risk as we would see an increase in maintenance and repair costs

What is the outcome that we want to achieve?

We have a clear vision to be the best and the top performing gas network for customer experience and efficiency and by the HSE for our safety performance.

We plan to continue to add value to our customers and grow our operations with the aim of developing into a world-class gas distribution business. Our success depends on the expertise and commitment of our employees and the vehicles they operate.

Our fleet strategy aims to meet the above objectives through the following:

- **Ensure vehicle availability to match operational demand** – to ensure we maintain our excellent reliability record by ensuring our workforce can continue to deliver the high levels of service our customers have come to expect
- **Reduce our carbon footprint** – through converting 25% of our non-engineering fleet to ultra-low emission or hybrid vehicles and all others to be Euro 6 by the end of RIIO-2 to reduce pollutants, Nitrogen Oxide (NOx,) hydrocarbons, particle matter and Carbon Monoxide in the process lowering CO2 emissions and increasing fuel economy.
- **Reduce Vehicle Off Road (VOR) percentage and duration** – to ensure we are maximising the value of our workforce and continue to meet our stretching customer output targets
- **Provide safe and reliable vehicles for our colleagues** – ensuring end users are given the opportunity to contribute to the design and specification of replacement vehicles and exploring where conversions can be reviewed to improve staff welfare facilities
- **Reduce overall fleet maintenance and running costs** – through more energy efficient and cost-effective vehicles

How will we understand if the spend has been successful?

If we undertake a Cost Benefit Analysis, we can determine the optimal point to replace our vehicles and through option analysis we can ensure that we choose the best vehicle type in terms of whole life cost, reliability, suitability, and environmentally friendly.

Our investment will have been a success if we can evidence at the end of RIIO-2 that we have invested no more than we proposed, that our VOR has reduced along with our operational costs to maintain and repair our fleet, our workforces welfare has improved and we have had a positive impact on our carbon footprint.

4.1. Narrative Real-Life Example of Problem

Case Study 1 – On board power engineering vehicle replacement

As we operate 24 hours / 365-day service, our vehicles are expected to operate the same. As our vehicles age, regardless of planned service intervals, they breakdown more frequently incurring more downtime, replacement hire costs, achieve very poor mpg and provide an old and dated impression to our customers. This was the case with our 2009-2013 on board power (OBP) Engineering vehicles and following a whole life cost assessment and Cost Benefit Analysis we replaced the vehicles with the latest Transit Base. reduce vehicle down time, vehicle maintenance costs and received immediate savings on any vehicles hired. We also improved staff working environments, mpg performance and overall our fleets presence to our customers and the public.

Case Study 2 – Water extraction tankers

We use 2300ltr Water Extraction Tankers mounted to a 7.5 tonne chassis for incident situations, where bulk water removal is required and to empty the network's syphon tanks. We originally owned one of this type of vehicle which was predominantly operated in Yorkshire and travelled to the North region. The vehicle was 7 years old and had a tank that was 14 years old which was showing significant signs of corrosion and wear and tear during inspection. Due to emergency flooding and sand blast damage scenario's that had been experienced over the winter months it became apparent that we were compromised due the demand for the vehicle to respond in a timely fashion at multiple geographic locations across the network. We replaced this vehicle and procured a second due to the important function it provides during incidents and in emptying our syphons. Having two vehicles has enabled us to operate one in the North and one in Yorkshire reducing overall mileage and response times.

Case Study 3 – CNG

In partnership with Leeds City Council we trialled a small CNG van (VW Caddy) and large CNG van (IVECO Daily Dropside) to explore the possibilities of converting Leeds based vehicles to being CNG fuelled. Based on this six month trial our Leeds Depot purchased three CNG IVECO Daily's as part of their support vehicle fleet. CNG reduces the NOx and particulates emitted into the environment and improves air quality. We plan to explore further options throughout RIIO-2 where more of our fleet can be converted when adequate infrastructure is implemented across the network.

4.2. Spend Boundaries

The boundaries of spend proposed by this justification paper include capital investment on the assets listed in Section 3. It includes all necessary project costs such as investment of the base vehicle purchase, vehicle racking conversion, vehicle ancillary equipment installation and vehicle livery across the vehicle class categories (Car, CDV, LCV & HGV). It does not include company vehicle costs, wheeled plant and operational costs such as fuel, tax, insurance etc.

5. Probability of Failure

The Probability of Failure (PoF) is the probability an asset will fail at a given point in time. When justifying our RIIO-2 Capital Investment, our Cost Benefit Analysis uses our Fleet Model to calculate the PoF of our vehicles. This section discusses how we have developed our Fleet Model methodology to understand the types vehicle failure as well as the rate of failure and deterioration, which is a function of the vehicle make, model, age and mileage.

Types of Failure

A failure in an asset is defined as the inability of an asset to fulfil one or more of its intended functions to a standard for performance that is acceptable and gives rise to a detrimental outcome. In our Fleet Model these failures have been categorised into Failure Modes, and can be split into the following seven categories:

- **Brake Faults** e.g. worn brake pads or discs, leaking brake fluid, damaged rotor discs
- **Electrical Faults** e.g. Battery, non-start, alternator, auxiliary battery/wiring faults, light units/bulbs
- **Engine Faults** e.g. oil leak, radiator, coolant leak, DPF Sensor, AdBlue, injectors, belts
- **Plant Faults** e.g. OBP compressor repairs
- **Other Faults** e.g. damage, mis-use and abuse, ancillary repairs, racking repairs
- **Steering Faults** e.g. Power steering, tracking/alignment, steering racks, struts, bearings
- **Transmission Faults** e.g. fluid, gearbox, clutch, flywheel

Rate of Failure

The Failure Rate for an asset is the frequency of failures at a given point in time, typically measured as the number of failures over a year. To understand the rate of failure for our fleet we used 5 years of data from VLS our fleet management and maintenance supplier to analyse vehicle faults and conduct general linear modelling analysis. Weighted regression analysis was used to demonstrate the relationship between vehicle fault types and potential explanatory variables with results showing that make, model, age and mileage had strong statistical relationships, in particular:

- age is a significant driver in predicting brake faults
- age and mileage are drivers in predicting engine faults
- make and mileage are drivers in predicting electrical faults
- age is a significant driver in predicting plant faults
- model is a significant driver in predicting other faults

- make is a significant driver in predicting steering faults
- mileage is a significant driver in predicting transmission faults

Models were developed based on this information to help predict the expected fault rates and allow for accurate estimates of the expected maintenance costs over time depending on vehicle characteristics. These estimates are used within our Fleet Cost Benefit Analysis Model.

NGN's Fleet Cost Benefit Analysis Model

Our fleet model is used to assess different vehicle strategy options and help make informed decisions that are value-based, objective, consistent, robust, rational and transparent. This model contains a set of assumptions relevant to the fleet analysis undertaken and allows for the costs and benefits to both NGN and the wider society to be quantified and compared. These include:

NGN Costs

- Capital costs
- MOT costs
- Maintenance costs
- Employee downtime
- Fuel costs

Social Costs

- Carbon emissions
- Air quality impacts

The model uses statistical fault data (developed as above) for each vehicle to estimate the expected number of faults over time and takes user defined inputs such as average annual mileage, miles per gallon, replacement vehicle cost and vehicle depreciation to calculate the net present value of the vehicles to be replaced along with the NGN and Societal payback periods for the investment.

5.1. Probability of Failure Data Assurance

We have 5 years of actual fleet data (2014 to 2018) which we used to derive failure models. The data supplied by VLS was in depth, of good quality and completeness and allowed us to identify fault rates across a range of fault types and consequences using make, model, age and mileage.

We used statistical modelling techniques, software and regression analysis testing to ensure the robustness of our model assumptions.

6. Consequence of Failure

Types of NARMs Consequence

For each failure there may be a Consequence of Failure (CoF) which can be valued in monetary terms and are linked directly to the Failure Modes.

The monetary values used for the Cost of Consequence are based on the industry approved values such as the cost of carbon or the social cost of air quality and values specific to our business such as the cost of maintenance.

When justifying our RIIO-2 capital programme the monetary value of each Consequence Measure is calculated to determine the benefit or avoided cost of an intervention. These are categorised into two Consequence Measures which are:

Financial Risk – Avoided GDN costs through reductions in maintenance costs and employee down time. Due to the wide range of costs associated with the repair of each fault we have subdivided costs into Low and High cost events. Low cost events are deemed to be <£600 as this would cover minor repairs incurred as part of a MOT or service. High costs are more variable and relate to significant mechanical and electrical faults.

Environmental Risk – Societal benefits in avoided costs through reductions in the volume of carbon air pollutants such as NOx. These costs are in accordance with industry approved values.

7. Options Considered

Types of Intervention

There are various ways in which we can intervene on our assets within this asset group. Each intervention has its own merits and drawbacks and the key to good fleet management is to understand how vehicles behave and use data and information to ensure the right decisions are made to balance risk and value to deliver a safe and reliable service for our customers. The interventions available for vehicles are:

Refurbishment – a proactive planned intervention which includes replacement or servicing of major components and soft parts with the intention of extending the expected life of the asset. The old asset is sold, and the costs offset against the new vehicle.

Replacement – purchase of a new vehicle to replace an existing one, often because of poor condition, the new vehicle will of the same type and size but could be from a different manufacturer and likely be a newer model or design.

Addition – purchase of a new vehicle on our network to provide extra capability or increased service levels, usually in response to increased growth or a Cost Benefit Analysis assessment.

Removal – where we no longer require a vehicle, or we can manage our network in a more efficient manner we sell or dispose of the vehicle.

Future Energy Pathways

We have gone with the default assumption of current assumed proportion of methane CO2 in natural gas projected forwards due to uncertainties in the potential energy pathways and because this is reflective of the current gas quality legislation. However, we acknowledge that significant changes to gas demand or the allowed methane content of gas, for example due to the blending with or conversion to hydrogen, would impact the benefits of our investments.

Arup conducted analysis on the potential benefits of our H21 Programme (see A13 - NGN RIIO-2 Consumer Value Proposition) that showed 45% of the gas in our network is expected to be Natural, 15% biomethane and the remaining 40% hydrogen by 2040; due to a combination of blending and sub-areas of our networks being fully converted. This is consistent with Net-zero by 2050 aligned with the ENA Navigant report.

We have not explicitly modelled changes in the methane content of gas in our CBAs, as overall gas demand and the change in C02 content of the gas is not expected to be different enough to materially impact the NPV, Payback & Option Ranking of our preferred investment programme. This is because carbon risk benefit is only one element of overall risk benefit and this will be reduced by up to 40% by 2040 across all scenarios if the ambitious but realistic ENA Navigant report pathway is chosen. Our chosen programme represents value for money over a 20-year period regardless and is mainly driven by financial benefits such as avoiding maintenance and repair costs. The investments also ensure that we are compliant with relevant legislation. Our strategy therefore represents a no regrets investment programme that is consistent with net zero and will deliver value to customers whether a hydrogen or electrification pathway is chosen.

7.1. Option Summary

We have analysed our stakeholder feedback when deciding our vehicle strategy for RIIO-2 and considered the importance of a safe and reliable service as well a growing significance placed on the environment in which we live.

The investment options considered for this asset class are listed below and have the following in common:

- All options use standard unit costs for different types of assets and interventions which have been derived from 2019 supplier quotes for the relevant makes and models. For more information on unit costs see Section 7.3.
- The programme of works will be delivered evenly over the five-year price control period.
- The primary benefit delivered by these intervention options is that the fleet will continue to meet the operational demands and a reduction in environmental emissions.

7.1.1. Baseline – Do nothing / minimum

This option is used as the baseline for which all other options are measured against. It does not include any capital investment but instead considers the cost of ongoing maintenance activities and repairs on failure. There are no direct benefits accrued under this option however it does include societal impacts associated with carbon and air quality.

7.1.2. Option 1 - Vehicle Replacement (100% Diesel)

This option replaces any vehicles with a like for like diesel vehicle when it reaches one of the following two conditions:

- The vehicle has done more than 90,000 miles and is at least 4 years old
- The vehicle has done more than 75,000 miles and is at least 7 years old

7.1.3. Option 2 - Vehicle Replacement (25% Ultra Low Emission)

This option considers the same two conditions for replacement as Option 1 however 136 of the vehicles replaced in RIIO-2 will be replaced with a full electric model to meet our objective to have at least 50% of our total fleet as ultra-low emission.

7.1.4. Option 3 - Deferred Investment (25% Ultra Low Emission)

This option considers the effects of deferring investment until RIIO-3. This option delivers the baseline 'do nothing / minimum' solution during RIIO-2 and then undertakes the Option 2 during RIIO-3.

7.1.5. Option 4 - Vehicle Replacement (25% Ultra Low Emission) Low Sensitivity Analysis

This option considers sensitivity on the replacement conditions set out in Options 1 and 2. This option replaces any vehicles with a like for like diesel vehicle apart from 136 vehicles which will be replaced with a full electric model, when it reaches the following condition:

- The vehicle has done more than 75,000 miles and is at least 4 years old

7.1.6. Option 4 - Vehicle Replacement (25% Ultra Low Emission) High Sensitivity Analysis

This option considers sensitivity on the replacement conditions set out in Options 1 and 2. This option replaces any vehicles with a like for like diesel vehicle apart from 136 vehicles which will be replaced with a full electric model, when it reaches the following condition:

- The vehicle has done more than 105,000 miles and is at least 4 years old
- The vehicle has done more than 75,000 miles and is at least 7 years old

7.2. Options Technical Summary Table

Option Title	First year of spend	Final year of spend	Workload Volume	Design Life	Total Capex RIIO-2 Cost
Baseline	-	-	-	-	-
Option 1 - Vehicle Replacement (100% diesel)	2021/22	2025/26	528	5 – 10 years	£18.2m
Option 2 - Vehicle Replacement (25% Ultra Low Emission)	2021/22	2025/26	528	5 – 10 years	£19.5m
Option 3 - Deferred Investment (25% Ultra Low Emission)	2026/27	2030/31	0	5 – 10 years	£0m
Option 4 - Vehicle Replacement (25% Ultra Low Emission) Low Sensitivity Analysis	2021/22	2025/26	554	5 – 10 years	£20.4m
Option 5 - Vehicle Replacement (25% Ultra Low Emission) High Sensitivity Analysis	2021/22	2025/26	509	5 – 10 years	18.8

7.3. Options Cost Summary Table

Our replacement costs of vehicles have been derived from 2019 supplier quotes for various makes, models and specifications that represent the best value, efficiency, reliability and fitness for purpose. The conversion and livery costs are based on historic costs incurred for this type of work.

Vehicle Type	Vehicle Description	Vehicle Use	Discounted Cost	Conversion & Livery	Total Vehicle Cost
LCV	Ford Transit (OBP)	Engineer & Connections	£24,558	£18,390	**£42,947**
LCV	Ford Custom	First Call Operatives	£22,057	£8,430	**£30,487**
LCV	Ford Custom (electric)	First Call Operatives	£24,431	£7,820	**£32,251**
LCV	Ford Transit Dropside	Support Driver	£24,004	£3,655	**£27,659**
LCV	Ford Ranger 4x4 Pick Up	Network Maintenance	£26,187	£1,220	**£27,407**
CDV	Ford Fiesta (electric)	Customer Care	£24,444	£3,655	**£28,099**
Cars	Toyota Rav4 (hybrid)	Network Maintenance	£26,331	£610	**£26,941**

8. Business Case Outline and Discussion

8.1. Key Business Case Drivers Description

The following narrative then discusses the strengths and weaknesses of each option.

Option 1 – Vehicle replacement (100% Diesel)

In this option we are replacing 528 vehicles on a like for like basis which our Fleet Model predicts will be older than 4 years and reach 90,000 miles in RIIO-2 or will be older than 7 years and reach 75,000 miles in RIIO-2. The total capital expenditure over this period is £18.2m with a total operational cost of £15.8m which includes maintenance, repair, MOT, downtime and fuel costs. In addition to these costs this option considers the cost of sold vehicles at just over £1m.

This Option has a total Net Present Value at 2033 (end of life) of £99.6m which proves that this investment is beneficial for our customers and a 5 year pay back means the return on our investment would more than repay the initial investment before they reached their end of life.

Option 2 – Vehicle Replacement (25% Ultra Low Emission)

In this option we are replacing 528 vehicles on a like for like basis which our Fleet Model predicts will be older than 4 years and reach 90,000 miles in RIIO-2 or will be older than 7 years and reach 75,000 miles in RIIO-2, however 146 of the vehicles will be replaced with a full electric model. This option aligns with our stakeholder feedback on a significant appetite for us to reduce our vehicle carbon footprint and go above and beyond phasing out diesel vehicle sooner (Customer Insights no. 46). The total capital expenditure over this period is £19.4m with a total maintenance and repair cost of £15.0m. In addition to these costs this option considers the cost of sold vehicles at just over £1m.

This Option has a total Net Present Value at 2033 (end of life) of £101.1m which proves that this investment is beneficial for our customers and a 5 year pay back ensures we would see benefit at least equivalent to the cost before we replaced the vehicles.

Conclusion

Our preferred option is Option 2 because it aligns with our stakeholder feedback. It has a slightly higher capital outlay than Option 1 due to the cost of installing EV charging points and the premium for electric vehicles, however the operating costs are lower due to the reduced fuel costs for the electric vehicles. It also has the highest NPV at 2033 when we would be expecting to replace the vehicles and so delivers more benefit to our customer than the all diesel option.

Sensitivity Analysis

We have Option 2 forward to test if deferring the investment until RIIO-3 or replacing the vehicles at a lower or higher mileage would provide a greater benefit for our customers.

Option 3 – Deferred Investment (25% Ultra Low Emission)

In this option we are not replacing any vehicles in RIIO-2 but instead replacing 528 vehicles in RIIO-3 of which 146 will be a full electric model. This option is clearly the lowest capital cost during RIIO-2, however over the period we see an increase in the expected numbers of failures for the fleet as the vehicles age and are not replaced. This leads to higher maintenance and repair costs in each year the vehicles are not replaced as the costs to keep them running rises the more miles the vehicles do. By the end of RIIO-2 the operational costs required to keep the vehicles on the road is 1.6 times higher than Option 2. In RIIO-2 the total costs of this option are higher than Option 2 by RIIO-3 are almost twice the cost. In addition, this option has a greater impact on carbon and air as Option 2 replaces the fleet in RIIO-2 delivering societal benefits from year one.

When considering the total Net Present Value of Option 3, it has the lowest total of all options and in every year, along with a slower payback of 8 years. This analysis shows that delaying investment in vehicle replacement does not provide benefit to our customers and in fact increases total expenditure and pollution.

Option 4 – Vehicle replacement (25% Ultra Low Emission) Low Sensitivity Analysis

In this option we are replacing 544 vehicles on a like for like basis which our Fleet Model predicts will reach 75,000 miles and is at least 4 years old however 153 of the vehicles will be replaced with a full electric model. The capital cost of this option is slightly higher than Option 2 however maintenance and repair costs are lower due to avoided maintenance and repair costs associated with higher mileage vehicles. The total cost of this option over RIIO-2 is slightly higher than Option 2. At 2033, this option has an equal NPV to that of Option 2 and it also has a 5-year payback.

This option shows that replacing vehicles at a lower mileage does not offer additional benefits over Option 2 as the NPV's are comparable. Option 2 remains our preferred option due to the higher total costs of this option during RIIO-2.

Option 5 – Vehicle replacement (25% Ultra Low Emission) High Sensitivity Analysis

In this option we are replacing 509 vehicles on a like for like basis which our Fleet Model predicts will reach 105,000 miles and is at least 4 years old however 103 of the vehicles will be replaced with a full electric model. The capital cost of this option is slightly less than Option 2 however maintenance and repair costs are higher due to avoided maintenance and repair costs associated with higher mileage vehicles. The total cost of this option over RIIO-2 is slightly higher than Option 2. At 2033, this option has a marginally lower NPV compared to Option 2 showing that you lose benefit by delaying replacing vehicles due to the rising maintenance and repair costs. This option also has a 5-year payback.

This option shows that replacing vehicles at a higher mileage does not offer additional benefits over Option 2 as the NPV is less. Option 2 remains our preferred option due to the higher total costs of this option during RIIO-2.

8.2. Business Case Summary

Option	Description	No. of Replacements in RIIO-2	RIIO-2 Operating Cost (£m)	RIIO-2 Capex Cost (£m)	Total Forecast Expenditure (£m)	NPVs relative to baseline (£m)		Payback (years)	Preferred Option
						2030	2033 (end of life)		
-	Baseline	0	£38.9	£0.0	£38.9	-	-	-	N
1	Vehicle Replacement (100% Diesel)	528	£15.8	£17.2	£33.0	£43	£100	5	N
2	Vehicle Replacement (25% Ultra Low Emission)	528	£15.0	£18.4	£33.4	£43	£101	5	Y
3	Deferred Investment (25% Ultra Low Emission)	0	£38.9	£0.0	£38.9	£12	£64	8	N
4	Vehicle Replacement (25% Ultra Low Emission) Low Sensitivity Analysis	554	£14.6	£19.1	£33.7	£43	£101	5	N
5	Vehicle Replacement (25% Ultra Low Emission) High Sensitivity Analysis	509	£15.4	£18.3	£33.7	£43	£100	5	N

The main options have a comparable cost (both capital expenditure and operational cost) and NPV as each other. The preferred option highlighted above is the optimal mix between value for customers and stakeholder feedback, which is why we believe it is the correct choice.

9. Preferred Option Scope and Project Plan

9.1. Preferred Option

Our preferred option is Option 2 – Vehicle replacement (25% Ultra Low Emission).

9.2. Asset Health Spend Profile

Vehicle Type	No. of Replacements	Forecast Expenditure (£m)					
		2021/22	2022/23	2023/24	2024/25	2025/26	**Total**
LCV - Engineer & Connections - Ford Transit (OBP)	170	£0.2	£2.0	£1.7	£2.1	£1.3	**£7.3**
LCV - First Call Operatives - Ford Custom	114	£1.0	£1.1	£0.9	£0.2	£0.2	**£3.5**
LCV - First Call Operatives - Ford Custom (electric)	116	£1.1	£1.2	£1.0	£0.3	£0.3	**£3.7**
LCV - Support Driver - Ford Transit Dropside	35	£0.3	£0.1	£0.3	£0.2	£0.0	**£1.0**
CDV - Customer Care - Ford Fiesta (electric)	30	£0.6	£0.2	£0.0	£0.0	£0.0	**£0.8**
LCV - Network Maintenance - Fiat Ducato	37	£0.8	£0.0	£0.0	£0.7	£0.0	**£1.6**
Cars - Network Maintenance - Toyota Rav4 (hybrid)	22	£0.0	£0.5	£0.1	£0.0	£0.0	**£0.6**
LCV - Network Maintenance - Ford Ranger 4x4 Pick Up	4	£0.0	£0.0	£0.1	£0.0	£0.0	**£0.1**
EV Charging Points	-	£0.4	£0.4	£0.0	£0.0	£0.0	**£0.9**
Total	**528**	**£4.5**	**£5.5**	**£4.1**	**£3.6**	**£1.8**	**£19.5**

The total forecast capital expenditure for Operational Vehicles have been included within this Cost Benefit Analysis and can be referenced back to the following documents:

- RIIO-2 Business Plan – Tables 6.9
- RIIO-2 Business Plan Data Tables – Table 3.06
- A23.K - NGN RIIO-2 Investment Decision Pack – Operational Vehicles - CBA

9.3. Investment Risk Discussion

Vehicles are a small asset class, and all have comparable failure rates and risk profiles. We therefore believe limited investment risk exists in this asset class.