North West Leicestershire District Council

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Meeting	**CORPORATE SCRUTINY COMMITTEE**
Time/Day/Date	6.30 pm on Wednesday, 1 September 2021
Location	Council Chamber, Council Offices, Coalville
Officer to contact	Democratic Services

AGENDA

Item **Pages**

1. APOLOGIES FOR ABSENCE

2. DECLARATION OF INTERESTS

Under the Code of Conduct members are reminded that in declaring disclosable interests you should make clear the nature of that interest and whether it is pecuniary or non-pecuniary.

3. PUBLIC QUESTION AND ANSWER SESSION

To receive questions from members of the public under rule no.10 of the Council Procedure Rules. The procedure rule provides that members of the public may ask any question on any matter in relation to which the Council has powers or duties which affect the District, provided that three clear days' notice in writing has been given to the Head of Legal and Support Services.

4. MINUTES

To approve and sign the minutes of the meeting held on 9 June 2021 **3 - 8**

5. ITEMS FOR INCLUSION IN THE FUTURE WORK PROGRAMME

To consider any items to be included in the work programme. The plan of forthcoming Cabinet decisions and the current work programme are attached for information. **9 - 26**

6. FLEET MANAGEMENT STRATEGY

Report of the Head of Community Services **27 - 178**

7. 2021/22 QUARTER 1 PERFORMANCE REPORT

Report of the Head of Human Resources and Organisational Development **179 - 238**

8. SPECIAL EXPENSES POLICY

Report of the Head of Finance **239 - 248**

9. EXCLUSION OF PRESS AND PUBLIC

The officers consider that the press and public should be excluded during consideration of the following items in accordance with Section 100(a) of the Local Government Act 1972 as publicity would be likely to result in disclosure of exempt or confidential information. Members are reminded that they must have regard to the public interest test and must consider, for each item, whether the public interest in maintaining the exemption from disclosure outweighs the public interest in making the item available.

10. THE RECOVERY OF OUR LEISURE CENTRES AND THE PARTNERSHIP CONTRACT WITH EVERYONE ACTIVE (OCTOBER 2021 TO MARCH 2022)

Report of the Head of Community Services **249 - 300**

Circulation:

Councillor R Boam (Chairman)
Councillor B Harrison-Rushton (Deputy Chairman)
Councillor E G C Allman
Councillor D Bigby
Councillor A J Bridgen
Councillor G Hoult
Councillor A C Saffell
Councillor S Sheahan
Councillor N Smith
Councillor M B Wyatt

MINUTES of a meeting of the CORPORATE SCRUTINY COMMITTEE held in the Council Chamber, Council Offices, Coalville on WEDNESDAY, 9 JUNE 2021

Present: Councillor R Boam (Chairman)

Councillors E G C Allman, D Bigby, A J Bridgen, G Hoult, V Richichi (Substitute for Councillor B Harrison-Rushton), S Sheahan and N Smith

Portfolio Holders: Councillors A C Woodman

Officers: Mr A Barton, Mr C Colvin, Ms E Kenyon, Mr J Knight, Mr C Lambert, J Marshall, Mr M Murphy, Mr P Sanders, Mrs B Smith, Mrs R Wallace, Miss E Warhurst and Mr P Wheatley

1. APOLOGIES FOR ABSENCE

Apologies were received from Councillors B Harrison-Rushton, A C Saffell and M B Wyatt.

2. DECLARATION OF INTERESTS

There were no declarations of interest.

3. PUBLIC QUESTION AND ANSWER SESSION

None received.

4. MINUTES

Consideration was given to the minutes of the meeting held on 10 March 2021.

It was moved by G Hoult, seconded by Councillor N Smith and

RESOLVED THAT:

The minutes of the meeting held on 10 March 2021 be approved as a correct record.

5. ITEMS FOR INCLUSION IN THE FUTURE WORK PROGRAMME

Consideration was given to the Committee's work programme and Cabinet's Executive Decision Notice.

A Member informed the Committee that a scoping form had been submitted in relation to the Renewable Heating Grant error which had previously been reported to the Audit and Governance Committee. It was hoped that a report on the matter would be presented at a future meeting and a task and finish group be established to investigate further.

A request was made to receive the following report before consideration at Cabinet in September:

'The Recovery of our Leisure Centres and the Partnership Contract with Everyone Active'

A Member asked that officers closely monitor the number of evictions due to the potential increase now that the eviction moratorium had ended and report to Committee any issues. The Strategic Director confirmed that this was being monitored and information had been circulated to Members earlier that day. Members were informed that this area would be reported regularly as part of the quarterly performance reports going forward.
By affirmation of the meeting it was

RESOLVED THAT:

a) The future work programme be received and noted.

b) Consideration be given by the Chairman to the proposed items for the work programme.

6. SCRUTINY ANNUAL REPORT

The Strategic Director presented the report to Members.

A discussion was had on the benefits of continuing the Scrutiny Cross Party Working Group. Members were in agreement that the group should not be disbanded, and it should be used to monitor progress of the scrutiny function with the next meeting in approximately 4 months' time.

In relation to the training package delivered the previous year, some Members felt that due to the virtual delivery it was not as successful as it could have been.

A Member referred to a consultation process undertaken with Committee Members the previous year in relation to the scrutiny function and asked for some information on the outcome. The Strategic Director explained that the consultation was part of the review undertaken by the Centre for Governance and Scrutiny, the final report would be provided outside of the meeting for information.

Councillor S Sheahan moved recommendation one within the report and that the Scrutiny Cross Party Working group should be continued. It was seconded by Councillor D Bigby.

RESOLVED THAT:

The annual report be noted ahead of its submission to Council at its meeting on 22 June 2021.

RECOMMENDED THAT:

The Scrutiny Cross Party Working Group be continued.

7. ZERO CARBON UPDATE

The Head of Community Services and the Climate Change Programme Manager gave a presentation to Members highlighting the progress made so far on the Council's zero carbon aims. The Portfolio Holder also spoke in support.

A Member referred to another Local Authority in the north of the country who were utilising unused mines to generate power and asked if this was something that could be done in the District. The Head of Community Services reported that although this was deemed unsuitable in the past, it was something that was currently being investigated and early conversations were being held with the Coal Authority.

A Member expressed opinions on biodiversity and the loss of natural habitats, officers were asked if this was being considered due to the proximity of the National Forest. The Climate Change Programme Manager reported that there was a wider environmental group across the region, led by Leicestershire County Council, which would look at these matters. She agreed to discuss the matter further with the Member outside of the meeting.

At the request of a Member, clarification was given on the position of the food waste collection trial and the process involved in recycling the waste. The Head of Community Services reminded Members that NWLDC was the only council in Leicestershire collecting food waste and it should be celebrated. The emerging plan was to roll the programme out to the whole District in the future.

A Member expressed concerns that there was not enough reduction of carbon footprint in the first two years to achieve the future targets. It was felt that the report did not contain enough context as comparison figures of the current position and current target position were not included, therefore it was difficult to see what was required. Other comments were also raised on the major work required to reduce the carbon footprint of council homes. The Head of Community Services explained that the plan was currently in its early stages with more data measurement was required. Members would receive more information going forward with a clear map to present the challenges ahead in meeting the Council's carbon reduction aims.

In response to a comment from a Member in relation to the change to a renewable energy supplier and the affordability for tenants, the Head of Housing explained that tenants had their own choice of energy supplier and it was not something the Council could enforce. The aim was to engage with tenants to inform, educate and encourage them to consider renewable energy. It was also confirmed that void properties were not currently changed to the Council's preferred energy supplier, but it was being considered.

A Member commented on the influence that could be made through the Local Plan and urged Local Plan Committee Members to seriously consider what could be done to impose good targets for the Carbon Footprint on new houses built in the District.

The Chairman thanked Members for their contributions and confirmed that comments made would be presented to Cabinet when it considers the report.

8. CORPORATE ACCOMMODATION

The Strategic Director gave a presentation to Members.

Members understood the problems with the current building and acknowledged the work required to raise the standard and become more energy efficient. They also agreed on the importance of retaining Stenson House due to its heritage within the area.

The majority of Members were in support of the location of Customer Services into Coalville Town Centre as it would provide better access for the public, but a suggestion was made that other customer service hubs be considered for other areas such as Ashby and Castle Donington to make services more accessible throughout the District.

Some questions were raised in relation to the support to be provided to Members as there were concerns that they would be based in a different building to officers. The Strategic Director reassured Members that they would be included in all plans and as a customer, would be engaged throughout the process. He felt it was important to listen to Members' needs and would be consulting on all aspects including the refurbishment of Stenson House to form the Civic Hub.

Although generally positive about the proposals, there were some strong views in relation to the accessibility of officers to Members as they were often unable to make contact, and this had become much worse since officers were working remotely due to the Pandemic. There were concerns that if services were split across several buildings, and officers were to continue to work remotely, the service to Members would decline. The Strategic

Director reported that the way of working due to the Pandemic had proven that officers did not need to be co-located anymore and the future working model, that staff were currently being consulted on, meant that 50 percent of staff would be able to work in the new accommodation at one time, so it would not be a fully remote workforce. It was confirmed that Members would be briefed on the new working model in the coming weeks.

Comments were made on the level of service provided to customers as part of the proposals and the possible confusion due to the split across three separate buildings. A further comment was made on the current amount of time it took to navigate through the customer services options when calling the service line as it was a very lengthy process which led to abandoned calls. The Strategic Director explained that the public would be encouraged to visit the Coalville Town Centre office if they needed to make contact in person and there would be a bigger focus on digital connectivity. The front office would need to have as much knowledge as possible to assist the public and appointments with specific officers would be available if the issue could not be dealt with in person, on the phone or online. The Strategic Director also confirmed that officers were currently working on a new customer services strategy that would hopefully be presented to Members in the autumn.

During discussion, a Member raised concerns that the proposals to reduce accommodation size were being put forward too soon as other large companies were now taking the decision to bring staff back into offices rather than continuing to work remotely. The Strategic Director explained that consultation with staff on the future working model had received a positive result and it had been confirmed that services could continue to be delivered remotely. He added that the proposals would also reduce the current running costs associated with the building and hence helping to achieve the savings set out in the budget.

The Chairman thanked Members for their contributions and confirmed that comments made would be presented to Cabinet when it considers the report at its meeting on 27 July 2021.

9. THE COMMUNITY HUB

The Head of Housing introduced the report, followed by a presentation to Members by the Leisure Services Team Manager and the Community Hub Lead Officer

Members spoke in support of the work undertaken and congratulated the team for the impact they had made on the community throughout the Pandemic.

10. 2020/21 QUARTER 4 PERFORMANCE REPORT

The Head of Human Resources and Organisational Development presented the report.

During discussion, several questions of clarity were sought and answered by officers from the relevant service area.

In response to a question in relation to retail units in the District, the Head of Economic Regeneration agreed to provide more information on the number of units in Ashby compared to Coalville outside of the meeting.

A question was raised regarding the number of council homes sold under the Right to Buy Programme, the Head of Housing reported that it was approximately 45 homes and would confirm outside of the meeting.
Some concern was raised that zero trees had been delivered to local communities, especially considering the climate change agenda. The Head of Community Services

explained that due to the Pandemic, Public Heath guidelines restricted contact with the community and therefore this service had been paused. The intention was to continue this service later this calendar year once the restrictions had been lifted and there were no concerns that targets could not be reached going forward.

A discussion was had on the large increase in the amount of fly tipping, and it was acknowledged that this was a problem across the country which had been exacerbated by the Pandemic. The Head of Community Services reported that work was being undertaken in this area with the street cleansing team, community groups such as the "Wombles" and litter pickers to make improvements. He also assured Members that enforcement was still a priority, and the budget was in place for cameras to be erected to detect fly tipping. The Council would continue to push forward and would prosecute offenders when caught.

In response to a question regarding the council spend on agency staff, the Head of Human Resources and Organisational Development explained that the overspend was entirely as a result of additional support required to run critical services during the Pandemic. There were a number of staff that were shielding or unable to work during the lockdown periods and therefore additional agency staff were brought in on that basis.

A comment was made on the target to seek external funding as it seemed to have been met by filling in the application forms rather than securing the funding itself. It was suggested that Scrutiny monitor how the targets are set more carefully. A request was also made for future reports to include an approximate figure on expected funding as well as the actual figure of funding received, for comparative purposes.

A request was made to receive a copy of the options appraisal for Moira Furnace as the report stated that it had been completed. The Strategic Director agreed to speak to the relevant officer and provide further information outside of the meeting.

In response to a comment made on the drop in figures in relation to the call centre statistics, the Strategic Director agreed to provide further narrative to Members outside of the meeting.

It was moved by Councillor N Smith, seconded by Councillor E Allman and

RESOLVED THAT:

The report be noted and comments made by the Committee be presented to Cabinet when it considers the report at its meeting on 27 July 2021.

11. COUNCIL DELIVERY PLAN REVIEW - 2021/22 AND 2022/23

The Chief Executive presented the report.

As a result of Member discussion on the Council Delivery Plan review, the following comments were made:

Support was given to the proposed Ward Member profiles as part of the performance management, Members felt this would be a valuable source of information.

Support was also given to the proposed Annual 'State of North West Leicestershire' exercise to provide Members with a summary of contextual information such as skills, employment and health.

Chairman's initials

Officers were asked to ensure that the customer friendly short version of the Delivery Plan concentrate on the important facts.

The targets for tackling obesity were acknowledged but it was felt that it could be expanded further, particularly health and fitness. The Chief Executive explained that the Council was working closely with the Clinical Commissioning Group (CCG) to develop a health place plan which would identify what could be done collectively to improve the health of people in the District. She confirmed that a workshop was being organised across all partners to develop this plan and Members would be briefed on this in more detail in due course.

Concerns were raised that there was not a carbon reduction target within the proposed plan and, as it was clear from the statistics in the earlier item on the agenda that the Council was behind on its aims, it was felt that there was a need for a target of this nature. The Head of Community Services explained that as planning was in the early stages, it was important to carry out the necessary research and feasibility studies to acquire baseline figures before targets could be put in place. He assured Members that although he was taking a cautious approach, the next 6 to 12 months would see movement going forward.

In relation to the target to increase tourism, it was commented that this was minimal, and it was possible to achieve more. The Chief Executive explained that the tourism sector was one of the hardest hit in the pandemic and considerable work had been undertaken to assess the impact. It was felt that the 2 percent target was an aspirational one when considering the current position of the sector. Members were also reminded that the baseline figures used would be pre-pandemic.

In response to a question regarding the time period for the proposed plan, the Chief Executive confirmed that it was a two-year plan that would go as far as early 2023, this would allow for a further review following the District Elections in May 2023.

The Chairman thanked Members for their contributions and confirmed that comments made would be presented to Cabinet when it considers the report.

The meeting commenced at 6.30 pm

The Chairman closed the meeting at 9.04 pm

Chairman’s signature

Corporate Scrutiny Committee – WORK PROGRAMME (as at 12/08/21)

Date of Meeting	Item	Lead Officer	Witnesses	Agenda Item Duration
10 November 2021				
10 November 2021	Budget proposals 2022/23	Dan Bates, Head of Finance	-	1 hour
10 November 2021	Review of Medium Term Financial Plan	Dan Bates, Head of Finance	-	30 minutes
8 December 2021				
8 December 2021	Customer Services Strategy Update and revised Customer Services Strategy	Karey Barnshaw		30 minutes
8 December 2021	2021/22 Quarter 2 Performance Report	Mike Murphy, Head of Human Resources and Organisational Development		30 minutes
5 January 2022				
5 January 2022	Draft Treasury Management Strategy Statement 2022/23 - 2026/27	Dan Bates, Head of Finance		
5 January 2022	Draft Investment Strategy - Service and Commercial 2022/23	Dan Bates, Head of Finance		
5 January 2022	Draft 2022/23 Capital Strategy	Dan Bates, Head of Finance		

Date of Meeting	Item	Lead Officer	Witnesses	Agenda Item Duration
5 January 2022	2022/23 - 2026/27 Draft Capital Programmes	Dan Bates, Head of Finance		
5 January 2022	Draft Housing Revenue Account Budget Proposals for 2022/23	Dan Bates, Head of Finance		
5 January 2022	Draft General Fund and Special Expenses Revenue Budget Proposals for 2022/23	Dan Bates, Head of Finance		
9 March 2022				
9 March 2022	2021/22 Quarter 3 Performance Report	Mike Murphy, Head of Human Resources and Organisational Development		

Requests for Items

Date request Received	Requested by	Summary of request	Consideration by scrutiny Y/N	Reasons
9 June 2021	Councillor D Bigby	• The recent failure to claim grants from the RHI scheme • Prevention of any similar future occurrence • Maximising grant income in the future	No	Already being addressed elsewhere – Audit & Governance Committee

Principles and Criteria used for Assessing Items Put Forward

Identify Issues for consideration by Scrutiny

- Consulting with members of Scrutiny Committees, senior officers, Cabinet members – horizon scanning on policy development
- Looking at the corporate priorities, Council Delivery Plan and Cabinet Forward plan – identify key issues/topics for investigation/inquiry
- Considering events and decisions in the Council's calendar which could require an input/consultation via scrutiny – eg budget setting, CDP development
- Considering requests from members – eg via another forum or scoping report submitted
- Evaluating the Council's performance – eg quarterly reports, end of year reports, reviewing success of a particular scheme or initiative
- Reviewing any follow up work required after previous scrutiny work

Prioritise the potential list of scrutiny topics based on factors including

- the resources required to deliver it (from members, offices and financially)
- the value and level of impact which could be achieved
- link to the council's priorities
- whether it is a regular recurring item which requires consideration before Cabinet/Council approval
- consideration of the guidance for selecting scrutiny topics

Topics **are** suitable for Scrutiny when	Topics **are not** suitable for Scrutiny when
Scrutiny could have an impact and add value	The issue is already being addressed elsewhere and change is imminent
The topic is of high local importance and reflects the concerns of local people	The topic would be better addressed elsewhere (and will be referred there)
The resources are available that would be required to conduct the review – staff and budget	Scrutiny involvement would have limited or no impact on outcomes
It avoids duplication of work elsewhere	The topic would be sub-judice or prejudicial to the councils interests
The issues is one that the committee can realistically influence	The topic is too broad to make a review realistic
The issue is related to an area where the council or one of its partners is not performing well	New legislation or guidance relating to the topic is expected in the next year

Notice of Executive Key Decisions

The attached notice lists the matters which are likely to be the subject of a key decision by the Council's executive and executive decision making bodies. This notice is produced in accordance with the Constitution adopted by North West Leicestershire District Council and will be published a minimum of 28 days before the date on which a key decision is to be made on behalf of the Council.

The date of publication of this notice is Friday, 20 August 2021. The Deadline for making any representations as to why items marked as private should be considered in public by **Cabinet on 21 September 2021 is 5pm Friday, 10 September 2021.**

Key Decisions

A key decision means a decision taken by the Cabinet, a committee of the Cabinet, an area or joint committee or an individual in connection with the discharge of a function which is the responsibility of the executive and which is likely:

(a) to result in the Council incurring expenditure which is, or the making of savings which are, significant having regard to the Council's budget for the service or function to which the decision relates; or

(b) to be significant in terms of its effects on communities living or working in an area comprising two or more wards in the area of the Council;

(c) for the purposes of (a) and (b) above £100,000 shall be regarded as significant in terms of expenditure or savings, and any issue which, in the opinion of the Leader is likely to have an impact on people, shall be regarded as significant in terms of impact on communities.

The Council's Executive

The Council's executive committee is the Cabinet. The Cabinet comprises:

Councillor R Blunt	-	Leader	Councillor A Woodman	-	Community Services
Councillor R Ashman	-	Deputy Leader and Planning & Infrastructure	Councillor N J Rushton	-	Corporate
Councillor T Gillard	-	Business and Regeneration	Councillor R D Bayliss	-	Housing, Property & Customer Services

Confidential Items and Private Meetings of the Executive

Whilst the majority of the Cabinet's business at the meetings listed in this notice will be open to the public and media organisations to attend, there will inevitably be some business to be considered that contains, for example, confidential, commercially sensitive or personal information. This is a formal notice under the Local Authorities (Executive Arrangements) (Meetings and Access to Information) (England) Regulations 2012 that part of the Cabinet meetings listed in this Forward Plan may be held in private because the agenda and reports for the meeting contain exempt information under Part 1 Schedule 12A to the Local Government Act (Access to Information) Act 1985 (as amended) and that the public interest in withholding the information outweighs the public interest in disclosing it. Those Items where it is considered that they should be considered in private are identified on the Notice.

Access to Agenda and Related Documents

Documents relating to the matters listed in this notice are available at least 5 clear working days prior to the date of decision as indicated below. Other documents relevant to the matters listed in this notice may be submitted to the decision maker.

If you wish to request or submit a document, or make representation in relation to any issue contained within this notice, please contact Democratic Services on telephone number 01530 454512 or by emailing memberservices@nwleicestershire.gov.uk

Executive Decisions

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
August 2021 (Extraordinary)							
Marlborough Centre	Cabinet	Key	Private Information relating to the financial or business affairs of any particular person (including the authority holding that information)	31 August 2021	Councillor Tony Gillard Tel: 01530 452930 tony.gillard@nwleicestershire.gov.uk Head of Economic Regeneration Tel: 01530 454 354 paul.wheatley@nwleicestershire.gov.uk	Report Marlborough Centre	Community Scrutiny Committee - 22 July 2021
Disposal of NWLDC Land Holding in Cropston Drive/Waterworks Road	Cabinet	Key	Private Information relating to the financial or business affairs of any particular person (including the authority holding that information) Will contain confidential financial information.	31 August 2021	Councillor Robert Ashman, Councillor Nicholas Rushton Tel: 01283 561700, Tel: 01530 412059 robert.ashman@nwleicestershire.gov.uk, nicholas.rushton@nwleicestershire.gov.uk Strategic Director of Place Tel: 01530 454555 james.arnold@nwleicestershire.gov.uk	Report Disposal of NWLDC Land Holding in Cropston Drive/Waterworks Road	Community Scrutiny - 22 July 2021
September 2021							

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
2021/22 Quarter 1 Performance Report	Cabinet	Key	Public	21 September 2021	Councillor Richard Blunt Tel: 01530 454510 richard.blunt@nwleicestershire.gov.uk Head of Human Resources and Organisational Development Tel: 01530 454518 mike.murphy@nwleicestershire.gov.uk	2021/22 Quarter 1 Performance Report	Corporate Scrutiny Committee - 1 September 2021
Review of Medium Term Financial Plan	Cabinet	Key	Public	21 September 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Review of Medium Term Financial Plan	Corporate Scrutiny Committee - 1 September 2021
Special Expenses Policy	Cabinet	Key	Public	21 September 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Special Expenses Policy	Coalville Special Expenses Working Party - 15 June 2021 Corporate Scrutiny Committee - 01 September 2021

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Corporate Governance Policies - Annual Review	Cabinet	Key	Public	21 September 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Legal and Commercial Services Tel: 01530 454762 elizabeth.warhurst@nwleicestershire.gov.uk	Review of Corporate Governance Policies	Audit and Governance Committee - 21 July 2021
Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Cabinet	Key	Public	21 September 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Not to be considered by a Scrutiny Committee. Under the constitution Cabinet are required to approve write-offs over £10,000.
Adoption of Fleet Management Strategy	Cabinet	Key	Public	21 September 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Adoption of Fleet Management Strategy	Corporate Scrutiny Committee - 1 September 2021

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Caravan Fit & Proper Person Fees Policy	Cabinet	Key	Public	21 September 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Caravan Fit & Proper Person Fees Policy	Not to be considered by a Scrutiny Committee.
Corporate Disposals Policy	Cabinet	Key	Public	21 September 2021	Councillor Roger Bayliss Tel: 01530 411055 roger.bayliss@nwleicestershire.gov.uk Head of Housing Tel: 01530 454780 chris.lambert@nwleicestershire.gov.uk	Report Corporate Disposals Policy	Corporate Scrutiny Committee - 6 January 2021
The Recovery of our Leisure Centres and the Partnership Contract with Everyone Active	Cabinet	Key	Private Information relating to the financial or business affairs of any particular person (including the authority holding that information)	21 September 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	the Recovery of our Lesiure Centres and the Partnership Contract with Everyone Active	Corporate Scrutiny Committee - 1st September 2021
November 2021							

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Empty Properties	Cabinet	Key	Public	9 November 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Empty Properties	Not to be considered by a Scrutiny Committee.
Zero Litter Campaign	Cabinet	Key	Public	9 November 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Zero Litter Campaign	29/09/21 Dog Fouling, Fly Tipping and Littering Update
Marlborough Square Public Realm	Cabinet	Key	Public	9 November 2021	Councillor Richard Blunt Tel: 01530 454510 richard.blunt@nwleicestershire.gov.uk Head of Economic Regeneration Tel: 01530 454 354 paul.wheatley@nwleicestershire.gov.uk	Report and appendices Marlborough Square Public Realm	To be considered at Scrutiny on 26th October 2021
December 2021							

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Draft General Fund and Special Expenses Revenue Budget Proposals for 2022/23	Cabinet	Key	Public	7 December 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Draft General Fund and Special Expenses Revenue Budget Proposals for 2022/23	Corporate Scrutiny Committee - 10 November 2021
Draft Housing Revenue Account Budget Proposals for 2022/23	Cabinet	Key	Public	7 December 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Draft Housing Revenue Account Budget Proposals for 2022/23	Corporate Scrutiny Committee - 10 November 2021
2022/23 - 2026/27 Draft Capital Programmes	Cabinet	Key	Public	7 December 2021	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	2022/23 - 2026/27 Draft Capital Programmes	Corporate Scrutiny Committee - 10 November 2021

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Housing Strategy	Cabinet	Key	Public	7 December 2021	Councillor Roger Bayliss Tel: 01530 411055 roger.bayliss@nwleicestershire.gov.uk Head of Housing Tel: 01530 454780 chris.lambert@nwleicestershire.gov.uk	Draft Strategy Document Housing Strategy	Community Scrutiny Committee - 29 September 2021
Minutes of the Coalville Special Expenses Working Party	Cabinet	Key	Public	7 December 2021	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Minutes of the Coalville Special Expenses Working Party	Coalville Special Expenses Working Party - 12 October 2021
January 2022							
Customer Service Strategy	Cabinet	Key	Public	11 January 2022	Councillor Roger Bayliss Tel: 01530 411055 roger.bayliss@nwleicestershire.gov.uk Strategic Director of Housing and Customer Services Tel: 01530 454819 andy.barton@nwleicestershire.gov.uk	Customer Service Strategy	Corporate Scrutiny Nov 21

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Council Tax Base 2022/23	Cabinet	Key	Public	11 January 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Council Tax Base 2022/23	Not to be considered by a Scrutiny Committee - The calculation of the council tax base is prescribed in statute
Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Cabinet	Key	Public	11 January 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Not to be considered by a Scrutiny Committee. Under the constitution Cabinet are required to approve write-offs over £10,000.
2021/22 Quarter 2 Performance Report	Cabinet	Key	Public	11 January 2022	Councillor Richard Blunt Tel: 01530 454510 richard.blunt@nwleicestershire.gov.uk Head of Human Resources and Organisational Development Tel: 01530 454518 mike.murphy@nwleicestershire.gov.uk	2021/22 Quarter 2 Performance Report	Corporate Scrutiny Committee - 8 December 2021

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
February 2022							
General Fund and Special Expenses Revenue Budget Proposals for 2022/23	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	General Fund and Special Expenses Revenue Budget Proposals for 2022/23	Coalville Special Expenses Working Party - 14 December 2021 Corporate Scrutiny Committee - 5 January 2022
Housing Revenue Account (HRA) Budget for 2022/23	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Housing Revenue Account (HRA) Budget for 2022/23	Corporate Scrutiny Committee - 5 January 2022
2022 - 2027 Medium Term Financial Plans	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk		Corporate Scrutiny Committee - 1 September 2021

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Treasury Management Strategy Statement 2022/23 and Prudential Indicators 2022/23 - 2024/25	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Treasury Management Strategy Statement 2022/23 and Prudential Indicators 2022/23 - 2024/25	Corporate Scrutiny Committee - 5 January 2022
Investment Strategy - Service and Commercial 2022/23	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Investment Strategy - Service and Commercial 2022/23	Corporate Scrutiny Committee - 5 January 2022
2022/23 Capital Strategy and 2022/23 - 2026/27 Capital Programmes	Cabinet	Key	Public	1 February 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	2021/22 Capital Strategy and 2022/23 - 2026/27 Capital Programmes	Corporate Scrutiny Committee - 5 January 2022

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Minutes of the Coalville Special Expenses Working Party	Cabinet	Key	Public	1 February 2022	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Minutes of the Coalville Special Expenses Working Party	Coalville Special Expenses Working Party - 14 December 2021
29 March 2022							
2021/22 Quarter 3 Performance Report	Cabinet	Key	Public	29 March 2022	Councillor Richard Blunt Tel: 01530 454510 richard.blunt@nwleicestershire.gov.uk Head of Human Resources and Organisational Development Tel: 01530 454518 mike.murphy@nwleicestershire.gov.uk	2021/22 Quarter 3 Performance Report	Corporate Scrutiny Committee - 9 March 2022

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Cabinet	Key	Public	29 March 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Not to be considered by a Scrutiny Committee. Under the constitution Cabinet are required to approve write-offs over £10,000.
North West Leicestershire Economic Growth Plan 2022	Cabinet	Key	Public	29 March 2022	Councillor Tony Gillard Tel: 01530 452930 tony.gillard@nwleicestershire.gov.uk Head of Economic Regeneration Tel: 01530 454 354 paul.wheatley@nwleicestershire.gov.uk	North West Leicestershire Economic Growth Plan 2022	To be considered by Community Scrutiny Committee 9 February 2022.
June 2022							
Treasury Management Stewardship Report 2021/22	Cabinet	Key	Public	7 June 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Treasury Management Stewardship Report 2021/22	Audit and Governance Committee - 20 April 2022

Decision	Decision Maker	Status of Decision	Public or Private (and reason – where private	Date of Decision	Contacts	Documents to be submitted to the Decision Maker	Considered by Scrutiny or other Committee
Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Cabinet	Key	Public	7 June 2022	Councillor Nicholas Rushton Tel: 01530 412059 nicholas.rushton@nwleicestershire.gov.uk Head of Finance Tel: 01530 454 707 dan.bates@nwleicestershire.gov.uk	Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs Former Tenant Rent Arrears, Current Tenant Rent Arrears, Council Tax, Non Domestic Rates and Sundry Debtor Write Offs	Not to be considered by a Scrutiny Committee. Under the constitution Cabinet are required to approve write-offs over £10,000.
Minutes of the Coalville Special Expenses Working Party	Cabinet	Key	Public	7 June 2022	Councillor Andrew Woodman Tel: 07970 520357 andrew.woodman@nwleicestershire.gov.uk Head of Community Services Tel: 01530 454832 paul.sanders@nwleicestershire.gov.uk	Minutes of the Coalville Special Expenses Working Party	Coalville Special Expenses Working Party - 27 April 2022

NORTH WEST LEICESTERSHIRE DISTRICT COUNCIL

CORPORATE SCRUTINY COMMITTEE – WEDNESDAY, 1 SEPTEMBER 2021

Title of Report	**DRAFT FLEET MANAGEMENT STRATEGY**	
Presented by	Paul Sanders Head of Community Services	
Background Papers	http://prod-modgov:9070/documents/s33508/Zero%20Carbon%20Roadmap%20Cabinet%20Report.pdf https://www.nwleics.gov.uk/files/documents/nwldc_zero_carbon_roadmap_nov_2019/20190234-NWLDC%20Zero%20Carbon%20Roadmap-04-Main%20Report-Rev%20K%20-%20final.pdf	**Public Report:** Yes
Financial Implications	Section 6 of this report outlines the financial exposure to the council which is expanded in further detail within **Annex A.**	
	Signed off by the Section 151 Officer: Yes The report sets out the financial implications of the proposed strategy in terms of additional annual expenditure. Importantly, the additional expenditure is expressed in terms of the outcomes of reduced carbon emissions which provides benchmark information for the cost of each tCO_2e saved. If the strategy is adopted then the additional financial commitment will be incorporated into the Medium Term Financial Plan review alongside other commitments and an assessment of future funding which is anticipated to reduce. Looking forward, it will be important that financial decisions are made with a view to delivering corporate plan outcomes whilst securing the longer term financial sustainability of the authority.	
Legal Implications	Procurement activities will be supported by the council's in house legal team	
	Signed off by the Deputy Monitoring Officer: Yes	
Staffing and Corporate Implications	The fleet management function is contained within current staffing responsibilities within Community Services. Service specific working practices and ways of working will be developed by respective teams in line with the action plan.	
	Signed off by the Deputy Head of Paid Service: Yes	

Reason Agenda Item Submitted to Scrutiny Committee	To offer Corporate Scrutiny Committee the opportunity to consider and comment upon the Draft Fleet Management Strategy prior to consideration by Cabinet on 21 September 2021
Recommendations	**THAT THE CORPORATE SCRUTINY COMMITTEE CONSIDERS AND COMMENTS ON THE DRAFT FLEET MANAGEMENT STRATEGY, RECOMMENDATIONS AND ACTION PLAN WITHIN ANNEX A**

1. BACKGROUND

1.1 In late 2020 it was agreed that no further vehicles would be purchased until a fleet management strategy had been created to demonstrate how the council's fleet could transition to zero carbon by 2030.

1.2 The council owns and maintains its fleet for all services within the council. The council's fleet is made up of 114 vehicles which is a mixture of refuse collection vehicles, parks maintenance vehicles, medium sized panel vans and smaller vehicles alongside more specialist equipment, such as sweepers and mowers.

1.3 The fleet replacement plan helps the council to ensure that all vehicles are replaced in a timely manner but previously has not considered vehicle emissions and environmental impact.

1.4 A fleet forum was created to bring together representatives from the main fleet user groups along with finance, procurement and zero carbon, to understand current and future challenges and concerns and to develop early fleet management strategy thinking.

1.5 Governance and legal compliance forms an element of a fleet management strategy. Officers have worked with the council's insurers to undertake a motor fleet risk assessment service.

1.6 A fleet management action plan has been developed to take a holistic approach. This report focuses on fleet and infrastructure for the first three years due to quickly changing technology.

2. TECHNICAL FLEET ASSESSMENT

2.1 In April 2021, Cenex, consultants specialising in low emission transport and associated energy infrastructure, were commissioned to undertake the development of a fleet management strategy, considering the fleet and infrastructure, and recommend how the council could transition to a zero carbon fleet by 2030. Cenex have undertaken similar projects in the East Midlands for Nottingham City Council, Derbyshire County Council and Severn Trent Water. The suite of Cenex reports are contained within **Annex B, C and D** to this report.

Current Fleet

2.2 The medium van segment produces the highest proportion of air quality emissions on the fleet, amounting to 60% and 69% of NO_X and PM emissions respectively. The high NO_X and PM emissions are impacted by the large proportion of older Euro 4 diesel vehicles currently in operation.

2.3 The rigid truck 3-axles (refuse vehicles) segment contributes 54% of CO_2e emissions despite only accounting for 16% of the total fleet. This is a result of the high fuel consumption of these vehicles and associated high energy usage due to the use of bin lifts and compaction units.

Technology Options

2.4 Given the wide range of vehicles in operation, Cenex advised that it was unlikely that there would be a single technological solution to reduce the council's carbon footprint and that some technologies are not yet considered mainstream solutions. They considered all the available technology in their review and noted that the harder task for fleet decarbonisation relates to the heavier duty vehicles

2.5 Three main technologies were identified based on current UK vehicle availability and supplier/ market maturity.

2.5.1 A zero-tailpipe emission vehicle or **ZEV** is a vehicle which does not emit greenhouse gas (e.g., carbon dioxide/CO_2) or air quality pollutant emissions from the vehicle exhaust/tailpipe. These include Battery Electric Vehicle (BEV), Fuel Cell Range Extended Electric Vehicle (FC REEV) and Fuel Cell Electric Vehicle (FCEV).

2.5.2 An ultra-low emission vehicle **ULEV** is currently defined as any car or van that emits less than 75 g/km of CO_2 from the exhaust/tailpipe. Due to advances in technology, it is expected that from 2021 an ULEV will be defined as a car or van that emits less than 50 g/km with a minimum required zero emission range. These include Range Extended Electric Vehicle (REEV) and Plug-in Hybrid Electric Vehicle (PHEV).

2.5.3 Low emission vehicle **LEV** technologies include all ULEVs and ZEVs in addition to internal combustion engine vehicles capable of using renewable fuels. This includes compressed natural gas (CNG), biodiesel (FAME) and renewable diesel (HVO) each have different levels of supplier maturity and different economic models.

Vehicle recommendations

2.6 A Battery Electric Vehicle (BEV) Assessment was completed using three key measures, does it:

- lead to a carbon saving compared to diesel
- have the range to complete the average daily journeys
- lead to a total cost of ownership saving compared to a new diesel vehicle

2.7 The analysis demonstrated that BEV is suitable for small cars, small vans, and medium vans across all three measures.

2.8 Hydrotreated Vegetable Oil (HVO) fuel was identified as an alternative to diesel and a method of achieving an immediate removal of CO_2e emissions pending vehicle replacement across the fleet or where alternative technology is not yet viable. It is a "drop-in" fuel so can be added directly to the existing diesel tank at Lindon Way Depot.

2.9 HVO is generally more expensive than diesel due to the market demand, however the market rate does vary. Costs are covered in section 6.

2.10 It is recognised that the market and technology is changing quickly, and it is anticipated that there will be further options available for the larger fleet over future years. Cenex advises repeating the analysis in 2024 to identify whether there are any viable options to replace HVO with BEV or alternative technology, such as hydrogen.

3. INFRASTRUCTURE

3.1 Cenex assessed the infrastructure required to facilitate the uptake of BEVs, taking into consideration that Housing staff would need home charging facilities. They provided a separate report on what best practice would look like for a home charging scheme.

3.2 Cenex considered charging powers, charge point providers, types of parking, reimbursement mechanisms, grant support, tax implications, ensuring installation readiness and liability for home charge points. The actions suggested by this study are included in the Action Plan.

3.3 Waste Services is rapidly outgrowing Linden Way depot, due to the increase of properties in the district producing more waste, needing more vehicles and staff to service them. As a key enabler to the progress of the fleet strategy the long term location of the depot is critical. With the potential to run the HGV fleet on hydrogen or another technology in a few years, provision needs to be considered for alternative fuel tanks. It is proposed that a project board is established to assess the requirements and if agreed, source a location for a new depot meeting the future requirements of the service and enabling long term infrastructure investment.

4. SPECIALIST FLEET

4.1 There are 20 specialist fleet vehicles on the NWLDC fleet, dominated by mowers, sweepers, tele-handlers, and tractors, these operate primarily on diesel.

4.2 Low emission options for specialist equipment and plant are at a lower level of product maturity and availability than those used in road vehicles. Therefore, a higher level analysis was taken than that used for other operational road vehicles.

4.3 Cenex assessed the technologies available and advised that electric vehicles are significantly more expensive than their diesel variant. It is recommended that HVO is used in the specialist fleet in order to reduce the emissions until an alternative technology is available.

5. REPLACEMENT PLAN

5.1 A 3 year replacement plan has been created to transition the fleet in line with the 7 year lifecycle to carbon zero. Technologies will be reviewed before any procurement activity is commenced.

3 Year Replacement Plan (in line with vehicle lifecycle)

Fuel	Team	What	Notes	Year 1 (29)	Year 2 (37)	Year 3 (20)
Electric	Environmental Protection (EP) & HR	Small Car (A)	Car parks Pool cars	3 EP 2 HR		
Electric	Parks Waste	Small van (B)			1 Parks 2 Waste	1 1 Waste
Electric	Housing	Medium Van (C)	Phased approach	6 (1 per trade)	29 (2 phases)	2
Electric	Waste EP	Medium Van (C)		1 Waste		1 Waste 1 EP
Diesel/HVO	Waste	Large Van (D)	Waste collection	1		
Diesel/HVO	Waste	Large van (D)	Food waste vehicles (pending approval)	5		
Diesel/HVO	Waste	Rigid Truck (E)	Waste collection vehicles	6		4
Diesel/HVO	Waste/Parks	Rigid Truck (F)	Reach truck	1		
Electric	Parks Waste	Large van (G)			4 Parks	3 Waste 2 Parks
Diesel/HVO	Parks & EP	Large SUV	4 x 4 pick up		1 Parks	1 EP
Diesel/HVO	Waste	Specialist	Forklift truck	1		
Gas oil	Parks Waste	Specialist	Chipper, mowers, boxing off machine, sweepers	3 Parks		2 Parks 2 Waste

Note: All diesel/HVO vehicles will meet latest emissions standards and will be an improvement on the oldest fleet which is Euro 4. Current standard is Euro 6. From an air quality perspective, No_x standard is 0.08 (68% improvement v Euro 4) and PM is 0.005 (80% improvement v Euro 4)

6. FINANCE AND EMISSIONS

6.1 The total capital cost of the three year replacement plan is £5.2 million. This along, with the costs of adopting HVO, is expected to increase the average annual revenue costs of running our fleet by £322,000.

6.2 Of the £5.2 million programme, £661,000 relates to the additional capital costs of adopting electric vehicles and the associated charging infrastructure. These costs are expected to be offset by lower running costs over the lifetime of the vehicles, bringing the net additional costs over their lifetime down to £118,000. The carbon emission savings from these vehicles is expected to be 1,221 tCO_2e over the vehicles' lifetime, when compared to using diesel vehicles, representing a cost of £97 per tCO_2e saved.

6.3 Using renewable diesel (HVO) in the remaining fleet is estimated to cost an extra 15 pence per litre over diesel, which is expected to equate to £265,000 over the next four financial years. This will save 3,531 tCO_2e over the next four financial years, representing a cost of £75 per tCO_2e saved.

6.4 These proposals go beyond the council's stated objective of making the council carbon zero by 2030, as the fleet will become carbon zero as soon as the proposal is adopted, which is likely to be later this year if members approve the proposal. This does, however, risk reducing funding available to reduce our carbon footprint in the longer term. Both proposals are currently unfunded, meaning savings will need to be made in other areas to balance the budget. This will be picked up in the budget setting process.

7. RECOMMENDATIONS

7.1 Corporate Scrutiny Committee is invited to:

- Consider the attached Fleet Management Strategy and Action Plan (**Annex A**) and the proposed 3 year fleet replacement schedule (section 5.1 of this report) and comment on the proposals.

- To consider the proposals for the purchase of electric vehicles to replace diesel vehicles in order to reduce the impact of the council fleet emissions
- To consider the proposals to use HVO as a replacement to diesel in all diesel fleet and comment on the options.
- To note and comment on the future potential location of the Waste and Parks Depots which is key to support a growing district and enable technology infrastructure investment to support our zero carbon agenda.

Policies and other considerations, as appropriate	
Council Priorities:	- Developing a clean and green district - Our communities are safe, healthy and connected
Policy Considerations:	Zero Carbon Policy and Roadmap as Fleet is a key area of work to reduce emissions . Human Resources Policies and Terms and Conditons in respect of staff training to use new technology as well as the need to charge from home.
Safeguarding:	N/A
Equalities/Diversity:	Housing vehicles are currently parked at home overnight, however, it is anticipated that not all properties will be suitable for home charging.
Customer Impact:	Housing Services is implementing a new electronic scheduling system designed to improve productivity. The impact of this system on their current operational practices together with the introduction of electric vehicles will need to be managed to ensure no adverse impact on their customers.
Economic and Social Impact:	N/A
Environment and Climate Change:	Reduction in CO_2e emissions by 100% in year 1
Consultation/Community Engagement:	Internal engagement with relevant stakeholders
Risks:	Risks and issues considered and highlighted in tab in the action plan
Officer Contact	Paul Sanders Head of Community Services paul.sanders@nwleicestershire.gov.uk

Lowering your emissions
through innovation in transport
and energy infrastructure

PROJECT

REPORT

Fleet Management Strategy

North West Leicestershire District Council

June 2021

Prepared for:

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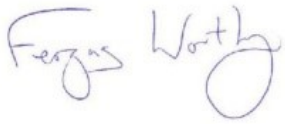
Approved by:



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Terms and Conditions

The contents of this report are considered confidential and are intended solely for the use of and by North West Leicestershire District Council.

Cenex has exercised all reasonable skill and care in the performance of our services and we shall be liable only to the extent we are in breach of such obligation.

While the information is provided in good faith, the ideas presented in the report must be subject to further investigation, and take into account other factors not presented here, before being taken forward.

Cenex shall not in any circumstances be liable in contract, or otherwise for (a) any loss of investment, loss of contract, loss of production, loss of profits, loss of time or loss of use; and/or (b) any consequential or indirect loss sustained by the client or any third parties.

Document Revisions

No.	Details	Date
1	Initial release, for Cenex review	21/06/2021
2	Cenex peer review	22/06/2021
3	NWLDC Feedback	02/07/2021
4	Final Report	08/07/2021

Contents

Abbreviations

BEV	Battery Electric Vehicle
CH_4	Methane
CI	Compression Ignition
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DF	Dual Fuel
DNO	Distribution Network Operator
FAME	Fatty Acid Methyl Ester
FC REEV	Fuel Cell Range Extended Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GVW	Gross Vehicle Weight
GWP	Global Warming Potential
HGV	Heavy Goods Vehicle
HRS	Hydrogen Refuelling Station
HVO	Hydrotreated Vegetable Oil
ICE	Internal Combustion Engine
LCV	Light Commercial Vehicle
LEV	Low Emission Vehicle
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MPV	Multi-Purpose Vehicle
N_2O	Nitrous Oxide
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PHEV	Plug-in Hybrid Electric Vehicle
PM	Particulate Matter
PTO	Power Take-Off
RCV	Refuse Collection Vehicle
REEV	Range Extended Electric Vehicle
RRV	Resource Recovery Vehicle
RTFO	Renewable Transport Fuel Obligation
SI	Spark Ignition
TCO	Total Cost of Ownership
TTW	Tank-to-Wheel
ULEV	Ultra-Low Emission Vehicle
WTW	Well-to-Wheel
ZEV	Zero Tailpipe Emission Vehicle

1. Executive Summary

Introduction

North West Leicestershire District Council (NWLDC) commissioned Cenex to undertake the development of a fleet management strategy, roadmap, and action plan with the overall aim of transitioning their existing Council fleet to a zero carbon/low carbon solution by 2030, along with the identification of the infrastructure requirements to support this transformation.

The NWLDC fleet has several components and is made up of around 114 vehicles and is a mix of refuse collection vehicles (RCVs), parks maintenance vehicles, medium sized panel vans and smaller vehicles alongside more specialist equipment, such as sweepers and mowers. The predominant users are Waste Services, which also manages the whole fleet and the in-house workshop, along with the Housing Team which has a home-based fleet of large panel vans.

The NWLDC fleet is diverse, with a wide variety of vehicles in use across multiple operational requirements. With such a wide range of vehicles in operation, NWLDC should accept that there is, at this time, unlikely to be a single technological solution that will enable their fleet operations to achieve zero emissions by 2030. This may result in a mix of technologies being utilised across the fleet depending on vehicle category and operational requirements.

Methodology

This analysis contained within this report is based on fleet operational and performance data supplied by NWLDC, supplemented by independent vehicle ownership cost data, vehicle fuel consumption values, and low emission vehicle energy consumption factors. These energy consumption factors are based on real-world (e.g. chassis dynamometer, test track or in-use) testing of low emission vehicles managed by Cenex or partners (e.g. Emissions Analytics, Zemo partnership) during commercial and research projects. Such vehicle tests are deemed independent as they do not involve vehicle manufacturers as part of the testing team, except as a source of the vehicles. Low emission vehicle data and any associated assumptions have been verified by industry working groups including fleet operators and trade associations. The fleet review was delivered through the following steps which commenced upon receipt of initial fleet data following a project initiation meeting delivered via a web conference.

- Summary of Current Fleet: using the data provided Cenex categorised individual vehicles into relevant operational vehicle segments before baselining the current fleet composition, operations, and emissions profile. Non-operational vehicles were included within the Specialist Fleet Review.
- Low Emission Vehicle Technology Options: an initial screening of low emission vehicle technologies based on current UK vehicle availability and supplier/ market maturity.
- Low Emission Vehicle Technology Selection: input of key fleet parameters such as annual mileage, fuel economy and ownership period into an in-house spreadsheet model to assess the suitability of low emission vehicle technologies against each individual vehicle and selection of the most suitable technologies based on two implementation scenarios – maximum emissions savings (at any cost) and total cost of ownership parity (or better) within each vehicle segment.
- Low Emission Vehicle Infrastructure Review: a high-level assessment to identify the required type, location, and indicative capital and installation costs of any required infrastructure.
- Recommended Replacement Vehicle Technologies: based on the results of the fleet review, Cenex has highlighted those vehicles which could theoretically be replaced by low emission vehicle technologies with minimal changes to the fleet's current operating patterns and planned ownership periods. A final technology selection has been applied based primarily on wider operational suitability, low emission vehicle maturity and viability of infrastructure.
- Implementation Recommendations and Next Steps: a summary of the recommended next steps for NWLDC to take to implement the recommended replacement vehicles.

Summary of Current Fleet

The NWLDC operational fleet numbers around 100 vehicles, dominated by light commercial vehicles (LCVs) less than 3.5t gross vehicle weight (GVW) with medium vans the largest vehicle segment (48% of the fleet). The remainder of the fleet consists mainly of heavy goods vehicles, dominated by 3 axle rigid trucks (16% of the fleet). 14 non-operational vehicles (e.g. tractors and mowers) were removed from this review and are included within a separate Specialist Fleet review.

		Number of Vehicles	Percentage of Total Fleet	% Contribution to Total WTW CO_2e Emissions	% Contribution to Total NO_X Emissions	% Contribution to Total PM Emissions
Car	Small Car	4	4%	1%	3%	1%
LCV	Large Commercial SUV	2	2%	1%	3%	0%
	Small Van	7	7%	1%	6%	3%
	Medium Van	48	48%	20%	60%	69%
	Large Van (< 3.5t GVW)	11	11%	5%	10%	2%
HGV	Large Van (> 3.5t GVW)	1	1%	0%	0%	0%
	Rigid Truck - 2 axles (7.5t GVW)	4	4%	3%	0%	1%
	Rigid Truck - 2 axles (18t GVW)	7	7%	15%	1%	2%
	Rigid Truck - 3 axles (26t GVW)	16	16%	54%	16%	22%
	Total	**100**	**100%**	**1,130 tonnes**	**1,100 kg**	**10 kg**

The medium van segment (accounting for 48% of the total fleet) produces the highest proportion of air quality emissions on the fleet, amounting to 60% and 69% of NO_X and PM emissions respectively. The high NO_X and PM emissions are impacted by the large proportion of Euro 4 diesel vehicles currently in operation within this van segment.

However, the Rigid Truck – 3 axles (26t GVW) segment contributes 54% of CO_2e emissions despite only accounting for 16% of the total fleet. This is a result of the high fuel consumption of these vehicles and associated high energy usage due to the use of bin lifts and compaction units.

Recommended Replacement Vehicles (TCO Parity with HVO)

Across the NWLDC fleet, there are opportunities to introduce battery electric vehicles (BEV) within the small car, small van, and particularly the medium van vehicle segments.

The table below shows a summary of the recommended replacement vehicles, with a focus on the deployment of BEV vehicles were identified as suitable and utilising Hydrotreated Vegetable Oil (HVO), a renewable diesel that is a 'drop-in' replacement for fossil diesel, across the remaining fleet vehicles.

In terms of number of vehicles, capital and revenue costs, and emissions savings. All values are compared to the procurement of a new Euro 6/ VI diesel vehicle excluding VAT. All costs are represented as a difference to an equivalent diesel vehicle where **positive values** are higher than the equivalent vehicle and **negative values** are lower than the equivalent vehicle. This is further highlighted by the use of **red** and **green** text across both tables.

Introducing 54 BEVs (55% of the fleet) would require additional capital of **£420,000** for vehicles and **£82,000** for electric vehicle charging infrastructure (hardware and installation costs only). These vehicles could provide total cost of ownership (TCO) savings of **£37,000** whilst reducing fleet well to wheel (WTW) CO_2e emissions by **16%** and fleet air quality pollutant emissions up to **60%** in NOx and **35%** in PM.

Fuelling the remaining fleet vehicles with HVO would lead to an increase in running costs of **£420,000** over the 7-year vehicle ownership period. Whilst HVO increases running costs and thus TCO, WTW CO_2e savings of **68%** of the fleet emissions can be achieved. As HVO uses the same engine as a diesel vehicle, there are no guaranteed air quality savings; only BEVs contribute to air quality pollutant emissions reductions.

Over all this scenario equates to a potential increase of **£4,700** per vehicle or £670/ vehicle per year for an **84%** reduction in fleet WTW greenhouse gas emissions.

	Small Car	Small Van	Medium Van	Small Van	Large Van	Rigid Truck	Large 4x4	Total
Replacement Technology	BEV (OEM)			HVO				
Number of Vehicles	4	2	48	5	12	26	2	**99**
% of vehicle segment	100%	29%	100%	71%	100%	100%	100%	**100%**
Additional Capital Cost (£)	£32,000	£12,300	£375,400	£0	£0	£0	£0	**£419,700**
Difference in Running Costs (£)	-£19,900	-£11,800	-£380,500	£3,500	£26,600	£385,400	£4,500	**£7,700**
Difference in Residual Values (£)	£12,600	£1,100	£31,100	£0	£0	£0	£0	**£44,800**
Difference in TCO (£)	£500	£600	£36,200	-£3,500	-£26,600	-£385,400	-£4,500	**-£382,600**
Ownership Period (years)	7	7	7	7	7	7	7	**7**
% of Fleet TTW CO_2 Savings	1%	1%	20%	0%	5%	67%	1%	**95%**
% of Fleet WTW CO_2 Savings	1%	1%	15%	0%	4%	62%	1%	**84%**
% of Fleet NOx Savings	3%	2%	55%	0%	0%	0%	0%	**62%**
% of Fleet PM Savings	3%	1%	31%	0%	0%	0%	0%	**36%**
Number of 7 kW Chargepoints	0	0	43	0	0	0	0	**43**
Number of 22 kW Chargepoints	4	2	5	0	0	0	0	**16**
Number of 50 kW Chargepoints	0	0	0	0	0	0	0	**0**
Infrastructure Capital Cost	£14,200	£7,100	£60,800	£0	£0	£0	£0	**£82,100**

The total column in the above table highlights the total saving that can be achieved, or cost increases resulting from adopting the recommended vehicles. In the case of TCO, while there are TCO savings available through the adoption of electric vehicles, these are outweighed by the increased costs associated with operating the remaining fleet on HVO.

The above costs for cars and LCVs (e.g. capital costs, residual values, TCO) have been derived from industry standard information readily available from Fleet News and Commercial Motor. All costs are based on the average of the top three bestselling models from each vehicle segment, where information is available.

The calculated infrastructure costs are based on the installation of 7 kW chargepoints at all relevant home locations and depot based dual socket 22 kW chargepoints, assuming that no grid upgrades are required.

Recommended Replacement Vehicle Schedule (TCO Parity with HVO)

The Recommended Replacement Vehicle Schedule presented below can be considered an outline action plan for the deployment of BEV and HVO across the NWLDC fleet. However, this plan assumes that NWLDC can readily purchase or lease the relevant vehicle models and specifications required for their operational requirements. The impacts of potential vehicle delivery lead times has not been accounted for as this can differ greatly from manufacturer to manufacturer. Similarly, the impact of any potential delays in deploying the relevant charging infrastructure has not been accounted for.

It will be essential that NWLDC discuss their vehicle and infrastructure needs with relevant vehicle and chargepoint suppliers to gain a clear understanding of the likely timeline for delivery/ installation. This will enable a more accurate vehicle and infrastructure deployment plan can be generated.

	Financial Year									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Small Car (BEV)	3	1	0	0	0	0	0	0	0	0
Large Commercial SUV (HVO)	1	1	0	0	0	0	0	0	0	0
Small Van (BEV and HVO)	5	1	0	0	1	0	0	0	0	0
Medium Van (BEV)	26	2	7	0	13	0	0	0	0	0
Large Van (HVO)	9	1	1	0	0	0	0	0	0	0
Large Van (> 3.5t GVW) (HVO)	0	0	0	0	1	0	0	0	0	0
Rigid Truck - 2 axles (7.5t GVW) (HVO)	0	0	1	0	2	0	0	0	0	0
Rigid Truck - 2 axles (18t GVW) (HVO)	0	0	0	5	1	1	0	0	0	0
Rigid Truck - 3 axles (26t GVW) (HVO)	9	1	2	0	4	0	0	0	0	0
Vehicle Replacements	53	7	11	5	22	1	0	0	0	0
Cumulative % of Fleet Replaced by LEV	54%	61%	72%	77%	99%	100%	100%	100%	100%	100%
Additional Vehicle Capital Costs (£)	£227,345	£29,823	£54,740	£0	£107,835	£0	£0	£0	£0	£0
Infrastructure Cost (£)	£41,757	£14,205	£9,551	£0	£16,551	£0	£0	£0	£0	£0
Annual Running Cost Savings (£)	£5,211	£4,271	£5,439	-£2,936	£633	-£1,094	-£1,094	-£1,094	-£1,094	-£1,094
Annual TTW CO_2 Savings (tonnes)	411.8	465.2	565.7	660.0	849.8	869.3	869.3	869.3	869.3	869.3
Annual WTW CO_2 Savings (tonnes)	446.1	508.3	617.2	725.7	929.2	951.5	951.5	951.5	951.5	951.5
Annual NOx Savings (kg)	103.3	112.6	136.6	136.6	194.1	194.1	194.1	194.1	194.1	194.1
Annual PM Savings (kg)	0.5	0.5	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8

There is a need for the immediate replacement of some 53 vehicles (54% of the fleet) which are at the end of their current ownership cycle (predominantly medium vans and 3 axle 26t GVW rigid trucks). The replacement of these vehicles will need to be carefully managed as it entails significant capital costs for both vehicle and infrastructure. However, the staged replacement of these vehicles will enable NWLDC to make immediate gains on their decarbonisation plans.

Most of the recommended replacement vehicles are medium vans which are due to be replaced during FY2021/2022 to FY2025/2026. By this date 99% of the entire fleet could be replaced by BEVs and HVO fuelled vehicles.

Other low emission vehicle technologies, such as bio-CNG, dual fuel hydrogen and hydrogen fuel cell electric, are currently economically challenging for the remainder of the fleet. This is mainly due to the high initial vehicle purchase costs and low market maturity combined with low annual mileages which limit the opportunities for running cost savings.

Implementation Recommendations and Next Steps

The recommendations in this section are of most relevance over the next five years with any occurring after these timescales considered closer to an outline strategy to 2030.

1. **Implement battery electric cars and light commercial vehicles (i.e. small cars and small and medium vans) along with the associated electric vehicle charging infrastructure** according to the current vehicle replacement schedule, if not sooner.
    a. Confirm which specific vehicle models meet the required operational specifications in terms of payload, towing capacity and minimum viable battery capacity required to meet day to day mileage variation. For a given vehicle model this is a trade-off between cost, payload, and range (smaller batteries = lower cost, higher payload, and lower operating range). It should be recognised that the analysis in this report has been based on average daily mileage and does not include the impact of additional factors (cabin heating, towing, etc.).
    b. Where possible, consider specifying vehicles with optional on-board AC chargers with increased power ratings, to enable higher rates of vehicle charging to occur (e.g. 11 kW or 22 kW vs. 7 kW).
    c. Undertake a short-term managed vehicle trial of between 4 – 8 weeks in each identified vehicle segment to confirm operational suitability and to verify the potential running cost and emissions savings.
    d. Plan and rollout a home charging pilot scheme, including the installation of appropriate 7 kW chargers, with targeted drivers to confirm applicability, operational suitability and to verify the running cost and emissions savings.
    e. Procure and install 22 kW AC chargepoints at the depot locations identified during the infrastructure review.
    f. Investigate the potential to reduce the ownership period of the remaining non-BEV vans from 7 years to 4 years to ensure that the results of the above electric vehicle trial can be implemented as quickly as possible.
2. **Investigate the feasibility of using renewable diesel (HVO) as an interim solution across all remaining vehicle segments to provide immediate WTW CO_2e emissions reductions.**
    a. Contact fleet operators currently using HVO to discuss operational experiences, implications and to verify potential cost increases.
    b. Contact relevant vehicle manufacturers to discuss verify any potential warranty and maintenance changes.
    c. Contact relevant fuel suppliers to discuss supply requirements such as volumes, delivery, costs, etc.

3. **Prepare for the potential introduction of ULEV HGVs (i.e. RCVs, Food Waste Disposal, etc.) beyond 2025;** vehicle segments without recommended replacement ULEVs account for 45% of the current fleet. This is primarily due to the relative immaturity of ULEV HGVs and the resulting increase in additional capital costs.
    a. Undertake the further analysis of journey profiles and daily routes within the relevant vehicle categories to assess and verify the suitability of BEV as a replacement technology.
    b. Where possible undertake vehicle trials within those operations identified as suitable for BEV deployment.
    c. The majority of rigid trucks are due for replacement from FY2024 onwards, therefore this date is considered critical to achieving NWLDC's 2030 aspirations. Any vehicles replaced after this point will likely remain on the fleet until at least 2031.
4. **NWLDC should consider the process of assessing, trialling, and implementation of ULEVs across the fleet as a continuous one, depending on the requirements of different vehicle segments.**
5. **Consider operational improvements that could increase the uptake of ULEVs.**

2. Purpose of Fleet Decarbonisation Options Review

North West Leicestershire District Council (NWLDC) commissioned Cenex to undertake the development of a fleet management strategy, roadmap, and action plan with the overall aim of transitioning their existing Council fleet to a zero carbon/ low carbon solution by 2030, with a focus on greenhouse gas emission savings, along with the identification of the infrastructure requirements to support this transformation.

The NWLDC fleet has several components and is made up of around 114 vehicles and is a mix of refuse collection vehicles (RCVs), parks maintenance vehicles, medium sized panel vans and smaller vehicles alongside more specialist equipment, such as sweepers and mowers. The predominant users are Waste Services, which also manages the whole fleet and the in-house workshop, along with the Housing Team which has a home-based fleet of large panel vans.

The recent UK Government Net Zero 2050 target will require zero-emission vehicles to be deployed across all industry sectors. For many sectors, especially those that utilise cars and light commercial vehicles (LCV), this transition should occur seamlessly, as there are a wide variety of electric options within these vehicle categories that are suitable for many business operations.

The harder task for fleet decarbonisation relates to heavier duty vehicles, where electric variants are either not currently available, not cost effective, or not applicable due to operational considerations.

The NWLDC fleet is diverse, with a wide variety of vehicles in use across multiple operational requirements. With such a wide range of vehicles in operation, it may be difficult to identify a specific technology or technologies that are most appropriate for the NWLDC fleet. NWLDC should therefore accept that there is, at this time, unlikely to be a single technological solution that will enable their fleet operations to achieve zero emissions by 2030.

2.1 Scope

To fulfil the requirements of the commission, Cenex undertook the following Work Packages:

- **ULEV Fleet Review**, where the operational fleet was analysed to identify the economic and operational suitability of selected Low Emission Vehicle (LEV), Ultra-low Emission Vehicle (ULEV), and Zero Emission Vehicle (ZEV) technologies taking into consideration the different ownership and usage patterns of individual fleet vehicles. This generated an indicative vehicle replacement schedule based on current replacement schedules, economic considerations, and vehicle availability.
- **Charging/ Refuelling Infrastructure Review**, where those operational vehicles identified as being suitable for replacement with LEVs, ULEVs and ZEVs were assessed to determine the likely infrastructure requirements needed to support their roll out. This analysis included a review into home charging, which is provided as a separate report with a summary contained in this report.
- **ULEV Specialist Fleet Review**, where the specialist fleet (e.g. tractors and mowers) was assessed to identify the possible low emission technology options that could be deployed within the fleet. The results of this analysis have been provided in a separate report.

2.2 Methodology

Figure 1 provides a summary of the overall methodology used during this Fleet Decarbonisation Options Review. This analysis has been undertaken using fleet and specialist fleet data (e.g. mileage, fuel use) supplied by NWLDC supplemented by the results of interviews with selected department managers. The work packages commenced upon receipt of initial fleet data following a project initiation meeting delivered via a web conference.

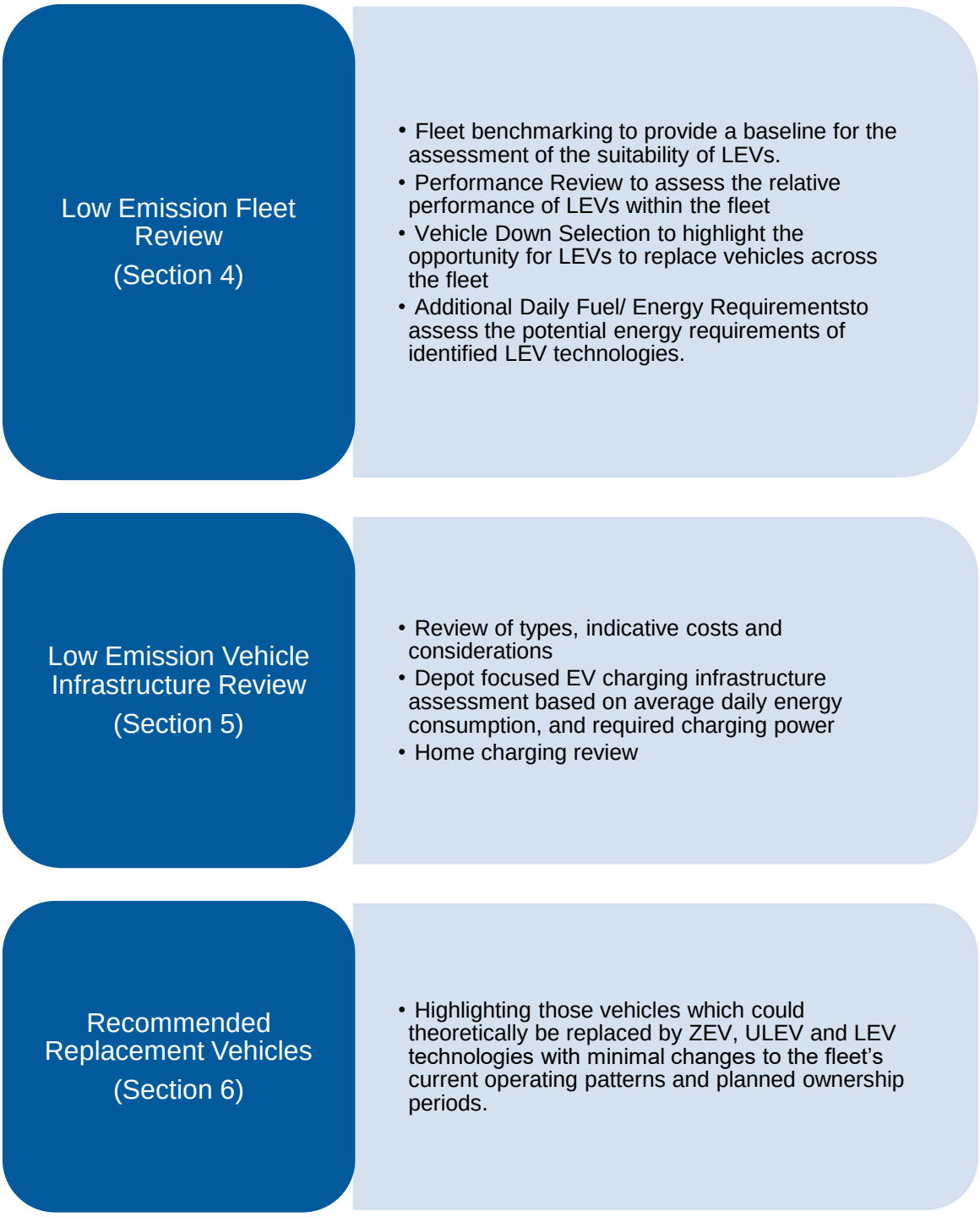


Figure 1 - Summary of Methodology

3. Low Emission Vehicle Technology Options

This section introduces the main technologies discussed in this report by providing basic definitions and technology descriptions alongside an initial screening of LEV technologies based on current UK vehicle availability and supplier/ market maturity.

More detail on LEV technologies, including case studies, can be found in Appendix G – Low Emission Technology Factsheets or in the Low Emission Van Guide[1] and Renewable Fuels Guide[2] produced by Zemo Partnership and Cenex.

3.1 Zero Tailpipe Emission Vehicle Technologies

A zero-tailpipe emission vehicle or ZEV is a **vehicle which does not emit greenhouse gas (e.g. carbon dioxide (CO_2)) or air quality pollutant emissions from the vehicle exhaust/ tailpipe**.

ZEVs do not have an internal combustion engine (ICE) and instead are driven by an electric motor which is powered by electricity generated by a battery and/ or a hydrogen fuel cell which converts stored chemical energy into electrical energy. Several types of battery electric vehicle (BEV) are described below, which have different levels of supplier maturity and different economic models, all three technologies have been assessed and reported within this analysis.

Table 1 provides a description of currently available ZEV technologies.

Table 1 - Zero Tailpipe Emission Vehicle Technologies

Technology	Example	Description
Battery Electric Vehicle (OEM)		A battery electric vehicle (BEV) stores energy in a battery and delivers its power to the wheels through an electric motor. Original equipment manufacturer (OEM) vehicles are supplied by mainstream vehicle suppliers.
Battery Electric Vehicle (low volume)		A new vehicle 'glider' chassis is taken from the production line and a battery electric drivetrain is fitted. Low volume (and re-powered) BEVs are available from the likes of Emoss, Magtec and Tevva.
Battery Electric Vehicle (re-power)		A new electric drivetrain is fitted into a reconditioned second-hand vehicle. Re-power units are often used for trucks to help reduce the capital cost of an electric truck and improve payback time.
Fuel Cell Range Extended Electric Vehicle (FC REEV)		A BEV which also has an onboard hydrogen fuel cell to recharge the battery on the go. The wheels are always powered by the electric motor. The battery can also be recharged by plugging the vehicle into a mains power source.
Fuel Cell Electric Vehicle (FCEV)		Hydrogen is taking its first steps to becoming commercially available as a road transport fuel in the UK. Compressed hydrogen can be used to power an electric motor by generating electricity through a fuel cell. A small battery is often used for peak power requirements and for regenerative braking only.

[1] https://www.lowcvp.org.uk/assets/reports/Low_Emission_Van_Guide_2019_Update.pdf
[2] https://www.zemo.org.uk/assets/lowcvpreports/ZEMO_Renewable%20Fuels%20Guide%20_2021.pdf

3.2 Ultra-Low Emission Vehicle Technologies

An ultra-low emission vehicle (ULEV) is currently defined as **any car or van that emits less than 75 g/km of CO_2 from the exhaust/ tailpipe**. Due to advances in technology, it is expected that from 2021 an ULEV will be defined as a car or van that emits less than 50 g/km with a minimum required zero emission range.

To be eligible for the UK Government plug-in grant[3], which offers up to £2,500 off the price of a brand-new car, a vehicle must have CO_2 emissions of less than 50 g/km and can travel 70 miles with zero tailpipe emissions. Conversely, for a brand-new van up to 3.5t gross vehicle weight (GVW) to be eligible for up to £6,000 off the purchase price the vehicle must have CO_2 emissions of less than 50 g/km and can travel 60 miles with zero tailpipe emissions. Further details of the current plug-in vehicle grants is available in Section 16 (Appendix I – Grant Funding Options).

Currently any private or public sector organisation can claim the above grant, which is usually administered through the vehicle supplier (i.e. retail or leasing company).

No equivalent definition currently exists for heavy duty vehicles, although the Zemo Partnership are current developing ultra-low emission truck (ULET) standards[4].

ULEV technologies include all ZEVs in addition to range extended electric vehicles (REEV) which use ICE generators, and plug-in hybrid electric vehicles (PHEV). Several types of ULEV are described below, which have different levels of supplier maturity and different economic models, all technologies have been assessed and reported within this analysis.

Table 2 provides a description of additional, currently available, ULEV technologies.

Table 2 - Ultra-Low Emission Vehicle Technologies

Technology	Example	Description
Range Extended Electric Vehicle (REEV)		A BEV which also has an onboard generator (powered by an ICE) to recharge the battery on the go. The wheels are always powered by the electric motor. The battery can also be recharged by plugging the vehicle into a mains power source.
Plug-in Hybrid Electric Vehicle (PHEV)		A PHEV has an internal combustion engine as well as a battery and electric motor. The wheels can be driven by either the combustion engine or the electric motor. The battery can be recharged by plugging the vehicle into a mains power source.

[3] https://www.gov.uk/plug-in-car-van-grants
[4] https://www.lowcvp.org.uk/projects/commercial-vehicle-working-group/developing-ulet-standards.htm

3.3 Low Emission Vehicle Technologies

Low emission vehicle (LEV) technologies include all ULEVs and ZEVs in addition to **ICE vehicles capable of using renewable fuels**. This includes compressed natural gas (CNG), biodiesel (FAME) and renewable diesel (HVO), as described below, which have different levels of supplier maturity and different economic models. All three technologies have been assessed and reported within this analysis.

Table 3 provides a description of additional, currently available, LEV technologies.

Table 3 - Low Emission Vehicle Technologies

Technology	Example	Description
Compressed Natural Gas* (CNG)		CNG is the compressed form of natural gas. It is stored on vehicles in pressurised cylinders at 200 to 250 bar and consumed via a dedicated gas engine.
Biodiesel (FAME)	BIODIESEL	Biodiesel, also known as Fatty Acid Methyl Esters (FAME) is primarily produced from waste plant products and is a low carbon, sustainable alternative to mineral diesel. Biodiesel is already present in regular diesel at up to 7%. High blend biodiesel contains at least 20% biodiesel (B20), most truck manufacturers warranty vehicles up to B20. It is possible to run on B100, but this requires additional equipment, fuel management and is not covered by all warranties.
Renewable Diesel (HVO)	NESTE MY Renewable Diesel	Renewable diesel, such as Hydrotreated Vegetable Oil (HVO) is chemically identical to fossil diesel but produced from waste feedstock and vegetable oil. It is classed as a 'drop-in' fuel, which means it can be substituted for conventional fossil fuel diesel with no impact on maintenance and warranty conditions.

* Natural gas vehicles can be powered by biomethane (bio-CNG) which is a sustainable and renewable version of natural gas.

4. Low Emission Fleet Review

This section focuses on the NWLDC operational fleet, with the specialist fleet being covered in a separate report.

The modelling presented in this report assumes all vehicles are fitted with a standard body without any additional ancillary equipment. Any differential in purchase cost is assumed to be dominated by the powertrain. The impact on vehicle energy consumption associated with loading, towing, and the use of ancillary equipment (e.g. bin lifts, waste compaction, charging of hand tools, etc.) is assumed to be included in any fleet provided fuel consumption data. As such the operating ranges of ZEVs, ULEVs and LEVs are scaled appropriately to accommodate for these additional energy demands.

It is understood that NWLDC is currently trialling an ISUZU 7.5t refuse vehicle for food waste, with the intent to acquire additional vehicles for operational rollout during 2021 – 2022. This vehicle has been included within the fleet summary and benchmarking analysis, (Section 4.1) but is not included within the accompanying Technology Performance Assessments and Recommended Vehicle Replacement Schedule. Instead, a separate performance review has been carried in Section 7 to identify the operational conditions that would need to be achieved to make deployment cost effective.

Therefore, Sections 4.5, 4.6, 5, and 6 do not include this trial vehicle in their analyses.

It should be recognised that NWLDC is reviewing their current operations due to COVID-19 and new services, which is expected to result in additional vehicles and working patterns being adopted. However, it is anticipated that the result contained within this review will be applicable for future vehicle deployments.

Further details, including data sources and references, can be found in Appendix A – Fleet Review References.

4.1 Summary of Current Fleet

This section reviews the NWLDC fleet list to understand and baseline the current fleet size, vehicle types, emissions profile, and current vehicle replacement schedule. The purpose of this section is to provide context for subsequent analysis and to provide a baseline for the assessment of the suitability of LEVs. This analysis has been undertaken using data relating to 2019 – 2020 as it captured the expected typical working environments experienced by NWLDC.

4.1.1 Fleet Vehicles in Use

Table 4 provides an overview of the types of vehicles operated by NWLDC.

Table 4 - NWLDC Fleet Vehicles

		Description
Car	**Small Car**	Small passenger cars with 5 seats (e.g. Ford Fiesta)
LCV	**Large Commercial SUV**	Pick up trucks, with up to 5 seats and exposed loading area (e.g. Ford Ranger)
	Small Van	Light commercial vehicles with up to 3 seats and a gross vehicle weight not exceeding 2 tonnes. (e.g. Ford Transit Connect)
	Medium Van	Light commercial vehicles with up to 3 seats and a gross vehicle weight not exceeding 3.1 tonnes. (e.g. Ford Transit Connect)
	Large Van (< 3.5t GVW)	Light commercial vehicles with up to 3 seats and a gross vehicle weight not exceeding 3.5 tonnes. (e.g. Ford Transit Tipper)
HGV	**Large Van (> 3.5t GVW)**	Heavy duty vehicles with up to 3 seats and a gross vehicle weight exceeding 3.5 tonnes but not exceeding 7.5 tonnes. (e.g. Iveco Daily)
	Rigid Truck - 2 axles (7.5t GVW)	Heavy duty vehicles with two axles and a gross vehicle weight exceeding 7.5 tonnes but not exceeding 12 tonnes. (e.g. Iveco Eurocargo)
	Rigid Truck - 2 axles (18t GVW)	Heavy duty vehicles with two axles and a gross vehicle weight exceeding 12 tonnes but not exceeding 18 tonnes. (e.g. Mercedes Econic Refuse Collection Vehicle)
	Rigid Truck - 3 axles (26t GVW)	Heavy duty vehicles with three axles and a gross vehicle weight exceeding 18 tonnes but not exceeding 26 tonnes. (e.g. Mercedes Econic Refuse Collection Vehicle)

4.1.2 Combined Fleet Composition

Table 5 shows a breakdown of the NWLDC fleet by vehicle type and sub-type. As can be identified from the table below, the NWLDC operational fleet numbers around 100 vehicles, dominated by medium vans and 3 axle rigid trucks (26t GVW).

Table 5 - Summary of Fleet Composition

		Average Annual Mileage (miles)	Average Fuel Consumption (MPG)	Number of Vehicles	Percentage of Total Fleet
Car	Small Car	8,600	49.6	4	4%
LCV	Large Commercial SUV	8,800	27.8	2	2%
	Small Van	5,200	42.8	7	7%
	Medium Van	8,900	27.0	48	48%
	Large Van (< 3.5t GVW)	5,500	15.6	11	11%
HGV	Large Van (> 3.5t GVW)	2,400	9.9	1	1%
	Rigid Truck - 2 axles (7.5t GVW)	11,200	12.6	4	4%
	Rigid Truck - 2 axles (18t GVW)	5,600	3.4	7	7%
	Rigid Truck - 3 axles (26t GVW)	10,000	3.8	16	16%
	Total	**8,225**	**21.7**	**100**	**100%**

68% of the fleet consists of light commercial vehicles (LCVs) less than 3.5t gross vehicle weight (GVW) with medium vans the dominant vehicle segment (48% of the fleet). The remainder of the fleet consists mainly of heavy goods vehicles, dominated by 3 axle rigid trucks (16% of the fleet).

14 non-operational vehicles (e.g. tractors and mowers) were removed from this review and included within the Specialist Fleet review.

While all vehicles operate for approximately five days a week (assumed to be 260 days per year) the overall average annual mileage of 8,200 miles is less than that within other local authority managed fleets assessed by Cenex. As of the 2011 census, NWLDC has a population of ~93,500 with 58% rural population. The local authority district is classified as '**largely rural**'[5]. This will most likely result in several different drive and duty cycles across the fleet. As such **the driving environment has been assumed to be mainly regional (30% urban, 50% rural, and 20% A-road)**.

It should also be noted that the average calculated fuel economy for each vehicle segment is typically similar to the expected ranges for such vehicles.

The annual mileage, number of days per week used and calculated vehicle fuel economy are used as primary inputs to the LEV suitability modelling (see Section 4.5).

4.1.3 Combined Fleet Emissions

The combustion of fossil fuels used for road transport (such as petrol and diesel) produces three main greenhouse gas emissions that contribute directly to climate change. These are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). For reporting purposes, greenhouse emissions are standardised to CO_2 equivalents (CO_2e) based on their global warming potential (GWP). For an equivalent amount of each gas released (e.g. 1 kg) the GWP of CO_2 = 1, CH_4 = 25 and N_2O = 298.

Tank to Wheel (TTW) or Scope 1 emissions represent the amount of CO_2 (derived from fossil fuels) which is released from a vehicle's tailpipe. Under the UK Greenhouse Gas reporting protocol, these Scope 1 emissions are the direct responsibility of the transport operator.

[5] Lookup for 2011 Rural Urban Classification of Local Authorities, Defra

Well to Wheel (WTW) or All Scope emissions are a more complete method of looking at CO_2 emissions and represent the amount of CO_2 emitted during the fuel's life cycle. This includes the upstream emissions associated with fuel extraction, processing, transportation, and dispensing, as well as the emissions from final fuel combustion. Although the upstream emissions from fuel manufacture are not the reporting responsibility of the transport operator (under UK emission reporting guidance), they are considered important by environmentally conscious fleets when making decisions on fuel and transport options.

As such the greenhouse gas emissions in the main body of the report are presented as WTW CO_2e.

In addition to greenhouse gas emissions, high-temperature combustion of fuels used for road transport also produces two main air quality pollutant emissions that at high concentrations or sustained low concentrations contribute directly to several health issues including respiratory and cardiovascular conditions as well as reduced life expectancy. These are **nitrogen dioxide (NO_2)** and **particulate matter (PM)**.

The National Atmospheric Emissions Inventory provide average speed related emissions factors for different vehicle types, euro standards and fuel types. These factors are provided for **oxides of nitrogen (NOx)**, a collective term that includes NO_2 as well as nitric oxide (NO), and PM. Although NO is not considered hazardous to human health it can lead to the formation of NO_2, as such the collective NOx emission factors are still relevant as evidenced by their use in the Emission Factor Toolkit published by Defra.

All data sources and references used within the delivery of this Fleet Review can be found in Appendix A – Fleet Review References.

Table 6 shows the emissions profile of the NWLDC fleet in terms of percentage contribution to annual WTW CO_2e, NOx and PM emissions.

Table 6 – Summary of Annual Fleet Emissions Contribution

		Percentage of Total Fleet	% Contribution to Total WTW CO_2e Emissions	% Contribution to Total NO_x Emissions	% Contribution to Total PM Emissions
Car	Small Car	4%	1%	3%	1%
LCV	Large Commercial SUV	2%	1%	3%	0%
	Small Van	7%	1%	6%	3%
	Medium Van	48%	20%	60%	69%
	Large Van (< 3.5t GVW)	11%	5%	10%	2%
HGV	Large Van (> 3.5t GVW)	1%	0%	0%	0%
	Rigid Truck - 2 axles (7.5t GVW)	4%	5%	1%	1%
	Rigid Truck - 2 axles (18t GVW)	7%	14%	1%	2%
	Rigid Truck - 3 axles (26t GVW)	16%	53%	16%	22%
	Total	**100%**	**1,200 tonnes**	**1,100 kg**	**10 kg**

The medium van segment (accounting for 48% of the total fleet) produces the highest proportion of air quality emissions on the fleet, amounting to 60% and 69% of NOX and PM emissions, respectively. The high NOX and PM emissions are impacted by the large proportion of Euro 4 diesel vehicles currently in operation within this van segment.

However, the Rigid Truck – 3 axles (26t GVW) segment contributes 53% of CO2e emissions despite only accounting for 16% of the total fleet. This is a result of the high fuel consumption of these vehicles and associated high energy usage due to the use of bin lifts and compaction units.

4.1.4 Combined Fleet Age and Euro Profile

Table 7 shows the calculated fleet age and Euro standard profile. The Euro standard regulations define the maximum acceptable limits for key pollutant emissions (including NOx and PM) for new vehicles sold in the EU.

Euro standards are denoted by Arabic numerals (e.g. Euro 6) for light-duty vehicles which are tested on a chassis dynamometer and Roman numerals (e.g. Euro VI) for heavy-duty vehicles where the engines are certified separately on a test bed.

Table 7 – Vehicle Age and Euro Standard Profile

		Vehicle Age (years)		Engine Euro Standard		
		Average Age (years)	Maximum Age (years)	Euro 4/IV or lower	Euro 5/V	Euro 6/VI
Car	Small Car	6.5	7	0%	75%	25%
LCV	Large Commercial SUV	6.0	7	0%	100%	0%
	Small Van	7.1	11	29%	57%	14%
	Medium Van	6.7	11	33%	25%	42%
	Large Van (< 3.5t GVW)	6.5	10	9%	82%	9%
HGV	Large Van (> 3.5t GVW)	3.0	3	0%	0%	100%
	Rigid Truck - 2 axles (7.5t GVW)	2.8	4	0%	0%	100%
	Rigid Truck - 2 axles (18t GVW)	2.7	3	0%	0%	100%
	Rigid Truck - 3 axles (26t GVW)	6.3	15	6%	13%	81%
	Total	**6.2**	**15**	**20%**	**32%**	**48%**

48% of the fleet meets the latest Euro 6/ VI emissions standard, with most of the HGV segments achieving this standard. A high proportion of the small and medium vans are **Euro 4 or lower**, causing increases in local air pollutants (NO_X and PM).

4.1.5 Current Fleet Replacement Schedule

NWLDC **purchased** 99 of their vehicles, with the capital cost funded and repaid over a seven-year period, although some vehicles may be kept for longer than this. Table 8 shows the vehicle replacement schedule that results from these ownership periods.

While NWLDC previously operated on a fixed 7-year vehicle replacement schedule, it is acknowledged that due to funding considerations and the COVID-19 pandemic this has fallen behind, with some vehicles now overdue replacement.

The below replacement schedule (Table 8) shows that around 60 vehicles are due for replacement in this and the next financial year. These vehicles are predominantly medium vans but does include some 3 axle 26t GVW rigid trucks. A proportion of 18t GWV and 26t GVW rigid trucks due for replacement in 2024 – 2026, which will provide an opportunity for NWLDC to further assess the potential LEV options for these vehicle segments, including trialling suitable vehicles, and preparing to introduce LEVs within this vehicle segment.

Table 8 – Calculated Vehicle Replacement Schedule (financial year)

		2021/ 2022	2022/ 2023	2023/ 2024	2024/ 2025	2025/ 2026	2026/ 2027	2027/ 2028	2028/ 2029	2029/ 2030	2030/ 2031
Car	Small Car	3	1	0	0	0	0	0	0	0	0
LCV	Large Commercial SUV	1	1	0	0	0	0	0	0	0	0
	Small Van	5	1	0	0	1	0	0	0	0	0
	Medium Van	26	2	7	0	13	0	0	0	0	0
	Large Van (< 3.5t GVW)	9	1	1	0	0	0	0	0	0	0
HGV	Large Van (> 3.5t GVW)	0	0	0	0	1	0	0	0	0	0
	Rigid Truck - 2 axles (7.5t GVW)	0	0	1	0	2	0	0	0	0	0
	Rigid Truck - 2 axles (18t GVW)	0	0	0	5	1	1	0	0	0	0
	Rigid Truck - 3 axles (26t GVW)	9	1	2	0	4	0	0	0	0	0
	Total	**53**	**7**	**11**	**5**	**22**	**1**	**0**	**0**	**0**	**0**

4.2 Operational Constraints

Following a discussion with the NWLDC fleet teams the following potential operational considerations and constraints have also been identified. It is acknowledged that many vehicles within the fleet may be required to meet a minimum specification to complete their daily duties. This may include carrying equipment, towing, use of ancillary power, and off-roading depending on the requirements and location of a given operation.

Table 9 highlights the potential operational restrictions that have been identified, listed out according to vehicle category.

Table 9 - NWLDC Fleet Operational Constraints and Considerations

		Potential Operational Constraint
Car	**Small Car**	No operational restrictions identified.
LCV	**Large Commercial SUV**	Some vehicles may require 4x4/ off road capabilities.
	Small Van	No operational restrictions identified.
	Medium Van	Vehicles currently running at weight limit; all vehicles must be able to undertake maximum potential daily mileages due to need to cover emergency shift patterns.
	Large Van (< 3.5t GVW)	Some vehicles running at weight limit; some vehicles identified as being required to tow. One vehicle identified as having a crane. Charging of electric hand tools required.
HGV	**Large Van (> 3.5t GVW)**	Some vehicles running at weight limit; some vehicles identified as being required to tow.
	Rigid Truck - 2 axles (7.5t GVW)	Some vehicles identified as being required to tow. Some identified as having tail lifts. One identified as being trial food waste vehicle.
	Rigid Truck - 2 axles (18t GVW)	High energy operation due to refuse collection requirements (bin lifts, compaction); up to three loads per day requiring round trip to Loughborough waste site for disposal.
	Rigid Truck - 3 axles (26t GVW)	High energy operation due to refuse collection requirements (bin lifts, compaction); up to three loads per day requiring round trip to Loughborough waste site for disposal.

The following Low Emission Vehicle Technology Selection analysis made no distinction between specific operational requirements as the calculated vehicle fuel economy figures were found to provide a good approximation for the operational weight/ power needs/ etc.

4.2.1 Low Emission Vehicle Technology Screening

To highlight which LEV technologies may have the potential to deliver emissions savings, Cenex has undertaken a high-level assessment of options based on current UK availability and supplier maturity (e.g. availability of service centres, lower technology maturity), as outlined in Figure 2. Further details of these technologies can be found in Appendix G – Low Emission Technology Factsheets. Technologies have been categorised based on the criteria below.

OEM product with a high level of maturity and aftersales support
Re-power or retrofit product with a lower supplier maturity
Technology has been demonstrated but is currently unavailable in the UK
Technology has not been demonstrated or is currently unavailable in the UK

		BEV (OEM)	BEV (low volume)	BEV (re-power)	REEV	PHEV	FCEV	FC REEV	FAME (~B30)	FAME (B100)	HVO	CNG
Car	Small Car	Renault Zoe										
LCV	Large Commercial SUV		Rivian									
	Small Van	Renault Kangoo ZE						Renault Kangoo ZE H2				
	Medium Van	Mercedes eVito			Ford Transit Custom							
	Large Van (< 3.5t GVW)	LDV EV80	Arrival					Renault Master ZE H2				Iveco Daily
HGV	Large Van (> 3.5t GVW)	Iveco Daily Electric	EMOSS	Magtec								Iveco Daily
	Rigid Truck – 2 axles (7.5t GVW)	FUSO eCanter	EMOSS	Magtec	Tevva				DAF LF			
	Rigid Truck – 2 axles (18t GVW)	Volvo FL Electric	EMOSS	Magtec	Tevva				DAF LF	Volvo FL		Iveco Eurocargo
	Rigid Truck – 3 axles (26t GVW)	Volvo FE Electric	EMOSS	Magtec					DAF CF	Volvo FE		Scania

Figure 2 - Low Emission Vehicle Technology Screening

All green and amber technologies have been assessed during the remainder of the report.

As such hydrogen fuel cell vehicles (FCEVs) and dual-fuel hydrogen vehicles (DF H_2) have not been assessed. Hydrogen powered vehicles are not yet market ready and it is not possible to purchase series production hydrogen powered vehicles within any of the NWLDC vehicle segments.

Early trials of such vehicles are underway, but vehicle manufacturers are not expected to release series produced vehicles until at least 2023. As such no costs or verified test data is available and the technology cannot be assessed to the same standard as the others.

4.3 Cenex Fleet Review Methodology

Cenex uses an in-house developed vehicle and fleet analysis spreadsheet model (Fleet Advice Tool) to provide companies with a detailed breakdown of the estimated real-world operating range, total cost of ownership (TCO) and emission reduction performance of low emission technologies relative to a new diesel-powered Euro 6/ VI vehicle.

The Cenex Fleet Advice Tool uses independent vehicle ownership cost data, vehicle fuel consumption values, and low emission vehicle energy consumption factors. These energy consumption factors are based on real-world (e.g. chassis dynamometer, test track or in-use) testing of low emission vehicles managed by Cenex or partners (e.g. Emissions Analytics, Zemo partnership) during commercial and research projects. Such trials are deemed independent as they do not involve vehicle manufacturers as part of the trial team, except as a source of the vehicles.

This wider data set is supplemented by information gathered via stakeholder interviews with vehicle and fuel suppliers. The data contained within the Fleet Advice Tool has been verified by industry working groups including fleet operators and trade associations.

Figure 3 below shows the methodology used during a fleet review and reflects the process undertaken during this commission.

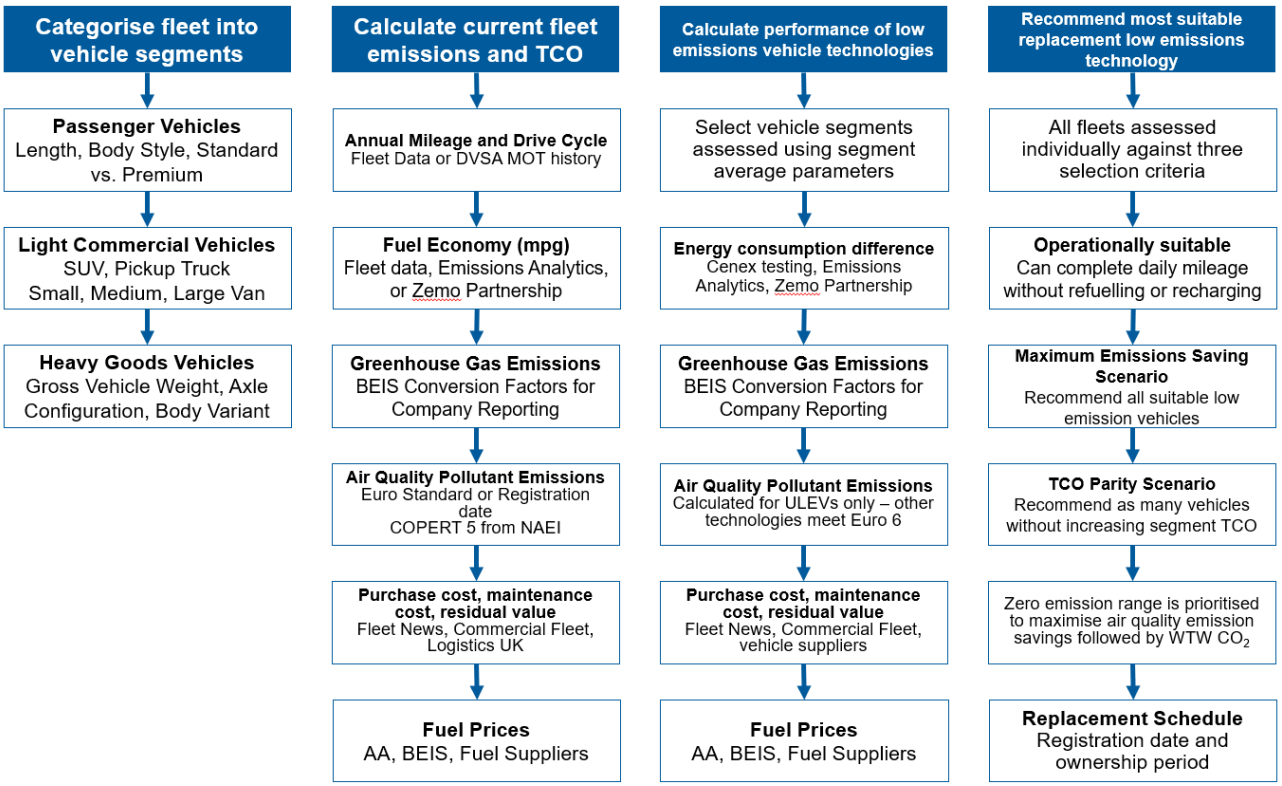


Figure 3 - Fleet review methodology

4.4 Data Input Considerations

The accuracy of this fleet review is dependent on the data provided by NWLDC. The supplied information is used to calculate the current fleet emissions and acts as a baseline for all low emission vehicle suitability calculations (e.g. modelled operating range, total cost of ownership and emissions savings). The list below describes the relationship between the input data and some of the key outputs of the reports. It is acknowledged that the fleet data provided reflects the best available data, as such this information is included to provide context for the subsequent results only.

- **Fuel consumption** is used to calculate the current vehicle CO_2 emissions and fuel costs. Additionally, this fuel consumption is converted into a baseline energy consumption that low emission vehicle technologies are compared against. The biggest risk is that fuel consumption is underreported. This would result in an underestimation of the emissions, fuel costs, and energy consumption requirements of a low emission vehicle. To minimise this risk Cenex check the fuel consumption data against maximum default values to highlight any potential outliers, which are then adjusted.
- **A typical driving environment** (e.g. either mostly congested/ urban/ rural/ motorway or mixed) is used to calculate the energy consumption difference between a low emission vehicle and the current vehicle. This is applied through a database of low emission vehicle 'efficiency factors' determined by independent real-world testing. If the actual drive cycle is significantly different to the assumed drive cycle this could lead to misleading results, particularly relating to the operating range of low emission vehicles. A worked example of the calculation method, for a small battery electric van, is shown below.

	Diesel Fuel Consumption	Electric Vehicle Energy Consumption Reduction	Electric Range	Fuel Cost Savings
Mostly Congested	36 mpg	-74%	104 miles	9.5 ppm
Mostly Motorway	48 mpg	-49%	70 miles	4.2 ppm

- **Annual mileage** is used to calculate the total cost of ownership and emissions savings of low emission vehicles. Typically, due to an increase in ownership costs (e.g. purchase cost and residual values), most low emission vehicle technologies currently have a minimum annual mileage (and ownership period) that is required to be economically viable. The number of days used per week combined with the annual mileage is used to calculate the average daily mileage, this is then compared against the operating range of low emission vehicles to assess operational suitability.

For vehicles on the fleet list **missing information**, average performance data from a similar vehicle in a similar operating group was assigned. Annual mileage, fuel consumption, driving environment, and days of use per week were estimated using this method.

An expanded summary of the key assumptions held within the model's calculation engine is shown in Table 10, with the primary reference for each parameter detailed alongside examples of assumptions for the key technologies (i.e. those which have a significant impact on the results and conclusions). All prices exclude VAT.

Table 10 - Key assumptions within Cenex Fleet Review

Parameter	Cars and Vans (up to 3.5t)	Rigid Trucks and Tractor Units
Energy / fuel consumption	**Diesel:** Emissions Analytics real-world testing (https://www.emissionsanalytics.com/) **ULEVs:** Cenex real-world testing (https://www.cenex.co.uk/)	**All technologies:** LowCVP testing - Emissions Testing of Urban Delivery Commercial Vehicles (https://www.lowcvp.org.uk/resource-library/reports-and-studies.htm) **Gas vehicles:** Emissions Analytics and Cenex managed testing - Dedicated to Gas (https://www.cenex.co.uk/app/uploads/2019/11/324-003-004-Dedicated-to-Gas-Assessing-the-Viability-of-Gas-Vehicles.pdf)
Purchase cost **Residual value** **Maintenance costs**	Fleet News (Car and van running costs) (https://www.fleetnews.co.uk/car-running-costs-calculator) All costs are an average of the **top three bestselling models** from each segment, where information is available.	**Diesel:** Freight Transport Association operating cost tables **All other technologies:** Fleet operators, Manufacturers, and industry interviews BEVs have the same absolute residual value as diesel equivalent (increased depreciation). Gas vehicles have 50% of the residual value of diesel equivalent.
Fuel prices	**Diesel:** AA fuel price reports **Electricity:** BEIS non-domestic electricity prices **Natural Gas:** Cenex consultation with gas suppliers	

4.5 Low Emission Vehicle Performance Reviews

This section shows the relative performance of ZEV, ULEV, and LEVs that have been selected for further analysis during the technology screening process.

The **Low Emission Vehicle Performance Reviews** reported below **are based on the combined fleet average vehicle for each segment** as calculated during the fleet baselining and are reported for selected vehicle segments to demonstrate the potential operational impacts of using the identified technologies within the vehicle segment.

Conversely, the **Low Emission Vehicle Technology Selection involves an assessment of each vehicle** to identify the most appropriate technology based on the individual vehicle requirements.

In both cases, the following parameters (exc. VAT) are used as the main inputs to the spreadsheet model:

- Annual mileage and number of used days per week.
- Fuel economy and driving environment of 30% urban, 50% rural, 20% A-road (mostly regional).
- Planned ownership period.
- Diesel = £1.00/ litre, Petrol = £0.96 / litre.
- Electricity = £0.14 / kWh.
- Bio-LPG = £0.53 / kg, CNG = £0.70 / kg (public gas station).
- FAME (B20) = £1.00/ litre.
- HVO = £1.15/ litre.

Table 11 summarises the key assumptions held within the calculation engine of the spreadsheet model. A table of references can be found in Appendix A – Fleet Review References.

Table 11 - Key Modelling Assumptions

Assumption	Description
Estimated real-world operating range	The electric-only vehicle range stated is based on the current vehicle fuel/energy consumption. As such, it includes the average impact of the current duty cycle as well as any ancillary power demands. The actual operating range on any given day will vary by driving style, payload, use of power take off (PTO), use of air conditioning/cabin heating or other external factors (e.g. ambient temperature). The actual electric-only range can vary significantly (by up to 50%) based on these variables.
Vehicle costs - body equipment / variants	The model assumes a standard vehicle configuration without additional equipment. Any differential in vehicle purchase cost is determined primarily by the powertrain. Compatibility between chassis and body variants as well as potential integration issues should be confirmed before procurement of LEVs.
Predicted residual values	Where possible predicted residual values are based on independent data. Despite this, predicted residual values are uncertain and vary significantly based on market factors such as supply vs. demand and policy measures. Additionally, they are forecast over the life of the vehicle. Where predicted residual values are unavailable (e.g. BEV HGVs) it has been assumed the LEVs have the same absolute residual value as an equivalent diesel vehicle. Natural gas vehicles have been assumed to have an absolute residual value of 50% of an equivalent diesel vehicle, this is due to feedback from the gas industry and the lack of a public refuelling network.
Infrastructure costs	Low emission vehicle infrastructure costs are assessed separately in Section 5 (Low Emission Vehicle Infrastructure Review)

Scope of Performance Reviews

Performance reviews have been undertaken for the following vehicle segments:

- Small Car
- Medium Van
- Large Van (<3.5t GVW)
- Rigid Truck – 3 axles (26t GVW)

These vehicle segments account for 80% of the fleet WTW CO_2e emissions, 89% of the fleet NOx emissions, and cover all relevant LEV technologies applicable across all NWLDC vehicle segments.

Table 12 summarises the key vehicle performance criteria used as part of the LEV performance reviews.

Table 12 - Average Vehicle Performance Criteria

	Typical Driving Type	Annual Mileage (miles)	Fuel Consumption (MPG)	Days per Week Used	Ownership Period (years)
Small Car	Mostly regional	8,632	49.6	5	7
Medium Van	Mostly regional	8,915	27.0	5	7
Large Van (< 3.5t GVW)	Mostly regional	5,547	15.6	5	7
Rigid Truck - 3 axles (26t GVW)	Mostly regional	9,995	3.8	4	7

The completed Performance Reviews are presented over two pages with charts for operating range, total cost of ownership (TCO) and CO_2e emissions followed by a summary of the key findings of each technology.

Results are based on a comparison of the identified low emission technology against an equivalent Euro 6 diesel vehicle and presented on a per vehicle basis in order of zero-emission range descending followed by WTW CO_2e emissions savings descending. All prices exclude VAT. **LEV technologies that are of least relevance as potential replacements have been highlighted in amber** with supporting justification provided on the relevant charts.

4.5.1 Low Emission Vehicle Performance Review – Small Car

Figure 4 to Figure 6 show the relative performance of LEV technologies for small cars. The calculations contained in Figure 5 outline the methodology used to calculate the vehicle depreciation.

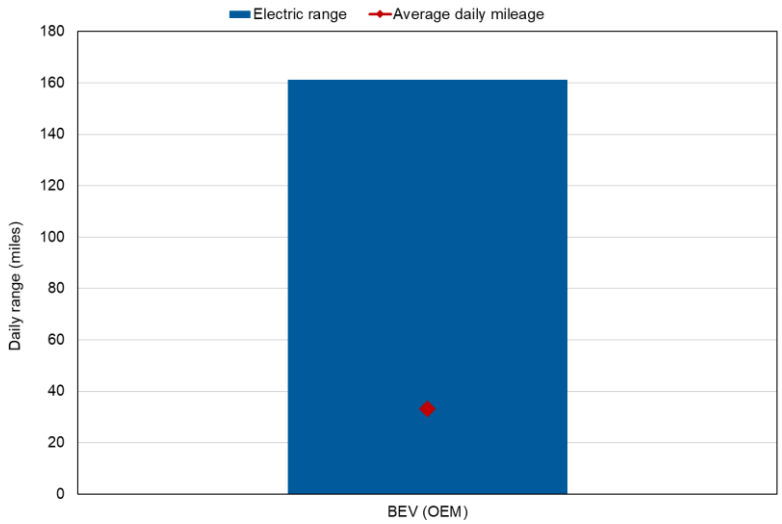


Figure 4 – Operating Range; Small Car

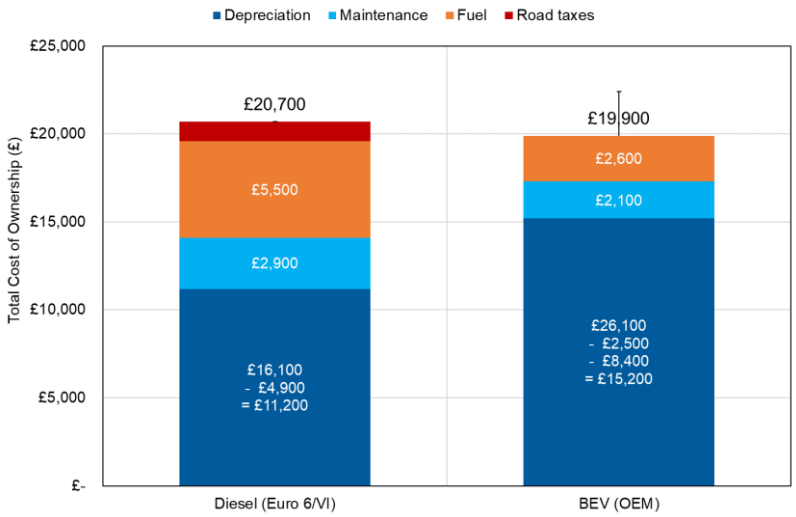


Figure 5 - Total Cost of Ownership; Small Car

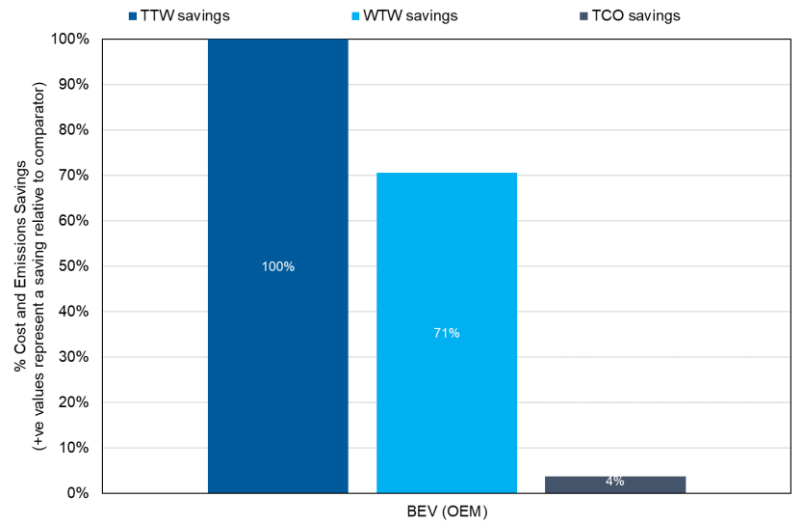


Figure 6 - CO_2e Emissions Savings vs. Cost Difference; Small Car

BEV (OEM)

Criteria	Performance
Operational	• Estimated real-world range of 161 miles (40 kWh battery). • 7kW AC on-board charger as standard = 8h charging time at 7kW chargepoint. • 1 hour to DC charge to 80% capacity using a 50 kW rapid charger.
TCO	• £10,000 increase in purchase cost (including £2,500 Plug-In grant). • No road taxes, lower fuel and maintenance costs result in a TCO saving of £800.
Emissions	• Zero tailpipe emissions. • 71% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further as the UK grid decarbonises.

4.5.2 Low Emission Vehicle Performance Review – Medium Van

Figure 7 to Figure 9 show the relative performance of LEV technologies for Medium Vans. The black error bars in Figure 8 highlight the potential impact of any future removal of the Plug in Van Grant, while the calculations outline the methodology used to calculate the vehicle depreciation.

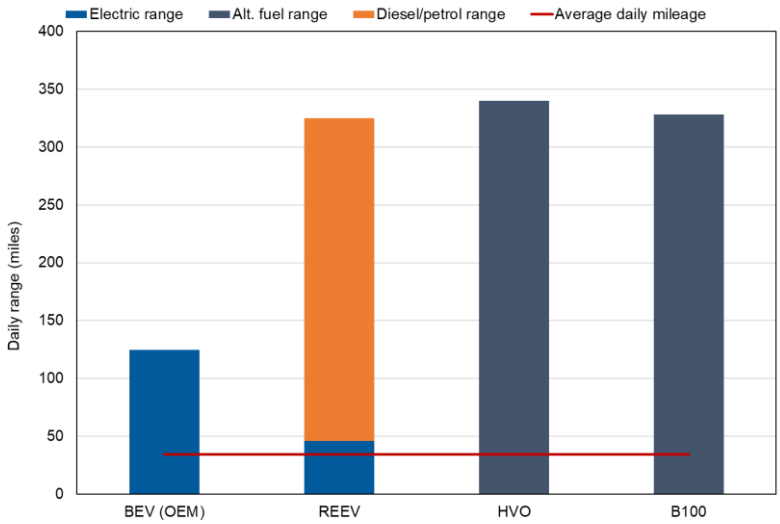


Figure 7 - Operating Range; Medium Van

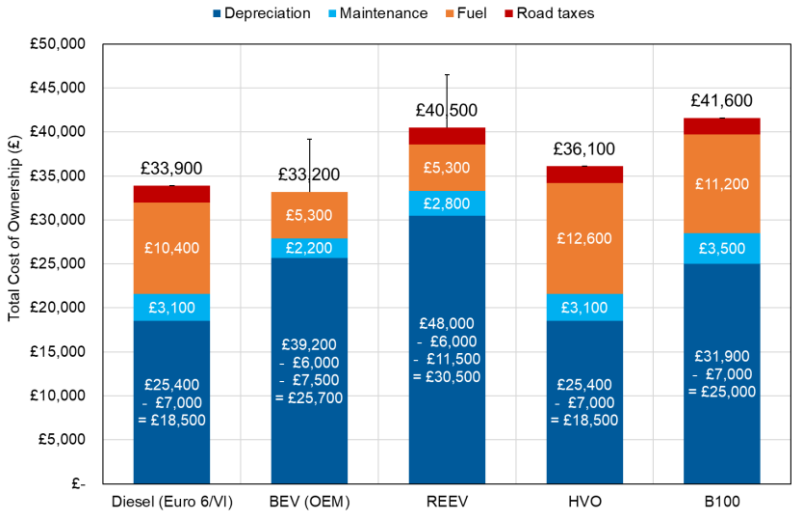


Figure 8 - Total Cost of Ownership; Medium Van

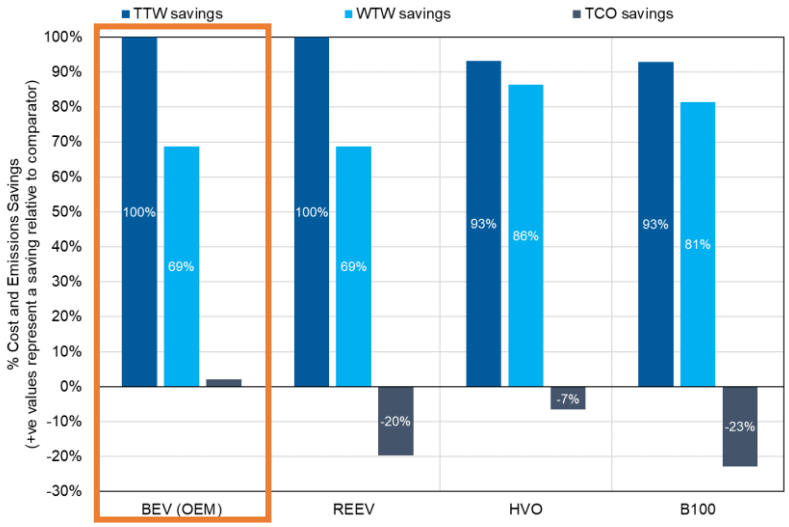


Figure 9 - CO_2e Emissions Savings vs. Cost Difference; Medium Van

BEV (OEM) operating range is over twice the average daily mileage and provides zero tailpipe emissions, a 69% reduction in WTW CO_2e emissions and is TCO neutral.

All other technologies increase TCO.

BEV (OEM)

Criteria	Performance
Operational	• Estimated real-world range of 124 miles (75 kWh battery) • 7kW AC on-board charger as standard = 8-10h charging time at 7kW chargepoint. • 1 hour to DC charge to 80% capacity using a 50 kW rapid charger. • Payloads of 640 kg to 1,000 kg available dependent on the model.
TCO	• £7,200 increase in purchase cost, per vehicle (including £6,000 Plug-In Grant). • Significant running cost savings lead to TCO neutrality.
Emissions	• Zero tailpipe emissions. • 69% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further as the UK grid decarbonises.

REEV

Criteria	Performance
Operational	• The estimated combined range is far greater than the average daily mileage. • Electric-only range approximately 40-50 miles • Up to 22kW AC on-board charger as standard = 3-5h charge time • 30 minutes to DC charge to 80% capacity using a 50 kW rapid charger • Payload of 830kg available dependent on model.
TCO	• £6,000 increase in purchase cost, per vehicle (including £6,000 Plug-In Grant). • Although running costs are reduced, TCO increases by £6,600.
Emissions	• Zero tailpipe emissions, when operating in electric mode • 69% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further depending on how often the vehicle operates in electric mode.

HVO

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel.
TCO	• No increase in capital cost as the vehicle is the same as a diesel. • The increased cost of HVO results in a TCO increase of £2,200.
Emissions	• 86% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro 6.

FAME (B100)

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel. • Additional fuel storage and handling requirements.
TCO	• £6,500 increase in purchase cost • Increased maintenance requirements. • Additional running costs results in TCO increase of £7,700
Emissions	• 81% reduction in WTW CO_2 emissions due to high biodiesel blend. • Air quality pollutant emissions equivalent to Euro 6.

4.5.3 Low Emission Vehicle Performance Review – Large Van (<3.5t GVW)

Figure 10 to Figure 12 show the relative performance of LEV technologies for Large Vans (<3.5t GVW). The black error bars in Figure 11 highlight the potential impact of any future removal of the Plug in Van Grant, while the calculations outline the methodology used to calculate the vehicle depreciation.

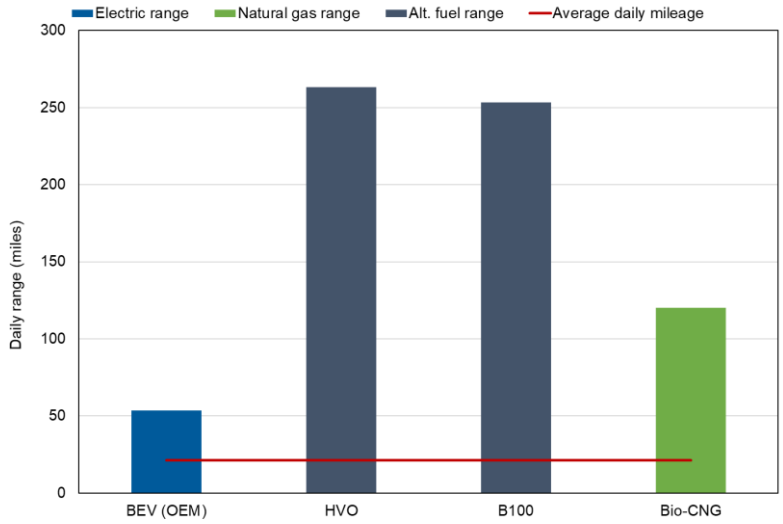


Figure 10 - Operating Range; Large Van (3.5t GVW)

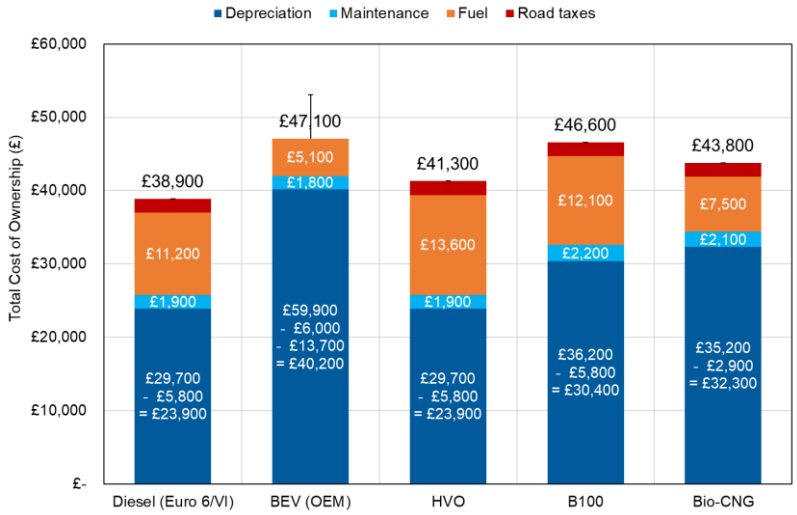
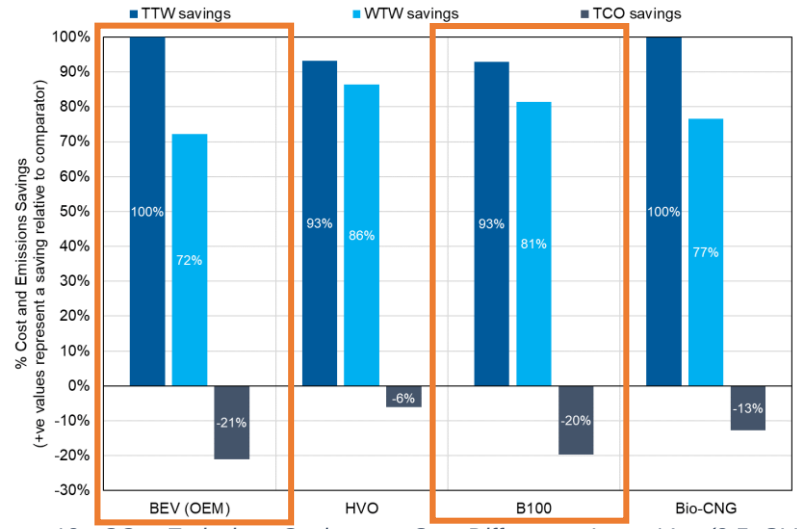


Figure 11 - Total Cost of Ownership; Large Van (3.5t GVW)



The increased purchase cost of BEV (OEM) is the main influencing factor in TCO.

B100 operating range is substantially more than the average daily mileage and provides an 81% reduction in WTW CO_2e emissions. However, TCO increases by 20%.

Figure 12 - CO_2e Emissions Savings vs. Cost Difference; Large Van (3.5t GVW)

BEV (OEM)

Criteria	Performance
Operational	• Estimated real-world range of 53 miles (45 kWh). • 7kW AC on-board charger as standard = 8h charging time at 7kW chargepoint. • 1 hour to DC charge to 80% capacity using a 50 kW rapid charger. • Dependent on the vehicle model and battery capacity, payloads ranging from 700 kg to 1,200 kg are available. • The payload can also be increased by 750 kg by using vehicles that make use of the government **derogation that allows a low emission vehicle to be rated at 4.25t GVW whilst still being used on a category B driving licence**. See Appendix B – for more details. • Except for the new Mercedes-Benz eSprinter, which has a towing capacity of 1,200 to 1,700 kg, **most BEV large vans (<3.5t GVW) are not able to tow**. The additional weight, rolling resistance and aerodynamic drag will also reduce the electric-only range which may further compromise operational suitability.
TCO	• £16,300 increase in purchase cost (including £6,000 Plug-In Grant). • Despite significant running cost savings, there is an overall TCO increase of £8,200.
Emissions	• Zero tailpipe emissions. • 72% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further as the UK grid decarbonises.

HVO

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel.
TCO	• No increase in capital cost as the vehicle is the same as a diesel. • Increased running costs lead to a TCO increase of £2,400.
Emissions	• 86% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro 6.

FAME (B100)

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel. • Additional fuel storage and handling requirements.
TCO	• £6,500 increase in purchase cost • Increased maintenance requirements. • Increased running costs lead to a TCO increase of £7,700.
Emissions	• 81% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro 6.

Bio-CNG

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel. • Payloads up to 1,200 kg are currently available.
TCO	• £8,400 increase in vehicle capital cost. • Despite access to low-cost public gas prices (£0.70 per kg), increased running costs lead to a TCO increase of £4,900.
Emissions	• 77% reduction WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro 6.

4.5.4 Low Emission Vehicle Performance Review – Rigid Truck (26t GVW)

Figure 13 to Figure 15 show the relative performance of LEV technologies for Rigid Trucks (26t GVW). The calculations contained in Figure 14 outline the methodology used to calculate the vehicle depreciation.

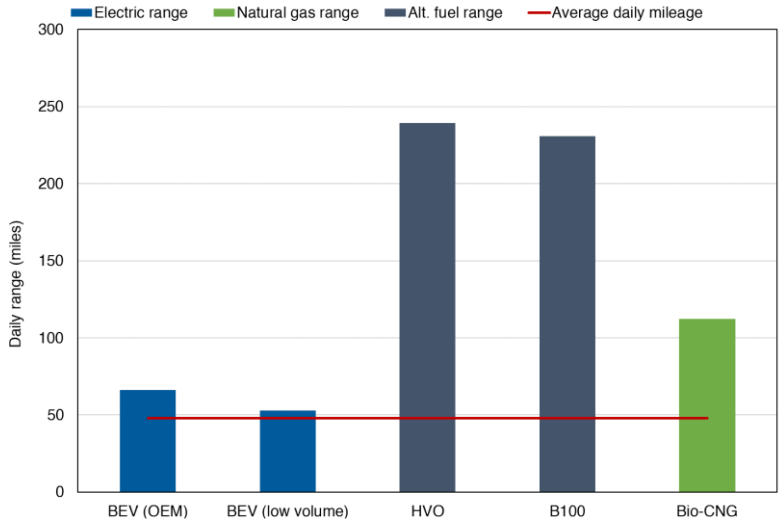


Figure 13 - Operating Range; Rigid Truck (26t GVW)

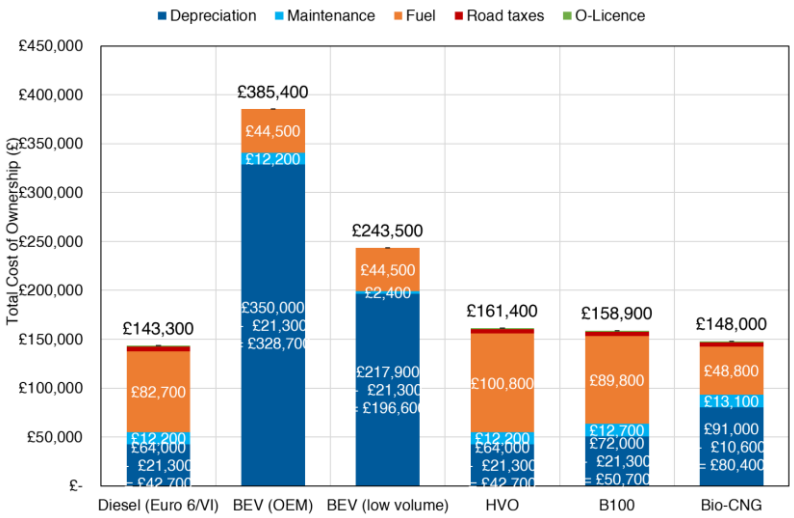
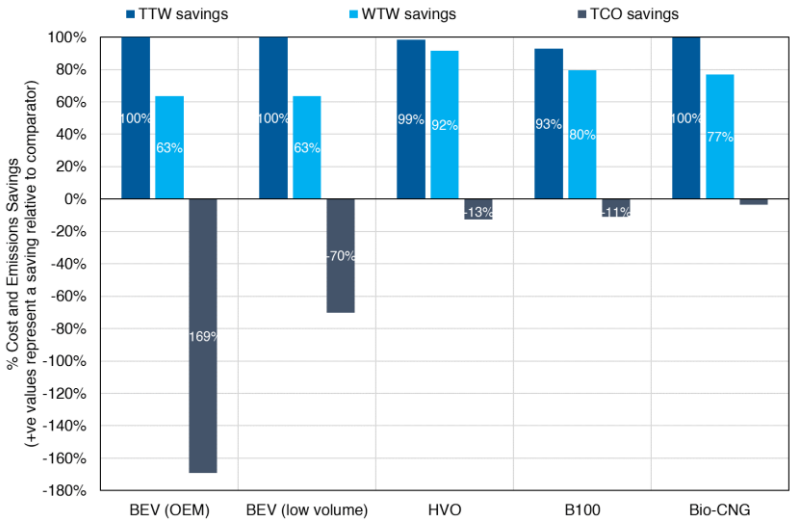


Figure 14 - Total Cost of Ownership; Rigid Truck (26t GVW)



The increased purchase cost of BEV (low volume) and BEV (re-power) is the main influencing factor in TCO.

The bio-CNG operating range is substantially more than the average daily mileage and provides a 77% reduction in WTW CO_2e emissions. However, air quality emissions remain at Euro VI levels.

Figure 15 – CO_2e Emissions Savings vs. TCO Difference; Rigid Truck (26t GVW)

BEV (OEM / low volume)

Criteria	Performance
Operational	• Estimated real-world range of between 44 – 66 miles (180 – 270 kWh). • The daily mileage uses at least half of the battery capacity. The BEV would have to be charged between shifts if it were to be double shifted. • Many of this vehicle category are specialist refuse collection vehicles, which may limit their suitability for battery-electric options due to the lack of available vehicles. • The payload will be reduced due to the additional weight of the batteries. See Appendix B – for more details.
TCO	• An increase in purchase costs of £154,000 – £286,000 leads to large depreciation cost increases. • Despite significant running cost savings, there is an overall TCO increase of at least £100,200 due to the low mileages undertaken by these vehicles. This rises to £242,100 for the BEV (OEM).
Emissions	• Zero tailpipe emissions. • 63% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further as the UK grid decarbonises.

HVO

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel.
TCO	• No increase in capital cost as the vehicle is the same as a diesel. • Increased running costs lead to a TCO increase of £18,100.
Emissions	• 92% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro VI.

FAME (B100)

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel. • Additional fuel storage and handling requirements.
TCO	• £8,000 increase in capital cost. • Increased maintenance requirements. • Increased running costs lead to a TCO increase of £15,600.
Emissions	• 80% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro VI.

Bio-CNG

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel.
TCO	• £37,700 increase in vehicle capital cost. • Despite access to low-cost public gas prices (£0.70 per kg), increased running costs lead to a TCO increase of £4,700.
Emissions	• 77% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro VI.

4.5.5 Low Emission Vehicle Technology Options Appraisal

Following the completion of the above Performance Reviews an additional appraisal was undertaken to assess the wider implications of the analysed technologies within the Medium Van and Rigid Truck (RCV) vehicle segments. This high-level options appraisal took into account emission reduction potential, vehicle and fuel availability, operational considerations, ownership costs and refuelling/ recharging infrastructure requirements.

This analysis has been undertaken as a qualitative assessment using a **red**, **amber**, **green** status with an additional **grey** category for neutral or conditional metrics (e.g. vehicle cost for 'drop-in' fuels). Table 13 shows the colour coding used for this additional low emission vehicle technologies options appraisal.

Table 13 - Technology Options Review Criteria

Key	Cost and Emissions	Maturity and Availability	All Others
	Better than diesel	OEM product	Advantage
	Same as diesel	Conditional	Neutral
	Slightly worse than diesel	Low volume	Minor disadvantage
	Worse than diesel	Demonstration phase	Disadvantage

Table 14 and Table 15 show a summary of the performance of each identified low emission vehicle technology within the Medium Van and Rigid Trucks (RCV) category respectively, against the key metrics studied. Vehicle technologies are presented left to right in order of vehicle cost ascending.

Table 14 - Summary of Low Emission Technology Options – Medium Vans

Performance Metric	Renewable Diesel (HVO)	Biodiesel (B100)	Battery Electric
Greenhouse Gas Emissions		Blend limited	
Air Pollutant Emissions	Euro VI	Euro VI	ZEV
Noise Pollution			
Maturity		Partial OEM	Partial OEM
Availability (2021)			
Availability (2030)			
Typical Operations		Fuel Use / Storage	
Intensive Operations		Fuel Use / Storage	Energy Storage
Vehicle Weight			Batteries
Vehicle Costs			
Fuel Costs			
Maintenance Costs			Currently the same
Existing Infrastructure			Depot Power
Infrastructure Cost			Varies by site
Infrastructure Viability			

Table 15 - Summary of Low Emission Technology Options – Rigid Trucks (RCVs)

Performance Metric	Renewable Diesel (HVO)	Biodiesel (B100)	Bio-CNG	Hydrogen Dual Fuel	Battery Electric	Fuel Cell Electric
Greenhouse Gas Emissions		Blend limited		SR[1] limited		H_2 Production
Air Pollutant Emissions	Euro VI	Euro VI	Euro VI	Euro VI	ZEV	ZEV
Noise Pollution			SI[1] Only			
Maturity		Partial OEM			Partial OEM	
Availability (2021)						
Availability (2030)			Could be phased out			Availability uncertain
Typical Operations		Fuel Use / Storage				
Intensive Operations		Fuel Use / Storage			Energy Storage	
Vehicle Weight[2]			Gas tanks	Gas tanks	Batteries	Batteries
Vehicle Costs						
Fuel Costs						
Maintenance Costs					Currently the same	
Existing Infrastructure					Depot Power	
Infrastructure Cost			Varies by site	Varies by site	Varies by site	Varies by site
Infrastructure Viability						

[1] SR = substitution ratio (by energy), SI = spark ignition engine (similar to a petrol engine)
[2] UK legislation[6] allows a 1,000 kg increase in maximum authorised weight for alternatively fuelled vehicles.

[6] 2017 No. 881 Road Vehicles, UK Government (2017)

4.6 Low Emission Vehicle Technology Selection

In this section, **the suitability of LEV technologies has been assessed for each vehicle in the NWLDC fleet**. The purpose of this assessment is to highlight the overall opportunity for each technology to replace diesel/petrol vehicles within each vehicle segment and across the wider fleet.

This analysis uses the same approach described during the Low Emission Vehicle Performance Reviews, but individual vehicle input parameters are used instead of the vehicle segment averages. The vehicle's locations are considered when analysing the emission performance of battery electric options. NWLDC uses renewable electricity on a Green Tariff at their depot, whereas home charging is accredited to the UK consumer mix. **ULEV pick-up trucks are not currently available in the UK and have been excluded from this analysis**.

The following suitability criteria have been applied to individual vehicles for all assessed LEV technologies.

- **Operating range suitability criteria** – LEVs must be able to complete the average daily mileage on less than one full charge or tank with at least 20 miles range remaining (including any secondary fuels).
- **Greenhouse gas emissions suitability criteria** – LEVs must provide WTW CO_2e emissions savings.

Individual vehicles that do not meet these suitability criteria have been excluded from both the 'Low Emission Vehicle Infrastructure Review' and from any recommendations regarding replacement vehicle technologies.

Technology selection results are reported for the two following potential implementation scenarios:

1. **Maximum emissions savings (at any cost) –** all LEVs that meet the above suitability criteria are included and no additional criteria are applied. This scenario represents the maximum emissions savings that can be achieved for each technology, regardless of the cost implications (e.g. vehicle segment TCO could increase).
2. **TCO parity (or better) within each vehicle segment –** in addition to the above suitability criteria, the number of LEVs is reduced (starting from the vehicle with the largest increase in TCO) until TCO parity is achieved across the vehicle segment. Individual vehicles can provide either an increase or decrease in TCO but the **cumulative TCO** of LEVs within each vehicle segment must **provide parity (or better)** compared to equivalent diesel/petrol vehicles. This scenario represents the emissions savings that can be achieved without increasing fleet TCO (although additional capital funding may still be required).

All previously discussed all relevant LEV technologies have been assessed as part of the Low Emission Vehicle Technology Selection. However, for reporting purposes, **the following LEV technologies have been removed from the technology selection tables and infrastructure reviews – FC REEV, REEV, PHEV, Bio-LPG and DF Bio-LPG**. Individually these technologies have the potential to reduce fleet WTW CO_2e emissions by a maximum of 7%. Additionally, for the reasons discussed previously, these technologies are those which have been identified as of least relevance as potential replacements due to economic or commercial availability reasons.

The Low Emission Vehicle Technology Selection results are presented across a series of tables showing the number and percentage of vehicles that meet the suitability criteria as well the associated emissions savings, additional capital costs and difference in TCO. For some vehicle categories, several technologies have been identified as suitable. This provides NWLDC with technology options, depending on the operational requirements of the vehicles. To provide robust recommendations for replacement vehicle technologies the charging/refuelling infrastructure must either be readily available or be viable to install and operate. LEV infrastructure requirements are assessed separately in Section 5 - Low Emission Vehicle Infrastructure Review.

4.6.1 Low Emission Vehicle Technology Selection – ***Maximum Emissions Savings***

Table 16 shows the number and percentage of vehicles that meet the operating range and greenhouse gas emissions suitability criteria for each LEV technology and vehicle segment.

Table 16 - Number of Suitable Vehicles (% of vehicle segment); Maximum Emissions Savings Scenario

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	4 (100%)					
Large Commercial SUV					2 (100%)	2 (100%)
Small Van	7 (100%)				7 (100%)	7 (100%)
Medium Van	48 (100%)		47 (98%)		48 (100%)	48 (100%)
Large Van (< 3.5t GVW)	10 (91%)			11 (100%)	11 (100%)	11 (100%)
Large Van (> 3.5t GVW)	1 (100%)			1 (100%)	1 (100%)	1 (100%)
Rigid Truck - 2 axles (7.5t GVW)	1 (33%)		3 (100%)		3 (100%)	3 (100%)
Rigid Truck - 2 axles (18t GVW)	6 (86%)	1 (14%)		6 (86%)	7 (100%)	7 (100%)
Rigid Truck - 3 axles (26t GVW)	5 (31%)	1 (6%)		16 (100%)	16 (100%)	16 (100%)
Total	**82 (83%)**	**2 (2%)**	**50 (51%)**	**34 (34%)**	**95 (96%)**	**95 (96%)**

It should be noted that more work is required to better understand the RCV daily rounds to determine the suitability of BEV within this vehicle segment. The calculation of vehicle energy consumption is complicated due to a variety of factors including driving, lifting, compacting, increasing payload, etc. In some instances, Cenex have seen ranges of 50 to 130 miles depending on duty cycle, which are achievable if the collection round is repeatable e.g. a vehicle might do 25 miles every day and use 50% of the capacity for a 50 mile 'range'.

Table 17 lists the annual WTW CO_2e emissions savings and annual NOx emissions savings achievable under this scenario.

Table 17 - Annual WTW CO_2e Emissions Savings (% of total fleet); Maximum Emissions Savings Scenario

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	1%					
Large Commercial SUV					1%	1%
Small Van	1%				1%	1%
Medium Van	15%		8%		17%	18%
Large Van (< 3.5t GVW)	4%			4%	4%	4%
Large Van (> 3.5t GVW)	0%			0%	0%	0%
Rigid Truck - 2 axles (7.5t GVW)	1%		2%		3%	3%
Rigid Truck - 2 axles (18t GVW)	12%	1%		3%	12%	13%
Rigid Truck - 3 axles (26t GVW)	10%	0%		43%	44%	47%
Total	**44%**	**1%**	**11%**	**56%**	**81%**	**86%**

Theoretically, 83% of the total fleet (predominately small cars and medium vans) could be replaced with battery electric variants, saving approximately 44% of annual fleet WTW CO_2e emissions and 78% of annual fleet NOx emissions. 34% of the fleet (LCVs and rigid trucks) could be replaced by bio-CNG variants, saving 56% of annual fleet WTW CO_2e emissions with similar Euro 6/ VI air quality pollutant emissions.

The CO_2 savings for HVO and biodiesel are shown as better than BEV due to the emission factors used, which considers the fuel production process, which is currently less polluting for these liquid fuels. However, electricity generation will continue to decarbonise in the future, while the emissions from the production of HVO and biodiesel are unlikely to change.

Table 18 - Annual NOx Emissions Savings (% of total fleet); Maximum Emissions Savings Scenario

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	3%					
Large Commercial SUV					0%	0%
Small Van	5%				0%	0%
Medium Van	55%		52%		0%	0%
Large Van (< 3.5t GVW)	6%			0%	0%	0%
Large Van (> 3.5t GVW)	0%			0%	0%	0%
Rigid Truck - 2 axles (7.5t GVW)	0%		2%		0%	0%
Rigid Truck - 2 axles (18t GVW)	5%	1%		0%	0%	0%
Rigid Truck - 3 axles (26t GVW)	4%	0%		0%	0%	0%
Total	**78%**	**1%**	**53%**	**0%**	**0%**	**0%**

B100 is available for 96% of the fleet, resulting in WTW CO_2e emissions savings of 81% with similar NOx emissions. HVO could cover the same fleet share with marginally higher WTW CO_2e reductions. B100 and HVO could be options for the rigid truck segments, especially those where bio-CNG and battery electric are either not currently available or not viable.

Table 19 and Table 20 highlight the cost differences for the alternative technologies compared to a new Euro 6/ VI vehicle for all vehicles meeting the suitability criteria. The tables show the total cost of ownership and additional capital costs. **Green numbers** indicate lower costs, with **red numbers** indicating higher costs compared to an equivalent Euro 6/ VI diesel option.

Table 19 – Difference in Total Cost of Ownership; Maximum Emissions Savings Scenario

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	£493					
Large Commercial SUV					-£14,754	-£4,499
Small Van	-£10,823				-£51,038	-£6,368
Medium Van	£36,246		-£420,293		-£372,056	-£107,827
Large Van (< 3.5t GVW)	-£95,955			-£55,453	-£83,733	-£24,866
Large Van (> 3.5t GVW)	-£52,760			-£4,706	-£6,636	-£1,724
Rigid Truck - 2 axles (7.5t GVW)	-£38,439		-£137,624		-£32,445	-£16,411
Rigid Truck - 2 axles (18t GVW)	-£1,227,419	-£85,299		-£64,559	-£88,190	-£77,918
Rigid Truck - 3 axles (26t GVW)	-£1,284,206	-£131,067		-£57,172	-£251,058	-£291,091
Total	**-£2,672,863**	**-£216,366**	**-£557,916**	**-£181,891**	**-£530,703**	**-£530,703**

BEV (OEM) small cars and medium vans yield a combined TCO saving of **~£36,500** over the life of the vehicles, procurement of these 52 vehicles would incur additional capital costs of **~£407,000** (excluding infrastructure).

Table 20 - Additional Vehicle Capital Cost; Maximum Emissions Savings Scenario

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	£32,033					
Large Commercial SUV					£13,000	£0
Small Van	£43,223				£45,500	£0
Medium Van	£375,360		£780,435		£312,000	£0
Large Van (< 3.5t GVW)	£242,097			£60,500	£71,500	£0
Large Van (> 3.5t GVW)	£60,000			£5,500	£6,500	£0
Rigid Truck - 2 axles (7.5t GVW)	£54,000		£180,000		£24,000	£0
Rigid Truck - 2 axles (18t GVW)	£1,404,000	£109,550		£120,000	£56,000	£0
Rigid Truck - 3 axles (26t GVW)	£1,430,000	£142,775		£432,000	£128,000	£0
Total	**£3,640,713**	**£252,325**	**£960,435**	**£618,000**	**£656,500**	**£0**

The above tables demonstrate that the economics for the replacement of entire vehicle segments with ZEVs, ULEVs, and LEVs are challenging across the NWLDC fleet. This is primarily due to higher capital costs and the low annual mileages undertaken by most vehicles. High annual mileages allow running cost savings to offset the disadvantage of increased capital costs, especially for BEV rigid trucks with their low relative maturity and increased costs.

Under this scenario the adoption of 12 battery electric rigid trucks would increase TCO by **~£2,545,000**.

However, even bio-CNG priced at £0.70/ kg, such as from a large public gas station, would increase fleet TCO by **~£182,000**. As reported in Section 5, this represents a realistic best-case scenario as small-scale depot based natural gas stations typically yield an increased gas price.

*4.6.2 Low Emission Vehicle Technology Selection – **Total Cost of Ownership Parity***

Table 21 shows the percentage of vehicles that meet the additional TCO parity selection criteria. This represents the percentage of vehicles that provide enough operating range, WTW CO_2e emissions savings **and** could be introduced **without** increasing fleet TCO.

Table 21 - Number of Suitable Vehicles (% of vehicle segment); TCO Parity Scenario

	ZEV	LEV
	BEV (OEM)	Bio-CNG
Small Car	4 (100%)	
Large Commercial SUV		
Small Van	2 (29%)	
Medium Van	48 (100%)	
Large Van (< 3.5t GVW)		
Large Van (> 3.5t GVW)		
Rigid Truck - 2 axles (7.5t GVW)		
Rigid Truck - 2 axles (18t GVW)		
Rigid Truck - 3 axles (26t GVW)		13 (81%)
Total	**54 (55%)**	**13 (13%)**

The introduction of battery electric and bio-CNG can provide some level of TCO parity within their respective vehicle segments although the suitability of bio-CNG is dependent on the provision of bio-CNG at £0.70/ kg. In addition, while both biodiesel and HVO provide emission savings and are operationally suitability, these fuels have been excluded from this analysis as their introduction increases TCO, due to increased fuel prices, and in the case of biodiesel, increased maintenance and vehicle capital costs.

Table 22 and Table 23 show the annual WTW CO_2e emissions savings and annual NOx emissions savings for the TCO parity scenario.

Table 22 - Annual WTW CO_2e Emissions Savings (% of total fleet); TCO Parity Scenario

	ZEV	LEV
	BEV (OEM)	Bio-CNG
Small Car	1%	
Large Commercial SUV		
Small Van	1%	
Medium Van	15%	
Large Van (< 3.5t GVW)		
Large Van (> 3.5t GVW)		
Rigid Truck - 2 axles (7.5t GVW)		
Rigid Truck - 2 axles (18t GVW)		
Rigid Truck - 3 axles (26t GVW)		39%
Total	**16%**	**39%**

Table 23 - Annual NOx Emissions Savings (% of total fleet); TCO Parity Scenario

	ZEV	LEV
	BEV (OEM)	Bio-CNG
Small Car	3%	
Large Commercial SUV		
Small Van	2%	
Medium Van	55%	
Large Van (< 3.5t GVW)		
Large Van (> 3.5t GVW)		
Rigid Truck - 2 axles (7.5t GVW)		
Rigid Truck - 2 axles (18t GVW)		
Rigid Truck - 3 axles (26t GVW)		0%
Total	**60%**	**0%**

In this scenario, 55% of the fleet, including all small cars, all medium vans and two small vans could be replaced by battery electric variants, saving 16% of annual fleet WTW CO_2e emissions and 60% of NOx emissions.

For larger vehicle segments, 81% of the rigid truck - 3 axles (26t GVW), could be replaced with bio-CNG variants, saving 39% of annual WTW CO_2e emissions while achieving Euro 6/ VI air quality pollutant standards.

Table 24 and Table 25 show the difference in total cost of ownership and additional capital cost **compared to a new Euro 6/ VI diesel vehicle** for all segments which contain ZEV and LEV technologies that can achieve TCO parity.

The procurement of 54 BEV (OEM) vehicles (55% of the fleet) would result in additional capital costs of **~£420,000** and would return TCO savings of **~£36,000**.

The procurement of 13 bio-CNG rigid trucks (13% of the fleet) would result in additional capital costs of **~£351,000** and would achieve TCO savings of **~£10,500**.

Table 24 - Difference in Total Cost of Ownership; TCO Parity Scenario

	ZEV	LEV
	BEV (OEM)	Bio-CNG
Small Car	£493	
Large Commercial SUV		
Small Van	£644	
Medium Van	£36,246	
Large Van (< 3.5t GVW)		
Large Van (> 3.5t GVW)		
Rigid Truck - 2 axles (7.5t GVW)		
Rigid Truck - 2 axles (18t GVW)		
Rigid Truck - 3 axles (26t GVW)		£10,528
Total	**£36,246**	**£10,528**

Table 25 - Additional Vehicle Capital Cost; TCO Parity Scenario

	ZEV	LEV
	BEV (OEM)	Bio-CNG
Small Car	£32,033	
Large Commercial SUV		
Small Van	£12,349	
Medium Van	£375,360	
Large Van (< 3.5t GVW)		
Large Van (> 3.5t GVW)		
Rigid Truck - 2 axles (7.5t GVW)		
Rigid Truck - 2 axles (18t GVW)		
Rigid Truck - 3 axles (26t GVW)		£351,000
Total	**£419,743**	**£351,000**

As a result of the above Low Emission Vehicle Technology Selection process, a decision was made to focus on the introduction of **BEV and bio-CNG** technologies as these provide a reduced risk solution to achieving a lower emission fleet. These technologies have been taken forward for an assessment of the average daily fuel/ energy requirements associated with their use, followed by the Low Emission Vehicle Infrastructure Review.

4.6.3 Additional remarks on range suitability for battery electric vehicles

The above technology selection process uses range suitability criterion based on average daily mileage. In reality, vehicle operations will vary from day to day. This daily variation can cause concern where on average vehicles have been identified as suitable, but not for every single day. Such exceeding days, if frequent, will compromise the suitability of BEVs.

Given the data provided by NWLDC, Cenex undertook an additional analysis of the suitability of battery electric options, based on the actual mileage data provided. The focus of this analysis was on medium vans, as these vehicles were identified as being the most operationally constrained due to mileage requirements.

Using the provided data it was calculated that a medium van with a battery capacity of 68 kWh has an average daily range of 125 miles. Figure 16, below, compares that value with the logged daily distances for the financial years 2019/2020 and 2020/2021. It should be noted that data logging started on the 12th of August 2019, resulting in fewer counts of daily distances for the period of 2019/20.

However, the calculated distributions between the two periods are similar, although financial year 2020/2021 skews towards shorter distances, which is believed to be a result of the COVID-19 pandemic.

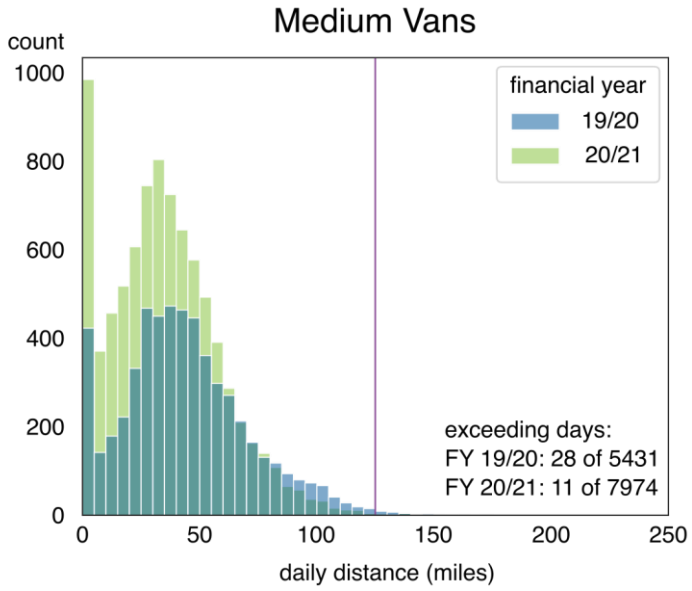


Figure 16 – Daily distance distribution for medium vans in the financial years 19/20 and 20/21

The share of trips exceeding the required 125 miles range is 0.5% for 2019/2020 and 0.14% for 2020/2021. While there are a proportion of journeys that are close to the available range, overall the bulk of daily journeys are shorter than the average BEV range of 125 miles and not all vehicles exceeded this. Table 26 lists the medium vans with logged daily distances above the battery range (Table 42 in the Appendix is an extended version of Table 26 containing all relevant vehicles). Most of them only show two or fewer days of exceedance a year.

Those numbers suggest that battery electric technology can be considered a suitable option, which is not likely to interfere with the current vehicle operation as **very few vehicles** have been found to exceed the calculated battery range. It would be expected that the low number of range exceedances can be overcome by opportunity charging during the day. However, further investigation in to the vehicle start locations and daily duties would need to be undertake the verify their suitability for BEV technology.

Table 26 – Medium vans with daily trips that exceeding battery range

Fleet Number	Vehicle Type	Department	Usable Battery Capacity (kWh)	Average BEV Range (Miles)	FY 2019/2020		FY 2020/2021	
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips
701	Medium Van	Housing Maintenance	68	125	1	164	2	232
710	Medium Van	Housing Maintenance	68	125	2	114	0	221
720	Medium Van	Refuse Department	68	125	3	223	2	200
735	Medium Van	Housing Maintenance	68	125	0	151	2	184
737	Medium Van	Housing Maintenance	68	125	11	134	2	189
739	Medium Van	Housing Maintenance	68	125	3	120	0	185
742	Medium Van	Housing Maintenance	68	125	2	64	1	149
743	Medium Van	Housing Maintenance	68	125	5	140	0	189
746	Medium Van	Housing Maintenance	68	125	0	111	1	68
748	Medium Van	Housing Maintenance	68	125	0	135	1	145
782	Medium Van	Housing Maintenance	68	125	1	131	0	231

4.6.4 Additional remarks on double shifting of RCVs

It is anticipated that it will be challenging to double shift battery electric RCVs. Initial calculations indicate that, using current usage patterns, the NWLDC BEV RCVs are projected to use on average 70% of their battery capacity each day so most vehicles would have to be charged between the two shifts if double shifted.

This would require multiple high power rapid chargepoints to charge the waste fleet during the limited charging window during shift changeover (as opposed to overnight charging when single shifted). It should be noted that currently available BEV RCVs cannot charge at high powers and typically take 4-8 hours to charge; however, the 2022 Mercedes eEconic will be able to charge at 150kW.

While it would be possible to double shift the BEV RCVs in the future, when suitable vehicles are available, it would require significant investments in to infrastructure and increased site grid capacity.

It should be noted that all current UK BEV RCV deployments have been single shifted days of around 8 hours.

4.7 Additional Daily Fuel/ Energy Requirements

Table 27 shows the average daily fuel or energy requirements by location for the ZEV, ULEV, and LEV technologies that have been selected for further analysis based on the Low Emission Vehicle Technology Selection. The main purpose of this analysis is to highlight which location(s) to study during the Low Emission Vehicle Infrastructure Review whilst also providing key economic modelling inputs such as the average daily fuel consumption for gaseous and liquid fuels.

The table includes all vehicles that meet the operating range and greenhouse gas emissions suitability criteria regardless of TCO. This provides a complete overview of the **maximum** potential energy requirements of ZEV, ULEV, and LEV technology per location.

Table 27 - Average Daily Fuel or Energy Consumption of Selected ZEV and LEV Technologies

Location	Baseline	ZEV	ULEV	LEV		
	Diesel (litres)	BEV (OEM) (kWh)	REEV (kWh)	Bio-CNG (kg)	B100 (litres)	HVO (litres)
Linden Way Depot	1,300	1,761	181	1,023	1,409	1,355
Home	256	950	535		277	266
London Road Depot	40	115		29	43	42
Council Offices	26	83	17		15	14
Total	**1,622**	**2,909**	**733**	**1,052**	**1,743**	**1,677**
Number of Vehicles	**99**	**82**	**51**	**34**	**95**	**95**

The current NWLDC vehicle fleet is spread across three Council locations, with a proportion taken home overnight. The introduction of BEVs has the potential to increase depot energy consumption depending on the number of vehicles based at each location. The largest increase in energy consumption is likely to be experienced by the Linden Way Depot due to the high number of rigid trucks and other HGVs stored there.

On an average day, the potential fleet of natural gas vehicles could consume about 1,000 kg of bio-CNG (assuming a shared natural gas station). This is a very small use demand with a typical small natural gas station having a daily capacity of ~10,000 kg.

High volumes of B100 biodiesel are required for economic delivery, with typical minimum on-site delivery of 10,000 litres required. Biodiesel is organic and has a shelf life meaning it requires using within three to four months. This means only sites with the capacity of at least 30,000 – 40,000 litres per annum are appropriate. With a daily demand in excess of 1,400 litres, the Linden Way Depot would have enough demand to consume the B100 before it exceeds its shelf life.

HVO does not suffer from a short shelf life like B100, although minimum deliveries are required to ensure reduce prices.

5. Low Emission Vehicle Infrastructure Review

This section assesses the infrastructure required to facilitate the uptake of those vehicles identified as being suitable for replacement with ZEV, ULEV, and LEV alternatives. This includes a high-level assessment of the required type, location, and indicative capital costs of any required infrastructure. Supporting guidance regarding the key factors to consider when installing and operating ZEV, ULEV, and LEV infrastructure are available in Appendix H – Infrastructure Considerations.

Although there are installation and operational considerations associated with the use of bunkered renewable fuel supplies, these are considered less significant than those associated with **electric vehicle charging infrastructure,** and **natural gas refuelling stations**.

5.1 Charging and Refuelling Infrastructure Baselining

To enable NWLDC to better understand whether staff can utilise existing publicly available infrastructure during their daily duties Cenex undertook an infrastructure mapping exercise, where NWLDC depot locations were mapped against the existing publicly available electric vehicle and natural gas infrastructure. The results of the exercise can be found in Figure 17, below.

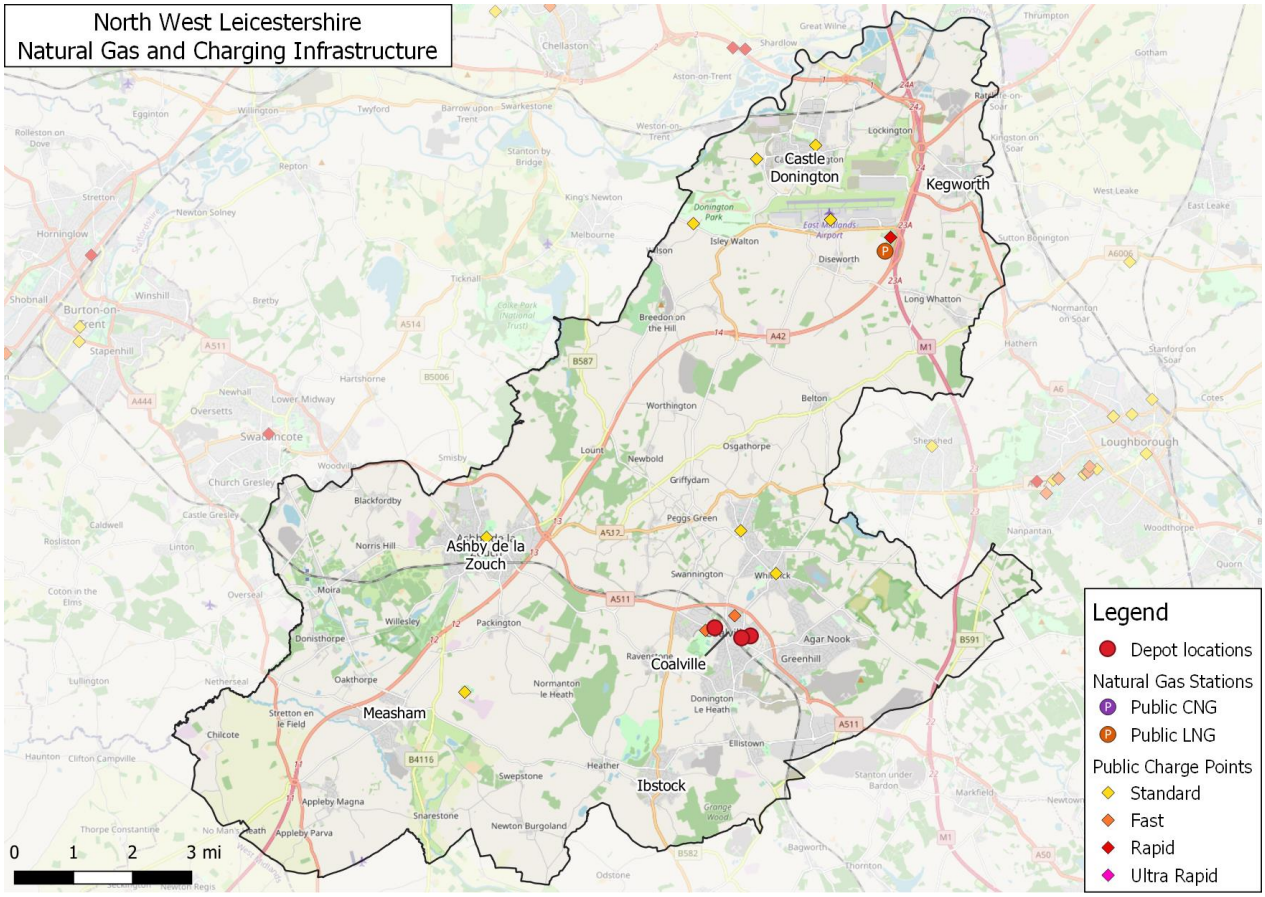


Figure 17 – Locations of Offices and Depots with EV and Natural Gas Infrastructure

The results of the benchmarking exercise indicate that there is some publicly available standard power infrastructure in the main population centres of the district. Additionally, there are 12 three-phase fast chargepoints in Coalville that can charge supported vehicles at up to 22 kW. Finally, there is one rapid charger in the district located at Castle Donington motorway services which can deliver 50 kW. Just outside the district, there are more fast and rapid chargers in the towns of Loughborough and Swandicote. Relying purely on publicly available electric vehicle infrastructure would not be appropriate given its limited availability. However, there are currently enough public chargepoints that a vehicle would not have to travel far if it required a top-up charge during the day. If NWLDC were to install additional public chargepoints across the region it would benefit both the operational fleet and residents wishing to transition to electric cars.

In terms of natural gas refuelling, there is one major liquified natural gas refuelling station in North West Leicestershire although this fuel is more relevant to long haul transit. The nearest public compressed natural gas stations are in Erdington (near Birmingham) and Newark.

5.1.1 Electric Vehicle Charging Infrastructure – Assessment

A high-level assessment of electric vehicle charging infrastructure requirements has been undertaken to identify the required number, type, and location of chargepoints based on the number and types of BEVs identified as being suitable under the **Maximum Emission Savings** and **TCO Parity** scenarios.

In addition, and for each scenario, the implications of operating all vehicles from a single depot has also been assessed.

The assessment has been undertaken based on the following assumptions:

- **Total time available for charging between shifts = 14 hours.**
    - Most vehicles in operation between 8:00 am and 6.00 pm.
    - Some housing vans are required to be on call until 9.00 pm, so would experience a reduced window for charging.
- **Calculated charging time = average daily energy consumption** (kWh) ***/*** **minimum charging power** (kW, on-board vehicle or chargepoint output) **x additional charging time safety factor** (1.25)
- The most suitable chargepoint has been selected out of three charging options assessed:
    - **7 kW AC** (230V, 32A single phase) – Home-based infrastructure only.
    - **22 kW AC** (400V, 32A three phases) – for reference the installed cost of a 22 kW AC chargepoint is typically only ~£225 more than a 7 kW AC chargepoint, based on a level depot installation, this provides a level of future-proofing and is considered best practice for fleet operators installing new chargepoints at operational sites. The costs for installing a 7kW charger at a depot are higher than those for a home charger due to the additional ground works and wiring usually involved.
    - **50 kW DC** (400V, 32A three phases)
    - Charging power is increased until the calculated charging time is less than the total time available. Vehicles can be excluded from the recommended replacement vehicles if charging under these conditions is not viable.
- Indicative hardware and installation costs are based on Cenex experience from electric vehicle charging infrastructure projects assuming 5m cabling and 2.5m^2 ducting; these costs include any relevant chargepoint grants:
    - 7 kW AC (Home – single output e.g. one vehicle) = £1,000
    - 22 kW AC (dual output e.g. two vehicles) = £7,103
    - 50 kW DC (single output e.g. two vehicles) = £24,087
    - **Prices exclude a warranty, annual operating costs** (e.g. back office system, 4G connection, maintenance etc.) **and any required grid upgrade costs**
    - **Infrastructure costs are reported on a per vehicle basis** (e.g. a vehicle requiring a 50 kW DC chargepoint will be assigned a hardware and installation cost of £12,043 or £24,087 divided by 2).

Table 28 shows a summary of the number, type, location, installed hardware costs, and peak charging power for the **maximum emissions savings scenario (i.e.** Low Emission Vehicle Technology Selection – **Maximum Emissions Savings**.)

Table 28 - Electric Vehicle Charging Infrastructure Requirements; Maximum Emissions Saving Scenario

	Number of 7 kW chargepoints (Home Charging)	Number of 22 kW chargepoints	Number of 50 kW chargepoints	Typical Hardware and Installation Cost (£)	Additional Power Needs (kW)
Home	43	0	0	£43,000	N/A
Linden Way Depot	0	21	0	£75,000	327
London Road Depot	0	10	0	£36,000	66
Council Offices	0	8	0	£28,000	56
Total	**43**	**39**	**0**	**£182,000**	**449**

All vehicles which were taken home were assumed to be able to charge at home using a 7 kW chargepoint, thus highlighting the maximum possible costs of chargepoint deployment. However, further investigation will need to be undertaken to assess the actual number of chargepoints that can be deployed for home-based vehicles. Further details of these considerations are summarised in Section 5.2 Home Charging and in the accompanying Home Charging Review report.

Additionally, for those vehicles stored at a depot, the 22 kW chargepoint was identified as having the ability to charge vehicles in a sufficient time, given the identified downtime. The procurement and installation of the above mix of 7 and 22 kW chargepoints to support the maximum uptake of BEVs would cost in the region of **£182,000**.

Without mitigating measures, such as smart charging (i.e. the ability for chargepoints to manage the timing and power of charging in response to user or site requirements), this could result in peak charging power demands that exceed the existing site electricity capacity. For example, at the Linden Way Depot, there would be an additional power demand of 327 kW if all the BEVs were plugged in to charge at the same time.

NWLDC voiced the possibility of redeploying all vehicles to operate from a single depot, including those that are currently home-based, therefore Table 29 includes such a scenario (in the last row).

With costs in the region of **£291,000**, the single depot option is **60%** more expensive due to the installation of additional 22 kW chargepoints instead of 7 kW, which would be sufficient to charge the currently home-based fleet. This cost can therefore be interpreted as an upper limit as Table 29 also shows additional scenarios for a single depot operation, with different numbers of vehicles from the housing fleet stationed at the depot.

The scenarios range from purely home-based operation (0% at the depot) to a purely depot-based operation (100%).

Table 29 - Electric Vehicle Charging Infrastructure Requirements for a single depot scenario and different percentages of the housing fleet stationed at the depot; Maximum Emissions Saving Scenario

	Number of 7 kW chargepoints (Home Charging)	Number of 22 kW chargepoints	Number of 50 kW chargepoints	Typical Hardware and Installation Cost (£)	Additional Power Needs (kW)
0% of the housing fleet at the depot					
Home	43	0	0	£43,000	N/A
Single Depot	0	39	0	£139,000	449
Total	**43**	**39**	**0**	**£182,000**	**449**
25% of the housing fleet at the depot					
Home	32	0	0	£32,000	N/A
Single Depot	0	50	0	£178,000	526
Total	**32**	**50**	**0**	**£210,000**	**526**
50% of the housing fleet at the depot					
Home	21	0	0	£21,000	N/A
Single Depot	0	61	0	£217,000	603
Total	**21**	**61**	**0**	**£238,000**	**603**
75% of the housing fleet at the depot					
Home	10	0	0	£10,000	N/A
Single Depot	0	72	0	£256,000	680
Total	**10**	**72**	**0**	**£266,000**	**680**
100% of the housing fleet at the depot					
Total Single Depot	**0**	**82**	**0**	**£291,000**	**750**

Table 30 and Table 31 show the respective results for the **TCO parity scenario (**Low Emission Vehicle Technology Selection – **Total Cost of Ownership Parity)**. Table 30 shows a summary of the number, type, location, installed hardware costs, and peak charging power.

Table 30 - Electric Vehicle Charging Infrastructure Requirements; TCO Parity Scenario

	Number of 7 kW chargepoints (Home Charging)	Number of 22 kW chargepoints	Number of 50 kW chargepoints	Typical Hardware and Installation Cost (£)	Additional Power Needs (kW)
Home	43	0	0	£43,000	N/A
Linden Way Depot	0	5	0	£18,000	35
Council Offices	0	6	0	£21,000	42
Total	**43**	**11**	**0**	**£82,000**	**77**

A single depot operation with different levels of stationing the housing fleet at the depot is summarised in Table 31.

Table 31 - Electric Vehicle Charging Infrastructure Requirements for a single depot scenario and different percentages of the housing fleet stationed at the depot; TCO Parity Scenario

	Number of 7 kW chargepoints (Home Charging)	Number of 22 kW chargepoints	Number of 50 kW chargepoints	Typical Hardware and Installation Cost (£)	Additional Power Needs (kW)
0% of the housing fleet at the depot					
Home	43	0	0	£43,000	N/A
Single Depot	0	11	0	£39,000	77
Total	**43**	**11**	**0**	**£82,000**	**77**
25% of the housing fleet at the depot					
Home	32	0	0	£32,000	N/A
Single Depot	0	22	0	£78,000	154
Total	**32**	**22**	**0**	**£110,000**	**154**
50% of the housing fleet at the depot					
Home	21	0	0	£21,000	N/A
Single Depot	0	33	0	£117,000	231
Total	**21**	**33**	**0**	**£138,000**	**231**
75% of the housing fleet at the depot					
Home	10	0	0	£10,000	N/A
Single Depot	0	44	0	£156,000	308
Total	**10**	**44**	**0**	**£166,000**	**308**
100% of the housing fleet at the depot					
Total Single Depot	**0**	**54**	**0**	**£192,000**	**378**

In the short term, introducing those BEVs which achieve TCO parity would require **£82,000** of capital for the installation of the required mix of chargepoints across the identified sites (or up to **£192,000** for a single site depot).

As fewer vehicles have been identified as being suitable for replacement in the TCO Parity scenario, there is lower peak power. While this is the case it is assumed that smart charging enabled chargepoints would be installed to future-proof the depot.

5.2 Home Charging

Since a majority of the fleet vehicles are currently taken home, identifying options to allow drivers to charge their vehicles overnight at their homes would reduce the need for the installation of additional depot-based or on-street/ public charging infrastructure. Given the overall analysis of the fleet the objective of this work package was to determine:

- What best practice would look like for a home charging scheme
- Provide recommendations for how such a scheme could work within NWLDC, and
- Outline a trial roll-out of the scheme.

Cenex carried out research across fleets that have already investigated home charging to give a range of perspectives on the rollout of home charging schemes for operational vehicles. In addition, Cenex explored a range of chargepoint providers including reviewing the types of chargepoint infrastructure and back office systems available for an employee home charging scheme.

The information outlined below has been taken from a separate, more in-depth, report which should be consulted before deciding on the best approach to implementing a home charging scheme.

5.2.1 Charging powers

Most EV drivers with off-street parking have a choice of two options for charging at home either by installing a dedicated EV chargepoint or by using a standard 3 pin household plug.

Home chargepoints typically have a power rating of 3.7 kW or 7 kW, with the UK Government proposing a minimum 7kW chargepoint for residential buildings. Some early home installations are 3.6 kW chargepoints but today the majority of the installations are 7 kW. Expected increases in battery sizes and technology developments could make chargepoints less powerful than 7 kW obsolete for future car models, so these should be avoided.

5.2.2 Chargepoint providers

There are many models of domestic chargepoint available from several reputable manufacturers. Cenex interviewed a selection of hardware providers and network operators to get an industry-wide perspective on the potential for offering an employee home charging scheme. All interviewees acknowledged that issues associated with charging multiple EVs at the same place and time are becoming more common as vehicles reach mass adoption. They are increasingly developing solutions to mitigate this challenge, including smart charging, and giving customers better remote visibility and control of charging events.

Results of this qualitative data collection exercise suggest that there are hardware and software solutions available in the market to support a home charging scheme, with remote visibility of energy consumption and the ability to reimburse drivers accurately for the electricity used.

5.2.3 Type of parking

Ideally, employees would have off-street parking where a standard 7 kW chargepoint can be connected directly to their home electricity supply.

For those without off-street parking, various solutions such as lamppost chargers are in trial and early development stages but are not considered suitable for widespread deployment by an employer.

Alternatively, these employees could make use of public charging infrastructure, providing there is availability in proximity to where they live. However, this solution relies on these public chargepoints being available when required and relevant chargepoint access cards being provided. It is also likely to be a much more expensive mode of charging.

5.2.4 Reimbursement mechanism

When charging at home there needs to be a method for reimbursing employees for the cost of the electricity that they have used. This requires a back-office system connected to the chargepoints with an associated web-based portal through which the relevant manager (e.g. fleet, energy, etc.) would be able to remotely monitor the energy consumption from charging events of all drivers. Some systems offer automatic reimbursement of employees based on tracked charging session data.

- For reimbursement, drivers usually have to submit proof of their electricity tariff. There is a risk here that employees might claim for personal use, so procuring a robust system is important.
- Smart cables such as that developed by Ohme or Ubitricity can connect to an existing chargepoint and identify the vehicle being charged to record the energy use and allow accurate reimbursement. Every vehicle is equipped with a Smart Cable featuring a mobile electricity meter and mobile power contract. Smart cables enable fleet managers to monitor and report the cost of charging at fleet and individual vehicle level, calculate home charging expenses and view CO_2 emissions and savings.
- There are hardware and software solutions (Mina, Chargepoint) available in the market to support a home charging scheme, with remote visibility of energy consumption and the ability to reimburse drivers accurately for the electricity used. The idea behind these solutions is that employees' chargepoints are integrated into a platform and the software operator is linked directly to their energy suppliers. All the drivers need to do is plug in and the employer gets a single invoice for all energy used.

5.2.5 Grant support

The installation of home chargepoints is incentivised by government funding under the Electric Vehicle Homecharge Scheme (EVHS) administered by The Office for Zero-Emission Vehicles (OZEV). The EVHS scheme provides funding for 75% of the total cost of the purchase and installation (up to a maximum threshold) of a chargepoint providing AC power between 3.5 – 22 kW. From 1st April 2020, the maximum eligible grant amount was reduced from £500 to £350 to enable a greater number of installations to be funded under the scheme.

Currently any private or public sector organisation can claim the above grant, which is usually administered through the chargepoint supplier.

5.2.6 Tax implications

According to the Income Tax Earnings and Pensions Act 2003 s149(4), electricity is not treated as a transport fuel. As a result, no benefit in kind tax arises if an employer:

- Pays to charge a pure-electric company vehicle;
- Pays for a chargepoint to be installed at the employee's home to charge the company vehicle; or
- Pays for a charge card to allow individuals access to commercial or local authority charging points

5.2.7 Ensuring installation readiness

We recommend that NWLDC engage with an installer and insist that surveys of properties are completed to find out any upgrades that may be required and the likely costs in advance of rollout.

The installation must be undertaken by an OZEV approved chargepoint installer. Installers will advertise if they are an approved installer, and OZEV also maintains a list [7]. Note that installers must also be approved by the chargepoint manufacturer to install their product. This helps to provide additional confidence that the installer has the necessary product knowledge to be able to deliver good quality and compliant installation.

5.2.8 Liability for home chargepoints

Cenex recommends that NWLDC only pay for damages to home chargepoints due to general wear and tear and not due to misuse.

NWLDC should encourage employees and train them in the proper use of chargepoint equipment to avoid any damages due to misuse (e.g. not dropping the cable, not leaving the cable uncoiled etc). The chargepoint provider may issue such guidelines themselves.

If the installed home chargepoint remains the property of NWLDC, this means they can be removed if an employee terminates employment, moves to a new property or stops participating in the scheme for any reason. In this instance, NWLDC would be responsible for the cost of removing the hardware and making good the site.

5.2.9 Planning a home charging trial

Cenex recommends that NWLDC plan, deliver and evaluate a trial of home EV charging for their operational fleet. A methodology for such a trial is provided below, which also explains how to transition from a trial into a wider deployment phase, assuming the trial is successful.

- **Consider an industry partner**: chargepoint providers may be enthusiastic to support a home chargepoint scheme trial since they recognise the need to demonstrate that their products and services can support fleets with the mass adoption of EVs. Working with an industry partner could potentially leverage funding to reduce the cost of running a trial. We recommend contacting more than one potential supplier to compare proposals.

[7] https://www.gov.uk/government/publications/electric-vehicle-homecharge-scheme-authorised-installers

- **Scale and duration**: decide how many vehicles and drivers should be involved. A trial with 10-50 employees should be enough to generate plenty of data and driver feedback and identify any potential challenges. The trial should be run for several months to allow any initial problems to be addressed and for drivers to get fully accustomed to the technology. The intention should be for the scheme to continue through the vehicle lifecycle, with an evaluation after six months.
- **Select hardware and back office system**: 7 kW wall-mounted chargepoints are best suited to this type of charging. All home chargepoints funded by the OZEV grant must use innovative 'smart' technology meaning that chargepoints must be able to be remotely accessed, and capable of receiving, interpreting, and reacting to a signal. This is a helpful piece of legislation for home charging as it means all of the offerings on the market have the capability to report their consumption for billing and monitoring purposes.

  Specify a back-office system that supports remote monitoring of energy consumption and shows when charging events take place. It is vital to have a remote web portal to track electricity consumption to ensure compliance, ensuring drivers are not overclaiming or not being fully reimbursed. Some systems offer automatic reimbursement of employees based on tracked charging session data.
- **Reimbursement mechanism**: The trial should consider how to automate the process of reimbursement to reduce driver and fleet administration. Reimbursements can either be provided as a flat fee per charging event or an accurate reimbursement using energy consumption data. The former is easier to administrate and provides a small incentive to drivers to take part. However, we strongly recommend seeking verification from your tax office to ensure compliance with the relevant legislations. While the flat fee approach is straightforward and could be used to get a trial set up, we recommend using accurate reimbursement when deploying at scale.

  It is worth mentioning that many electricity suppliers are starting to offer tariffs specifically targeted at EV drivers which charge higher electricity price tariffs at peak times and lower tariffs at off-peak times.
- **Monitoring and evaluation:** define the criteria that will be used to evaluate the trial and the methods for data collection. This should include quantitative data such as energy consumption and cost, as well as qualitative feedback from drivers and department managers. Feedback could be gathered via email, internal meetings, or workshops.
- **Select participants**: Survey drivers to determine who is eligible and gather expressions of interest. At a minimum, drivers will need to have off-street parking and have a vehicle that is allocated solely for their use. NWLDC may wish to set other criteria for participation but be mindful that additional criteria will reduce the pool for potentially eligible drivers.
- **Launch the trial and evaluate**: once underway, the trial should run for several months before carrying out a formal evaluation. Interim evaluation of driver and manager experiences and monitoring of energy consumption data is recommended to ensure any potential problems can be rectified during the trial. After six months, evaluate the trial using the criteria identified. Check that vehicles have been able to meet operational needs and that any concerns from departmental managers, drivers and/or union representatives are collated and addressed.
- **The business case** for EVs should be updated with a 'home charging scheme business case' to include the cost of electricity from employees' homes, cost of hardware and associated support. This can be compared to the current diesel vehicle business case to evidence the cost saving available.
- **Communicate findings** throughout the organisation and, assuming the pilot was successful, secure funding for wider deployment.
- **Wider deployment:** wider roll-out of the scheme should be undertaken until all relevant drivers have an EV and a home chargepoint. At the same time, any new employees that have off-street parking should be provided with an EV as a default, with a home chargepoint

installed. Their interest and eligibility for participating in the scheme can be assessed during the recruitment process.

Drivers who were unwilling to participate in the original trial may change their views once a successful pilot has been undertaken. Survey these individuals again to assess their appetite for involvement in the scheme.

5.3 Natural Gas Refuelling Infrastructure

While bio-CNG has been identified as a potential replacement technology within the Large Van and Rigid Truck vehicle segments, its use depends greatly on the availability of low-cost fuel.

A high-level assessment of natural gas refuelling infrastructure viability has been undertaken by mapping nearby gas stations then calculating the estimated gas price that NWLDC could achieve from a small gas station with an average daily gas demand of 1,082 kg.

Figure 18 shows the typical economics for a small bio-CNG station funded by a station supplier with a 10-year payback period.

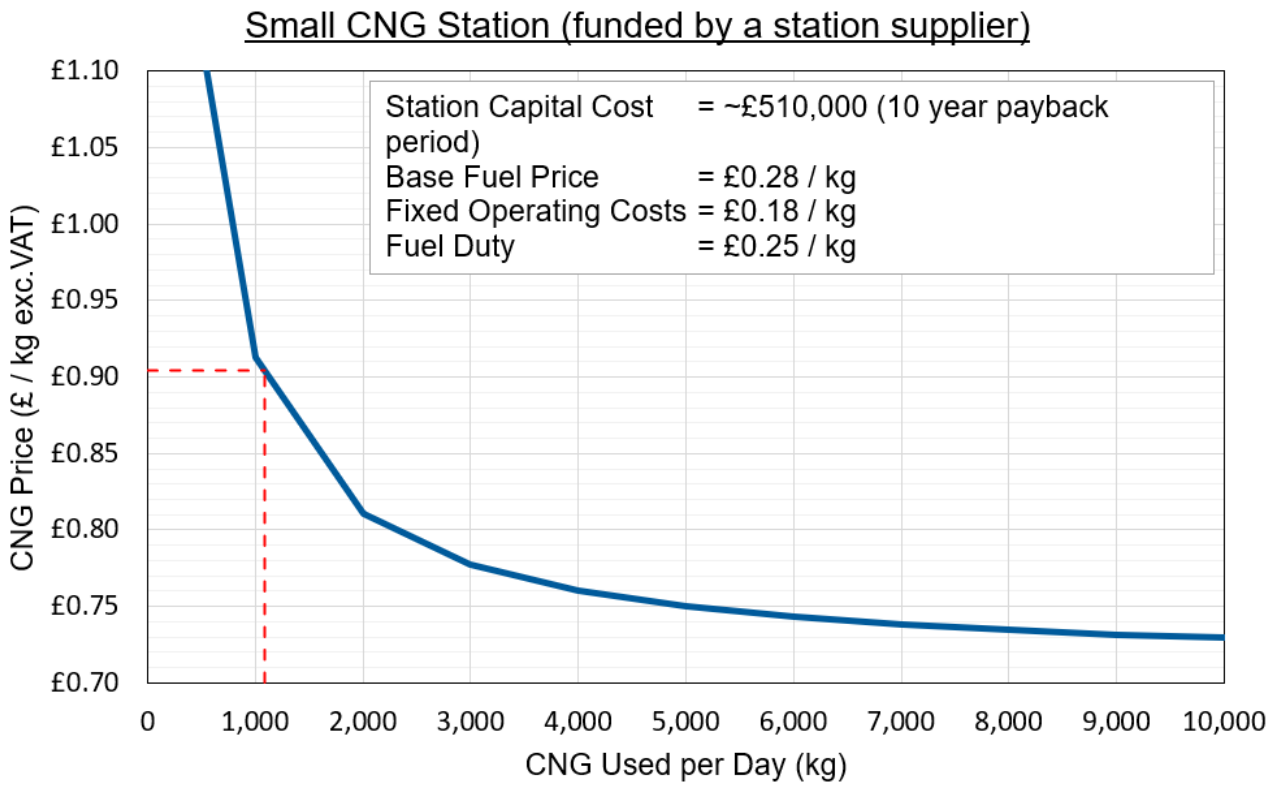


Figure 18 - Typical Economics for a Small Capacity Bio-CNG Station

This shows that **with an average daily gas demand of 1,082 kg** (as identified in the Additional Daily Fuel/ Energy Requirements) **NWLDC could expect a gas price of £0.90/ kg**, compared to the **£0.70/ kg** that could be achieved from a larger public station. Natural gas supplied at this price would result in an increase in fuel costs of **~£325,000** across the fleet.

For a bio-CNG fleet to break even on TCO, NWLDC would require bio-CNG to be supplied at a price of **~£0.57/ kg**; well below that of a depot-based station. This calculated fuel price is close to the base fuel cost (inc. fuel duty) and does not include capital and operational expenditure so is not financially viable for a fuel station provider.

Given the current public station availability and viability of a depot-based station, bio-CNG is deemed unsuitable across the entire NWLDC fleet and has not been considered within the following replacement analysis.

6. Recommended Replacement Vehicle Technologies

Based on the results of the Low Emission Vehicle Technology Selection process and Low Emission Vehicle Infrastructure Review, **Cenex has highlighted those vehicles which could theoretically be replaced by ZEV, ULEV and LEV technologies with minimal changes to the fleet's current operating patterns and planned ownership periods (i.e. TCO Parity)**. The recommended replacement vehicles focus on two technologies: BEV and HVO.

Acknowledging that several practical considerations could limit the introduction of certain technologies, a final technology selection has been applied based primarily on wider operational suitability, ownership costs, technology maturity and viability of fuelling/ charging infrastructure.

Table 32 and Table 33 show a summary of the recommended replacement vehicles in terms of the number of vehicles, capital costs, and emissions savings. All values are compared to the procurement of a new Euro 6/ VI diesel vehicle (excluding VAT). All costs are represented as a difference to an equivalent diesel vehicle where **positive values** are higher than the equivalent vehicle and **negative values** are lower than the equivalent vehicle. This is further highlighted by the use of **Red** and **Green** text across both tables.

A further analysis, taking account of the impact of the Maximum Emissions Savings scenario is presented in Appendix B – NWLDC Maximum Emission Savings Results.

Table 32 summarises the impacts of deploying the identified BEVs within the **TCO Parity scenario**.

Table 32 - Summary of Recommended BEV Replacement Vehicles

	Small Car	Small Van	Medium Van	Total
Replacement Technology	BEV (OEM)			
Number of Vehicles	4	2	48	**54**
% of Vehicle Segment	100%	29%	100%	**55%**
Additional Capital Cost (£)	£32,000	£12,300	£375,400	**£420,000**
Difference in Running Costs (£)	-£19,900	-£11,800	-£380,500	**-£412,000**
Difference in Residual Values* (£)	£12,600	£1,100	£31,100	**£45,000**
Difference in TCO (£)	£500	£600	£36,200	**£37,000**
Ownership Period (years)	7	7	7	**7**
% of Fleet TTW CO_2 Savings	1%	1%	20%	**22%**
% of Fleet WTW CO_2 Savings	1%	1%	15%	**16%**
% of Fleet NOx Savings	3%	2%	55%	**60%**
% of Fleet PM Savings	3%	1%	31%	**35%**
Number of 7 kW Chargepoints	0	0	43	**43**
Number of 22 kW Chargepoints	4	2	5	**11**
Number of 50 kW Chargepoints	0	0	0	**0**
Infrastructure Capital Cost	£14,200	£7,100	£60,800	**£82,000**

* Estimated residual values are an incoming payment rather than a cost, as such positive / higher values are better. Due to the selected sign convention, the difference in TCO = difference in vehicle capital cost – difference in residual value + difference in total running costs. For example, for small cars the difference in TCO is calculated as follows: £32k – £12.6k – £19.9k = – £500.

Across the NWLDC fleet, there are opportunities to introduce battery electric vehicles within the small car, small van, and particularly the medium van vehicle segments.

Introducing 54 BEVs (55% of the fleet) would require additional capital of **£420,000** for vehicles and **£82,000** for electric vehicle charging infrastructure (hardware and installation costs only). These vehicles could provide TCO savings of **£37,000** over their 7 year ownership period, whilst reducing fleet WTW CO_2e emissions by **16%** and fleet air quality pollutant emissions up to **60%** in NOx and **35%** in PM.

It is acknowledged that the identified Medium Vans may need to meet a minimum specification to complete their daily duties especially if the main role of the vehicle is carrying equipment and towing required depending on the location of a given job. However, the Vauxhall Vivaro-e has a payload capacity of between 970 – 1,000 kg with a towing capability of 1,000 kg. While this may be short of what is typically required by the NWLDC operations, it should be sufficient to account for a high proportion of the vehicles. It is recommended that further investigation is made into the carrying and towing needs of these vehicles.

In addition to the BEVs identified in the TCO Parity scenario, NWLDC has expressed an interest in fuelling the remaining fleet vehicles with HVO. Table 33 summarises the impacts of this fuel within these remaining vehicles.

Fuelling the remaining fleet vehicles with HVO would lead to an increase in running costs of **£420,000** over their 7 year ownership period. Whilst HVO increases running costs and thus TCO, significant WTW CO_2e savings of **68%** of the fleet emissions can be achieved. As HVO uses the same engine as a diesel vehicle, there are no guaranteed air quality savings; only BEVs contribute to air quality pollutant emissions reductions. These remaining vehicles would require an estimated 1,400 litres of HVO per day.

Table 33 - Summary of Recommended HVO Vehicles

	Small Van	Large Vans	Rigid Truck	Large 4x4	Total
Replacement Technology	HVO				
Number of Vehicles	5	12	26	2	**45**
% of vehicle segment	71%	100%	100%	100%	**45%**
Additional Capital Cost (£)	£0	£0	£0	£0	**£0**
Difference in Running Costs (£)	£3,500	£26,600	£385,400	£4,500	**£420,000**
Difference in Residual Values (£)	£0	£0	£0	£0	**£0**
Difference in TCO (£)	-£3,500	-£26,600	-£385,400	-£4,500	**-£420,000**
Ownership Period (years)	7	7	7	7	**7**
% of fleet TTW CO_2 savings	0%	5%	67%	1%	**73%**
% of fleet WTW CO_2 savings	0%	4%	62%	1%	**68%**
% of fleet NOx savings	0%	0%	0%	0%	**0%**
% of fleet PM savings	0%	0%	0%	0%	**0%**

Table 34 combines the two separate replacement recommendations into an overall summary.

Table 34 - Summary of Recommended Replacement Vehicles

	Small Car	Small Van	Medium Van	Small Van	Large Van	Rigid Truck	Large 4x4	Total
Replacement Technology	BEV (OEM)			HVO				
Number of Vehicles	4	2	48	5	12	26	2	**99**
% of vehicle segment	100%	29%	100%	71%	100%	100%	100%	**100%**
Additional Capital Cost (£)	£32,000	£12,300	£375,400	£0	£0	£0	£0	**£419,700**
Difference in Running Costs (£)	-£19,900	-£11,800	-£380,500	£3,500	£26,600	£385,400	£4,500	**£7,700**
Difference in Residual Values (£)	£12,600	£1,100	£31,100	£0	£0	£0	£0	**£44,800**
Difference in TCO (£)	£500	£600	£36,200	-£3,500	-£26,600	-£385,400	-£4,500	**-£382,600**
Ownership Period (years)	7	7	7	7	7	7	7	**7**
% of Fleet TTW CO_2 Savings	1%	1%	20%	0%	5%	67%	1%	**95%**
% of Fleet WTW CO_2 Savings	1%	1%	15%	0%	4%	62%	1%	**84%**
% of Fleet NOx Savings	3%	2%	55%	0%	0%	0%	0%	**62%**
% of Fleet PM Savings	3%	1%	31%	0%	0%	0%	0%	**36%**
Number of 7 kW Chargepoints	0	0	43	0	0	0	0	**43**
Number of 22 kW Chargepoints	4	2	5	0	0	0	0	**16**
Number of 50 kW Chargepoints	0	0	0	0	0	0	0	**0**
Infrastructure Capital Cost	£14,200	£7,100	£60,800	£0	£0	£0	£0	**£99,900**

Over all this scenario equates to a potential TCO increase of **£4,700** per vehicle or **£670**/ vehicle per year for an **84%** reduction in fleet WTW greenhouse gas emissions.

In the above scenario, any vehicle that cannot be replaced with an equivalent battery electric variant is assumed to be using HVO. In the case of Small Vans, only 2 have been identified as being appropriate for battery electric, hence the remaining 5 are deemed to be using HVO.

6.1 Recommended Replacement Vehicle Schedule

The current vehicle age and planned ownership periods have been used to calculate the replacement schedule for the recommended replacement vehicles. It shows the required number of replaced vehicles each year as well as the associated vehicle and infrastructure costs and emissions savings.

Table 35 shows the calculated recommended replacement vehicle schedule highlighted by the fleet review. This is reported by financial years to 2030. HVO vehicles have been shown entering the fleet when the current diesel vehicles are replaced, however, as HVO is a drop-in fuel the introduction can be moved forward without replacing the vehicles. The identified schedule and costs only include the first replacement and not recurring substitutions. With technological advancement and an increase in low-emission options, especially for HGVs, it is not meaningful to recommended subsequent replacements. Instead, Cenex advises repeating the present analysis in 2023 to identify whether there are any viable options to replace HVO with BEV or hydrogen power (dual fuel or fuel cell).

All costs are represented as a difference to an equivalent diesel vehicle where **positive values** are higher than the equivalent vehicle and **negative values** are lower than the equivalent vehicle. This is further highlighted by the use of **Red** and **Green** text across both tables.

Table 35 - Recommended Replacement Vehicle Schedule

	Financial Year									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Small Car (BEV)	3	1	0	0	0	0	0	0	0	0
Large Commercial SUV (HVO)	1	1	0	0	0	0	0	0	0	0
Small Van (BEV and HVO)	5	1	0	0	1	0	0	0	0	0
Medium Van (BEV)	26	2	7	0	13	0	0	0	0	0
Large Van (HVO)	9	1	1	0	0	0	0	0	0	0
Large Van (> 3.5t GVW) (HVO)	0	0	0	0	1	0	0	0	0	0
Rigid Truck - 2 axles (7.5t GVW) (HVO)	0	0	1	0	2	0	0	0	0	0
Rigid Truck - 2 axles (18t GVW) (HVO)	0	0	0	5	1	1	0	0	0	0
Rigid Truck - 3 axles (26t GVW) (HVO)	9	1	2	0	4	0	0	0	0	0
Vehicle Replacements	53	7	11	5	22	1	0	0	0	0
Cumulative % of Fleet Replaced by LEV	54%	61%	72%	77%	99%	100%	100%	100%	100%	100%
Additional Vehicle Capital Costs (£)	£227,345	£29,823	£54,740	£0	£107,835	£0	£0	£0	£0	£0
Infrastructure Cost (£)	£41,757	£14,205	£9,551	£0	£16,551	£0	£0	£0	£0	£0
Annual Running Cost Savings (£)	£5,211	£4,271	£5,439	-£2,936	£633	-£1,094	-£1,094	-£1,094	-£1,094	-£1,094
Annual TTW CO_2 Savings (tonnes)	411.8	465.2	565.7	660.0	849.8	869.3	869.3	869.3	869.3	869.3
Annual WTW CO_2 Savings (tonnes)	446.1	508.3	617.2	725.7	929.2	951.5	951.5	951.5	951.5	951.5
Annual NOx Savings (kg)	103.3	112.6	136.6	136.6	194.1	194.1	194.1	194.1	194.1	194.1
Annual PM Savings (kg)	0.5	0.5	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8

There is a need for the immediate replacement of some 53 vehicles (54% of the fleet) which are at the end of their current ownership cycle; these are predominantly medium vans and 3 axle 28t GVW rigid trucks. The replacement of these vehicles will need to be carefully managed as it entails significant capital costs for both vehicle and infrastructure. However, a staged replacement of these vehicles will enable NWLDC to make immediate gains on their decarbonisation plans.

Most of the recommended replacement vehicles are medium vans which are due to be replaced during FY2021/2022 to FY2025/2026. By this date 99% of the entire fleet could be replaced by BEVs and HVO fuelled vehicles.

The largest additional capital costs are incurred during FY20201/2022 of **£227,000** for vehicles and **£42,000** for infrastructure.

Where possible, it is suggested that NWLDC should investigate the feasibility of redeploying vehicles to bring forward the introduction date of LEVs. This would entail replacing an end of service life vehicle with another vehicle already in the fleet to allow the replacement BEV to be used on the most suitable or cost-effective duty cycle.

6.2 Emission Impacts

Figure 19 and Figure 20 show the effects of the suggested replacement schedule contained in Table 35 on Greenhouse Gas (expressed as CO_2e) and air quality emissions. The figures illustrate the potential reduction trajectory in comparison to a Euro 6/VI diesel fleet and the maximum achievable emission savings, i.e. the strongest promotion of battery-electric vehicles.

Greenhouse gas emissions from internal combustion engines are directly linked to the amount of petrol or diesel burnt. In this fleet review, the amount of diesel burnt has been calculated using the annual mileage and the fuel consumption of each vehicle. It should be noted that the average CO_2 emissions of new vehicles have decreased over the last decades.[8] Newer vehicles therefore tend to have marginally improved fuel consumption compared to older models, but moreover, show reduced pollutant emissions such as particle matter and NOx.

Other factors such as driving duty, payload, and driving style have a larger impact on fuel consumption than recent Euro standards. This means the possible CO_2 savings that can be achieved when moving from a Euro 4 engine to a Euro 6 engine are marginal. Regarding any replacement schedule, Euro 6/VI is the latest emission standard and represents standard practice.

Any efforts to actively reduce carbon emissions should therefore be benchmarked against a Euro 6/VI vehicle.

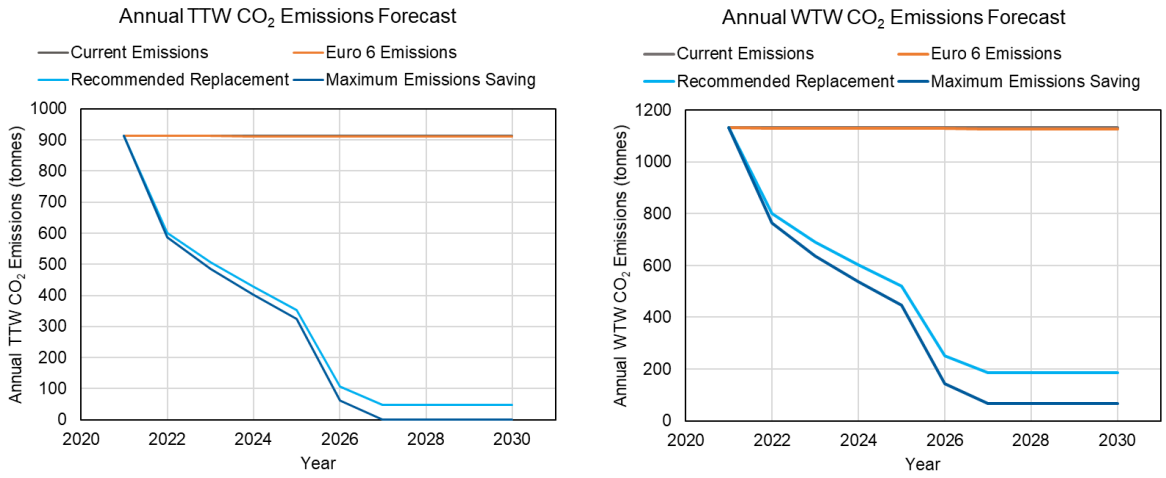


Figure 19 - Annual TTW and WTW CO_2 emissions for different replacement scenarios

[8] https://www.smmt.co.uk/reports/co2-report/

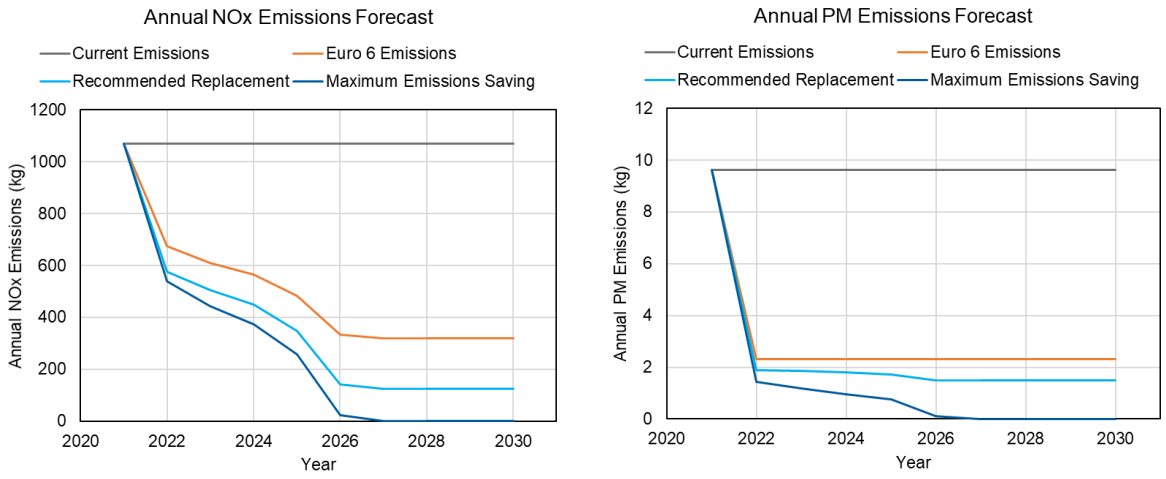


Figure 20 - Annual NOx and PM emissions for different replacement scenarios

The replacement of 53 vehicles in 2021/2022, as identified previously, has the potential to reduce greenhouse gas emissions significantly. It should be noted that the differences between the projected TTW and WTW emissions arise from the fuel supply, which entails the production and distribution of electricity and HVO.

The effect on air quality pollutants is even more pronounced. With many small and medium vans on the fleet currently conforming to Euro 4 standards, their replacement in 2021 significantly reduces NOx and PM emissions from the fleet. This means that in all scenarios there is a considerable drop in PM emissions.

Using HVO as a transition fuel can significantly reduce carbon emissions compared to the Euro 6/VI diesel alternative. While the carbon savings are close to the maximum achievable values, the level of air quality pollutant emissions is unchanged for HVO and any savings relative to the Euro 6/VI lines are due to introduced BEVs.

When the last vehicle gets replaced in 2026/27, the annual WTW CO_2e emissions would be 950 tonnes (see Table 35) lower than the present value of 1,130 tonnes (see Table 6). This is a reduction of 84% in annual emissions.

Table 36, below, provides an outline of the potential annual emission impacts of the switch to the identified vehicle technologies, based on the difference between Euro 6/ VI diesel and BEV or HOV.

Table 36 - Potential Annual Emission Savings Compared to Euro 6/ VI

	Vehicle Category	Annual TTW CO_2e Savings (Tonnes)	Annual WTW CO_2e Savings (Tonnes)	Annual NOx Savings (Kg)	Annual PM Savings (Kg)
BEV	Small Car	2.0	1.8	2.3	0.02
	Small Van	2.4	2.0	3.8	0.02
	Medium Van	3.9	3.3	3.7	0.01
HVO	Large Commercial SUV	3.6	4.2	0	0
	Small Van	0.9	1.1	0	0
	Large Van	3.6	4.2	0	0
	Large Van (> 3.5t GVW)	2.6	3.0	0	0
	Rigid Truck - 2 axles (7.5t GVW)	8.8	10.1	0	0
	Rigid Truck - 2 axles (18t GVW)	17.9	20.6	0	0
	Rigid Truck - 3 axles (26t GVW)	29.0	33.3	0	0

Table 37, below, provides an outline of the potential annual emission impacts of the switch to the identified vehicle technologies, based on the difference between Euro 4/ IV diesel and BEV or HOV.

Table 37 - Potential Annual Emission Savings Compared to Euro 4/ IV

	Vehicle Category	Annual TTW CO_2e Savings (Tonnes)	Annual WTW CO_2e Savings (Tonnes)	Annual NOx Savings (kg)	Annual PM Savings (kg)
BEV	Medium Van	3.9	3.3	10.0	0.39
HVO	Small Van	0.6	0.7	1.8	0.10
	Large Van	0.8	0.9	1.2	0.07
	Rigid Truck - 3 axles (26t GVW)	4.8	5.5	18.8	0.14

6.3 Deployment Planning

The Recommended Replacement Vehicle analysis outputs presented in this Section, specifically the information outlined in Table 35 can be considered an outline action plan for the deployment of BEV and HVO across the NWLDC fleet. In addition to this outline plan, more detailed vehicle by vehicle information is provided in an accompanying MS Excel spreadsheet which provides further evidence of the potential emission and ownership cost savings that could be achieved through the deployment of the identified low emission technologies.

The plan outlined in Table 35 assumes that NWLDC can readily purchase or lease the relevant vehicle models and specifications required for their operational requirements; the impacts of potential vehicle delivery lead times has not been accounted for as this can differ greatly from manufacturer to manufacturer. Similarly, the impact of any potential delays in deploying the relevant charging infrastructure has not been accounted for.

It will be essential that NWLDC discuss their vehicle and infrastructure needs with relevant vehicle and chargepoint suppliers to gain a clear understanding of the likely timeline for delivery/ installation. This will enable a more accurate vehicle and infrastructure deployment plan can be generated.

7. Food Waste Refuse Disposal Vehicle

This section takes a separate look at the hired Isuzu 7.5t GVW rigid truck which is currently being trialled as part of the NWLDC food waste disposal scheme. Like Section 4.5, this section of the fleet review carries out a low emission vehicle performance review to identify the most likely ZEV, ULEV or LEV replacement technology. The methodology is identical to the previous analyses and described in Section 4.5.

It should be recognised that this analysis has been undertaken using fuel and mileage data from a single vehicle. In addition, Cenex have been informed that the daily duties of this vehicle have changed significantly during its trial period. It is likely that these issues will impact on the accuracy of the results generated through this analysis but will identify potential operational parameters that should be met to ensure the successful transition to low emission technologies.

Table 38, below, lists the performance criteria used for the analysis, which are based on the monitored trial vehicle. Section 7.2 shows a more detailed analysis regarding variations in daily operation (compared to average values).

Table 38 - Average Vehicle Performance Criteria for Rigid Truck (7.5t GVW)

	Typical Driving Type	Annual Mileage (miles)	Fuel Consumption (MPG)	Days per Week Used	Ownership Period (years)
Rigid Truck (7.5t GVW)	Mostly regional	10,994	8.9	4	7

7.1 Low Emission Vehicle Performance Review – Rigid Truck (7.5t GVW)

Figure 13 to Figure 15 show the relative performance of LEV technologies for Rigid Trucks (7.5t GVW). The black error bars in Figure 22 highlight the potential impact of any future removal of the Plug in Truck Grant, while the calculations outline the methodology used to calculate the vehicle depreciation.

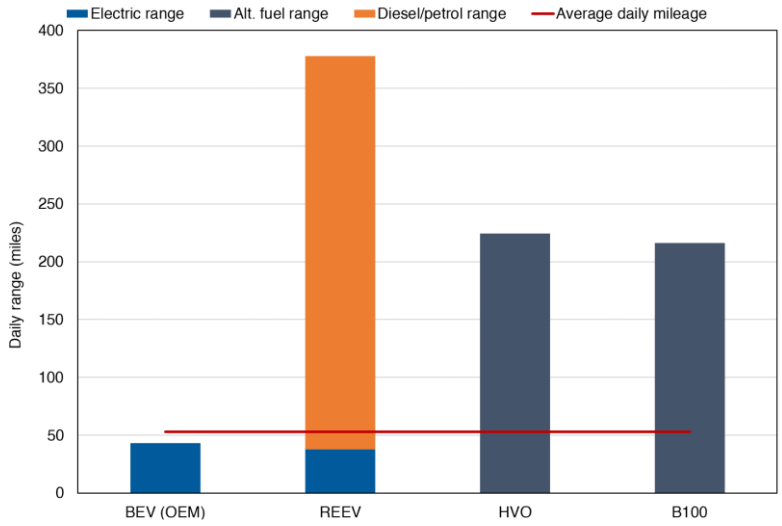


Figure 21 - Operating Range; Rigid Truck (7.5t GVW)

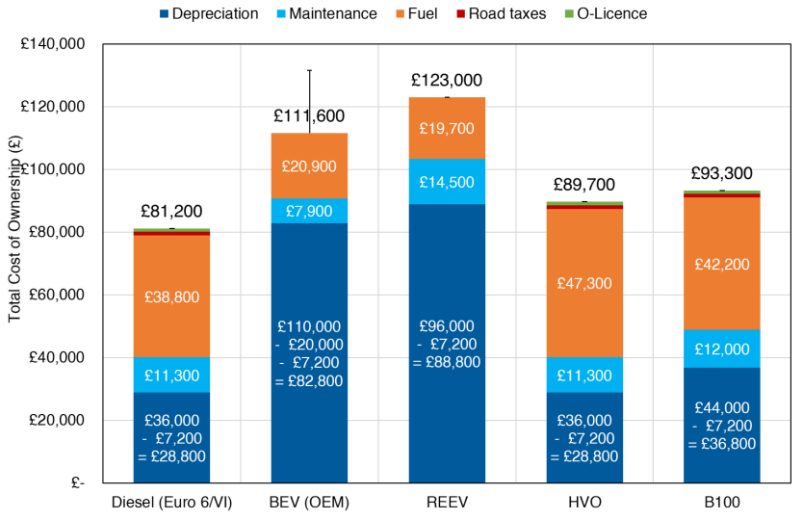


Figure 22 - Total Cost of Ownership; Rigid Truck (7.5t GVW)

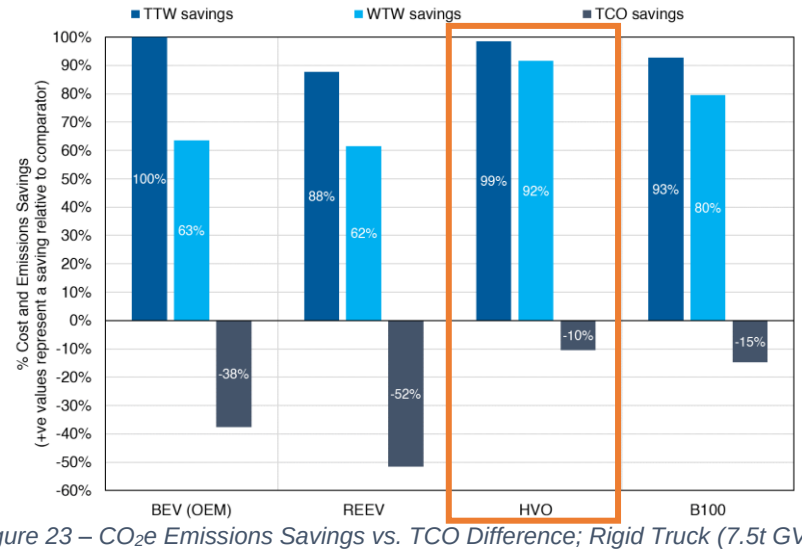


Figure 23 – CO_2e Emissions Savings vs. TCO Difference; Rigid Truck (7.5t GVW)

The increased purchase cost of BEV and REEV is the main influencing factor in TCO.

The HVO operating range is substantially more than the average daily mileage and provides a 92% reduction in WTW CO_2e emissions. However, air quality emissions remain at Euro VI levels.

BEV (OEM)

Criteria	Performance
Operational	• Estimated real-world range around 43 miles with an 83 kWh battery. • The daily mileage seems to exceed the battery range • Many of this vehicle category are specialist refuse collection vehicles, which may limit their suitability for battery-electric options due to the lack of available vehicles. Only one OEM produced BEV exists in this vehicle segment. • The payload will be reduced due to the additional weight of the batteries. Approximate payload of 4,200 kg.
TCO	• An increase in purchase costs of £54,000 leads to large depreciation cost increases. • Despite significant running cost savings, there is an overall TCO increase of £30,400
Emissions	• Zero tailpipe emissions. • 63% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further as the UK grid decarbonises.

REEV

Criteria	Performance
Operational	• The estimated combined range is far greater than the average daily mileage. • Electric-only range approximately 35-45 miles with a 74 kWh battery. • 22kW AC on-board charger as standard = 3-5h charge time. • Many of this vehicle category are specialist refuse collection vehicles, which may limit their suitability for range extended options due to the lack of available vehicles. Only one REEV exists in this vehicle segment, and it is produced by a low-volume manufacturer. • The payload will be reduced due to the additional weight of the batteries.
TCO	• £60,000 increase in purchase cost. • Although running costs are reduced, TCO increases by £41,800.
Emissions	• Zero tailpipe emissions, when operating in electric mode • 62% reduction in WTW CO_2 emissions based on the current UK grid energy mix. This will reduce further depending on how often the vehicle operates in electric mode.

HVO

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel.
TCO	• No increase in capital cost as the vehicle is the same as a diesel. • Increased running costs lead to a TCO increase of £8,500.
Emissions	• 92% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro VI.

FAME (B100)

Criteria	Performance
Operational	• The estimated range is far greater than the average daily mileage. • Refuelling can be done in a similar time to diesel. • Additional fuel storage and handling requirements.
TCO	• £8,000 increase in capital cost. • Increased maintenance requirements. • Increased running costs lead to a TCO increase of £12,100.
Emissions	• 80% reduction in WTW CO_2 emissions. • Air quality pollutant emissions equivalent to Euro VI.

7.2 Analysis of daily operation

NWLDC provided monitored data covering daily vehicle operations for the food waste trial vehicle, which allow for a more detailed investigation to be undertaken. Figure 24 – Monitored daily distances for the food waste trial Figure 24 illustrates the daily driven distances of this vehicle.

The left-hand side chart represents the data as a timeseries; the effects of the Covid-19 pandemic are evident as there are fewer trips from April 2020 through to September. However, from November 2020, it seems regular service has been reinstated.

On average, a battery electric 2-axle rigid truck with 7.5t GVW has an electric range of about 61 miles. However, this range depends on the vehicle operation. The duty cycle of the food waste disposal truck could lower the range to 43 miles (dashed line in Figure 24, consistent with Figure 21). Even when assuming the average value, the truck runs into range limitations. Up to 35% of the daily trips within a year could not be performed without some form of additional charging; Table 39 lists the detailed results from this analysis.

The right-hand side chart in Figure 24 indicates that a BEV range around 100 miles would be required to achieve greater than 95% of all recorded mileages. However, his is about twice the average BEV range of such vehicles.

Figure 24 reveals severe range limitations for a batter-electric option. REEV or HVO provide enough range and could also significantly reduce carbon emissions. Therefore, switching to HVO would provide a transitory option until BEVs with larger ranges are available.

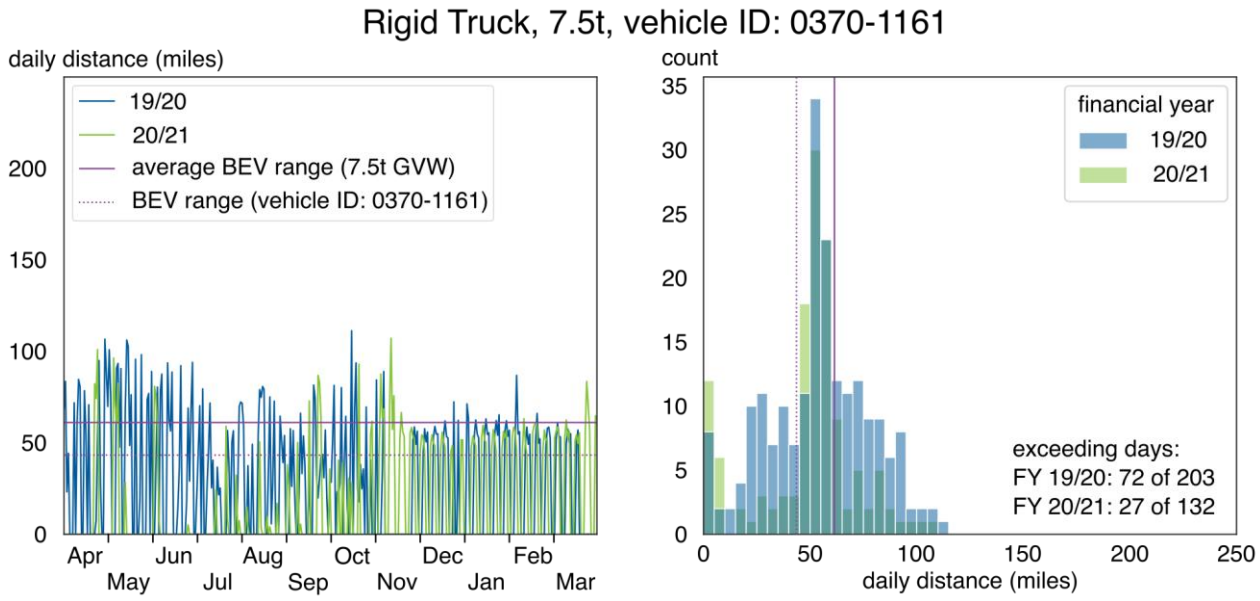


Figure 24 – Monitored daily distances for the food waste trial vehicle.

Table 39 –Exceeding daily trips for food waste disposal vehicle.

Fleet Number	Vehicle Type	Department	Usable Battery Capacity (kWh)	Average BEV Range (Miles)	FY 2019/2020		FY 2020/2021	
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips
0370-1161	Rigid Truck	food waste trial vehicle	75	61	72	203	27	132

8. Recommended Next Steps and Implementation Guidance

The Recommended Replacement Vehicle analysis outputs presented in Section 6, specifically the information outlined in Table 35 can be considered an outline action plan for the deployment of BEV and HVO across the NWLDC fleet. In addition to this outline plan, more detailed vehicle by vehicle information is provided in an accompanying MS Excel spreadsheet which provides further evidence of the potential emission and ownership cost savings that could be achieved through the deployment of the identified low emission technologies.

The plan outlined in Table 35 assumes that NWLDC can readily purchase or lease the relevant vehicle models and specifications required for their operational requirements; the impacts of potential vehicle delivery lead times has not been accounted for as this can differ greatly from manufacturer to manufacturer. Similarly, the impact of any potential delays in deploying the relevant charging infrastructure has not been accounted for.

It will be essential that NWLDC discuss their vehicle and infrastructure needs with relevant vehicle and chargepoint suppliers to gain a clear understanding of the likely timeline for delivery/ installation. This will a more accurate vehicle and infrastructure deployment plan to be generated.

This section provides a summary of the recommended next steps for NWLDC required to implement those LEVs highlighted as candidate replacement vehicles. The actions outlined below are based on Cenex's recommended approach to deploying LEVs within a fleet of:

Trial → Review → Assess → Deploy

This approach is recommended as the analysis and results contained within this report are based on historical fleet and vehicle performance and operational data and therefore may not fully reflect the current operations experienced within NWLDC. Undertaking trials of relevant LEVs within the selected fleet operations will enable a more accurate assessment of possible day to day impacts to be undertaken. These can then be reviewed and adapted to ensure additional LEVs can be deployed with minimum impact on service provision.

It is recognised that NWLDC may wish to accelerate the deployment of LEVs within their fleet; while this ambition is to be applauded Cenex would still recommend a period of vehicle trials to ensure that their implementation does not adversely impact on service delivery.

The below recommendations and actions are presented in order of priority (although many will occur in parallel) with an initial focus on those vehicles that can be replaced by BEV and HVO most easily before targeting the harder to transition vehicles. This results in a phased transition, which as outlined above is in line with Cenex's recommended approach. Appendix C, along with the accompanying MS Excel spreadsheet should be used by NWLDC to identify those operational vehicles that can be transitioned to BEV and HVO in the first instance.

Supporting justifications are provided below each recommendation. Where appropriate, additional implementation recommendations are provided. These typically relate to operational considerations or measures to increase the uptake of LEVs (with a focus on ZEVs and ULEVs).

The recommendations in this section are of most relevance over the next five years with any occurring after these timescales considered closer to an outline strategy to 2030.

6. **Implement battery electric cars and light commercial vehicles (i.e. small cars and small and medium vans) along with the associated electric vehicle charging infrastructure** according to the current vehicle replacement schedule, if not sooner.
    a. Confirm which specific vehicle models meet the required operational specifications in terms of payload, towing capacity and minimum viable battery capacity required to meet day to day mileage variation. For a given vehicle model this is a trade-off between cost, payload, and range (smaller batteries = lower cost, higher payload, and lower operating range). It should be recognised that the analysis in this report has been based on average daily mileage and does not include the impact of additional factors (cabin heating, towing, etc.).
        i. BEVs have been highlighted as potentially suitable replacements for:

1. 100% of small cars (45 kWh battery)
2. 29% of small vans (40 kWh battery)
3. 100% of medium vans (75 kWh battery)

b. Where possible, consider specifying vehicles with optional on-board AC chargers with increased power ratings, to enable higher rates of vehicle charging to occur (e.g. 11 kW or 22 kW vs. 7 kW).

c. Undertake a short-term managed vehicle trial of between 4 – 8 weeks in each identified vehicle segment to confirm operational suitability and to verify the potential running cost and emissions savings.

   i. Vehicles should initially be trialled within lower mileage applications with the implementation advised by real world performance and day to day mileage variation considered before a more detailed implementation phase is undertaken, this will ensure that all relevant preparations are made for their introduction.

d. Plan and rollout a home charging pilot scheme, including the installation of appropriate 7 kW chargers, with targeted drivers to confirm applicability, operational suitability and to verify the running cost and emissions savings.

   i. Details of how to manage such a trial, including operational and deployment considerations, is provided in the accompanying Home Charging Review report.

e. Procure and install 22 kW AC chargepoints at the depot locations identified during the infrastructure review.

   i. Engage with a certified installer to undertake detailed site assessments and discuss power supply capacity with the DNO.

   ii. Any deployment of charging infrastructure should take into consideration any potential future changes to depot locations.

f. Investigate the potential to reduce the ownership period of the remaining non-BEV vans from 7 years to 4 years to ensure that the results of the above electric vehicle trial can be implemented as quickly as possible.

   i. This may result in new Euro 6 diesel vehicles being deployed across the fleet for a short period of time. However, this approach will ensure that the NWLDC have sufficient time to assess the possible impacts of deploying BEV across this vehicle segment, considering the operational requirements of these vehicles.

7. Investigate the feasibility of using renewable diesel (HVO) as an interim solution across all remaining vehicle segments to provide immediate WTW CO_2e emissions reductions.

a. Contact fleet operators currently using HVO to discuss operational experiences, implications and to verify potential cost increases.

   i. Cenex can provide details or make introduction to such organisations if required.

b. Contact relevant vehicle manufacturers to discuss verify any potential warranty and maintenance changes.

c. Contact relevant fuel suppliers to discuss supply requirements such as volumes, delivery, costs, etc.

   i. Cenex can provide details or make introduction to such organisations if required.

d. A recent study by the Zemo Partnership explored the opportunity for high blend renewable fuels to decarbonise heavy duty vehicles over the next decade and beyond. The renewable fuels covered were biodiesel, hydrotreated vegetable oil (HVO) and biomethane – considering blends of more 20% renewable fuel content[9]

8. **Prepare for the potential introduction of ULEV HGVs (i.e. RCVs, Food Waste Disposal, etc.) beyond 2025;** vehicle segments without recommended replacement ULEVs account for 45% of the current fleet. This is primarily due to the relative immaturity of ULEV HGVs and the resulting increase in additional capital costs.

   It is reasonable to expect that the availability, purchase cost, and capabilities of ULEV rigid trucks and large vans will improve significantly by NWLDC's next major replacement date. Despite this it is suggested that NWLDC should be proactive in preparing for the potential introduction of additional ULEVs from this date.

   a. Undertake the further analysis of journey profiles and daily routes within the relevant vehicle categories to assess and verify the suitability of BEV as a replacement technology.

      i. Such an assessment should take into considerations any proposed changes to collection routes and the potential for double shifting of vehicles. Such operational changes will have additional implications on the deployment of charging infrastructure and associated depot power demands.

   b. Where possible undertake vehicle trials within those operations identified as suitable for BEV deployment.

      i. BEVs are currently the only technology that could be deployed at scale across the HGV segments within the next 3 – 5 years and have potential to provide the lowest running costs of all LEVs studied within the large van and rigid truck vehicle segments. The main challenges associated with these vehicles are the limited availability of appropriate variants, the increased purchase costs, the availability of appropriate charging infrastructure and the potential impact on the depot power supply.

   c. The majority of rigid trucks are due for replacement from FY2024 onwards, therefore this date is considered critical to achieving NWLDC's 2030 aspirations. Any vehicles replaced after this point will likely remain on the fleet until at least 2031.

      i. NWLDC should formally review ULEV options again in 2023; this review would likely include a much wider selection of ZEVs including BEV, FC REEV and FCEV.

9. **NWLDC should consider the process of assessing, trialling, and implementation of ULEVs across the fleet as a continuous one, depending on the requirements of different vehicle segments.**

10. **Consider operational improvements that could increase the uptake of ULEVs.**

    a. Confirm specific towing requirements and investigate the feasibility of introducing operational changes to reduce this requirement for potential ULEV replacement vehicles (e.g. designation of dedicated towing vehicles, moving any towing requirement to ULEV technologies or vehicle segments with increased capabilities such as pickup trucks).

    b. Review and, if necessary, optimise the number of vehicles on the fleet to increase utilisation.

[9] https://www.zemo.org.uk/assets/lowcvpreports/Market_opportunities_decarbonise_HDV_using_HBRF_2021.pdf

9. Appendix A – Fleet Review References

Table 40 shows a table of references used during the fleet review. It should be noted that wherever possible data provided by the fleet takes priority over supplementary data sources (such as baseline fuel economy) and likewise, independent data takes priority over information provided by suppliers.

Table 40 - Table of References

Parameter	Reference
Vehicle Details	**Driver and Vehicle Licensing Agency (DVLA)** https://ukvehicledata.co.uk/dvla-data-api
Annual Mileage	**Driver and Vehicle Standards Agency (DVSA)** https://www.gov.uk/check-mot-history
Baseline Fuel Economy	**Emissions Analytics** – Passenger Vehicles and LCVs https://www.emissionsanalytics.com/
	Low Carbon Vehicle Partnership (LowCVP) – HGVs https://www.lowcvp.org.uk/
Greenhouse Gas Emissions Factors and Energy Content	**UK Government** https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020
Air Quality Pollutant Emissions Factors	**National Atmospheric Emissions Inventory (NAEI)** https://naei.beis.gov.uk/data/ef-transport
Low Emission Vehicle Energy Consumption (Examples from the public domain)	**Cenex** – ULEV passenger vehicles and LCVs https://www.cenex.co.uk/ **Cenex, Emissions Analytics and LowCVP** – LCVs and HGVs Unpublished testing of plug-in commercial vehicles completed on behalf of LoCITY in 2019 Dedicated to Gas - Assessing the Viability of Gas Vehicles Emissions Testing of Urban Delivery Commercial Vehicles Emissions Testing of Gas-Powere Commercial Vehicles
Vehicle Costs Purchase Cost Maintenance Costs Predicted Residual Values	**Fleet News and Commercial Fleet** – Passenger vehicles and LCVs https://www.fleetnews.co.uk/car-running-costs-calculator https://www.commercialfleet.org/tools/van/running-costs/ **Logistics UK (formerly the FTA)** – HGVs (diesel only) https://logistics.org.uk/distribution-costs **Vehicle Suppliers and Fleet Operators** – Any remaining technologies
Fuel Prices	**AA** – Diesel, petrol and LPG https://www.theaa.com/driving-advice/driving-costs/fuel-prices **Department for Business, Energy and Industrial Strategy (BEIS)** – electricity https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector **Low Emission Fuel Suppliers** – natural gas, hydrogen and biofuels

10. Appendix B – NWLDC Maximum Emission Savings Results

Table 41 shows the Maximum Emissions Saving Scenario with a focus on ZEVs as these make the largest combined greenhouse gas and air quality emission savings.

Table 41 - Maximum Emissions Saving Replacement Summary Table

	Small Car	Small Van	Medium Van	Large Van	Large Van - (> 3.5t GVW)	Rigid Truck - 2 axles (18t GVW)	Rigid Truck - 2 axles (7.5t GVW)	Rigid Truck - 3 axles (26t GVW)	Large Commercial SUV	Total
Replacement Technology	BEV (OEM)								HVO	
Number of Vehicles	4	7	48	11	1	7	3	16	2	**99**
% of Vehicle Segment	100%	100%	100%	100%	100%	100%	75%	100%	100%	**100%**
Additional Capital Cost (£)	£32,000	£43,200	£375,400	£266,300	£60,000	£1,638,000	£162,000	£4,576,000	£0	**£7,152,900**
Difference in Running Costs (£)	-£19,900	-£28,700	-£380,500	-£84,800	-£7,200	-£208,400	-£52,500	-£712,500	£4,500	**£1,490,000**
Difference in Residual Values (£)	£12,600	£3,700	£31,100	£83,400	£0	£0	£0	£0	£0	**£130,800**
Difference in TCO (£)	£500	-£10,800	£36,200	-£98,100	-£52,800	-£1,429,600	-£109,500	-£3,863,500	-£4,500	**-£5,532,100**
Ownership Period (yearts)	7	7	7	7	7	7	7	7	7	**7**
% of Fleet TTW CO_2 Savings	1%	1%	20%	5%	0%	15%	3%	54%	1%	**100%**
% of Fleet WTW CO_2 Savings	1%	1%	15%	5%	0%	15%	3%	54%	1%	**94%**
% of Fleet NOx Savings	3%	5%	55%	8%	0%	5%	2%	22%	0%	**99%**
% of Fleet PM Savings	3%	3%	31%	4%	0%	9%	3%	45%	0%	**98%**
Number of 7 kW Chargepoints	0	0	43	0	0	0	0	0	0	**43**
Number of 22 kW Chargepoints	4	7	5	11	1	7	3	16	4	**58**
Number of 50 kW Chargepoints	0	0	0	0	0	0	0	0	0	**0**
Infrastructure Capital Cost	£14,200	£24,900	£60,800	£39,100	£3,600	£24,900	£10,700	£82,300	£0	**£260,500**

10.1 Replacement Vehicle Schedule

	Financial Year									
	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Small Car (BEV)	3	1	0	0	0	0	0	0	0	0
Large Commercial SUV (HVO)	0	0	0	0	0	0	0	0	0	0
Small Van (BEV)	5	1	0	0	1	0	0	0	0	0
Medium Van (BEV)	26	2	7	0	13	0	0	0	0	0
Large Van (BEV)	9	1	1	0	0	0	0	0	0	0
Large Van (> 3.5t GVW) (BEV)	0	0	0	0	1	0	0	0	0	0
Rigid Truck - 2 axles (7.5t GVW) (BEV)	0	0	1	0	2	0	0	0	0	0
Rigid Truck - 2 axles (18t GVW) (BEV)	0	0	0	5	1	1	0	0	0	0
Rigid Truck - 3 axles (26t GVW) (BEV)	9	1	2	0	4					
Vehicle Replacements	53	7	11	5	22	1	0	0	0	0
Cumulative % of Fleet Replaced by LEV	54%	61%	72%	77%	99%	100%	100%	100%	100%	100%
Additional Vehicle Capital Costs (£)	£3,050,105	£340,033	£704,950	£1,170,000	£1,653,835	£234,000	£0	£0	£0	£0
Infrastructure Cost (£)	£140,425	£29,800	£23,757	£17,757	£44,963	£3,551	£0	£0	£0	£0
Annual Running Cost Savings (£)	£100,614	£112,868	£137,815	£160,006	£208,328	£212,879	£212,879	£212,879	£212,879	£212,879
Annual TTW CO_2 Savings (tonnes)	433.3	489.9	595.7	696.9	896.7	917.5	917.5	917.5	917.5	917.5
Annual WTW CO_2 Savings (tonnes)	499.4	569.4	691.6	817.1	1045.4	1071.3	1071.3	1071.3	1071.3	1071.3
Annual NOx Savings (kg)	166.3	184.5	225.7	239.3	318.9	319.9	319.9	319.9	319.9	319.9
Annual PM Savings (kg)	1.1	1.3	1.6	1.7	2.3	2.3	2.3	2.3	2.3	2.3

11. Appendix C – NWLDC logger data evaluation

Table 42 compares the average BEV ranges by vehicle type with the recorded distances for each vehicle within the financial years 2019/2020 and 2020/2021. It is accepted that the provided data for this analysis did not cover a full year, however this analysis should provide an initial insight into the applicability of vehicles for the first phase of electric vehicle deployment.

The below table has been colour coded, to enable NWLDC to identify relevant vehicles: **Red** (exceeding range); **Amber** (no range exceedance but less than 20 miles remaining range); **Green** (no range exceedance with more than 20 miles remaining range). It is recommended that those vehicles highlighted in **Green** are investigated as a priority.

Table 42 – List of daily trips that exceeding battery range by vehicle

Fleet Name	Vehicle Type	Department	Usable Battery Capacity (kWh)	Avg. BEV Range (miles)	FY 2019/2020			FY 2020/2021		
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)
626	Small Car	Enforcement Team	45	161						
627	Small Car	Enforcement Team	45	161						
628	Small Car	Enforcement Team	45	161						
629	Small Car	Office Pool Vehicle	45	161						
679	Small Van	Office Pool Vehicle	36	93						
680	Small Van	Garage	36	93						
681	Small Van	Garage Pool Vehicle	36	93						
682	Small Van	Parks Department	36	93						
684	Small Van	Parks Department	36	93						
686	Small Van	Commercial Team	36	93						
687	Small Van	Pest Control	36	93						
700	Medium Van	Housing Maintenance	68	125	0	133	12.2	0	127	28.9
701	Medium Van	Housing Maintenance	68	125	1	164	-7.0	2	232	-12.6
702	Medium Van	Housing Maintenance	68	125	0	130	13.4	0	235	7.9
703	Medium Van	Housing Maintenance	68	125	0	138	31.6	0	174	45.0
704	Medium Van	Housing Maintenance	68	125				0	89	61.8
705	Medium Van	Housing Maintenance	68	125				0	8	54.0
706	Medium Van	Housing Maintenance	68	125	0	139	3.6	0	169	17.9
707	Medium Van	Housing Maintenance	68	125	0	123	39.9	0	156	42.9
708	Medium Van	Housing Maintenance	68	125	0	130	15.2	0	190	38.2
709	Medium Van	Housing Maintenance	68	125	0	145	23.1	0	213	33.2
710	Medium Van	Housing Maintenance	68	125	2	114	-4.5	0	221	11.5
711	Medium Van	Housing Maintenance	68	125	0	102	13.9	0	76	48.0
712	Medium Van	Housing Maintenance	68	125	0	88	21.4	0	205	4.4
720	Medium Van	Refuse Department	68	125	3	223	-6.1	2	200	-7.1
730	Medium Van	Housing Maintenance	68	125	0	151	36.2	0	206	20.6

Fleet Name	Vehicle Type	Department	Usable Battery Capacity (kWh)	Avg. BEV Range (miles)	FY 2019/2020			FY 2020/2021		
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)
731	Medium Van	Housing Maintenance	68	125	0	141	38.1	0	208	30.7
732	Medium Van	Housing Maintenance	68	125	0	53	38.5	0	188	30.4
733	Medium Van	Housing Maintenance	68	125	0	131	53.5	0	143	47.7
734	Medium Van	Housing Maintenance	68	125	0	102	48.0	0	192	27.8
735	Medium Van	Housing Maintenance	68	125	0	151	4.4	2	184	-49.1
736	Medium Van	Housing Maintenance	68	125	0	140	91.3	0	207	67.7
737	Medium Van	Housing Maintenance	68	125	11	134	-23.3	2	189	-12.8
738	Medium Van	Housing Maintenance	68	125	0	153	27.6	0	251	16.9
739	Medium Van	Housing Maintenance	68	125	3	120	-15.7	0	185	17.0
740	Medium Van	Housing Maintenance	68	125	0	69	37.1	0	159	54.1
741	Medium Van	Housing Maintenance	68	125	0	119	35.5	0	41	49.7
742	Medium Van	Housing Maintenance	68	125	2	64	-32.7	1	149	-3.8
743	Medium Van	Housing Maintenance	68	125	5	140	-141.1	0	189	35.5
744	Medium Van	Housing Maintenance	68	125	0	131	40.6	0	166	37.8
745	Medium Van	Housing Maintenance	68	125	0	119	63.1	0	164	63.1
746	Medium Van	Housing Maintenance	68	125	0	111	27.2	1	68	-4.0
748	Medium Van	Housing Maintenance	68	125	0	135	19.7	1	145	-31.2
749	Medium Van	Housing Maintenance	68	125	0	163	18.6	0	247	6.8
750	Medium Van	Housing Maintenance	68	125	0	129	46.4	0	199	23.3
751	Medium Van	Housing Maintenance	68	125	0	166	61.8	0	235	73.6
752	Medium Van	Housing Maintenance	68	125	0	134	32.2	0	212	48.2
777	Medium Van	Garage Pool Vehicle	68	125				0	0	0.0
779	Medium Van	Housing Maintenance	68	125				0	74	23.8
780	Medium Van	Housing Maintenance	68	125	0	131	25.9	0	151	4.0
782	Medium Van	Housing Maintenance	68	125	1	131	-0.5	0	231	27.5
783	Medium Van	Enforcement Team	68	125	0	0	0.0	0	0	0.0
784	Medium Van	Housing Maintenance	68	125	0	110	55.1	0	172	20.2
785	Medium Van	Street Cleansing	68	125	0	221	6.8	0	259	13.6
786	Medium Van	Housing Maintenance	68	125	0	136	19.5	0	224	26.3
787	Medium Van	Housing Maintenance	68	125	0	0	0.0	0	62	43.3
788	Medium Van	Housing Maintenance	68	125	0	127	8.9	0	194	13.5
789	Medium Van	Housing Maintenance	68	125	0	37	40.2	0	174	65.3
790	Medium Van	Housing Maintenance	68	125	0	153	53.2	0	211	68.6
721	Large Van	Refuse Department	45	52	143	211	-104.7	127	229	-84.0

Fleet Name	Vehicle Type	Department	Usable Battery Capacity (kWh)	Avg. BEV Range (miles)	FY 2019/2020			FY 2020/2021		
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)
797	Large Van	Garage Pool Vehicle	45	52						
798	Large Van	Parks Department	45	52						
799	Large Van	Parks Department	45	52						
800	Large Van	Parks Department	45	52						
801	Large Van	Parks Department	45	52						
802	Large Van	Parks Department	45	52						
803	Large Van	Street Cleansing	45	52	2	279	-56.4	42	263	-26.6
804	Large Van	Parks Department	45	52						
805	Large Van	Parks Department	45	52						
806	Large Van	Street Cleansing	45	52	194	335	-29.6	99	353	-61.6
807	Large Van	Parks Department	50.4	52						
810	Rigid Truck	Commercial Team/ Housing	75	61	38	51	-73.7	63	141	-51.9
811	Rigid Truck	Refuse Department	75	61	97	135	-80.2	93	140	-105.2
812	Rigid Truck	Street Cleansing	75	61	89	171	-57.0	72	132	-57.8
827	Rigid Truck	Street Cleansing/ Parks	270	66	9	93	-39.5	10	60	-38.2
867	Rigid Truck	Refuse Department	250	55	10	150	-16.2	35	200	-27.3
868	Rigid Truck	Refuse Department	250	55	33	210	-22.9	21	199	-28.0
870	Rigid Truck	Refuse Department	250	55	2	198	-13.8	12	212	-19.6
871	Rigid Truck	Refuse Department	250	55	16	204	-15.3	36	211	-20.4
878	Rigid Truck	Refuse Department	250	55	3	209	-11.3	29	205	-23.7
879	Rigid Truck	Refuse Department	250	55	1	207	-3.1	40	208	-35.1
880	Rigid Truck	Refuse Department	270	66	120	207	-43.9	105	212	-54.3
881	Rigid Truck	Refuse Department	270	66	114	206	-42.5	105	212	-46.8
882	Rigid Truck	Refuse Department	270	66	148	247	-63.1	143	231	-51.0
883	Rigid Truck	Refuse Department	270	66	47	205	-39.6	76	226	-52.1
884	Rigid Truck	Refuse Department	270	66	93	206	-35.2	104	209	-37.0
885	Rigid Truck	Refuse Department	270	66	130	203	-45.8	116	201	-46.9
886	Rigid Truck	Refuse Department	270	66	128	205	-30.7	113	210	-59.4
888	Rigid Truck	Refuse Department	270	66	20	63	-44.4	29	182	-30.3
889	Rigid Truck	Refuse Department	270	66	10	133	-17.2	19	184	-21.4
894	Rigid Truck	Refuse Department	270	66	70	183	-47.0	48	130	-71.9
895	Rigid Truck	Refuse Department	270	66	10	183	-39.8	36	182	-43.1
896	Rigid Truck	Refuse Department	270	66	15	186	-38.4	10	174	-34.5
897	Rigid Truck	Refuse Department	270	66	16	204	-33.2	4	136	-4.9

Fleet Name	Vehicle Type	Department	Usable Battery Capacity (kWh)	Avg. BEV Range (miles)	FY 2019/2020			FY 2020/2021		
					Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)	Number of Daily Trips Exceeding BEV Range	Number of Daily Trips	Worst Case Remaining Range (miles)
898	Rigid Truck	Refuse Department	270	66	180	215	-52.6	144	197	-50.4
899	Rigid Truck	Street Cleansing	250	55	6	127	-42.1	1	88	-6.6
856	Rigid Truck	Street Cleansing/ Parks	270	66	9	93	-39.5	10	60	-38.2
0370-1161	Rigid Truck	Food Waste Trial Vehicle	75	61	72	203	-50.2	27	132	-46.1

12. Appendix E – Alternatively Fuelled Vehicle Derogations

A 2018 UK Government licensing derogation allows Category B license holders to drive an alternatively fuelled vehicle that weighs up to 4.25t (as opposed to 3.5t GVW)[10]. The existing derogation will remain in place until at least 2023. The conditions for this derogation are:

- The licence holder must undertake a minimum of five hours training by a registered instructor on the driving of an alternatively fuelled vehicle.
    - “registered instructor” means a person who is on the National Register of LGV instructors or the National Vocational Driving Instructors Register.
- The vehicle must be driven for the purpose of transporting goods.
- The vehicle must not have a trailer attached.
- The vehicle must not be driven outside of the territory of Great Britain.

For HGVs, a 2017 amendment increased the maximum allowable weight of an alternatively fuelled HGV by 1,000kg[11]. The conditions are:

- A type or individual approval has been granted to the vehicle under the Framework Directive which provides evidence that the weight of the alternative fuel powertrain exceeds the weight of a conventional powertrain by a specified amount.
- The weight of the alternative fuel power train is included in the maximum permitted gross or train weight specified on any plates required by regulation 66(a) or regulation 70(b) of the 1986 Regulations.

10 https://www.legislation.gov.uk/uksi/2018/784/pdfs/uksi_20180784_en.pdf
11 https://www.legislation.gov.uk/uksi/2017/881/pdfs/uksi_20170881_en.pdf

13. Appendix F – Funding and Managing Vehicle Trials

Where it is not currently possible or economically viable to deploy a significant number of LEVs at a depot or fleet level there can still be numerous benefits to running a trial of an individual or small number of vehicles as follows:

- Validate any assumptions made during initial fleet analysis.
- Gain real-world experience with both the vehicle and required infrastructure (recharging and ease of use), validate the real-world technical capabilities of the vehicle (range, payload) and gain driver feedback.
- Quantify the real-world operating and maintenance costs.
- Provide a competitive advantage and a positive company image by being proactive in supporting the low emission transport agenda.

Vehicle trials can either be self-funded or can make use of public funding. Funding calls are often announced by Innovate UK, The Office for Low Zero Vehicles and through EU funding streams such as EU Horizon 2020.

To maximise learnings and ensure good value for money (particularly when public funds are used) vehicle trials should adhere to the following process:

1. **Plan and allocate resources**: allocation of sufficient financial and staffing resources for the successful delivery of the trial.
2. **Define output criteria**: definition of key metrics and how to monitor them such as fuel consumption, range, driver perceptions, costs and practicality. Consideration of baseline for comparison purposes.
3. **Minimise sources of variation**: to ensure repeatability of the trials sources of variation should be considered including driver, route(s) and season. It may be desirable to control some of these parameters, such as operating in urban vs. rural environments, to measure the vehicle performance across the entire fleet.
4. **Drive cycle development or Duty cycle selection**: For large fleets it may be desirable to define a fleet wide drive cycle to represent vehicle usage patterns which can be used to assess numerous technologies on a chassis dynamometer in controlled conditions. Alternatively, smaller fleets may choose to select a vehicle which is running on their preferred duty cycle and route for detailed analysis.
5. **Data collection**: consider manual (such as fuel and mileage records) or automatic (such as telemetry and fuel monitoring devices) collection of data.
6. **Secure vehicle and fuel supply**: finalise and secure supply of vehicle and infrastructure before commencing trial.
7. **Data analysis and project meetings**: data should be reviewed on an ongoing basis during the trial to highlight and resolve any issues.
8. **Partnership approach**: it may be possible to enter into partnership with vehicle manufacturers, fuel suppliers and fleet operators to reduce the individual cost burden of running the trial.
9. **Reporting**: a comprehensive written report should accompany the results of the trial; additional dissemination events or workshops are also worth considering to gain third party input.

14. Appendix G – Low Emission Technology Factsheets

Battery Electric Vehicles

<table>
<tr><td>Technology Introduction</td><td colspan="3">A battery electric vehicle (BEV or EV) stores energy in a battery (usually lithium-ion) and delivers its power to the vehicle's wheels through an electric motor. Braking energy can be captured by the electric motor, through regenerative braking, and stored as electrical energy in the battery.

Most battery electric vehicles are available through major OEMs and smaller low volume manufacturers; however, there are a growing number of vehicle conversion companies who can covert a standard commercial vehicle to run on electric power.

 
An OEM manufactured battery electric large van.
Source: Ford UK</td></tr>
<tr><td>Availability</td><td colspan="3">Cars: Available from OEMS in most vehicle form factors.
Small Vans: Available from most OEMs.
Large Vans: Available from a growing number of OEMs.
Rigid Trucks: Available from early adopter OEMs as well as low-volume manufacturers such as EMOSS and Magtec.
Tractor Units: Not available in the UK.</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>• Battery electric vehicles are currently more expensive to purchase. This is largely due to the cost of batteries and as such the cost premium tends to grow considerably for heavier vehicles with larger batteries.
• Residual values are currently uncertain.
• Due to a reduced number of moving parts, maintenance costs are reduced.
• Fuel costs are significantly reduced as BEVs are more efficient than diesel vehicles so require less energy and electricity is cheaper than diesel.</td><td>Capital
Maintenance
Fuel
Residual Value</td><td>+
-
-
~</td></tr>
<tr><td>Operational Performance</td><td colspan="3">• Most electric vehicles have a real-world range of 80 – 200 miles on a single charge depending on battery size. This will reduce if the vehicle is driven aggressively or with high heater use in winter. However, vehicle range can be increased by using specialist routing software to optimise daily journeys.
• The time taken to fully charge an electric vehicle depends on the size of the battery and the power rating of the charging infrastructure. A full charge typically takes between 30 mins (rapid charge) and 8 - 10 hours (standard charge).
• The payload on electric vehicle is lower than on a diesel vehicle due to the additional weight of the batteries. A payload reduction of around 5% – 30% can be expected, depending on the vehicle type and battery size. However, load volume is not generally changed.</td></tr>
<tr><td>Environmental Performance</td><td colspan="3">Electric vehicles produce zero tailpipe emissions. This makes them ideal for improving air quality in our cities and reducing CO_2 emissions. They can offer CO_2 savings of up to 70% even when the carbon intensity of electricity production is considered.</td></tr>
<tr><td>Case Studies</td><td colspan="3">Electric vehicles have been deployed by many British councils, British Gas, DPD, Mitie, Severn Trent Water, Warburtons and many more.</td></tr>
<tr><td>Further Information</td><td colspan="3">https://www.zap-map.com/live/ for a map public charging locations.</td></tr>
</table>

Hydrogen (H_2)

<table>
<tr><td>Technology Introduction</td><td colspan="2">Hydrogen is taking its first steps to becoming commercially available as a road transport fuel in the UK.
Hydrogen can be used to power a vehicle by burning it in an engine or to generate electricity through a fuel cell (FCEV).
There is currently a limited but growing public hydrogen refuelling station network.
Hydrogen is stored on a vehicle in compressed gas cylinders. 
An FCEV rigid truck on a Swiss trial. Source: Hyundai</td></tr>
<tr><td>Availability</td><td colspan="2">Cars: A limited number of hydrogen fuel cell vehicles are available, such as the Toyota Mirai and Hyundai Nexo.
Small Vans: Fuel cell range extenders can be fitted to battery electric vans which generate electricity from on-board hydrogen to charge their batteries. These are available in the UK through Arcola Energy.
Large Vans: Diesel vans converted to operate on hydrogen and diesel (dual-fuel) are available from ULEMCO.
Rigid Trucks: Diesel trucks converted to operate on hydrogen and diesel (dual-fuel) are available from ULEMCO. FCEVs are currently in the early stages of European trials.
Tractor Units: Not available in the UK.</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>Hydrogen vehicles are currently more expensive to purchase and operate than their fossil fuel counter parts. Most hydrogen vehicle deployments are subsidised through UK and EU funding programmes to allow technology demonstration and development.
Savings accrued through daily use of a zero emission H_2 powered vehicle in the London Congestion Zone can reduce the total cost of ownership to a similar level to a conventional vehicle.</td><td>Capital +
Maintenance +
Fuel +
Residual Value -</td></tr>
<tr><td>Operational Performance</td><td colspan="2">Hydrogen cars and dual-fuel vehicles have a similar range to their fossil fuel equivalents of 300 - 800 km depending on vehicle size and tank options.
Hydrogen range extenders typically double the range of an electric vehicle.
Payload and load space of range extended hydrogen vans are often reduced (by around 10%) as the fuel cell and tank components are normally located within the load space.
Dual-fuel hydrogen vehicles offer the same load space, but payload is reduced by around 150kg for vans and 300kg for trucks.</td></tr>
<tr><td>Environmental Performance</td><td colspan="2">Hydrogen releases no tailpipe CO_2 when used to power a vehicle, and when used in a fuel cell only water vapour is emitted.
When hydrogen is combusted alongside other fuels, such as diesel, the hydrogen proportion reduces the vehicle's tailpipe emissions.
The fuel life cycle CO_2 emissions of hydrogen vans depend on how the hydrogen is manufactured and the technology used on the van: they can be worse than diesel when the hydrogen is manufactured from fossil fuels (brown hydrogen); or have a very low carbon intensity when made from renewable green hydrogen.</td></tr>
<tr><td>Case Studies</td><td colspan="2">Hydrogen fuel cell cars are operated by fleets such as Green Tomato Cars (as taxis) and the Metropolitan Police. Range extended and dual fuel vehicles are operated by fleets such as Aberdeen City Council and the Commercial Group.</td></tr>
<tr><td>Further Information</td><td colspan="2">https://www.zap-map.com/live/ for a map of hydrogen refuelling station locations.</td></tr>
</table>

Natural Gas (CNG, LNG, Biomethane)

<table>
<tr><td>Technology Introduction</td><td colspan="3">

Natural gas-powered vehicles run on either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG).
A dedicated gas vehicle uses CNG or LNG in a spark ignited internal combustion engine similar to a petrol engine.
Volvo’s Dual Fuel LNG technology uses a typical compression ignition engine and a blend of natural gas and diesel.
Whilst CNG and LNG are fossil fuels, Biomethane is the renewable and sustainable form. Biomethane is produced from organic waste and can be directly used in gas powered vehicles. Biomethane is available in compressed and liquefied forms.

LNG tractor unit refuelling
Source: NGV Network
</td></tr>
<tr><td>Availability</td><td colspan="3">Cars: Not available in the UK.
Small Vans: Not available in the UK.
Large Vans: Available in most body configurations from Iveco.
Rigid Trucks: Available from Iveco, Volvo, and Mercedes in varying configurations.
Tractor Units: Available from Iveco, Scania, and Volvo</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>

Gas vehicles cost a premium price from around £5k (vans) to around £30k (depending on vehicle class and gas tank size).
Maintenance costs increase and the residual value of the vehicles is lower due to limited infrastructure and demand for second-hand vehicles.
Fuel consumption increases due to a reduction in engine efficiency between a diesel compression ignition engine and petrol spark ignition engine vehicles.
Fuel price can be significantly cheaper leading to an overall cost saving if an attractive fuel supply deal is available.

</td><td>Capital
Maintenance
Fuel
Residual Value</td><td>+
+
-
-</td></tr>
<tr><td>Operational Performance</td><td colspan="3">

CNG range of between 300 – 800 km depending on vehicle and tank size.
LNG range can be over 1,000 km dependent on fuel tank sizes.
Load space is the same as diesel equivalent.
Payload is marginally reduced (by around 200kg for vans to 750kg for trucks).

</td></tr>
<tr><td>Environmental Performance</td><td colspan="3">

Fossil natural gas vehicles have similar or better CO_2 emissions but when operated on 100% biomethane they offer around 85% WTW CO_2 emission savings compared to diesel.
Dedicated gas vehicles generally produce lower noise than Euro VI diesel.
Air quality performance between Euro VI gas and diesel vehicles is similar.

</td></tr>
<tr><td>Case Studies</td><td colspan="3">Natural gas vehicles operated by the John Lewis Partnership, Tesco, Ocado, Asda, Kuehne + Nagel, Great Bear, Muller Wiseman and more.</td></tr>
<tr><td>Further Information</td><td colspan="3">www.gasvehiclehub.co.uk provides a maps of gas refuelling stations and further information on the vehicle availability and making the switch to gas vehicles.

http://www.ngvnetwork.co.uk/ The natural gas vehicle network website provides information promoting natural gas vehicles as a transport solution</td></tr>
</table>

Liquefied Petroleum Gas (LPG)

<table>
<tr><td>Technology Introduction</td><td colspan="3">• Liquified petroleum gas (LPG) is a fossil fuel extracted alongside natural gas and is also a by-product of the oil refining process. LPG is stored on vehicles under pressure as a liquid.
• A dedicated LPG vehicle uses LPG in spark ignited (petrol) engine to power the vehicle.
• A dual fuel LPG vehicle simultaneously combusts diesel and LPG in a compression ignition (diesel) engine.</td></tr>
<tr><td>Availability</td><td colspan="3">Although LPG conversions are available from mainstream manufacturers in Europe, here in the UK you have to have a dedicated LPG system retrofitted to a petrol van, or a dual fuel LPG system retro-fitted to a diesel truck.</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>Dedicated LPG:
• Retro-fit conversion costs start from around £1k.
• There is a marginal increase in maintenance costs.
• LPG fuel cost is low; however fuel consumption increases due to the engine efficiency loss between diesel (CI) engine and petrol (SI) engine vehicles.
Dual fuel LPG:
• Conversion costs range from £4.5 - £7.5k depending on GVW.
• Maintenance costs increase by around £360 per annum.
• LPG fuel is much lower cost than diesel.</td><td>Capital
Maintenance
Fuel
Residual Value</td><td>+
+
-
~</td></tr>
<tr><td>Operational Performance</td><td colspan="3">• LPG vehicles offer similar duties and performance to regular vehicles due to the long range available between refuelling events.
• Refuelling is easy, there are nearly 1,500 refuelling stations offering LPG across the UK suitable for vans. Trucks that cannot fit under a forecourt canopy would normally be refuelled from a bunkered supply of fuel at a depot.
• The vehicles retain their original refuelling system and can switch back to petrol or diesel operation if LPG is not available. Payload is similar to a regular vehicle.</td></tr>
<tr><td>Environmental Performance</td><td colspan="3">• Dedicated LPG vehicles offer similar CO_2 emissions compared to diesel vehicles, with lower noise operation. LPG powered vans offer improved CO_2 emissions compared to petrol vans.
• Dual-fuel LPG vehicles offer similar or better CO_2 emissions compared to diesel vehicles, with lower noise operation.
• Bio-LPG is a renewable and sustainable version of LPG that can significantly reduce CO_2 emissions.</td></tr>
<tr><td>Case Studies</td><td colspan="3">LPG vehicles are used by Humberside Police Force, Grass Hopper Couriers, Clear Channel UK, Nobel foods and more.</td></tr>
<tr><td>Further Information</td><td colspan="3">For advice and information about converting to LPG including a list of approved installers and UK refuelling stations see DriveLPG: www.drivelpg.co.uk

More information on the use of LPG as an automotive fuel can be found via UK LPG, the trade association for the LPG industry in the UK: https://www.uklpg.org/

Locations of current LPG refuelling stations within the UK can be found via MyLPG: https://www.mylpg.eu/stations/united-kingdom/</td></tr>
</table>

Biodiesel (FAME)

<table>
<tr><td>Technology Introduction</td><td colspan="3">Biodiesel, also known as FAME (Fatty Acid Methyl Esters), is a renewable fuel produced from vegetable crops or used cooking oil. It has similar properties to fossil fuel diesel and is already present in regular diesel purchased at public forecourts up to 7% blend.

High blend biodiesel usually contains at least 20% biodiesel. Common blend strengths are B20 (20% biodiesel), B30 (30% biodiesel) and B100 (100% biodiesel).

 
An HGV using biodiesel.
Source: McDonald's</td></tr>
<tr><td>Availability</td><td colspan="3">• All diesel vehicles sold within the EU must be warranted to run on BS EN 590 diesel fuel, which can contain up to 7% biodiesel.
• Many manufacturers design their vehicles to operate on higher biodiesel blends, normally up to a 30% blend (B30). For example, Citroen and Peugeot warrant their range of high-pressure diesel injection engines to run on B30 biodiesel blends.
• Truck manufactures such as Mercedes, DAF, Scania, Dennis Eagle, and Volvo also warrant various blends up to B100 depending on vehicle model.</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>• Operating on biodiesel incurs slightly greater costs (~3%) dependent on the biodiesel blend.
• Some manufacturers require a biodiesel upgrade package to be purchased with the vehicle which involves a negligible cost increase.
• Maintenance frequency also increases with biodiesel use.
• Fuel consumption may decrease due to the lower energy content of biodiesel.</td><td>Capital
Maintenance
Fuel
Residual Value</td><td>~
~
~
~</td></tr>
<tr><td>Operational Performance</td><td colspan="3">• Similar range and performance to a regular diesel vehicle, maintains the ability to run on diesel which can be used in the same tank.
• Payload and load space are unaffected.
• Biodiesel blends are normally provided as bunkered supplies to a fleet depot. Fuel is organic and has a shelf life of around 3-4 months. Fuel quality requires monitoring and lower blends (~B20) or heated fuel tanks are normally used during the winter months to improve cold temperature flow characteristics.</td></tr>
<tr><td>Environmental Performance</td><td colspan="3">• Biofuel use can offer significant reductions in carbon emissions. Blends of 25% to 100% biodiesel offer emission improvements of 16% to 68% WTW, with greater savings if the biodiesel is manufactured from used cooking oil.
• You should ensure that biodiesel used is from sustainable sources. Biodiesel manufactured from used cooking oil has a very low environmental impact as it is a waste material and does not require food crops to be grown to produce it.
• Biodiesel vehicles normally emit less particulate matter with similar, or marginally decreased, NOx emissions.</td></tr>
<tr><td>Case Studies</td><td colspan="3">Biodiesel vehicles are operated by fleets such as McDonalds, Environment Agency, Gateshead Council and many more.</td></tr>
<tr><td>Further Information</td><td colspan="3">See the LowCVP Renewable Fuels Guide for more information:
https://www.lowcvp.org.uk/assets/reports/RenewableFuelsGuide_March2020.pdf</td></tr>
</table>

Renewable Diesel (HVO)

<table>
<tr><td>Technology Introduction</td><td colspan="3">Hydrotreated vegetable oil (HVO) is a paraffinic fuel that is chemically similar to conventional fossil fuel diesel. It is classed as a ‘drop-in’ fuel, which means it can be substituted for conventional fossil fuel diesel with no impact on operational requirements. HVO can be produced from virgin vegetable oil, typically crude palm oil, and waste feedstock such as UCO and waste vegetable oils.

UK suppliers of HVO include Green Biofuels and Prema Energy. These companies import HVO produced in continental Europe by Neste.

An RCV in Hackney operating on HVO.</td></tr>
<tr><td>Availability</td><td colspan="3">As HVO is a drop-in fuel its use has no impact on maintenance or warranty. All major truck OEMs approve 100% HVO for use in their vehicles as long as the fuel meets European Standard EN15940.</td></tr>
<tr><td>Cost (vs. Diesel)</td><td>• As HVO is a drop-in fuel it can be used in diesel vehicles. Therefore, the costs of purchasing and maintaining the vehicles is the same as diesel. The residual value of the vehicles will also be identical to that of a diesel vehicle.
• No specialist equipment is needed to store HVO.
• The cost per litre of HVO is typically higher than diesel.</td><td>Capital
Maintenance
Fuel
Residual Value</td><td>=
=
+
=</td></tr>
<tr><td>Operational Performance</td><td colspan="3">• Similar range and performance to a regular diesel vehicle, maintains the ability to run on diesel which can be used in the same tank.
• Payload and load space are unaffected.
• HVO is not currently available at retail fuel forecourts, although HVO suppliers can provide and install refuelling infrastructure at depots. HVO can be stored in the same way and has the same storage life as regular diesel. There is no need for any specialist equipment.</td></tr>
<tr><td>Environmental Performance</td><td colspan="3">• HVO use can offer significant reductions in carbon emissions. WTW CO_2 savings of around 91% are expected from the use of HVO instead of diesel.
• The GHG emission savings of HVO varies depending on the type of feedstock. Efforts are being made to increase the volume of HVO produced from waste based raw materials.</td></tr>
<tr><td>Case Studies</td><td colspan="3">Currently the UK market for HVO is very small, its use is more prevalent in Europe. HVO is used by the London Borough of Hackney, Luckett’s Travel and Red Funnel.</td></tr>
<tr><td>Further Information</td><td colspan="3">See the LowCVP Renewable Fuels Guide for more information:
https://www.lowcvp.org.uk/assets/reports/RenewableFuelsGuide_March2020.pdf</td></tr>
</table>

UK ULEV Waste & Recycling Vehicle Deployment Status

Technology	Deployment Status
Battery Electric Vehicle 	**Largest Single Deployment (to date)** • Biffa[12] / Manchester City Council – 27 vehicles. • Vehicles produced by Electra Commercial Vehicles. • £10m investment (£370,000 per vehicle[13]). **Other Known Deployments** • At least 12 local authorities with 1 or 2 vehicles each including City of London, Nottingham and Newport.
Fuel Cell Electric Vehicle Demonstration vehicles coming soon	**Largest Single Deployment (to date)** • Fuel cell electric trucks have not been used in the UK. **Other Known Deployments** • Glasgow City Council[14] – £10.5m agreed for 19 vehicles. • Arcola Energy awarded ~£685k for the first vehicle[15]. • Aberdeen City Council – 1 vehicle to be delivered by Q2 2021 under the HECTOR project[16].
Natural Gas Vehicle 	**Largest Single Deployment (to date)** • Liverpool City Council[17] – 20 vehicles. • Mercedes-Benz Econic NGT 2630L (CNG). • £3.4m investment (~£170,000 per vehicle). **Other Known Deployments** • Bradford[18] (formerly Leeds) – £5.5m plan to install a grid connected CNG station in 2021/22 for 77 HGVs, including ~54 RCVs over the next seven years.
Hydrogen Dual Fuel 	**Largest Single Deployment (to date)** • Glasgow City Council[19] – 20 gritters (by winter 2021). • ULEMCo to convert half of existing fleet, remainder to be new vehicles. • Supported by Transport Scotland funding. **Other Known Deployments** • Cheshire East, Grundon, Aberdeen and Fife.
Renewable Diesel (HVO) and High Blend Biodiesel (B100) 	**Largest Single Deployment (to date)** • London Borough of Hackney[20] – 100 vehicles (HVO). • Considered a cost-effective option for reducing greenhouse gas emissions despite higher fuel costs. • Used biodiesel up to B100 for several years. **Other Known Deployments** • Babergh[21] District Council (proposed to 2023).

12 https://www.biffa.co.uk/media-centre/news/uks-largest-fleet-of-electric-waste-vehicles-launches-in-manchester
13 EST Fleet Review - Electric Refuse Collection Vehicles, EST (2019)
14 https://fuelcellsworks.com/news/worlds-largest-fleet-of-hydrogen-powered-bin-lorries-to-arrive-in-glasgow/
15 The Conversion of a Council RCV to Hydrogen Fuel Cell, Glasgow City Council (2020)
16 HECTOR Project, Life N Grab Hy Conference (2021)
17 https://airqualitynews.com/2020/03/12/liverpools-waste-vehicles-to-be-powered-by-biomethane/
18 Advanced Fuel Centre, City of Bradford Metropolitan District Council (2020)
19 https://ulemco.com/delivering-hydrogen-fuelled-gritters-to-glasgow-cc/
20 The Renewable Fuels Guide, Zemo Partnership and Cenex (2021)
21 Transfer of the Council's Vehicle Fleet to HVO, Babergh District Council (2021)

15. Appendix H – Infrastructure Considerations

15.1 Electric Vehicle Charging Infrastructure

Electric vehicle chargepoints can output AC and / or DC electricity ranging from 3.7 kW to 22 kW AC (using a 230V / 16A domestic supply and 400V / 32A three phase supply respectively) or 50+ kW DC. Figure 25 shows three common connector standards that are typically used for charging of plug-in vehicles.

Figure 25 - Common Electric Vehicle Connector Types

Electric vehicle charging speeds are dependent on several factors including but not limited to:

- Chargepoint power output (kW)
- On-board vehicle charger power rating (kW, for AC charging only)
    - Charging power is limited to the minimum of the chargepoint power output or the on-board vehicle charger power rating
- Battery capacity (kWh) and starting state of charge (%)

Charging rates vary from slow chargers which can take more than 12 hours to completely replenish a battery to rapid chargers which can provide 80% charge in 30 minutes.

Table 43 summarises electric vehicle chargepoint types, typical locations and provides indicative hardware costs. More detail on electric vehicle chargepoints can be found in the UK EVSE Procurement Guide[22].

Table 43 - Electric Vehicle Chargepoint Types

	Charging Time (50 kWh battery)	Vehicle Connector Type	Typical Locations	Indicative Hardware Costs*
AC Standard - 7kW to 11kW	5 – 7 hours	Type 1 Type 2	Domestic, Workplace, On-street, Public Car Park	£750 - £5,000
AC Fast - 11kW or 22kW	2 – 5 hours	Type 2	Domestic, Workplace, On-street, Public Car Park	£1,800 - £5,000
AC Rapid - 43kW	~1 hour	Type 2	Workplace, On-Street, Public Car Park, Motorway Services	£15,000 - £30,000
DC Rapid - 50kW	~1 hour	CCS, CHAdeMO		
DC Ultra-rapid - 150kW	20 minutes	CCS, CHAdeMO	Charging Hub, Public Car Park, Motorway Services	> £30,000

* excluding VAT

[22] https://www.r-e-a.net/wp-content/uploads/2020/03/Updated-UK-EVSE-Procurement-Guide.pdf

Chargepoint Installation Process

Once it is decided which chargepoints are needed, then the process of planning, installation and procurement begins. Contracting the services of a reputable certified installer will help with this process and includes:

- Testing and surveying the power supply of your site to determine the available capacity i.e. the number and type of chargepoints it could support.
- Liaising with the distribution network operator (DNO) on any upgrades needed to support the charging capacity that has been identified.

Getting good information on these parameters early in the planning process will support informed decision making. Cenex's Energy Systems and Infrastructure team has experience in managing or supporting both activities, if appropriate.

The number of vehicles being charged is closely linked to downtime because fleets where many EVs charge for longer periods of time require a greater number of lower-powered chargepoints. On the other hand, fleets where many vehicles charge at different times and for shorter periods of time may need fast or rapid chargepoints to ensure vehicles receive an adequate charge before the next vehicle arrives or the next shift begins.

A site survey should be conducted to determine the supply and any spare capacity available (the difference between actual load used and the maximum available) before vehicles or infrastructure are acquired. If electrical capacity limitations are identified on a site where many EVs are planned to operate from, it is important to consider that these limitations could quickly become an issue, regardless of the type of chargepoint used.

For example, a very similar amount of available capacity would be required to run a fleet of 15 EVs in the following configurations:

- One 50 kW rapid charger, with EVs scheduled to charge one-by-one;
- Two 22 kW fast and one 7 kW slow charger, all being used at the same time; or
- Seven 7 kW slow chargers, all being used at the same time.

This means that electrical capacity should be considered, ideally even before EVs are procured.

When it comes to locating chargepoints, there are a number of key factors to take into account, which Cenex or an experienced installer can advise on. Air flow to charging equipment is critical for preventing overheating and ensuring safe and effective working of the power electronics. Trailing cables can also create trip hazards and unnecessary obstructions. This can be minimised for slow and fast charging by installing non-tethered units where users provide their own charging cables. This also reduces the requirement to provide both type 1 and 2 connectors to the chargepoint. Where tethered (non-detachable) charging cables are employed, provision should be made for safe storage when not in use. Furthermore, the placement of the chargepoint should not present any unnecessary obstructions.

Figure 26 shows the two main mounting methods for electric vehicle chargepoints.

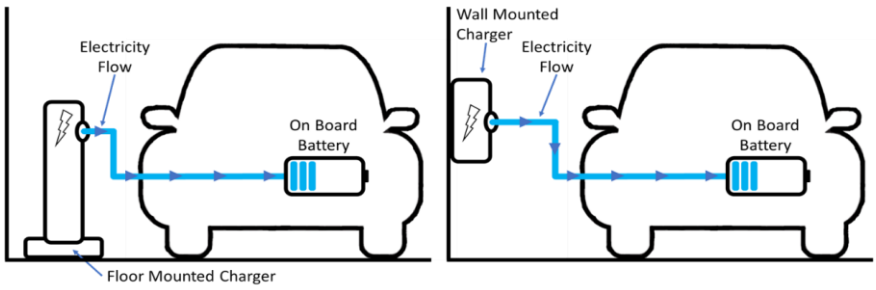


Figure 26 - Typical Mounting Methods for EV Chargepoints

Indoor EV charging tends to favour wall mounted units, which take up less space and can be fed using cabling on the surface of walls and ceilings. For central areas within a floor, floor mounted chargepoints may need to be used as wall space is not available. Where floor-mounted chargepoints are used, impact

barriers or kerbing may be worth installing to protect the chargepoint for accidental damage by moving vehicles.

The success of chargepoint installations hinge on the successful cooperation between multiple stakeholders. Table 44 outlines the high priority stakeholders and the recommended steps required to ensure delivery can be achieved on time and within budget.

Table 44 – Stakeholder Engagement Recommendations

	Recommendations
DNO	Ensure the DNO is engaged as early as possible.
	Reinforcement costs to the network required for the installation will be passed onto the user.
	Any grid upgrades required will impact the delivery timescale.
	Engagement can be carried out through the installer assuming this is agreed before works begin.
Energy Supplier	Some chargepoint installations may require the installation of a new electrical supply point which is completed by the energy supplier. Disruption can be reduced by early engagement.
Landlord	The landlord should be notified of the project, permission is required to start the work on site.
	There may be a requirement for legal agreements, which will carry a financial impact in addition to increasing delivery timescales.
Internal Stakeholders	Health and safety representatives at the organisation should be notified well in advance of works starting to allow for additional procedure to be developed if required. Facilities, energy and fleet managers will need to cooperate to ensure a smooth and effective installation

Installation Costs

Before engaging a charge point installer, it is advisable to first develop a clear strategy for the location and power of chargers required for the site. This will prevent issues with re-quoting or receiving tenders for inadequate or differing scopes of work.

The cost of an installation can be greatly impacted by several factors, including:

- **Distance from electrical supply** - A greater distance requires more excavation and electrical cabling. These are two of the highest cost aspects of installation so should be minimised where possible. Electrical cabling diameter will also increase with distance, adding further cost.
- **Ground type** - If cabling to the chargepoint is to be run underground this will require excavating and replacing the ground. Different ground types could have a significant impact on the cost, with excavating road typically costing more than double that of excavating turf or soil.
- **Demarcation of parking bays** - the addition of bay painting, protective barriers and signage can often be missed off an installers original price, resulting in delays and additional costs to rectify post project. Therefore, it is important to consider any requirements for demarcation prior to engaging with an installer.

Table 45 shows typical installation cost items and indicative costs for each.

Table 45 - Typical Chargepoint Installation Costs

	Typical Costs
Excavations	Turf: ~£120 per meter; Pavement: ~£200 per meter; Road: ~£250 per meter
Earthing	£300 - 500 per pit
Electrical Cabling	£40 - 50 per meter
Signage	£75 - 100 per sign
Road Markings	£75 - 150 per bay
Protective Barriers	£200 - 300 per bay

Grid Upgrade Costs

DNOs are responsible for ensuring that the local electricity network has the capacity and reliability to meet demand. Increases in demand by a customer can require the DNO to carry out network upgrades.

Costs vary significantly depending on the characteristics of the network, the additional demand required and whether the site is owned or leased. Large upgrades can take six months or more, and can be very costly, so early engagement with the DNO to agree timescales and secure funding is essential.

Although the latest decarbonisation plan from Ofgem proposes to give DNOs greater leeway to decide on upgrades to enable the future electrification of heat and transport, the funding model that DNOs operate under means the customer making the request shoulders the cost burden. Many customers are unable to pay these costs so seek alternative technical measures to manage within existing constraints until the connection is upgraded by someone else.

Table 46 shows indicative costs and timescales for various upgrades ranging from small (70 kVA) to large (1,000+ kVA).

Table 46 – Indicative Grid Upgrade Costs and Timescales

	Small	Medium	Large
Power	Up to 70 kVA	200 to 1,000 kVA	Above 1,000 kVA
Number of charge points	• 1-3 fast, or • 1 rapid	• 10-50 fast, • 4-20 rapid, or • 1-6 ultra-rapid	• 50+ fast, • 20+ rapid, or • 6+ ultra-rapid
Approximate connection time	8-12 weeks	8-12 weeks	6 months +
Approximate connection cost	£1,000 - £3,000	£4,500 - £75,000	£75,000 - £2 million

Alternative Power Supply Options

It is possible to avoid paying for grid upgrade using alternative power supply options such as:

- **Load management**
  - Using controllable hardware or switches and a series of business rules to ensure that the load from chargers never exceeds a pre determined level.
  - Implemented as standard in many available chargepoint solutions (‘smart charging’).
- **On site generation and storage**
  - On site generation (e.g. solar PV) and battery storage can reduce the overall demand of the installation by trickle charging batteries which then accommodate peaks in demand.

Load Management

The most common way to manage a constrained connection is through load management. This involves using controllable hardware or switches and a series of business rules to ensure that the load from chargers never exceeds a pre determined level. This is implemented as standard in many chargepoint solutions available on the market (usually referred to as ‘smart charging’) and involves measuring demand of other loads on site in order to calculate the available capacity for chargers. Charger powers are modulated accordingly to ensure that any capacity threshold is not breached. Attention should be paid to the load management strategy for instance are some chargers turned on/off, is the power varied across chargers or are certain chargers given priority in order to ensure it meets NWLDC needs.

Timed connections These give a different approach which acknowledges that constraint is more than simply the total current carrying capacity of the wire to the site. Network constraints change in time and space, so there may be set times when demand must be constrained in one location but other periods when a higher draw can be permitted. This minimises the DNO upgrade work required to meet the fluctuating demand but must be coupled with load management technologies. This service is not currently available from all DNOs and terminology can vary between regions.

Multiple connections A large site may be supplied by more than one substation, so the DNO may be able to provide the necessary additional capacity at a cheaper cost elsewhere on the estate. This option would normally be highlighted by a survey.

Alternatively, other organisations sharing the same connection or substation may also need additional capacity. If applicable, an arrangement with such organisations may be possible to spread costs.

On-site Generation and Storage

In areas where network constraints are significant, systems involving on-site generation such as solar PV and battery storage may be beneficial. This can be used to reduce the overall demand of the installation by trickle-charging batteries which then accommodate any peaks in demand. Additional revenue may be gained from generation assets or cost-savings as demand is managed in accordance with variable tariffs.

Additionally, the electrical topology should be carefully examined in order to reduce losses associated with on-site storage. Some chargepoints come equipped with in-built battery storage which can be charged on low power and then supplement the existing grid connection to deliver high kW rapid charging. Whilst more compact, these do limit the regularity with which single chargepoints can be used, potentially leading to multiple vehicle swaps to free up parking spaces with charged chargepoints. An alternative approach is to install a single large battery on a site which feeds a series of chargers. The most common systems charge and discharge on AC to allow interconnection with existing equipment and wiring on-site. The size of the battery, charging power and discharging power can vary significantly according to the specific make and model of the battery. It should be noted that this may also make any grid connection requests more complex because the DNO has to consider that on-site storage may export back to the grid. The downside of this approach is that electricity stored has to undergo AC/DC conversion three times when rapid charging is required. Firstly AC>DC for the storage, then DC>AC when releasing power and finally AC>DC at the chargepoint for rapid charging.

Therefore, a less common but electrically optimised solution would be to install a battery storage system which feeds DC directly to rapid chargers. This would bring the advantage of the battery-backed rapid chargers together with the benefit of a single large battery, without the efficiency losses of multiple conversions between AC and DC.

Solar PV

Efficiency: The higher a solar panel's efficiency, the more energy it will generate, relative to its size. Modern commercial solar panel efficiency is typically 16 –20%. However, you should also consider the size of your roof: if you do not have much roof space, then you will need to buy a small number of the most energy efficient panels you can afford. If you have a large roof you can install more panels of a lower efficiency, reducing your upfront costs. Other factors which affect how much energy a solar panel can generate are:

- Seasonal variations – more electricity will be generated in the summer rather than winter.
- Weather variations – more electricity will be generated on a sunny day as opposed to a cloudy one.
- Daily variations – electricity generation will peak at noon and obviously not occur at night
- Panel orientation – electricity generation will be optimised with a south-facing panel at a tilt angle appropriate for the latitude of the location (typically around 30°from horizontal in the UK)
- Shading – the panels should be situated to avoid any shading from surrounding buildings or trees as well as self-shading (being in the shadow of an adjacent panel) as this will reduce the electricity generated.

Cost: Due to advancements in the technology the cost of solar panels has reduced significantly in recent years. An average business could have a system of around a 5-9kW output but a commercial operation with large land or roof space could install a system with an output of 25kW to even as much as 200kW.

Table 47 - Indicative costs for solar PV systems

Commercial PV System Size	Typical Cost
<9 kW	£8,000 – £14,500
10 kW	£15,000 – £17,000
25 kW	£40,000 – £43,500
50 kW	£70,000 – £74,000

Installation: It usually takes between 2 and 5 days to install solar panels, depending on the size of the panels required and the complexity of the system. Scaffolding will need to be erected around the premises prior to the solar panel installation so that workers can access the roof. Most installers will arrange this, but they may require that this is organised by the site owners.

Exporting to the Grid: Solar panel owners can benefit from the Smart Export Guarantee (SEG) scheme. This requires electricity suppliers to pay their customers for any electricity generated from renewable sources which they export into the grid. Table 48 shows some indicative prices from 2020.

Table 48 - SEG prices for UK energy suppliers, 2020.

Energy Supplier	SEG price (p/kWh)
E.ON / Npower	3-5.5
Octopus	5.5
EDF	3.5
SSE	3.5
OVO	4
British Gas	1.5
Bulb	5.38

Battery Storage

At times of high generation and low demand for renewable energy sources, integrated energy storage can allow a site to be energy self-sufficient by capturing the electricity when it is readily available and saving it for a time when it is useful.

While the use of an energy storage system can reduce your fuel bills and carbon emissions, the savings are dependent on the system installed and how it is used. Most energy storage systems offer smart operations, allowing you to keep track of your energy use online and to decide when to charge your storage unit and when to draw power from it.

Energy storage systems manufactured using lithium-ion batteries are the best on the market, offering fast charging and high capacity. The cost of such a system generally ranges from £200,000 to £600,000, depending on variables such as the capacity of the battery, material, lifespan, and installation process.

Capacity: the market standard battery size ranges from 1-13MWh. A battery's 'useable capacity' is the percentage of a battery's energy that can be used before having to recharge, otherwise it can be damaged. It is thus less than the 'total capacity'.

Power: the higher a battery's power rating, the more devices it can power. A high-capacity battery with a low power rating will store a lot of energy but will not be able to discharge it at a high rate. A standard battery's power rating typically ranges from 2-5kW.

Depth of Discharge: if a battery's full capacity is continually used before recharging, its total capacity will be reduced over time. A battery's depth of discharge dictates how much of the battery's capacity should be used before recharging. Most modern lithium-ion batteries come with a depth of discharge of 90-95%.

Warranty: every battery comes with a guaranteed number of 'cycles', with one 'cycle' being one complete discharge and one complete recharge. Most operations use about 50% of the battery capacity before charging it back up to 100%; this would count as half a cycle. Every battery also comes with a product warranty, which is usually 10 years.

15.2 Natural Gas Refuelling Infrastructure

Natural gas refuelling can take place either on-site at depots (with an installed refuelling station), or at a commercial natural gas station. Natural gas refuelling typically occurs at either a gas grid connected CNG station or by using a station that is supplied by CNG / LNG delivered by road tanker.

All major station suppliers now offer biomethane certified under the Renewable Transport Fuel Obligation (RTFO) scheme. This ensures that the fuel is produced from renewable sources and allows reporting of the CO_2 savings by the transport operator (the fuel dispensed into the vehicle is balanced with biomethane injected into the grid elsewhere). Any additional cost due to this certification is included in the gas price used during the fleet review (historically 3 p/kg).

Additional details about natural gas stations, including current UK availability, can be found on the Gas Vehicle Hub[23], managed by Cenex.

Gas Grid Connected Stations (CNG Only)

Natural gas is extracted from the gas grid and conditioned before being compressed into storage tanks. Grid connected stations are cost effective for delivering large volumes of CNG, but the suitability of the connection depends on the pressure and distance from the network.

- Higher pressure = lower compression costs but potentially greater distance (e.g. higher connection costs)

CNG is dispensed at 200 bar or 250 bar using an NGV1 (cars and some LCVs) or NGV2 (HGV) connector. Refuelling is convenient, safe and takes a similar amount of time to a diesel vehicle at a fast fill station (in comparison to a plug-in electric vehicle). Slow fill stations, which compress gas directly into the vehicle tanks, can be suitable for some applications.

Figure 27 shows the typical configuration of a CNG station.

Figure 27 - Typical CNG Station Configuration (Source: US Environmental Protection Agency, Image: CNG Fuels Station, Warrington)

Mother and Daughter Arrangement

A ‘mother and daughter’ station arrangement can be used when a gas grid connection is not feasible, or additional flexibility is required, or for fleets with low natural gas usage. In this arrangement the daughter

[23] https://gasvehiclehub.org/

station is supplied by CNG using a tanker or consists of a CNG tube trailer, coupled to a dispenser. The mother station, often grid connected, supplies CNG as and when required.

LNG Stations

LNG is not available via a grid connection, instead LNG is delivered to stations by tanker from LNG terminals such as the Isle of Grain. LNG stations consist of low-pressure cryogenic storage tanks and a fuel dispenser. LNG can be dispensed with the aid of a cryogenic pump or by the pressure difference between the station and vehicle storage tanks.

LNG stations may suffer from very slow fuel loss as heat 'boils off' the stored LNG and increases pressure in the storage tank. As such, modern stations have vent capture systems to prevent leakage. Stations are designed to ensure an optimal storage capacity that allows for regular LNG deliveries to maintain a low temperature in the storage tank.

LNG is dispensed at 3 bar to 8 bar using an JC Carter or Mactrotech connectors.

Figure 28 shows the typical configuration of an LNG station.

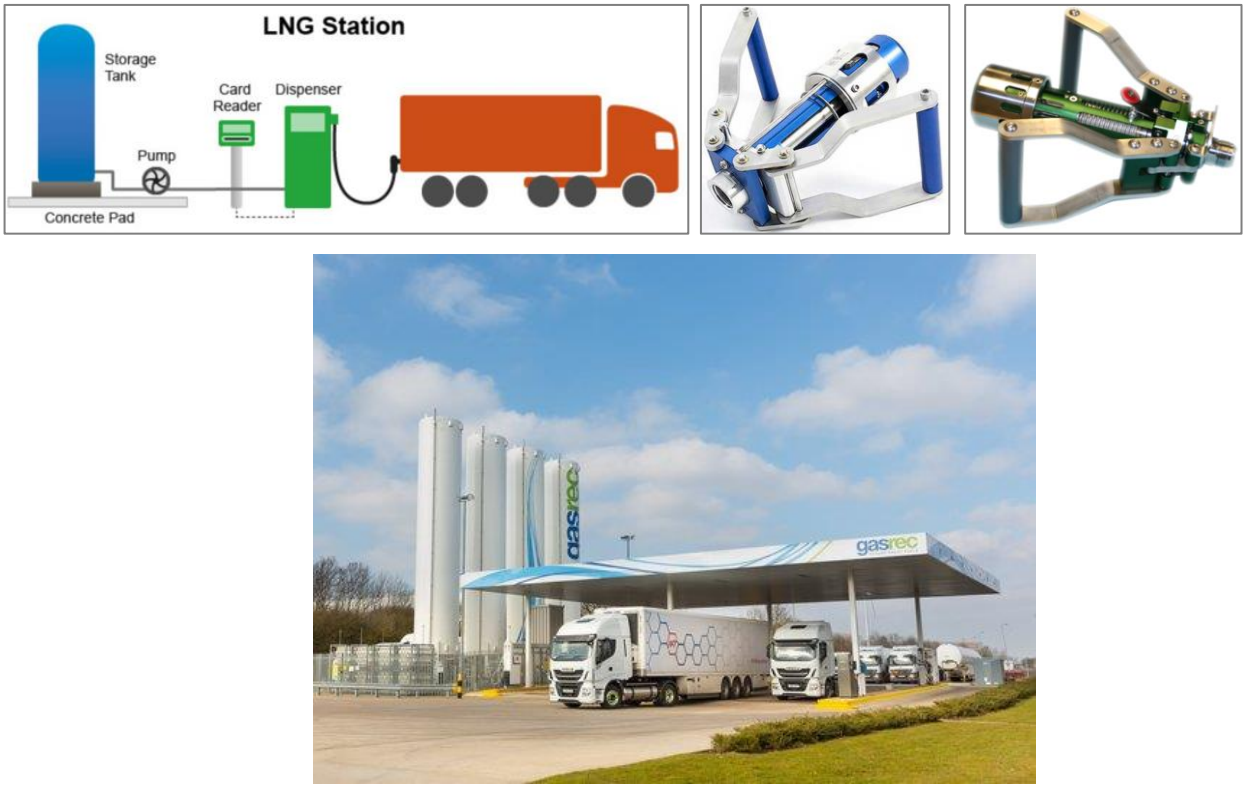


Figure 28 – Typical LNG Station Configuration (Source: US Environmental Protection Agency, Image: Gasrec Station, Daventry International Rail Freight Terminal)

Access Arrangements

There are currently ~11 public access natural gas stations in the UK (CNG and LNG), these stations are typically openly accessible, available 24/7 and require either an account with the station operator or provide payment via a key fob.

All other stations have some form of access restrictions. Stations located on customer depot sites typically require third parties to make prior arrangements to access these facilities.

Options for Funding Depot Based Natural Gas Stations

There are two options for funding depot based natural gas stations:

1. **A gas station supplier installs and operates the refuelling station**. This reduces capital outlay and risk, but a marginally higher price is paid per kilo dispensed. Contracts include agreed prices for fuel and maintenance, helping fleets forecast ongoing expenditure.

a) Station suppliers rely on demand for an acceptable business case: an indicative cost for grid connected public CNG station = >£1.95m with a minimum viable natural gas demand of ~900 kg per day

b) Gas price = fuel duty + wholesale gas price (variable) + station CAPEX + station OPEX + profit

2. **The fleet pays for and operates the station**. This provides the cheapest cost per kilo gas dispensed but requires substantial upfront capital and the fleet takes on the risk of making the station viable.

As previously discussed, vehicle total cost of ownership relies heavily on the provision of low-cost gas. Advantageous fuel duty of 24.7 p/kg until 2032, compared to 57.95 p/litre for diesel, provides some stability in fuel price.

Natural Gas Station Installation Process

To install depot based natural gas stations, fleets need to first assess the following:

- The distance from the refuelling station to the national gas grid – this will have a significant impact on installation costs. CNG station providers can carry out the necessary site survey.
- The number of vehicles to be refuelled and the time of day they will use the station. This will determine the number of dispensers required and the required refuelling speed.
- Availability of space for storage tanks, compression systems and dispensers.
- The distance from the refuelling station to a suitable electricity connection, as this will also influence the cost of the installation.

Table 49 shows the key processes and timescales involved in station delivery as reported by Element Energy.

Table 49 - Natural Gas Station Installation Process

	Process	Tasks	Timeline
Site Concept	Establish demand	Engage with local fleets to assess appetite for a shared station	↓
↓	Identify suppliers	Tender for suppliers, define contract for equipment and gas supply	6 months
	Identify site	Identify potential locations and arrange site surveys	↓
	Site design	Security arrangements, layout drawings, design work (for civils and station), safety assessment	
	Planning and consent	Submit planning application	10 months
	Site preparation and civil works	Carry out civil works (electrics, pipework, firewalls)	↓
	Installation and commissioning	Installation, testing and commissioning	
Site Operation	Operation and maintenance	Day to day station operation, servicing and maintenance	18 months

15.3 Biodiesel Fuel Use and Storage Considerations

Vehicle Operational Considerations

Biodiesel has a lower energy content than diesel (~8%) resulting in slightly higher fuel consumption at higher blends.

Biodiesel requires more fuel management than regular diesel. It absorbs more water than diesel and can be susceptible to microbial growth, additives are added to fuel tanks to prevent fuel filter blockages. Manufacturers also recommend increased fuel filter and oil inspections.

Biodiesel can gel or wax at cold temperatures. Depending on the feedstock, B100 can start to be affected at temperatures as high as 10°C. Low temperature waxing can be controlled and eliminated through interventions such as fuel additives, feedstock control and varying seasonal blends.

Biodiesel Infrastructure Considerations

Although the basic components used for refuelling high blend biodiesel are the same as diesel there are several operational changes that must be considered in infrastructure design and maintenance before use. The specific properties of the fuel that result in increased infrastructure and fuel management considerations are as follows:

- Long term storage stability / oxidation – fuel quality can degrade over a period of months resulting in increased acidity, increased viscosity and the formation of deposits in filters.
- Microbial contamination – bacteria can grow if water accumulates, draining of tanks and use of biocides may be required to avoid formation of 'sludge'.
- Cleaning / solvent effect – methyl esters in biodiesel have a cleaning effect which can flush any existing deposits in the fuel system after transitioning from diesel to biodiesel.
- Materials compatibility – biodiesel can degrade certain materials used for hoses and gaskets.
- Low temperature operability – biodiesel may freeze or gel at typical winter temperatures, this can lead to poor flow properties and even difficulties pumping from the fuel tank. Low temperature flow additives, lower blends or heated fuel systems may be required in some climates.

Additional fuel management to address these challenges is often required, Shell provides the following 'housekeeping' guidance to its customers using B100 and blends above 10%:

- Is the construction material of your tanks, fuel lines, hoses and seals suitable?
- Is your system able to store biodiesel at the required temperature?
    - Follow the temperature requirements for storage.
- Is your system clean and dry and have you removed excess deposits?
    - Drain water from tanks regularly (dependant on turnover at your site). Recording of water content, quantity of water drained, and any abnormal observations will help to monitor the effectiveness of the housekeeping.
    - Check your filters periodically.
    - Consider stability checks if biodiesel is stored for longer periods.
    - Consider testing for microbial contamination at certain occasions.

Biodiesel Fuel Costs

High volumes of biodiesel are required to guarantee economic delivery. Fuel suppliers typically require a minimum on-site delivery of 10,000 litres and as biodiesel has a shelf of 3-4 months this equates to 30,000 to 40,000 litres a year. Additional delivery charges may also be applicable at lower volumes.

15.4 Hydrogen Refuelling Stations

The installation of a hydrogen refuelling station (HRS) typically involves a number steps, some of which are dependent on preceding activities, whereas others may be undertaken in parallel.

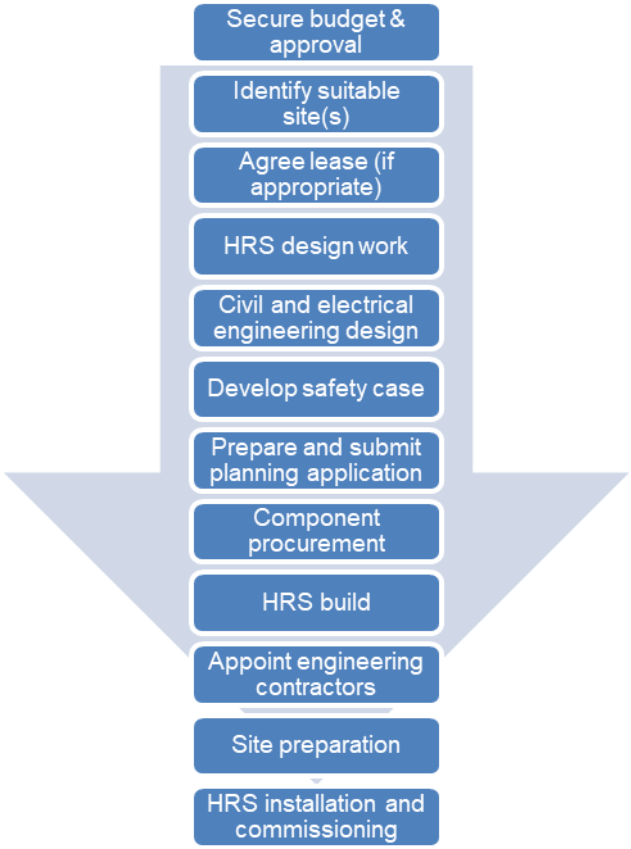
Given the low number of HRS in the UK today, it is difficult to characterise the installation process in terms of a typical installation time. However, experience from several pre-commercial demonstration projects suggests that a period of eighteen months or more from project start to station commissioning is not unusual.

Most HRS installed to date in the UK have been through projects with an element of public funding. Given the poor business case for HRS during the early years of FCEV commercialisation, it is likely that some form of support will continue to be required for a number of years.

Budgeting therefore involves establishing a breakdown of the total costs (capex and opex), securing grant funding as necessary, and agreeing a budget allocation between partners.

Challenges in this process include determining costs (until a site is selected and detailed design work completed it can be difficult to assess the total installation costs), and uncertainty over future demands for hydrogen (which affects revenues and the overall business case for investment).

The figure below shows a typical HRS design, development and installation process.



The technical design of hydrogen refuelling stations is becoming increasingly standardised. Most HRS are based on a modular arrangement, with three principal elements:

- The main skid, housing any on-site production equipment, the hydrogen compressor, control equipment, and a small amount of high-pressure storage.
- Bulk hydrogen storage – bottles / tubes / vertical tanks. Bottles of compressed hydrogen offer insufficient storage capacity for most HRS. Vertical tanks around 20m high are being installed in a number of HRS in Germany. These are preferred over tubes when space is at a premium as they offer a lower footprint solution.
- Hydrogen dispenser (which may include pre-cooling equipment depending on distance from the main skid). This is generally the only part of the station that is publicly accessible.

Costs for HRS installations are difficult to calculate as they depend on many factors, as outlined previously.

Most HRS installations are part funded through government grants, due to the high cost and risks associated with the deployment. As an example, Logan Energy has been chosen as the partner to supply two publicly accessible hydrogen refuelling stations in Teesside, as part of a £2.25m project. The initial four-year contract is part of a government project, funded by the Office for Low Emission Vehicles' (OLEV) Hydrogen for Transport Fund, which aims to deliver five new hydrogen refuelling stations across the UK.

15.5 Example Infrastructure Costs

To put the vehicle total cost of ownership and energy demand results in context, this subsection provides a summary of typical costs for permanent depot based refuelling infrastructure and electric vehicle charging infrastructure.

This is based on publicly available reports supplemented by previous Cenex studies.

Table 50, Table 51 and Table 52 show example infrastructure costs for compressed natural gas, hydrogen and electric vehicle charging, respectively.

Table 50 - Example Infrastructure Costs; Compressed Natural Gas Stations

Source	Description
City of Bradford Metropolitan District Council (2020)	• Council owned Household Waste Recycling Facility. • 77 HGVs including RCVs (+ 3rd party access to improve business case, also considering mother and daughter station arrangements). • Estimated CNG station cost = £1.6m to £1.8m. • Gas grid connection = £0.5m. • 500 kVA power supply = £0.25m (contingency). • Total additional capital (including vehicles, site prep etc.) = £5.5m • Funding = £0.77m loan, fuel cost savings = £2.3m by 2027, royalties at 5p / kg = £1.4m by 2027, other = £0.025m
Cenex (2020)	• Private depot based CNG station (10,000 kg capacity) • Estimated CNG station cost = £0.51m (approx. costs for compressors, dispensers, civils and other installation costs). • Estimated CNG price = £0.91 / kg at 1,000 kg a day and £0.79 / kg at 2,500 a day (including base fuel cost, capital payback over ten years, operating costs, fuel duty, excludes operator profit).
Element Energy (2015) Transport & Travel Research (2011)	• CNG station (5,000 kg capacity). • Estimated CNG station cost = £0.47m. • Estimated CNG price = £0.69 / kg at 5,000 kg a day.

Table 51 - Example Infrastructure Costs; Hydrogen Refuelling Stations

Source	Description
Department of Energy (2020)	• Capital equipment cost estimates for 111 grant funding proposals submitted to the California Energy Commission. • 700-bar fuelling capability for passenger and light commercial vehicles, stations supplied by tube trailers or liquid hydrogen tanks. • Median capacity = 1,500 kg / day. • Median capital cost = $1.9m (£1.34m).
Logan Energy (2020)	• £2.25m contract to supply two publicly accessible hydrogen refuelling stations for cars and vans in Teesside. • £1.3m funding from the Hydrogen for Transport Programme.
Element Energy (2015)	• Hydrogen refuelling station cost (1,000 kg / day) = £1.3m (2025)

Table 52 - Example Infrastructure Costs; Electric Vehicle Charging

Source	Description
Cenex (2021) UK EVSE	• 22 kW AC chargepoints = £0.33m (ground mounted, dual output including typical installation costs). • 50 kW DC chargepoints = >£1.8m (ground mounted, single output including typical installation costs). Not recommended. • Grid power supply upgrade = £0.05m to £0.5m but can be higher. • Excludes annual operating costs such as back office / control systems and maintenance.

16. Appendix I – Grant Funding Options

Low Emission Vehicle Plug-in Grant

A discount on the purchase cost of a brand new low-emission vehicle is available through the government's plug-in grant scheme. The grant is applied by the dealer and is included in the purchase cost of the vehicle. The grant amount depends on the category of the recipient vehicle. Only vehicles that have been approved by the government are eligible, even if the vehicle otherwise meets the emissions criteria.

Category	CO_2 emissions limit (g/km)	Zero emission distance (miles)	Percentage of purchase paid by grant	Maximum grant value
Cars	50	70	35%	£2,500
Vans (<2.5t GVW)	50	60	35%	£3,000
Vans (2.5 – 3.5t GVW)	50	60	35%	£6,000
Small Trucks (>3.5 – 12t GVW)		60	20%	£16,000
Large Trucks (>12t GVW)		60	20%	£25,000

Notes (Truck Grants):

- Grants for Small Trucks are available for the first 250 orders placed per financial year and are limited to 10 per customer.
- Grants for Large Trucks are available for the first 100 orders placed per financial year and are limited to 5 per customer.

Electric Vehicle Charging Infrastructure Grants

There are three UK Government schemes that provide financial support to assist with the installation of electric vehicle charge points. Depending on the exact use case of each vehicle, different schemes may be most appropriate.

Grant Scheme	Details
Workplace Charging Scheme (WCS)	• Voucher-based scheme that provides support towards up-front costs of the purchase and installation of chargepoints at workplaces. • Covers 75% of costs up to a maximum of £350 for each socket for up to 40 sockets across all sites. • Authorised installer claims voucher from the Office for Low Emission Vehicles (OLEV) following installation.
Electric Vehicle Homecharge Scheme (EVHS)	• Aimed at private plug-in vehicle owners (registered keeper, lessee or have primary use of the vehicle) to their home. • 75% grant funding contribution towards the cost of one chargepoint and its installation up to a maximum of £350. • Includes "Individuals who are named by their employer as the primary user of an eligible vehicle for at least six months".
On-Street Residential Chargepoint Scheme (ORCS)	• Grant funding for local authorities towards the cost of installing on-street residential chargepoints. • Grant set at £6,500 funding per chargepoint. • "The location(s) will meet current or anticipated future demand".

Workplace Charging Scheme (WCS)
Any business, charity or public authority is eligible to claim this grant towards the cost of installing EV chargepoints provided they have dedicated off-street parking for staff or fleet use only.

Electric Vehicle Homecharge Scheme (EVHS)
The scheme allows for third party contributions so the cost of charger and installation at an employee's home can be covered by the employer in this way.

The installation address must have designated private off-street parking which is suitable for chargepoint installation. If an individual moves to a new address, they must contact the DVLA to notify them. They can request permission to take their chargepoint with them but OLEV will not contribute to the costs of moving the chargepoint to a new address.

Benefit in Kind Tax Considerations

For BEVs newly registered after April 2020, company cars for personal use will pay no Benefit in Kind (BIK) tax. The tax rate will rise to 1% in April 2021, then to 2% in April 2022, until in 2023 the BIK tax rates are realigned. This means that for the next three years significant tax savings are available from the use of a pure-electric company vehicle.

Additionally, according to the Income Tax Earnings and Pensions Act 2003 s149(4), electricity is not treated as a transport fuel. As a result, no benefit in kind tax arises if an employer:

- Pays to charge a pure-electric company vehicle.
- Pays for a chargepoint to be installed at the employee's home to charge the company vehicle.
- Pays for a charge card to allow individuals access to commercial or local authority charging points.

Lowering your emissions through innovation in transport and energy infrastructure

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PROJECT

REPORT

Specialist Fleet Review

North West Leicestershire District Council

August 2021

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Terms and Conditions

Document Revisions

No.	Details	Date
1	Initial release, for Cenex Review	16/06/2021
2	Peer reviewed copy for release	24/06/2021
3	Final release	06/08/2021

Contents

Abbreviations

BEV	Battery Electric Vehicle
CH_4	Methane
CI	Compression Ignition
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DF	Dual Fuel
DNO	Distribution Network Operator
FAME	Fatty Acid Methyl Ester
FC REEV	Fuel Cell Range Extended Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GVW	Gross Vehicle Weight
GWP	Global Warming Potential
HGV	Heavy Goods Vehicle
HRS	Hydrogen Refuelling Station
HVO	Hydrotreated Vegetable Oil
ICE	Internal Combustion Engine
LCV	Light Commercial Vehicle
LEV	Low Emission Vehicle
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MPV	Multi-Purpose Vehicle
N_2O	Nitrous Oxide
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PHEV	Plug-in Hybrid Electric Vehicle
PM	Particulate Matter
PTO	Power Take-Off
RCV	Refuse Collection Vehicle
REEV	Range Extended Electric Vehicle
RRV	Resource Recovery Vehicle
RTFO	Renewable Transport Fuel Obligation
SI	Spark Ignition
TCO	Total Cost of Ownership
TTW	Tank-to-Wheel
ULEV	Ultra-Low Emission Vehicle
WTW	Well-to-Wheel
ZEV	Zero Tailpipe Emission Vehicle

1. Executive Summary

Low emission options for specialist equipment and plant are at a lower level of product maturity and availability than those used in road vehicles. Therefore, the evaluation of specialist fleet options within North West Leicestershire District Council (NWLDC) and the resulting implementation strategy and recommendations in this report have been undertaken at higher level than that used for other operational road vehicles.

The focus of this high level review was aimed at mobile specialist fleet items; hand tools and similar items were deemed out of scope.

Methodology

This specialist fleet review is based on relevant operational data supplied by NWLDC supplemented by supplier interviews. The review was delivered through the following steps which commenced upon receipt of initial fleet data following a project initiation meeting delivered via a web conference.

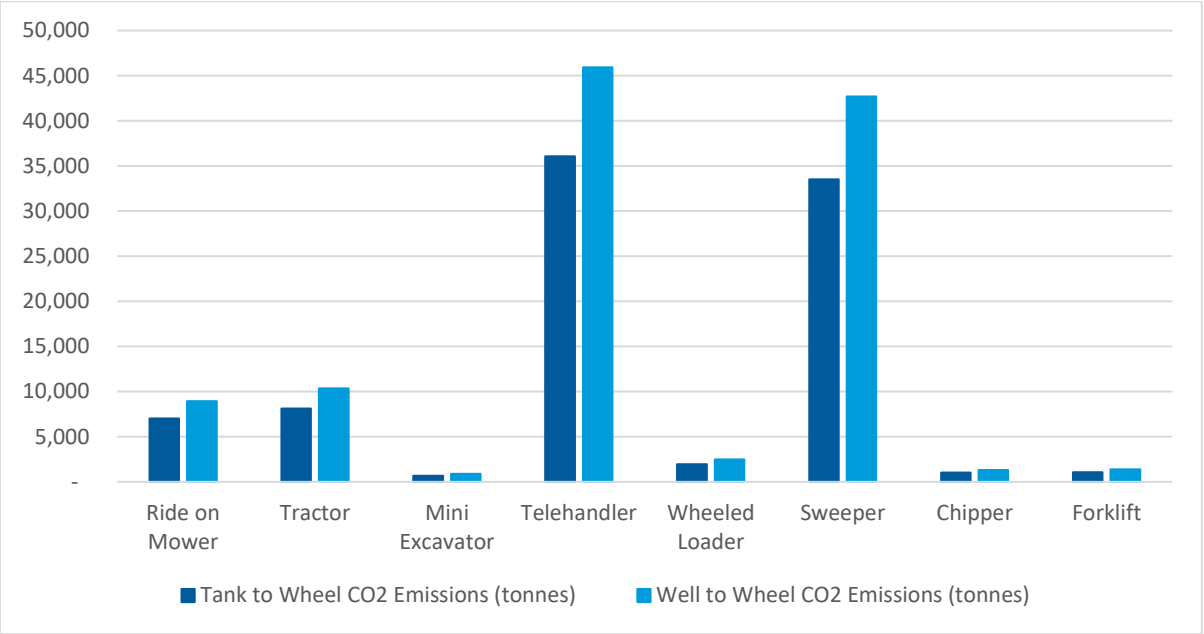
- Summary of Current Specialist Fleet: using the data provided, Cenex segregated the list into key groups, with each group baselined to show the current position including the number of units, fuel consumption, and carbon emissions.
- Low Emission Technology Options: The currently available (2021) lower carbon technology options are then reviewed for each identified equipment group commenting on the effect of the alternative options on product fit, emissions, operability, ease of refuelling, and cost. Other alternatively fuelled lower carbon technology options, expected to be available in 2030, are examined based on technology trends and development road maps.
- Recommended Replacement Technologies: based on the outcomes of the Technology Options review, recommendations are presented identifying those options that could be implemented into the NWLDC specialist fleet through trials to establish capability and performance of alternative options in 2021.

Summary of Current Plant Equipment

There are 20 specialist fleet vehicles on the NWLDC fleet, dominated by Mowers, Sweepers, Telehandlers and Tractors. The specialist fleet operates primarily on diesel, with fuel consumption data provided on a per vehicle basis where available, outlined in the table below.

	Number	Fuel Consumption (litres/ annum)
Ride on Mower	6	3,234
Tractor	3	3,748
Mini Excavator	1	318
Telehandler	3	16,632
Wheeled Loader	1	895
Sweeper	4	15,454
Chipper	1	470
Forklift	1	500
Total	**20**	**41,251**

The annual carbon dioxide emissions associated with specialist fleet operations have been derived using the 2020 UK Government GHG Conversion Factors for Company Reporting. Based on these calculations, the NWLDC emits some 91 tonnes of Tank to Wheel (TTW) and 117 tonnes of Well to Wheel (WTW) CO_2 emissions. The figure below illustrates the annual WTW CO_2 emissions associated with each specialist fleet category; the majority of emissions are associated with the use of telehandlers and sweepers due to a combination of high usage patterns and high fuel consumption.



Recommended Options

The completed Low Emission Technology Options review has indicated that biodiesel, hydrotreated vegetable oil (HVO), electric and alternative hydrocarbon fuels such as compressed natural gas (CNG) and biomethane (bio-CNG) have some applicability across the identified groups of specialist fleet vehicles.

However, both biodiesel and CNG/ bio-CNG are likely to experience increased costs in terms of capital and operational expenditure. These alternative options have therefore not been recommended for further investigation. In terms of HVO, while there is an operating expenditure increase compared to diesel this is expected to be outweighed by the emission reduction, and operational benefits of this fuel coupled with no impact on capital expenditure. While electric is significantly more expensive, in terms of capital expenditure, than the equivalent diesel variant, with some operational changes required, these should be outweighed by the emission reduction, and operational expenditure benefits of this technology.

It is therefore recommended that NWLDC further investigate the options to trial electric variants of the following specialist fleet equipment:

- Ride on Mowers
- Tractors
- Telehandlers
- Compact & Truck Mounted Sweepers

Where electric variants prove incompatible with existing working practices within NWLDC the use of HVO is recommended as an alternative.

However, prior to the wider deployment of low emission alternatives, it is recommended that NWLDC undertake a more detailed investigation into the operational, environmental, and economic impacts of those options highlighted. This would include the development of appropriate total cost of ownership (TCO) models similar to those generated through the main operational fleet review. In addition, such deployments need to take into consideration the outcomes of the operational fleet review in terms of charging and refuelling infrastructure provision to ensure that vehicles can maintain their operational duties.

It is further recommended that NWLDC remain attentive to relevant innovation demonstration opportunities from funded research and development programmes, for example though Innovate UK or the Advanced Propulsion Centre.

2. Specialist Fleet Review

Low emission options for specialist equipment and plant are at a lower level of product maturity and availability than those used in road vehicles. Therefore, the evaluation of specialist fleet options within North West Leicestershire District Council (NWLDC) and the resulting implementation strategy and recommendations in this report have been undertaken at higher level than that used for other operational road vehicles.

The focus of this high level review was aimed at mobile specialist fleet items; hand tools and similar items were deemed out of scope.

It should be recognised that in the Budget 2020, the UK Government announced that it will remove the entitlement to use duty discounted 'red' diesel from non-agricultural NRMM in April 2022, therefore the NWLDC specialist equipment fleet will be required to transition to standard road diesel at a duty rate of 57.95ppl compared to the current 11.14ppl for red diesel.

2.1 Methodology

This specialist fleet review is based on relevant operational data supplied by NWLDC supplemented by supplier interviews. The review was delivered through the following steps which commenced upon receipt of initial fleet data following a project initiation meeting delivered via a web conference.

- Summary of Current Specialist Fleet: using the data provided, Cenex segregated the list into key groups, with each group baselined to show the current position including the number of units, fuel consumption, and carbon emissions. Where fuel consumption data was not available estimated fuel consumption and associated emission factors have been applied.
- Low Emission Technology Options: The currently available (2021) lower carbon technology options are then reviewed for each identified equipment group commenting on the effect of the alternative options on product fit, emissions, operability, ease of refuelling, and cost. Other alternatively fuelled lower carbon technology options, expected to be available in 2030, are examined based on technology trends and development road maps.
- Recommended Replacement Technologies: based on the outcomes of the Technology Options review, recommendations are presented identifying those options that could be implemented into the NWLDC specialist fleet through trials to establish capability and performance of alternative options in 2021.

2.2 Equipment Baselining

The baselining process allows the usage, fuel consumption, emissions, and operating patterns to be understood before the low emission vehicle technology assessment takes place. The baselining process also allowed for the identification of those items of equipment that were the highest carbon emitters, and therefore the focus of the alternative technology review.

There are 20 pieces of specialist fleet vehicles on the NWLDC fleet as highlighted in Table 1; these have been categorised according to nearest equipment type.

Item	Number
Ride on Mower	6
Tractor	3
Mini Excavator	1
Telehandler (e.g. Yard Vehicles)	3
Wheeled Loader (e.g. Cat Loader)	1
Sweeper	4
Chipper	1
Forklift	1

Table 1 - Numbers of Specialist Equipment

It is noted that NWLDC operate a HIAB/crane, which is associated with a Tipper on the operational fleet. As the HIAB is operated via a power-take off coupling it is difficult to accurately calculate the emissions associated with its operational use. This piece of equipment has, therefore, been discounted as part of this review.

2.3 Estimated Fuel Consumption and Emissions

The NWLDC specialist fleet operates primarily on diesel, with fuel consumption data provided on a per vehicle basis where available. Where fuel consumption data was not available it was estimated based on the engine size of the equipment and similar equipment operations.

The calculated fuel consumption for the NWLDC specialist fleet is outlined in Table 2.

Table 2 - Estimated Annual Fuel Consumption

	Number	Fuel Consumption (litres/ annum)
Ride on Mower	6	3,234
Tractor	3	3,748
Mini Excavator	1	318
Telehandler	3	16,632
Wheeled Loader	1	895
Sweeper	4	15,454
Chipper	1	470
Forklift	1	500
Total	**20**	**41,251**

The annual carbon dioxide emissions associated with specialist fleet operations have been derived using the 2020 UK Government GHG Conversion Factors for Company Reporting. Based on these calculations, the NWLDC emits some 91 tonnes of Tank to Wheel (TTW) and 117 tonnes of Well to Wheel (WTW) CO_2 emissions. Sweepers and Telehandlers are the largest emitters, accounting for around 78% of fuel consumption and emissions, with Mowers and Tractors also identified as significant emitters. These four vehicle categories have been taken forward for a more detailed assessment as part of this review.

Figure 1, below illustrates the annual TTW and WTW CO_2 emissions of each specialist equipment type within the NWLDC fleet.

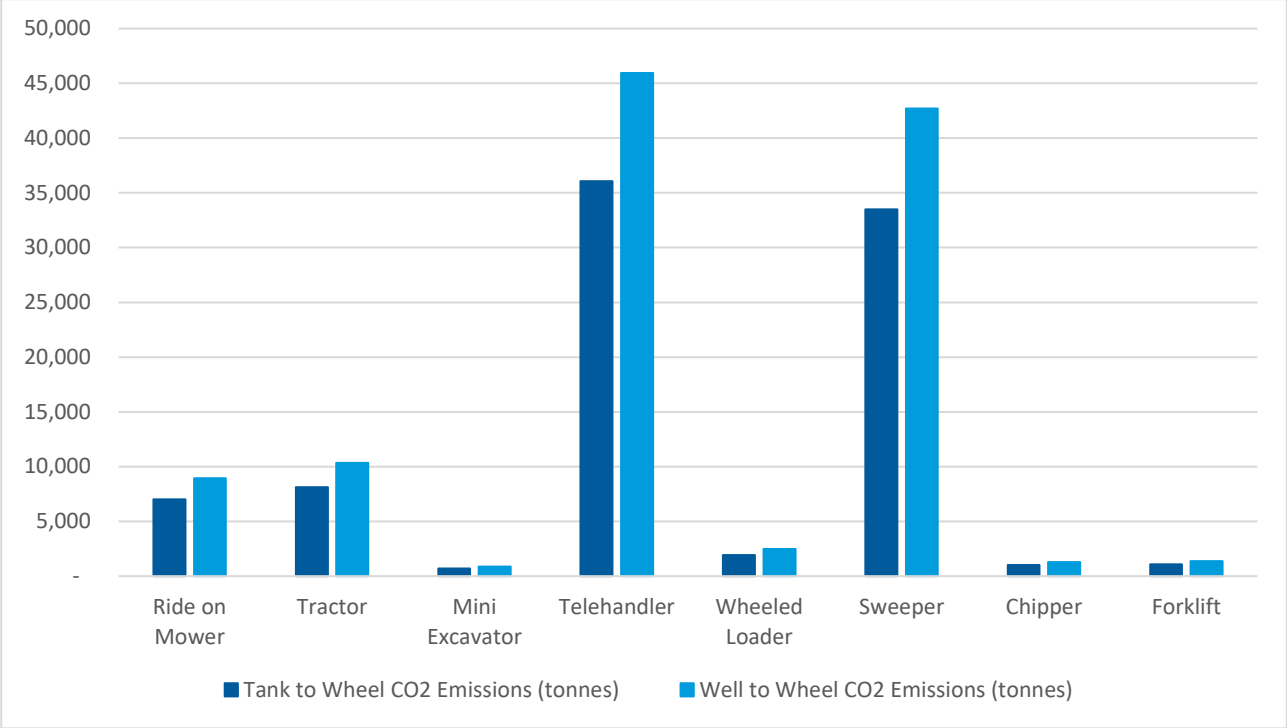


Figure 1 – Specialist Fleet Annual CO_2 Emissions

2.4 Regulatory Emission Standards

Emission standards for specialist equipment and plant machinery is known as Non-Road Mobile Machinery (NRMM); these standards have traditionally lagged behind road transport in terms of emission reduction. However, recent action is addressing this in part, due to legislative pressures to clean up all aspects of modern society to reach key regional, national, and global emission targets. NRMM regulations are an internationally standardised set of emission controls, with the date when a piece of plant machinery was manufactured determining which standard a given item of machinery must comply with.

At the time of writing Stage V is in effect, with Figure 2 illustrating the reduction in permitted emissions per emission stage for high power NRMM diesel engines.

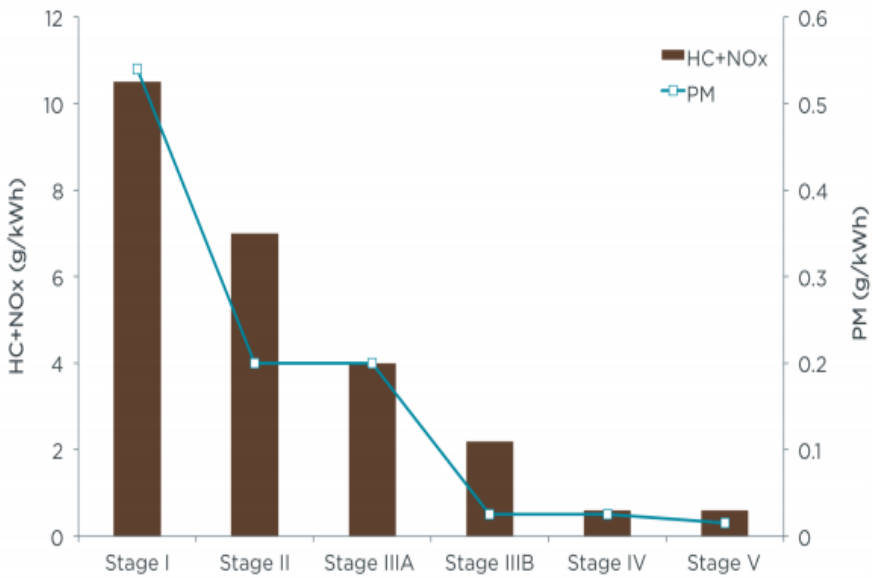


Figure 2 - NRMM Emission Reduction Standards

The latest Stage V engines offer increased fuel efficiency compared to previous emission stage compliant engines. For example, Scania Stage V engines are noted to report up to a 5% reduction in fuel costs compared to their Stage IV compliant engines. Off cycle emission control is also further controlled by Stage V regulation which has effectively mandated Diesel Particulate Filters on all but the lowest power engines.

The current NWLDC specialist fleet emission stages are shown below in Figure 3. It should be recognised that the replacement of older early-stage equipment with Stage V equipment will both reduce regulated emissions (CO, NOx, HC & PM) and is highly likely to reduce the machines CO_2 emissions.

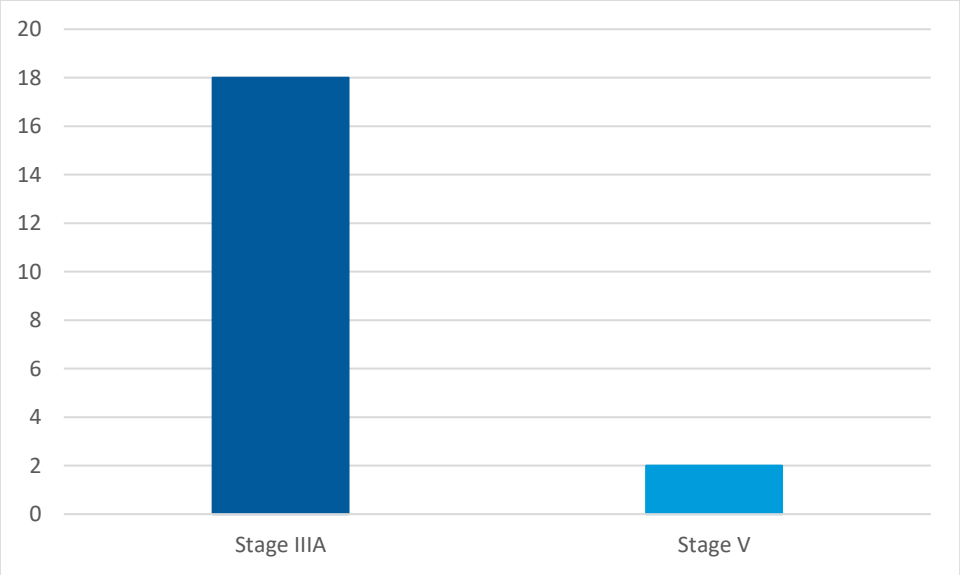


Figure 3 – NWLDC Specialist Equipment Emission Stages

2.5 Low Emission Technology Options Review

This section assesses the lower carbon alternative technologies available for each of the identified specialist equipment categories. Each category of has been assessed regarding their suitability against the following fuels/powertrain options.

- Bio & synthetic diesels (biodiesel (FAME) & hydrotreated vegetable oil (HVO))
- Diesel-electric hybrid
- Electric
- Alternative hydrocarbon (HC) fuel (e.g. CNG, Bio-CNG)
- Hydrogen

The low emission technologies review firstly presents the identified equipment category and its operational requirements. Next the review examines each of the above technology options, where the maturity of the alternative technology is assessed to focus the review on eligible options. This assessment of eligible technologies examines:

- Operational restrictions and benefits
- Range
- Refuelling/ recharging time
- Emission reduction potential
- Cost (operational and capital)

An example of this assessment, for Mowers is presented below, with assessments of the other identified specialist fleet vehicle categories outlined in Appendix A – Alternative Technology Data Tables.

Specialist Fleet Category: Mowers	
 	
No of Vehicles	4 units
Typical Operating Pattern	Seasonal, spring to autumn. Mowing of playing fields and park lands.
Technology Maturity	• **Biodiesel (FAME & HVO)**: Available • **Diesel-Electric Hybrid**: Not available • **Electric**: Available • **Alternative Fuel (HC)**: limited CO_2 benefit, some air quality improvement. • **Hydrogen**: Not available Options for detailed review: **Biodiesel (FAME & HVO)** and **Electric**.
Operational Restrictions and Benefits	• **Biodiesel:** FAME: Increased maintenance regime, mineral diesel fuel and engine flush required before use, fuel quality requires monitoring and managing. HVO: drop in fuel equivalent to diesel. • **Electric**: Reduced maintenance regime, some potential performance improvements over diesel/petrol equivalent.
Range	• **Biodiesel**: Like-for-like replacement (~75 miles on a 15 litre tank). • **Electric**: Mean Green have large electric mowers with (claimed) up to 7-hour operational time.
Refuelling/ Recharging Time	• **Biodiesel**: Same as diesel. • **Electric**: 7 hours at 240v 13 amps, Mean Green (standard outlet).
Emission Reduction	• **Biodiesel**: FAME: Variable depending on blend (approx. 18% WTW and 23% TTW CO_2 reduction available from B25 blend). Engine design, fuel quality and operational cycles essential in assessing total emission with biodiesel – with some authors reporting increases in emitted NOx, particulates and CO. HVO: approx. 91% WTW CO_2 reduction available. • **Electric**: Zero TTW emissions, WTW CO_2 emissions depend on energy generation, with ~50-60% reductions based on current grid mix.
Additional Notes	• **Biodiesel**: FAME: Manufacturer approaches vary depending on emission stage for example all John Deere engines can use biodiesel blends. Stage V engines operated within the European Union may use blends up to 8 percent (B8). Concentrations up to 20 percent (B20) can be used for all other John Deere engines providing the biodiesel used in the fuel blend meets European Standard (EN) 14214. HVO: May require manufacturer approval before use. • **Electric**: Operational information suggests charging will not limit operations. Mean Green is a small manufacturer, quality and reliability should be investigated.

Specialist Fleet Type: Mowers	
Costs	• **Diesel**: At the Budget 2020, the government announced that it will remove the entitlement to use red diesel from non-agricultural NRMM in April 2022 • **Biodiesel**: FAME: Equipment Costs: For high biodiesel blend use manufacturers may require a biodiesel upgrade package to be installed, typically costing a few hundred pounds. For B100 use, the vehicles require a conversion to include a simple system for warming the fuel. Various conversions are available either at factory or retrofitted. These typically cost from £6,500 - £8,000 per vehicle but may not be available for small equipment items. Fuel Costs: Comparable to Road Diesel. Maintenance Costs: Some vehicle manufacturers suggest modified routines such as increased fuel filter and oil changes. Infrastructure Costs: Biodiesel blends up to B30 can be stored in and dispensed from existing infrastructure for diesel vehicles at no extra cost. B100 however needs to be kept at an appropriate temperature to ensure it remains liquid in the colder months. This will result in some additional energy costs. FAME has a shelf life of around 3 months so requires constant usage to ensure fuel quality is maintained. HVO: Equipment Costs: No impact on vehicle cost. Fuel Costs: Cost of fuel per litre is typically 10-15p/l higher than diesel. Maintenance Costs: Maintenance costs are identical to that of diesel vehicles. Infrastructure Costs: No specialist equipment is needed to store HVO. FAME and HVO fuel costs rely on minimum order quantities would ned to be factored into any wider deployment of these fuels across the operational fleet. • **Electric**: Equipment Costs: significantly higher than diesel. Fuel Costs: significantly lower that diesel. Maintenance Costs: Lower than that of identical diesel mowers. Infrastructure Costs: Slow charge (13A) no cost; higher charging rates will require specific infrastructure at additional cost.

A ‘Traffic Light’ approach was utilised to summarise the above alternative technology review. This approach rates the suitability of the identified alternative technology options in the following areas: Operational, Emissions, Capital Expenditure (CapEx) and Operational Expenditure (OpEx) in a **RED AMBER GREEN** traffic light matrix, as shown in Table 3.

Table 3 - Plant Equipment Traffic Light Criteria

Factor	Red	Amber	Green
Operational	Fails to meet operational requirements	Meets some operational requirements	Meets all operational requirements
Emissions	Higher CO_2 emission (in comparison to Stage-V)	Reduced CO_2 emission (in comparison to Stage-V)	Zero emissions at tailpipe
CapEx	Significantly higher plant + infrastructure CapEx	Broadly similar plant + infrastructure Capex	Potential CapEx saving (in comparison to Stage-V)
OpEx	Significantly higher operating costs	Broadly similar operating costs	Lower operating costs (in comparison to Stage-V)

Note, where the technology was not deemed eligible for the specialist equipment group or there is no information available the Cell will be shown in **GREY**. The summary traffic light analysis for the Mowers group is shown below in Table 4.

The assessments for the other relevant specialist fleet groups can be found in Appendix A – Alternative Technology Data Tables.

Table 4 - Traffic Light Analysis - Mowers

Fuel	Factor	Mowers
Biodiesel	Operational	
	Emissions	
	CapEx	
	OpeEx	
HVO	Operational	
	Emissions	
	CapEx	
	OpeEx	
Diesel-Electric Hybrid	Operational	
	Emissions	
	CapEx	
	OpeEx	
Electric	Operational	
	Emissions	
	CapEx	
	OpeEx	
Alternative Hydrocarbon-based Fuels	Operational	
	Emissions	
	CapEx	
	OpeEx	
Hydrogen	Operational	
	Emissions	
	CapEx	
	OpeEx	

The summary traffic light analysis for all selected NWLDC specialist fleet categories is shown in Table 5 below.

Table 5 – NWLDC Specialist Fleet Summary Traffic Light Analysis

Fuel	Factor	Sweeper	Mowers	Telehandler	Tractor
Biodiesel	Operational				
	Emissions				
	CapEx				
	OpeEx				
HVO	Operational				
	Emissions				
	CapEx				
	OpeEx				
Diesel-Electric Hybrid	Operational				
	Emissions				
	CapEx				
	OpeEx				
Electric	Operational				
	Emissions				
	CapEx				
	OpeEx				
Alternative Hydrocarbon-based Fuels	Operational				
	Emissions				
	CapEx				
	OpeEx				
Hydrogen	Operational				
	Emissions				
	CapEx				
	OpeEx				

2.6 Recommendations

This section of the report makes recommendations based on the traffic light assessment of the alternative technologies that could be currently deployed (from 2021 onwards) for each identified specialist equipment group within the NWLDC fleet.

The traffic light review has indicated that biodiesel, HVO, electric and alternative hydrocarbon fuels (in this case CNG) have some applicability across the identified groups of specialist equipment. However, both biodiesel and CNG are likely to experience increased costs in terms of Capital expenditure (e.g. machine modification and fuel storage infrastructure) and Operational expenditure (e.g. additional maintenance requirements). These alternative options have therefore not been recommended for further investigation.

In terms of HVO, while there is an Operating Expenditure increase compared to diesel this is expected to be outweighed by the emission reduction, and operational benefits of this fuel coupled with no impact on capital expenditure.

While electric options are significantly more expensive, from a capital expenditure, than the equivalent diesel variant, with some operational changes required, these should be outweighed by the emission reduction, and operational expenditure benefits of this technology.

It is therefore recommended that NWLDC further investigate the options to trial electric variants of the following specialist fleet equipment:

- Ride on Mowers
- Tractors
- Telehandlers
- Compact & Truck Mounted Sweepers

Where electric variants prove incompatible with existing working practices within NWLDC the use of HVO is recommended as an alternative.

However, prior to the wider deployment of low emission alternatives, it is recommended that NWLDC undertake a more detailed investigation into the operational, environmental, and economic impacts of those options highlighted. This would include the development of appropriate total cost of ownership (TCO) models similar to those generated through the main operational fleet review. In addition, such deployments need to take into consideration the outcomes of the operational fleet review in terms of charging and refuelling infrastructure provision to ensure that vehicles can maintain their operational duties.

It is further recommended that NWLDC remain attentive to relevant innovation demonstration opportunities from funded research and development programmes, for example though Innovate UK or the Advanced Propulsion Centre.

Small items further analysis: It is noted the small non-wheeled plant items, such as chainsaws, were out of scope for this study. A further technology review would present the zero emission options for these small items.

2.7 Future Technologies Review

Considering the longer term, this section examines the direction of low and zero emission technology towards 2030. This will allow a procurement strategy to be identified NWLDC to adopt the relevant low and zero emission specialist fleet items as they come to market.

Figure 4 and Figure 5 below shows the Advanced Propulsion Centre Heavy Goods and Off-Highway Vehicle product technology road map. These road maps are developed by the Automotive Council Technology group, which is a collaboration between the UK Government and industry, where the road maps represent a shared vision of technology developments from UK manufacturers and suppliers and provide a consensus both to facilitate collaboration and to help inform policy making in technology support.

The relevant areas of the maps have been highlighted, from which the following can be seen:

- Low and medium power NRMM: Electrification is likely to be widespread, with reduced cost and increased operability. Hydrogen fuel cell technology may be available for machines requiring rapid refuelling or high levels of utilisation.
    - BEV total cost of ownership likely to be close to diesel.
    - Fuel cell total cost of ownership likely to remain above diesel (excluding infrastructure costs)
- Medium to high power NRMM: Some electrification likely, ICE with alternative fuels and Fuel cells for high utilisation or specific fleet operations.
    - BEV total cost of ownership likely to be above diesel.
    - Alternative HC fuels are cost effective, with local fuel supply they can be net zero in a closed loop. Infrastructure requires operational scale.
    - Fuel Cell total cost of ownership likely to remain above diesel (excluding infrastructure costs).

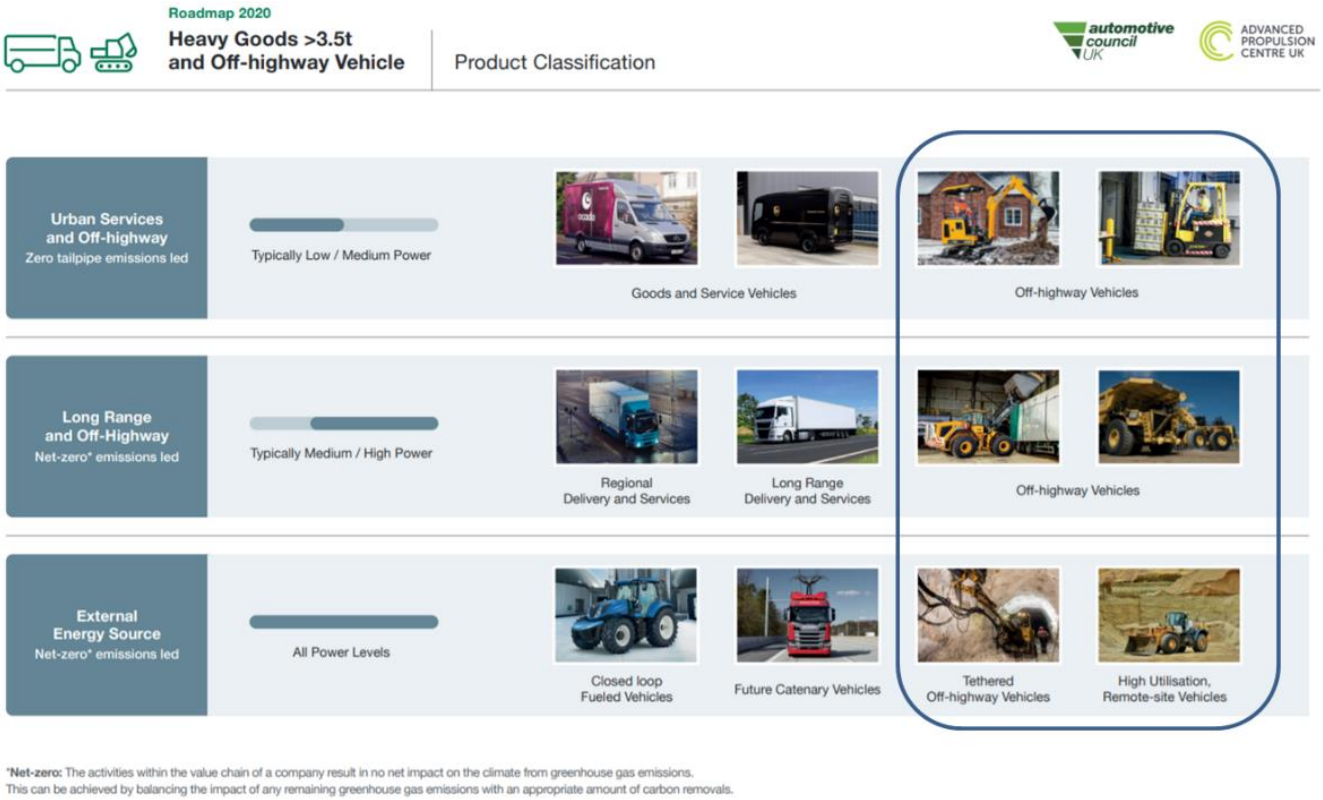


Figure 4 - APC Roadmap - Product Classification

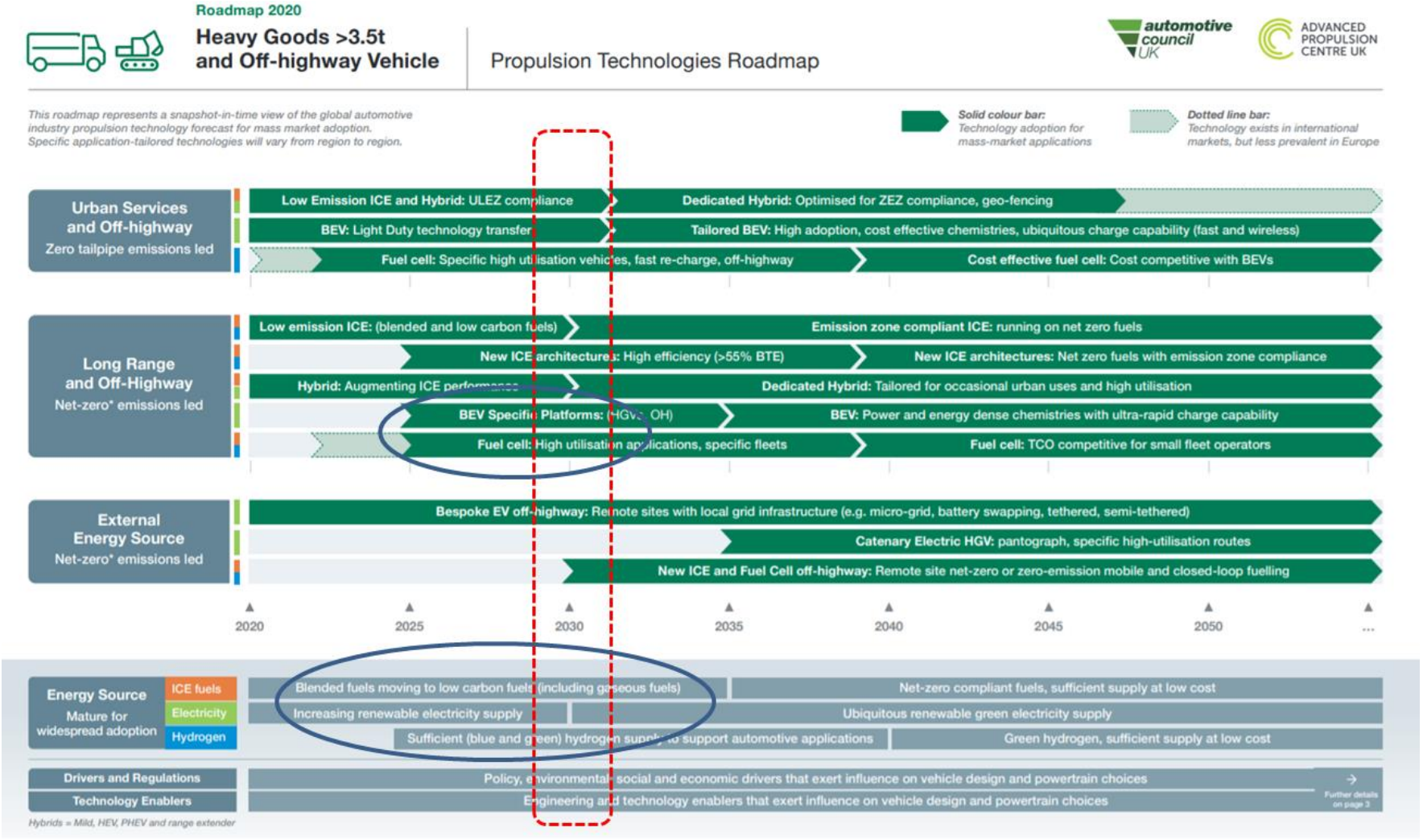


Figure 5 - APC Roadmap - Propulsion Technologies

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3. Appendix A – Alternative Technology Data Tables

Specialist Fleet Category: Telehandler	
	
No of Vehicles	3 units
Typical Operating Pattern	Year round, depot loading e.g. salt loading for road spreading
Technology Maturity	• **Biodiesel (FAME & HVO):** Available. • **Diesel-Electric Hybrid:** Past product, reduced case with EV available. • **Electric:** Available. • **Alternative fuel (HC):** After-market CNG only. • **Hydrogen:** Not available. Options for detailed review are **Biodiesel (FAME & HVO) & Electric**.
Operational Restrictions and Benefits	• **Biodiesel:** FAME: Increased maintenance regime, mineral diesel fuel and engine flush required before use, fuel quality requires monitoring and managing. HVO: drop in fuel equivalent to diesel. • **Electric**: Reduced maintenance and operating costs thanks to the elimination of many service points compared to diesel machines. Operational time is limited, see below.
Operating Time	• **Biodiesel**: Same as diesel. • **Electric**: JCB 525-60E Indicative run time: 8 hours, 24 kWh battery.
Refuelling/ Recharging Time	• **Biodiesel**: Same as diesel. • **Electric**: JCB 525-60E 240V 8 hours (standard outlet) or 415V rapid charge available, 60 mins for 80% (additional infrastructure required).
Emission Reduction	• **Biodiesel**: FAME: Variable depending on blend (approx. 18% WTW and 23% TTW CO_2 reduction available from B25 blend). Engine design, fuel quality and operational cycles essential in assessing total emission with biodiesel – with some authors reporting increases in emitted NOx, particulates, and CO. HVO: approx. 91% WTW CO_2 reduction available. • **Electric**: Zero TTW emissions, WTW CO_2 emissions depend on energy generation, with ~50-60% reductions based on current grid mix.
Additional Notes	• **Biodiesel**: FAME: Manufacturer approaches vary depending on emission stage for example all John Deere engines can use biodiesel blends. Stage V engines operated within the European Union may use blends up to 8 percent (B8). Concentrations up to 20 percent (B20) can be used for all other John Deere engines providing the biodiesel used in the fuel blend meets European Standard (EN) 14214. HVO: May require manufacturer approval before use. • **Electric**: JCB 525-60E used as illustration other options exist.

Specialist Fleet Category: Telehandler	
Costs	• **Diesel**: At the Budget 2020, the government announced that it will remove the entitlement to use red diesel from non-agricultural NRMM in April 2022. • **Biodiesel**: FAME: Equipment Costs: For high biodiesel blend use manufacturers may require a biodiesel upgrade package to be installed, typically costing a few hundred pounds. For B100 use, the vehicles require a conversion to include a simple system for warming the fuel. Various conversions are available either at factory or retrofitted. These typically cost from £6,500 - £8,000 per vehicle. Fuel Costs: comparable to Road Diesel. Maintenance Costs: Some vehicle manufacturers suggest modified routines such as increased fuel filter and oil changes. Infrastructure Costs: Biodiesel blends up to B30 can be stored in and dispensed from existing infrastructure for diesel vehicles at no extra cost. B100 however needs to be kept at an appropriate temperature to ensure it remains liquid in the colder months. This will result in some additional energy costs. FAME has a shelf life of around 3 months so requires constant usage to ensure fuel quality is maintained. HVO: Equipment Costs: No impact on vehicle cost. Fuel Costs: Cost of fuel per litre is typically higher than road diesel. Maintenance Costs: Maintenance costs are identical to that of diesel vehicles. Infrastructure Costs: No specialist equipment is needed to store HVO. FAME and HVO fuel costs rely on minimum order quantities would ned to be factored into any wider deployment of these fuels across the operational fleet. • **Electric**: Equipment Costs: Research suggests a significant price premium JCB 525-60E ~ 60% higher that diesel equivalent. Fuel Costs: Estimated running cost for operators using an industrial electricity supply, will be around 50% lower than for diesel. Maintenance Costs: Lower than that of identical diesel telehandlers. Infrastructure Costs: Slow charge (13A) no cost; higher charging rates will require specific infrastructure at additional cost.

Fuel	Factor	Telehandler
Biodiesel	Operational	
	Emissions	
	CapEx	
	OpeEx	
HVO	Operational	
	Emissions	
	CapEx	
	OpeEx	
Diesel-Electric Hybrid	Operational	
	Emissions	
	CapEx	
	OpeEx	
Electric	Operational	
	Emissions	
	CapEx	
	OpeEx	
Alternative Hydrocarbon-based Fuels	Operational	
	Emissions	
	CapEx	
	OpeEx	
Hydrogen	Operational	
	Emissions	
	CapEx	
	OpeEx	

Specialist Fleet Category: Tractor	
 	
No of Vehicles	3 units
Typical Operating Pattern	Year round, large area grounds maintenance.
Technology Maturity	• **Biodiesel (FAME & HVO):** Available. • **Diesel-Electric Hybrid:** Not available. • **Electric:** Small tractor only. • **Alternative Fuel (HC):** Large tractor CNG. • **Hydrogen:** R&D prototypes only. Options for detailed review are **Biodiesel (FAME & HVO), Electric & Alternative Fuel (HC).**
Operational Restrictions and Benefits	• **Biodiesel:** FAME: Increased maintenance regime, mineral diesel fuel and engine flush required before use, fuel quality requires monitoring and managing. HVO: drop in fuel equivalent to diesel. • **Alternative Fuel (HC):** CNG/Bio-CNG tractor requires a CNG/Bio-CNG refuelling station on site on within close driving range. • **Electric:** Reduced maintenance and operating costs thanks to the elimination of many service points compared to diesel machines. Operational time is limited see below. Small tractor only, 15kw electric motor, small and light-duty work.
Operating Time	• **Biodiesel**: Same as diesel. • **Alternative Fuel (HC):** CNG/Bio-CNG tractor similar to diesel. • **Electric**: Farmtrac FT25G electric indicative run time: 6 hours.
Refuelling/ Recharging Time	• **Biodiesel**: Same as diesel. • **Alternative Fuel (HC):** Same as diesel. • **Electric**: Farmtrac FT25G electric 240V 5 hours (standard outlet).
Emission Reduction	• **Biodiesel**: FAME: Variable depending on blend (approx. 18% WTW and 23% TTW CO_2 reduction available from B25 blend). Engine design, fuel quality and operational cycles essential in assessing total emission with biodiesel – with some authors reporting increases in emitted NOx, particulates, and CO. HVO: approx. 91% WTW CO_2 reduction available. • **Alternative Fuel (HC):** approx. 10% WTW CO_2 reduction available from CNG; Bio-CNG CO_2 emissions depend on production route, but typically near zero. Very significant PM & NOx reduction. • **Electric**: Zero TTW emissions, WTW CO_2 emissions depend on energy generation, with ~50-60% reductions based on current grid mix.

Specialist Fleet Category: Tractor	
Additional Notes	• **Biodiesel**: FAME: Manufacturer approaches vary depending on emission stage for example all John Deere engines can use biodiesel blends. Stage V engines operated within the European Union may use blends up to 8 percent (B8). Concentrations up to 20% (B20) can be used for all other John Deere engines providing the biodiesel used in the fuel blend meets European Standard (EN) 14214. HVO: May require manufacturer approval before use. • **Alternative Fuel (HC):** Large tractor, New Holland T6.180 Methane Power, used as illustration only option available. • **Electric**: Farmtrac FT25G electric used as illustration used as illustration only option available.
Costs	• **Diesel**: At the Budget 2020, the government announced that it will remove the entitlement to use red diesel from non-agricultural NRMM in April 2022 • **Biodiesel**: FAME: Equipment Costs: For high biodiesel blend use manufactures may require a biodiesel upgrade package to be installed, typically costing a few hundred pounds. For B100 use, the vehicles require a conversion to include a simple system for warming the fuel. Various conversions are available either at factory or retrofitted. These typically cost from £6,500 - £8,000 per vehicle. These are not likely to be available for small plant like an ATV. Fuel Costs: comparable to Road Diesel. Maintenance Costs: Some vehicle manufacturers suggest modified routines such as increased fuel filter and oil changes. Infrastructure Costs: Biodiesel blends up to B30 can be stored in and dispensed from existing infrastructure for diesel vehicles at no extra cost. B100 however needs to be kept at an appropriate temperature to ensure it remains liquid in the colder months. This will result in some additional energy costs. FAME has a shelf life of around 3 months so requires constant usage to ensure fuel quality is maintained. HVO: Equipment Costs: No impact on vehicle cost. Fuel Costs: Cost of fuel per litre is typically higher than road diesel. Maintenance Costs: Maintenance Costs are identical to that of diesel vehicles. Infrastructure Costs: No specialist equipment is needed to store HVO. FAME and HVO fuel costs rely on minimum order quantities would ned to be factored into any wider deployment of these fuels across the operational fleet. • **Alternative Fuel (HC):** Equipment Costs: Research suggests a 10% price premium. Fuel Costs: dependent on CNG/Bio-CNG prices and supply. Infrastructure Costs: Very significant (Minimum £30k), only viable if combined with other users. • **Electric**: Equipment Costs: Research suggests a significant price premium; Farmtrac FT25G electric ~ 100% higher that diesel equivalent. Fuel Costs: Estimated running cost for operators using an industrial electricity supply, will be around 50% lower than for diesel. Maintenance Costs: Lower than that of identical diesel tractor. Infrastructure Costs: Slow charge (13A) no cost; higher charging rates will require specific infrastructure at additional cost.

Fuel	Factor	Tractor
Biodiesel	Operational	
	Emissions	
	CapEx	
	OpeEx	
HVO	Operational	
	Emissions	
	CapEx	
	OpeEx	
Diesel-Electric Hybrid	Operational	
	Emissions	
	CapEx	
	OpeEx	
Electric	Operational	
	Emissions	
	CapEx	
	OpeEx	
Alternative Hydrocarbon-based Fuels	Operational	
	Emissions	
	CapEx	
	OpeEx	
Hydrogen	Operational	
	Emissions	
	CapEx	
	OpeEx	

Specialist Fleet Category: Sweeper	
 	
No of Vehicles	4 units
Typical Operating Pattern	Year round, inner and outer rounds.
Technology Maturity	• **Biodiesel (FAME & HVO):** Available. • **Diesel-Electric Hybrid:** Not available. • **Electric** – Compact and truck mounted. • **Alternative Fuel (HC)** – CNG • **Hydrogen** – R&D prototypes only. Options for review are **Biodiesel (FAME & HVO), Electric & Alternative Fuel (HC).**
Operational Restrictions and Benefits	• **Biodiesel:** FAME: Increased maintenance regime, mineral diesel fuel and engine flush required before storage, fuel quality requires monitoring and managing. HVO: drop in equivalent for diesel fuel. • **Alternative fuel (HC):** CNG/Bio-CNG Sweeper requires a CNG/Bio-CNG refuelling station on site on within close driving range. May have reduced bin/hopper capacity depending on siting of gas tanks. • **Electric:** Reduced maintenance and operating costs thanks to the elimination of many service points compared to diesel machines. Operational time is limited, see below. Compact (45 – 63 kWh battery) and truck mounted (up to 200 kWh battery).
Operating Time	• **Biodiesel**: Same as diesel. • **Alternative Fuel (HC):** CNG/Bio-CNG has similar operating time to diesel • **Electric**: Bucher CityCat VS20e (45 kWh) run time of 6 hours; Bucher CityCat V20e (63 kWh) run time of 8 hours; Bucher V65e (200 kWh) available range of 200 km.
Refuelling/ Recharging Time	• **Biodiesel**: Same as diesel. • **Alternative Fuel (HC):** Similar to diesel. • **Electric**: Dependant on battery pack; typically, 4-9 hours on 22 kW chargepoint
Emission Reduction	• Biodiesel: FAME: Variable depending on blend (approx. 18% WTW and 23% TTW CO_2 reduction available from B25 blend). Engine design, fuel quality and operational cycles essential in assessing total emission with biodiesel – with some authors reporting increases in emitted NOx, particulates, and CO. HVO: approx. 91% WTW CO_2 reduction available. • Alternative Fuel (HC): approx. 10% WTW CO_2 reduction available from CNG; Bio-CNG CO_2 emissions depend on production route, but typically near zero. Very significant PM & NOx reduction. • Electric: Zero TTW emissions, WTW CO_2 emissions depend on energy generation, with ~50-60% reductions based on current grid mix.

Specialist Fleet Category: Sweeper	
Additional Notes	• **Biodiesel**: FAME: Manufacturer approaches vary depending on emission stage. Typically Stage V engines operated within the European Union may use blends up to 8 percent (B8), with concentrations up to 20 percent (B20) used providing the biodiesel used in the fuel blend meets European Standard (EN) 14214. • **Alternative Fuel (HC):** Dulevo 6000 CNG used as illustration only, other option are available. • **Electric:** Bucher electric variants used as illustration only, other options are available.
Costs	• **Diesel**: At the Budget 2020, the government announced that it will remove the entitlement to use red diesel from non-agricultural NRMM in April 2022 • **Biodiesel**: FAME: Equipment Costs: For high biodiesel blend use manufacturers may require a biodiesel upgrade package to be installed, typically costing a few hundred pounds. For B100 use, the vehicles require a conversion to include a simple system for warming the fuel. Various conversions are available either at factory or retrofitted. These typically cost from £6,500 - £8,000 per vehicle. Fuel Costs: comparable to Road Diesel. Maintenance Costs: Some vehicle manufacturers suggest modified routines such as increased fuel filter and oil changes. Infrastructure Costs: Biodiesel blends up to B30 can be stored in and dispensed from existing infrastructure for diesel vehicles at no extra cost. B100 however needs to be kept at an appropriate temperature to ensure it remains liquid in the colder months. This will result in some additional energy costs. FAME has a shelf life of around 3 months so requires constant usage to ensure fuel quality is maintained. HVO: Equipment Costs: No impact on vehicle cost. Fuel Costs: Cost of fuel per litre is typically higher than road diesel. Maintenance Costs: Maintenance costs are identical to that of diesel vehicles. Infrastructure Costs: No specialist equipment is needed to store HVO. FAME and HVO fuel costs rely on minimum order quantities would ned to be factored into any wider deployment of these fuels across the operational fleet. • **Alternative Fuel (HC):** Equipment Costs: Research suggests a 10% price premium. Fuel Costs: Dependent on CNG/Bio-CNG prices and supply. Infrastructure Costs: Very significant (Minimum £30k), only viable if combined with other users. • **Electric**: Equipment Costs: Research suggests a significant price premium compared to diesel equivalent, dependant on variant and battery capacity. Fuel Costs: Estimated running cost for operators using an industrial electricity supply, will be around 50% lower than for diesel. Maintenance Costs: Lower than that of identical diesel sweeper. Infrastructure Costs: Slow charge (13A) no cost; higher charging rates will require specific infrastructure at additional cost.

Fuel	Factor	Sweeper
Biodiesel	Operational	
	Emissions	
	CapEx	
	OpeEx	
HVO	Operational	
	Emissions	
	CapEx	
	OpeEx	
Diesel-Electric Hybrid	Operational	
	Emissions	
	CapEx	
	OpeEx	
Electric	Operational	
	Emissions	
	CapEx	
	OpeEx	
Alternative Hydrocarbon-based Fuels	Operational	
	Emissions	
	CapEx	
	OpeEx	
Hydrogen	Operational	
	Emissions	
	CapEx	
	OpeEx	

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Lowering your emissions
through innovation in transport
and energy infrastructure

PROJECT

REPORT

Electric Vehicle Home Charging Options Review

NW Leicestershire District Council

August 2021

Prepared for:

North West Leicestershire Distict Council

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1. Background and Approach

1.1 Background

Cenex undertook a fleet review for North West Leicestershire District Council (NWLDC) to assess the operational and economic suitability of ultra-low emission vehicles (ULEVs) and the potential cost and emissions savings associated with their deployment.

The combined fleet consists of some 1,200 vehicles covering a wide range of vehicle segments from small vans to rigid rucks and refuse collection vehicle. Module 1 analysed these vehicles to identify their suitability for replacement by battery electric (BEV) and other low emission vehicle technologies.

However, the switch to BEV is not simply a matter of matching journey characteristics and vehicle type; the charging implications of such a change must also be considered. Since some of the vehicles in the fleet, particularly those associated with Housing Maintenance, are currently taken home overnight, identifying options to allow drivers to charge their vehicles overnight at their homes would dramatically reduce the need for depot-based or on-street charging infrastructure.

Given the overall analysis of the fleet the objective of this work package was to determine:

- What best practice would look like for a home charging scheme.
- Provide recommendations for how such a scheme could work across NWLDC.
- Outline a trial roll-out of the scheme.

1.2 Methodology

Cenex carried out desk based research, including telephone interviews, with fleet operators that have already investigates home charging to give a range of perspectives on the rollout of home charging schemes for operational vehicles.

Cenex also explored a range of chargepoint providers including: Alfen, ChargeMaster, Chargepoint, Electric Blue, EO Charging, Phoenix Works and Ubitricity to review the types of chargepoint infrastructure and back-office systems available for an employee home charging scheme.

1.3 Chargepoint Equipment Introduction

The following table outlines key definitions[1] and terms used within this report:

Table 1 - Key definitions

Term	Definition
Chargepoint	The stand or wall unit which an EV is plugged into, encompassing one or more sockets or tethered plugs, the user interface, access control, energy metering and circuit protection.
Chargepoint access	Domestic chargepoints are often open access, whereas public chargepoints require some way of recognising different users (such as linking to a smart phone app or users swiping an RFID card).
Back-office system	The back-office functions that control and control access to chargepoints. It is usually hosted on a secure server and typically holds data on locations of, and sends/receives commands to/from, chargepoints on the network. The back-office system also holds information on authorised users (i.e. their RFID card or membership details) in order to enable charging access to the EV user when the system is requested by a chargepoint. A typical add-on feature to a back-office system may include instant access billing where the authorised user is billed for access to a chargepoint.
Smart chargers	Smart charging is the ability for EV supply equipment to control the timing of charging and the power output level in response to a user-defined input or signal. At the most basic level, this allows charging to be scheduled for times when grid demand is lower, and electricity is cheaper.

[1] http://ukevse.org.uk/resources/procurement-guidance/

RFID cards	Radio Frequency Identification card. A card holding information that is wirelessly read to identify its user. For chargepoints, an RFID card provides authentication to activate and terminate an EV charging event at equipment with access control.

2. Company Experiences of Employee Home Charging Schemes

This section provides details of the experiences of a range of organisations in terms of the implementation of electric vehicle home charging schemes.

2.1 Leeds City Council

The Leeds City Council (LCC) van fleet supports a range of departments including property maintenance, highway maintenance, greening, parks, and waste management. LCC has an ambition for all its fleet vehicles to operate using an alternative fuel by 2025. It has been adding electric vehicles (EVs) into its operational fleet since 2016 and has currently deployed more than 40 Nissan eNV200 vans. LCC needs to procure an additional 300 vans to meet its target and intends to acquire electric models in all possible cases. Most vehicles operate on a back-to-base model, so LCC identified capacity constraints at their depots as a potential barrier to accelerated vehicle deployment.

2.1.1 Pilot study

LCC undertook a pilot home charging scheme involving 10 employees. Expressions of interest were requested via a Chief Officer Briefing Note, asking for volunteers to take part in the trial. The eligibility requirements for participating stated that employees must:

- Already drive a Council vehicle and (for the pilot only) already take this vehicle home overnight.
- Have off-street parking which they can use for the Council vehicle.
- Agree to have a chargepoint installed at their home.
- Agree to provide feedback on the pilot to LCC.

More than 10 expressions of interest were submitted and LCC was able to identify enough employees who met the above criteria.

The Phoenix Works were commissioned to install the chargepoints and provide the back-office software. 7 kW wall-mounted units were supplied by EO Charging. The Phoenix Works audited participants' homes to ensure they were suitable for installation. LCC paid the cost of hardware and installation directly to The Phoenix Works, so the employees did not get involved in the process or need to pay anything upfront.

During the trial, drivers were paid a flat fee of £3 for each night that they charged the vehicle. This was based on a 'worst case' scenario in which vehicles would be fully discharged before each recharge; in that case, the cost in electricity would still be below £3. Employees submitted claims and were paid weekly in arrears.

2.1.2 Evaluation and deployment

Evaluation of the trial found that the trial participants were positive about their experience with the vehicles and the home charging solution. There was no notable internal resistance within the Council; drivers and managers recognised that EVs were a key component of the transport solution for LCC's fleet. This is due in part to a parallel piece of work to get senior officials and Councillors bought into using EVs and supportive of their deployment within the fleet. Union representatives also endorsed the scheme based on the positive feedback from drivers.

LCC is preparing a wider roll-out of the scheme. The criteria for participation in this stage of the deployment state that employees must:

- Already drive a Council vehicle.
- Have off-street parking which they can use for the Council vehicle.
- Agree to have a chargepoint installed at their home.
- Provide evidence showing their current electricity tariff (pence per kWh).

LCC is currently undertaking a procurement exercise for various charging solutions, including this home charging scheme. When this evidence was collected, installations were scheduled to take place from 2019 onwards.

The significant change for the full scheme deployment compared to the pilot concerns the reimbursement mechanism for drivers' electricity consumption. The chargepoint software will be specified so that LCC can use a web-based portal to remotely monitor the energy consumption of each chargepoint. This is already a feature of the chargepoints installed by The Phoenix Works, and whoever provides network services for the full deployment will also be required to provide this service. The Phoenix Works charges LCC a fee of £100 per year for the use of the telemetry in the charger and the portal to monitor electricity use. Drivers will submit a utility bill or other proof of the rate they pay for electricity in pence per kWh. LCC will use the energy consumption data and cost information to accurately reimburse employees for the electricity used. Payments will be provided every four weeks in arrears.

The scheme proposes that the chargepoints would remain the property of LCC; this means they can be removed by the Council if an employee terminates employment or stops participating in the scheme for any reason. Drivers sign an agreement binding them to the key terms of the scheme; the driver agreement is provided in Appendix A: Leeds City Council Driver Agreement.

2.1.3 Next steps and remaining challenges

As part of its drive to roll out BEVs and home charging across the fleet, LCC is working to make BEVs the default vehicle type for new employees. As part of the interview process, potential new starters are asked whether they would be happy to drive an EV and have a domestic chargepoint installed.

LCC recognises that this scheme is not suitable for all vehicles, employees and duty cycles. There are three challenges which remain to be addressed:

- EVs are not provided to staff who don't have off-street parking. While various solutions such as lamppost chargers are in trial and early deployment stages, these are not considered suitable for widespread deployment.
- A small number of vehicles are shared between two or more operatives. These vehicles are considered outside the scope of the current home chargepoint scheme, as infrastructure would need to be installed at more than one property. LCC will need to assess how many such examples there are and what the costs and benefits are of installing additional chargepoints.
- While the increased range of the latest Nissan eNV200 has made deployment easier, the increased cost is placing additional pressure on Council budgets. There may be a need to acquire other vehicles such as the Renault Kangoo Z.E. which has a lower specification (e.g. no rapid charging capability) but offers a significant cost saving.

2.2 Transport for London

Transport for London (TfL) operates a diverse fleet of around 1,000 pool cars and vans. Vehicles operate from depots across the capital and are used to support a wide range of jobs including maintenance of public transport assets, lineside tree clearing and movement of lost property. Duty cycles are mixed, with vehicles either returning to base or being taken home by employees at the end of a shift.

TfL is working towards the aim set out in the Mayor's Transport Strategy for all cars to be zero emission capable by 2025 at the latest, and all newly purchased vans (below 3.5 tonnes) to be zero emission capable from 2025 onwards. It should be noted that the financial implications of the coronavirus pandemic mean that this target is currently under review.

The duty cycles of most vehicles, with relatively low daily mileages in an urban environment, is well suited to the adoption of plug-in vehicles. Access to charging infrastructure is their greatest challenge, with two use cases posing a particular difficulty:

- Depots where multiple vehicles would need to be charged at the same time and place, placing constraints on the available electricity supply.
- Vehicles which are already taken home by employees after a shift and therefore can't be charged at the depot.

TfL scoped out a home charging scheme, where chargepoints would be provided at employees' homes for use with operational cars and vans. The challenges identified by TfL's review were as follows:

- Vehicles are not allocated to a single named individual; each vehicle is typically shared between several employees at a department or depot. TfL was, therefore, unable to identify enough vehicles that are taken home by the same driver each night. They would need to install chargepoints at multiple homes for each vehicle, to cover all permutations of duty cycles and shift patterns.

- Many employees don't have off street parking and therefore would not be able to install a chargepoint for their sole use. Some drivers have on-street public infrastructure nearby, but there was no way to ensure that these chargepoints would be available when required.
- Concerns were raised about the capital cost of infrastructure. First, the total cost would be high because installations would be required at multiple properties for each vehicle. Second, it was unclear what would happen in the event of an employee leaving TfL. In this instance, TfL couldn't confirm that they would be able to recover costs or remove the chargepoint.
- TfL was unable to devise a suitable scheme for managing the cost of electricity consumption from the chargepoint. They were concerned that employees would need to pay the bill upfront and then reclaim back the cost. Drivers' representatives, including union officials, argued that employees should receive compensation for being 'out of pocket' in the period between paying the bill and being reimbursed by TfL.
- Issues were raised around liability and insurance costs in the event of a defective chargepoint or installation causing fire or other damages to a property.

TfL concluded that the drawbacks identified would outweigh any potential benefits, so at this time their proposed scheme has not been taken forward.

2.3 Centrica[2]

When Centrica Business began the process of electrifying its fleet of 14,000 vehicles – the third largest commercial fleet in the UK – the distributed energy and power company faced several challenges. As well as the significant hurdle of electrification of their own fleets, the company also planned to launch Centrica Electric Vehicle Services (CEVS) to help other businesses tackle the challenges of transitioning to the EV future.

Centrica Business sought a scalable, smart and user-friendly EV charging software to manage both of these tasks and after a procurement exercise, Driivz was selected.

All EV fleets need to be primed and ready to overcome general EV obstacles, such as the availability of chargers, cost of charging, ability to prioritize which cars are charged first and whether drivers can charge at home. The Driivz service provides Centrica Business' own fleet and those of its customers a self-service portal to manage their account, set up payment plans, and be directed to available Centrica chargepoints.

Centrica compensates drivers for home charging, using the Driivz billing system, and has also linked its Hive Active Heating smart product to offer a combined mobility and heating package to CEVS customers.

CEVS has been running since the beginning of 2019, with fleet drivers from Centrica Business and its customers being able to charge at home, at work and on the road, based on the Driivz charging solution.

The next steps for the project are to analyse and use data to futureproof against potential issues with energy supply and demand as customer demand grows. Centrica Business is also aiming to allow its customers to integrate their EV chargers with existing energy infrastructure to generate, store and manage their own power, plus access local energy management services.

2.4 British Gas

As part of its commitment to become a net zero organisation, British Gas, has committed electrify its 12,000 strong operational fleet by 2025, five years earlier than originally planned.

In addition to the 1,000 Vauxhall Vivaro-e vans purchased in 2020, British Gas has recently ordered an additional 2,000 models, representing the largest commercial EV order in the UK to date. All 3,000 electric vehicles will be on the road by 2022.

While engineers can volunteer to have the new vans during the rollout, the company is prioritising high pollution areas to help lower emissions, or where existing vans need replacing. The engineers will receive a charger installation at their homes, which will be managed as part of a home charging scheme. It is unknown whether this will use Centrica's Driivz solution or take advantage of its 2019 announcement of a partnership with Ford and Bord Gáis Energy that will allow Ford customers across the UK and Ireland to benefit from lower energy prices for overnight charging.

2.5 Mitie

In August 2020, Mitie Group selected Mina[3] for a trial to support the transition to an all-electric fleet, using Mina's software to manage, monitor and pay for electric vehicle charging at employees' homes. Mitie are currently trialling the Mina 'EV fuel card' system with a test group within their 500+ EV fleet.

[2] For further information, see https://driivz.com/
[3] For further information, see https://www.mina.energy/

Previously, Mitie had stated that a major barrier to mass EV adoption within their fleet was the management of home charging at employee houses. Mina's software integrates with existing chargepoints at employee homes and their home energy supplier to offer payment for energy consumed to charge the EV via an online dashboard. Mitie's fleet manager can also view the amount of energy used, which helps avoid the need for the expense forms previously used by employees to claim-back the energy used to charge their EVs.

In addition, drivers are able to input a personal/ business mile split into their driver portal, which is recorded using a separate tracking tool to help ensure that businesses only pay for business miles and likewise that employees don't end up paying for business mileage in their domestic energy bill.

It is expected that the fleets will save money by benefiting from drivers charging at home too, thanks to the low cost per kWh of domestic energy compared to public or business charging.

Cenex discussed with Mina's representatives about their solution and found out that they offer their platform services with a fee of 2p/kWh to 5p/kWh that is consumed depending on the vehicle volume.

3. Home Charging Scheme Recommendations

Home charging is likely to account for up to 80% of all charging done by EV drivers, including those who drive an EV for busines purposes. Therefore, this section gives an overview of the solutions available.

3.1 Charging powers

Most EV drivers have a choice of two options for charging at home either by installing a dedicated EV chargepoint or by using a standard 3 pin household plug.

Home chargepoints typically have a power rating of 3.7 kW or 7 kW, with the UK Government proposing a minimum 7kW chargepoint for residential buildings. Some early home installations are 3.6 kW chargepoints but today the majority of the installations are 7 kW. Expected increases in battery sizes and technology developments could make chargepoints less powerful than 7 kW obsolete for future car models, so these should be avoided.[4]

3.2 Connector types

Typically, charging units are wall-mounted and available either with a tethered Type 2 cable which can be plugged straight into the car or with a Type 2 socket for use with the vehicle's own charging cable.

Table 2 - Key facts on domestic chargepoint types

Charger Type	Charge Time	Connection Type	Miles of range added per hour of charging
Slow (AC) 2.3 – 3.7kW	0-100% in 10-12 hours	3-Pin Plug 	Up to 15 miles
Fast (AC) 7kW	0-100% in 4-6 hours	Type 2 (Mennekes) 	Up to 30 miles

3.3 Chargepoint providers

There are many models of domestic chargepoint available from several reputable manufacturers. Cenex interviewed a selection of hardware providers and network operators to get an industry-wide perspective on the potential for offering an employee home charging scheme.

All interviewees acknowledged that issues associated with charging multiple EVs at the same place and time (i.e. depot based) is becoming more common as vehicles reach mass adoption. They are increasingly

[4] https://www.gov.uk/government/consultations/electric-vehicle-chargepoints-in-residential-and-non-residential-buildings

developing solutions to mitigate this challenge, including smart charging, and giving customers better remote visibility and control of charging events.

Results of this qualitative data collection exercise suggest that there are hardware and software solutions available in the market to support a home charging scheme, with remote visibility of energy consumption and ability to reimburse drivers accurately for the electricity used.

The information below is taken from the interviews with a select group of companies. Cenex has not undertaken independent market research into the products and services described. However, all the chargepoint providers had products that supported employee home charging schemes and provided online visibility of energy use.

A summary of relevant experience is detailed by the manufacturers is provided in the table below.

Table 3 - Chargepoint manufacturer experience

Company	Hardware Provided	Provides Back-office?	Installation?
Alfen	Their own smart chargers	Any chargepoint management system	Sub-contracted
Chargemaster	Their own smart chargers	POLAR app	Sub-contracted
Chargepoint	Their own smart chargers	Chargepoint app and dashboard System automatically reimburses employees based on kWh use.	Sub-contracted
Electric Blue	Their own smart chargers	Electric Blue back office can be linked to vehicles' telematics systems to monitor mileage and energy consumption. This means there is no need for drivers to manually enter odometer readings	Sub-contracted
EO Charging	Their own smart chargers	EO Web Portal RFID cards can be used to differentiate between work and personal vehicles	Sub-contracted
The Phoenix Works	All types of manufacturers	The Phoenix Works portal – monthly flat fee of 10£/charger	They are primarily an installer
Ubitricity	Their own smart chargers	Ubitricity/Siemens back office	Sub-contracted

3.4 Vehicle Sharing

Some vehicles may be shared by employees so the overnight location may not always be the same. In these instances, it would need to be ensured that appropriate charging infrastructure is installed at all sites where the vehicle may be parked overnight.

3.5 Type of Parking

Ideally, employees would have off-street parking where a standard 7 kW chargepoint can be connected directly to their home electricity supply.

For those without off-street parking, various solutions such as lamppost chargers are in trial and early development stages but are not considered suitable for widespread deployment by an employer.

Alternatively, these employees could make use of public charging infrastructure, providing there is availability in proximity to where they live. However, this solution relies on these public chargepoints being available when required and relevant chargepoint access cards being provided. It is also likely to be a much more expensive mode of charging.

3.6 Reimbursement Mechanism

When charging at home there needs to be a method for reimbursing employees for the cost of the electricity that they have used. This requires a back-office system connected to the chargepoints with an associated web-based portal through which the relevant manager (e.g. fleet, energy, etc.) would be able to remotely monitor the energy consumption from charging events of all drivers. Some systems offer automatic reimbursement of employees based on tracked charging session data.

- For reimbursement, drivers usually have to submit proof of their electricity tariff. There is a risk that employees might claim for personal use, so procuring a robust system is important.
- Smart cables such as that developed by Ohme[5] or Ubitricity[6] can connect to an existing chargepoint and identify the vehicle being charged to record the energy use and allow accurate reimbursement. The smart cables feature an electricity meter and mobile power contract enabling fleet managers to monitor and report the cost of charging at fleet and individual vehicle level, calculate home charging expenses and view CO_2 emissions and savings.
- There are hardware and software solutions (Mina[7], Chargepoint[8]) available in the market to support a home charging scheme, with remote visibility of energy consumption and ability to reimburse drivers accurately for the electricity used. The idea behind these solutions is that employees' chargepoints are integrated in a platform and the software operator is linked directly to their energy suppliers. All the drivers need to do is plug in and the employer gets a single invoice for all energy used.

3.7 Providing home chargepoints to employees

3.7.1 Grant schemes

The installation of home chargepoints is incentivised by Government funding under the Electric Vehicle Homecharge Scheme (EVHS) [9] administered by The Office for Zero Emission Vehicles (OZEV). The EVHS scheme provides funding for 75% of the total cost of the purchase and installation (up to a maximum threshold) of a chargepoint providing AC power between 3.5 – 22 kW.

From the 1st April 2020, the maximum eligible grant amount was reduced from £500 to £350 to enable a greater number of installations to be funded under the scheme[10]. Contributions will cover no more than 75% of the cost of a chargepoint and its installation, and grants will only be available for those that have the unit fully-installed by an OZEV-accredited installer. It has been confirmed that the scheme will continue to run until at least 31st March 2021 to continue to support the UK's transition to electric vehicles.

Individuals assigned a company vehicle or who are named by their employer as the primary user of an eligible EV for at least six months are eligible for the grant. The EVHS allows for third party contributions so the cost of charger and installation could be covered by NWLDC in this way.

Table 4 - Overview of EVHS grant

Domestic chargepoint funding			
Electric Vehicle Homecharge Scheme	1 point per eligible vehicle	75% Maximum grant	£350 (Incl. VAT)

3.7.2 Taxation implications

According to the Income Tax Earnings and Pensions Act 2003 s149(4), electricity is not treated as a transport fuel.[11] As a result, no benefit in kind tax arises if an employer:

- Pays to charge a pure-electric company vehicle;
- Pays for a chargepoint to be installed at the employee's home to charge the company vehicle; or
- Pays for a charge card to allow individuals access to commercial or local authority charging points

3.8 Ensuring installation "readiness"

It is recommended that NWLDC engage with an appropriate chargepoint installer and insist that initial surveys of properties are completed to assess whether any upgrades may be required and the likely costs in advance of rollout.

The installation must be undertaken by an OZEV approved chargepoint installer. Installers will advertise if they are an approved installer, and OZEV also maintains a list[12]. Note that installers must also be approved by the

[5] https://www.ohme-ev.com/
[6] https://www.ubitricity.com/en/mobilecharging-system-2/
[7] https://www.mina.energy/fleet-solutions/
[8] https://www.chargepoint.com/files/brochures/br-fleet.pdf
[9] https://www.gov.uk/government/publications/customer-guidance-electric-vehicle-homecharge-scheme
[10] https://www.gov.uk/government/news/update-on-the-infrastructure-grants-schemes
[11] https://www.gov.uk/government/publications/advisory-fuel-rates/advisory-fuel-rates-from-1-march-2016
[12] https://www.gov.uk/government/publications/electric-vehicle-homecharge-scheme-approved-chargepoint-model-list

chargepoint manufacturer to install their product. This helps to provide additional confidence that the installer has the necessary product knowledge to be able to deliver a good quality and compliant installation.

In summary, the key responsibilities for the customer and installer are listed below (note that OZEV is currently reforming the EVHS claim process with the intention of reducing the administrative effort and time for grant funds to be released, so the below responsibilities are subject to change):

- Provide evidence of the vehicle ownership or order details.
    - Note that the chargepoint can be installed up to 4 months ahead of the date of delivery or start date of usage of the vehicle.
    - The customer guidance gives details of the acceptable proof that the customer is the vehicle's registered keeper or has ordered the vehicle.
    - If the vehicle is a company car, then the customer is responsible for obtaining proof that they are/will be the primary user for the minimum period of 6 months from their employer. A template form is provided in the OZEV customer guidance document.
- Provide any necessary information to the installer concerning the property electrical system and parking arrangement.
    - This may remove the need for the installer to do a survey prior to performing the installation and can help to reduce the cost to the customer.
    - The exact process will vary by installer.
- Provide details of the installation address and contact information for the primary user.
- Make a declaration to allow the installer to claim the EVHS grant for their installation.
- Provide approval that the installation costs are as agreed with the installer.
    - It is acceptable for a third party, such as an employer such as NWLDC, to contribute to the cost of the chargepoint installation.
    - In this case the customer must verify the source and amount of this contribution(s).

Installer responsibilities:

- Complete the chargepoint installation ensuring compliance with BS 7671 and the IET Code of Practice for Electric Vehicle Charging Installations.
- Provide a breakdown of installation costs to the customer and for the grant claim.
    - A template for this is again provided in the installer and customer guidance documents.
- Declare that the installation has been completed and is compliant with the terms laid out by OZEV for the EVHS grant.
- Complete an Electrical Installation Certificate (EIC) as per BS 7671 and Building Regulations compliance certificate for the installation.
- Provide the installation evidence required by OZEV – at the time of writing this is a photo of the installed chargepoint serial number and the property off-street parking.
- Notify the relevant Distribution Network Operator (DNO) of the installation works.

If NWLDC are interested in installing chargepoints at employees' homes, then all the above responsibilities for the employee as the end customer remain valid. However, the employer can assist by developing a relationship with the installer to start the process. A professional installer will then guide the customer through the process. The employer may wish to give additional guidance to their employees including assistance with completing the necessary claim forms and evidence, in particular concerning the details of the company vehicle for which the chargepoint is being provided.

Note that if the employer wishes to make a contribution to the cost of the chargepoint, it may be necessary to get a quote from the installer for the installation, to first understand the remaining costs that will not be covered by the grant fund as this may vary with installation address, even if the chargepoint hardware being installed is the same.

The supply and installation of a home chargepoint which is approved by OZEV and hence eligible for grant funding typically costs in the region of £400 to £1200. The variation in cost is mostly dependent on the chargepoint model selected. More expensive models will offer additional functions and features such as:

- Solar power compatibility.
- Timing functions.
- Mobile app integration
- Load management devices.
- More aesthetic designs or reduced size.
- Customisable options and colours.

The table below shows a breakdown of typical home chargepoint hardware and installation costs:

Table 5 - Typical hardware and installation costs

Cost Element	Typical Cost Range (£)
Chargepoint unit cost	250 – 800
Other electrical equipment costs (including cabling, switchgear, distribution equipment)	50 – 150
Other eligible costs (such as site surveys)	0 – 100
Labour costs	100 – 300

The cost of hardware is only guidelines and subject to change. The cost of installing a chargepoint depends very much on the individual situation such as whether an energy supply exists and has enough capacity or needs upgrade, how far the installation is from a suitable energy supply and what surface the chargepoint is to be mounted. These may be factors which will impact whether a particular home is selected for home charging.

3.9 Liability for home chargepoints

Cenex recommends that NWLDC only pay for damages to home chargepoints due to general wear and tear and not due to misuse.

NWLDC should encourage employees and train them in proper use of chargepoint equipment to avoid any damages due to misuse (e.g. not dropping the cable, not leaving the cable uncoiled etc). The chargepoint provider may issue such guidelines themselves.

If the installed home chargepoint remains property of NWLDC, this means they can be removed if an employee terminates employment, moves to a new property or stops participating in the scheme for any reason.

4. Recommendations

NWLDC face similar challenges to LCC and other organisations around providing enough charging infrastructure to support widescale BEV uptake.

It is therefore recommend that NWLDC plan, deliver and evaluate a trial of home EV charging for their operational fleet. This section proposes a methodology for such a trial based on the information gathered from stakeholders involved in this research. It also explains how to transition from a trial into a wider deployment phase, assuming the trial is successful.

4.1 Plan the Trial

4.1.1 Consider an industry partner

Chargepoint providers may be enthusiastic to support a home chargepoint scheme trial since they recognise the need to demonstrate that their products and services can support fleets with mass adoption of EVs.

There may also be potential for private sector funding for the trial including provision of hardware. Working with an industry partner could potentially leverage funding to reduce the cost of running a trial. We recommend contacting more than one potential supplier to compare proposals.

NWLDC may wish to involve Cenex in a privately funded trial, to ensure data monitoring is robust and impartial.

4.1.2 Scale and duration

Decide how many vehicles and drivers should be involved. A trial with 10 – 50 employees, as undertaken by LCC, should be enough to generate plenty of data and driver feedback, and identify any potential challenges.

The trial should be run for several months to allow any initial problems to be addressed and for drivers to get fully accustomed to the technology. The intention should be for the scheme to continue through the vehicle lifecycle, with an evaluation after six months.

4.1.3 Select hardware and back office system

7 kW wall-mounted chargepoints are best suited to this type of charging. Slower (3 kW) chargers are available but would mean vehicles would need to be plugged in for around 12 hours to receive a full charge. This means charging could not be scheduled to take advantage of cheap electricity tariffs.

As mentioned before, OZEV administers a grant scheme which offers up to 75% off the total capital costs of qualifying chargepoints and associated installation costs (capped at £300 including VAT).All home chargepoints funded by this grant must use innovative 'smart' technology from July 2019. This means chargepoints must be able to be remotely accessed, and capable of receiving, interpreting, and reacting to a signal. This is a helpful piece of legislation for home charging as it means all of the offerings on the market have the capability to report their consumption for billing and monitoring purposes.

Specify a back-office system which supports remote monitoring of energy consumption and shows when charging events take place. It is vital to have a remote web portal to track electricity consumption to ensure compliance, ensuring drivers are not overclaiming or not being fully reimbursed. Some systems offer automatic reimbursement of employees based on tracked charging session data. We recommend specifying this as 'desirable' rather than 'essential', as it may restrict your procurement to a small number of suppliers. Likewise, consider specifying the ability to remotely control and schedule charging.

NWLDC will need to determine the best route for procuring hardware and installation services. Ideally there will be a framework in place which can be used for purchasing 7 kW wall-mounted chargepoints. However, if an industry partner has been appointed for a private sector funded trial, they may supply hardware directly, without the need to undertake a competitive procurement exercise.

As outlined in Section 2, many of the suppliers Cenex contacted provide the necessary remote visibility of energy consumption.

4.1.4 Reimbursement mechanism

The trial should consider how to automate the process of reimbursement to reduce driver and fleet administration.

Reimbursements can either be provided as a flat fee per charging event, as in the LCC trial, or an accurate reimbursement using energy consumption data, as per the full LCC deployment. The former is easier to administrate and provides a small incentive to drivers to take part. Our understanding, based on LCC's experience, is that there would be no tax implications if the vehicle is not driven to the same place of work each day, and the employee can't use the chargepoint for their own vehicle. This mechanism is somewhat similar to paying Approved Mileage Allowance Payments (AMAP rates) to grey fleet drivers, which are provided irrespective of exact fuel consumption. However, we strongly recommend seeking verification from your tax office to ensure compliance with the relevant legislations.

While the flat fee approach is straightforward and could be used to get a trial set up, we recommend using accurate reimbursement when deploying at-scale. As shown in Section 3.6, hardware and software are available to facilitate this approach, and it provides clarity and fairness to drivers and NWLDC.

It is worth mentioning that many electricity suppliers are starting to offer tariffs specifically targeted at EV drivers which charge higher electricity price tariffs at peak times and lower tariffs at off-peak times. In the case of the employer offering a fixed fee for EV use, the employee would be able to maximise their benefit by switching to an EV energy tariff if they wanted. However, as we recommend that employers reimburse for actual EV energy consumption, this will go in the employer's favour, but the employee may lose out as they have a high day time tariff. More information about EV tariffs can be found at Appendix B: EV Tariffs.

4.1.5 Monitoring and evaluation

Define the criteria that will be used to evaluate the trial and the methods for data collection. This should include quantitative data such as energy consumption and cost, as well as qualitative feedback from drivers and department managers. Feedback could be gathered via email, internal meetings, or workshops.

4.1.6 Stakeholder engagement

Once NWLDC have planned the trial, the next step is to secure support from key internal stakeholders. One of the features underpinning LCC's success was the positive feedback received about the trial from operational departments, drivers, senior managers, and Unions. Undertake a stakeholder engagement exercise as early as possible to achieve buy-in across and at all levels of the organisation. Ideally, identify a senior manager to act as sponsor for this project. Meet with managers from operational departments and union representatives to explain the purpose of the trial and what is involved.

Key points to note are:

- The trial is voluntary, so no drivers are being forced to change their working practices or have a chargepoint installed.
- Drivers will benefit from having an EV to use for commuting to and from work: vehicles are quiet, comfortable and easy to drive.
- Facilitating widespread EV deployment is a key part of achieving the objectives of the Go Ultra Low programme.
- Deployment of home charging will save the council money by avoiding the need to fund expensive network upgrades at the depot.

4.2 Select participants

Survey drivers to determine who is eligible and gather expressions of interest. At a minimum, drivers will need to have off-street parking and have a vehicle which is allocated solely for their use. NWLDC may wish to set other criteria for participation but be mindful that additional criteria will reduce the pool for potentially eligible drivers. Assuming no other criteria are imposed, drivers can be categorised into three groups:

- Group 1: Have off-street parking, an assigned vehicle, and are willing to participate.
- Group 2: Have off-street parking, an assigned vehicle, but have reservations about participating.
- Group 3: Either don't have off-street parking or share a vehicle with another employee.

Drivers from group one, plus drivers who already have an allocated EV, should be taken forward for participation in the trial. Until the survey has been undertaken, it is not possible to say how many employees will be in this group. The list of drivers and assigned vehicles will need to be cross-referenced against the fleet review to identify cases where a vehicle is due for replacement. Identify a cohort of around ten vehicles and employees that meet these criteria. These individuals will need to sign an agreement, including agreeing to provide structured feedback.

4.2.1 Launch the trial and evaluate

Once underway, the trial should run for several months before carrying out a formal evaluation. Interim evaluation of driver and manager experiences and monitoring of energy consumption data is recommended to ensure any potential problems can be rectified during the trial. After six months, evaluate the trial using the criteria identified. Check that vehicles have been able to meet operational needs and that any concerns from departmental managers, drivers and/or union representatives are collated and addressed.

The business case for EVs should be updated with a 'home charging scheme business case' to include cost of electricity from employees' homes, any additional commuting mileage of the vehicles, cost of hardware and support. This can be compared to the current diesel vehicle business case to evidence the cost saving available.

Communicate findings throughout the organisation and, assuming the pilot was successful, secure funding for wider deployment.

4.2.2 Wider deployment

Wider roll-out of the scheme should be undertaken until all the drivers in group one (see 4.2) have an EV and a home chargepoint. At the same time, any new employees that have off-street parking should be provided with an EV as a default, with a home chargepoint installed. Their interest and eligibility for participating in the scheme can be assessed during the recruitment process.

Drivers in group two (those who met the criteria but were unwilling to participate in the survey) may change their views once a successful pilot has been undertaken. Survey these individuals again to assess appetite for involvement in the scheme.

4.2.3 Further considerations

Drivers in group three, with either no off-street parking or without an assigned vehicle, are a more challenging cohort for a home charging scheme.

- For drivers without off-street parking, local authorities can apply for OZEV funding to help with the costs of procuring and installing on-street chargepoints for residential use. Applicants need to secure a minimum of 25% of capital funds via sources other than OZEV funding. Note that chargepoints must be accessible to local residents, rather than for the sole use of NWLDC employees, so this is likely to only be an option if there is a back-up chargepoint nearby.
- NWLDC will need to undertake further analysis to determine whether it is viable to provide chargepoints to support vehicles which are shared by two or more employees. It may be possible for

two drivers to share an EV with only one of them having access to a chargepoint. This could potentially work if the vehicle has a high range, covers short daily distances, and one staff member takes the vehicle home more often than the other.

5. Conclusions

This report has reviewed the contrasting approaches and outcomes at LCC, TfL and other examples, with a successful trial and deployment in the first, and a decision not to pursue a home charging scheme after challenges with the second. Operationally, there are differences between those two fleets which partly account for the different outcomes. For example, TfL has a substantial number of vehicles which are shared between more than one employee, and fewer drivers with access to off-street parking. These conditions make offering a home charging solution more challenging. It is likely that the NWLDC operations are more like LCC than TfL and would therefore be well suited to a home charging scheme.

A second key difference between LCC and TfL is the ownership of this activity by an individual with the ability to drive it forward and secure buy-in across and at all levels of the organisation. If NWLDC can follow this approach, and bring departmental managers, senior managers and Unions on board, we see no reason why they should not be able to implement a home charging scheme themselves.

Currently more and more fleets offer a home charging scheme for operational vehicles. Chargepoint operators already provide software to facilitate this approach, for example with remote visibility of energy consumption. This is likely to develop further, for example with automated reimbursement and increased scheduling of charging events. From our review of the market we conclude that the systems currently available are already able to support the type of home charging scheme proposed here.

To achieve their ambition to run a zero emission fleet, NWLDC will need to implement innovative measures to provide their fleet with enough supporting charging infrastructure. Installing chargepoints at drivers' homes, while challenging, would overcome the barriers around constraints and unlock the potential for fleet BEV deployment.

We recommend NWLDC proceed with a home charging trial as outlined in this report.

6. Appendix A: Leeds City Council Driver Agreement

6.1.1 Introduction

This document constitutes an agreement between you and Leeds City Council which sets out the terms and conditions of the home charging of the electric van that you use in the course of your work.

6.1.2 The Charge Unit

- You agree for the charging unit to be installed in a suitable position in your property to allow charging of the vehicle within your boundary and off the road.
- The charging unit will remain the property of Leeds City Council.
- You will be responsible for ensuring that the charge unit is used correctly, and you will follow any guidance provided on the use and maintenance of the charge unit.
- Any problems with the device should be immediately reported to Fleet Services who will carry out any necessary repairs.
- The charge unit be made available at all times for the LCC fleet vehicle and its charging requirements.
- If the charge unit is deliberately damaged or misused, then this will become a conduct issue and be dealt with under the Council's disciplinary procedures.
- Use of the charge unit is there to be used at the employee's discretion. However, only works for the fleet vehicle charge will be reimbursed as per the agreement.

6.1.3 Length of Agreement

The charging unit will remain on site for the length of the vehicle's life cycle (6 years) or until the agreement is terminated by either party.

6.1.4 Charging Costs and Payment

Your electricity usage will be recorded by the charging unit which will be accessible via a web portal by yourself, the council and the company operating the charging unit. A monthly summary of the electricity used will be sent by the company to Business Support Services who will check this against expected usage. This sum will then be included in your monthly pay.

6.1.5 Driver Responsibility

By signing this agreement, you agree to maintain the charger in good order and keep the electric vehicle charged to suit your needs.

6.1.6 Termination of the Agreement

You may terminate this agreement by informing your line manager in writing that you no longer want to participate in the scheme.

Leeds City Council may terminate this agreement for any one or more of the following reasons:

- Ending the pilot agreement.
- Due to outcome of any disciplinary procedures.
- The ending of your employment with Leeds City Council.

On termination of the agreement for any reason Leeds City Council will attend at your property to remove the chargepoint and make good.

Writing termination within the 3 months.

By signing this agreement, I confirm I have read, understood, and agree to the above terms and conditions.

Signature	
Name	
Job Title	
Date	

……

Signature	
Name	
Line Manager	
Date	

7. Appendix B: EV Tariffs

Previously, the only way to save money on electric vehicle charging was by making use of the Economy 7 or Economy 10 tariffs, charging overnight when electricity was cheapest. However, some suppliers are now introducing targeted electric vehicle tariffs (EV tariffs).

With no EV tariff in place, for a typical electric car with 60kWh battery and around 200-mile range, charging your car at home from empty to full will cost about £7.80 on an average tariff. With an EV tariff or an Economy tariff giving cheaper overnight electricity, combined with intelligent charging control, you could halve this cost. This means it's important that EV owners consider switching to a focused EV tariff to keep costs down.

Further details of currently available EV tariffs are provided in the table below.

Table 6 - EV Home Energy Tariffs (as per Sep '20)

Supplier	Tariff Name	Cost	Other benefits
British Gas	Electric Drivers Nov 2021	Standard: 20p/kWh Off-peak: 4.7p/kWh	• Free smart meter installation, if you haven't got one already • For dual fuel, smart meter customers • 5 hours of lower priced electricity 00:00-05:00 every day (35 hours per week)
Ecotricity	Green Electricity + EV	Standard: 16.54p/kWh Off-peak: 10.31p/kWh	• 1/2 price Electric Highway charging • Discounted home chargepoint
EDF Energy	GoElectric Nov21	Standard: 12.75p/kWh Off-peak: 8p/kWh Peak: 19.9p/kWh	• 5,000 free miles when you also lease an electric vehicle through EDF • Save up to £210 on the single rate version (No Smart meter required) • Half-Price off-peak charging 21:00-07:00 Mon-Fri, and all day Sat-Sun (with a compatible smart meter)
E.On	Fix and Drive v9	Standard: 17.81p/kWh Off-peak: 10.9p/kWh Peak: 20.67p/kWh	• 850 free EV mile reward equivalent to £30 • Carbon offset gas • Cheaper overnight charging 00:30-07:30 every day (49 hours per week)
Good Energy	EV Driver 4	Standard: 16.27p/kWh Off-peak: 12.2p/kWh Peak: 16.34p/kWh	• Standard, Economy 7 & Economy 10 available • Three tariffs depending on meter set-up
Octopus Energy	Octopus Go	Off-peak: 5p/kWh Peak: 13.33p/kWh	• 50% cheaper than typical Economy 7 night time rate • Smart friendly API: Automatically charge when it's cheapest with a smart charger or cable • Upgrade to 100% carbon offset gas with Supergreen Octopus • 4 hours off-peak electricity 00:30-04:30 every day (28 hours per week)

Table 7 - EV Home Energy Tariffs (as per Sep '20) – Con't

Supplier	Tariff Name	Cost	Other benefits
OVO Energy	EV Everywhere	Standard: 15.89p/kWh Off-peak: 10.33p/kWh Peak: 17.78p/kWh	• Polar Plus membership • 2 Year Fixed Energy plan • 7 hours off-peak electricity, typically 00:00-07:00 every day (49 hours per week)
Tonik	Home & Smart EV	Standard: 10p/kWh Off-peak: 4.17p/kWh	• Charge your EV with 8,000 miles for only £80 • Two rate meter or compatible smart meter • Get a Zappi installed by us and receive £100 reward credit on selected tariffs, inc our EV tariff • 7 hours of cheaper overnight energy, every day (49 hours per week

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NORTH WEST LEICESTERSHIRE DISTRICT COUNCIL

CORPORATE SCRUTINY COMMITTEE – WEDNESDAY, 1 SEPTEMBER 2021.

Title of Report	**2021/ 22 QUARTER 1 PERFORMANCE REPORT**	
Presented by	Mike Murphy Head of Human Resources and Organisation Development	
Background Papers	Various documents on the In-Phase performance management system.	**Public Report:** Yes
Financial Implications	As detailed in the report.	
	Signed off by the Section 151 Officer: Yes	
Legal Implications	None identified	
	Signed off by the Deputy Monitoring Officer: Yes	
Staffing and Corporate Implications	As detailed in the report	
	Signed off by the Head of Paid Service: Yes	
Purpose of Report	The report provides members of the Cabinet with information on the performance and progress made against the Council Delivery Plan actions and performance indicators for Quarter 1 (April – June 2021)	
Recommendations	**THAT THE CORPORATE SCRUTINY COMMITTEE NOTES THE QUARTER 1 PERFORMANCE REPORT AND PROVIDES COMMENTS FOR CONSIDERATION BY CABINET AT ITS MEETING ON 21 SEPTEMBER 2021.**	

1. INTRODUCTION

1.1 This report provides an update of the Councils key objectives and performance indicators for the period April to June 2021. Performance is managed at a strategic, service, operational and individual level. This report provides information measured against the Council Delivery Plan agreed in November 2020. Members of the Corporate Scrutiny Committee will be aware that a new Council Delivery Plan was considered at this Committees last meeting in June 2021, and the plan was agreed by Cabinet in July 2021. However, the updated plan has not yet been approved by full Council according to the Constitution, so we have not been able to measure against that plan at this stage. The Quarter 2 report will be measured against the new plan if adopted by Council later in September 2021.

1.2 At a strategic level, Members and the Corporate Leadership team need to ensure that services are provided meeting the needs of the community, both now and in the future. Members and the leadership team also need to ensure that there are appropriate and meaningful measures underpinning our vision and objectives so that they can be assured that we are making good progress towards our vision, priorities and objectives published in our Council Delivery Plan. Much of the Councils regular work and objectives was impacted by the COVID-19 pandemic during 2020 and 2021, but as restrictions have been lifted during recent months many of our activities are starting to return to normal operation.

1.3 The quarterly performance reports seek to recognise good performance, share best practice across the organisation and also to identify 'performance gaps' highlighting if and where action is required to meet targets. Once these gaps are identified, time bound intervention plans will be created or adapted to improve performance towards the target. This will be part of a continual cycle of review and action.

2. SUMMARY OF PERFORMANCE QUARTER 1.

2.1 This report sets out the performance and progress against the Council Delivery Plan - priority actions, performance indicators, Health and Safety, Customer services, and sickness absence management.

2.2 A report on the progress made against the Council Delivery Plan at the end of Q1 is included in Appendix 1. In summary of the 32 actions in the Council Delivery Plan 17 had been achieved, good progress was made with 2 of the actions and 9 have not been progressed at this stage. (4 are on hold due to Covid-19 or annual target).

2.3 The following notable achievements in the first quarter of 2021/22 were: -

2.4 Supporting Coalville to be a more vibrant, family friendly town

- A levelling up bid for Coalville has been submitted which if successful will significantly move forward regeneration in the town. Progress is also being made towards implementing a number of other projects.
- Contracts for the Marlborough Square redevelopment will be tendered during quarter 2 and 3 of 2021/22.
- During quarter 1 we have delivered an open-air gallery of artworks in Coalville designed to attract new visitors to the town centre.
- The existing market has traded successfully in line with the various pandemic lockdown criteria and virtual sessions were delivered before the end of the year to support the various traders' business plans and some face-to-face sessions will be implemented when restrictions allow. 22 new traders have joined us at the market during the past year selling a variety of products ranging from homemade foodstuff, artisan gifts, fashion, and accessories. Traders have commented on the vibrancy of the market and the support provided from the team.
- An opening date of the new indoor market in Marlborough Square is targeting early September 2021.
- We have continued to work with developers to ensure housing developments, notably in Money Hill, Ashby de la Zouch, Park Lane Castle Donington and at Standard Hill and Cropston Drive Coalville, accord with the Councils high aspirations for design quality.
- Options are being developed for the decommissioned Hermitage Leisure Centre in close consultation with residents, community groups, sports clubs, children and young people and other interested stakeholders. The options appraisals will be presented to the Community Scrutiny Committee and Cabinet later in 2021.

2.5 **Our communities are safe, healthy, and connected.**

- Significant progress continues to be made on the construction of the new Leisure Centre in Coalville/Whitwick in accordance with the contract programme with completion due in July 2022.
- In conjunction with our partner Everyone Active, the new outdoor pool offering was promoted as "Ashby by the sea", the centre has been relaunched as "Ashby Leisure Centre and Lido" with a taster open day and outreach events.
- We continued to make excellent progress in the availability of digital services across our service areas with 13K of digital forms created during the quarter and nearly 2,000 additional on-line accounts created.
- The integrated neighbourhood team have been undertaking research in the key areas of the Obesity strategy and have identified Healthy Weight, Mental Health, Palliative care and COVID-19 recovery as the priority areas where partners can best assist. An action plan will be developed for 2022/23
- The projects led by our community partners at Measham Leisure Centre and Ibstock Leisure complex continue to progress.
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- The final stage of the public consultation on the Hugglescote and Donington-le-heath Neighbourhood plan was hosted during the quarter and the plan progressed to Examination, and work continues to seek to develop Neighbourhood plans in other areas of the district.

2.6 **Local people live in High quality, affordable homes**

- Planning permission has been secured for the build of new Council homes at a site in Moira and a decision is anticipated early in Q2 for a site in Measham. Subject to the planning decisions, construction work will then be able to commence on sites later in the year. Offers have been accepted for section 106 units on three sites delivering a total of an additional 16 homes. The majority of these are expected to complete in 2021/22
- All major housing schemes approved during the quarter have scored positively against the building for life criteria and the Councils Good Design Supplementary Planning Document (SPD).
- Our upgrade programme to improve tenants' homes continued to be affected by the COVID-19 restrictions where a primary consideration was the safety of tenants and staff when working in people's homes. Despite the restrictions £384,000 value of work was completed, and the programme is anticipated to increase significantly during future quarters. The backlog of work from the previous financial year caused by the various COVID impacts is being remodelled and rescheduled wherever possible.
- The estate improvement programme has restarted with external improvement schemes in Ashby and Castle Donington completed in the period.
- A new Housing asset management strategy is being updated for the Councils Housing Stock which will focus on the completion of essential compliance works with estate improvements commencing later in the financial year

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2.7 **Support for businesses and helping people into jobs**

- The key focus of Economic Development work in the quarter has been to continue to support business recovery during the COVID-19 pandemic. This has included virtual jobs fairs, business support and advice and grant funding opportunities.
- We continue to work with our Leisure partner Everyone Active and the construction contractor "Metnor" to engage local companies in supply chains to support the construction and delivery of the new Whitwick and Coalville Leisure Centre.
- While the COVID-19 pandemic impacted our ability to complete our programme of food hygiene inspections in the district, we have focussed our attention on working with businesses to help them with their reopening plans to ensure COVID regulations and safe methods of working were in place for their employees and customers.
- Business Enquiries have increased by over 100% since 2019. We are working with several large companies to support relocation to the district.
  We are delivering a programme of initiatives to improve high street vibrancy using "Welcome Back" Funds provided by the government.
- To June 2021 the Council had issued 565 Restart Grants to eligible local businesses totalling in excess of £4m

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- Through the Access to Work Partnership we are continuing to support the new Airway 9 scheme which provides transport connections between the employers at East Midland Airport and SEGRO through Melbourne, Ashby de la Zouch, and Burton.

2.8 **Developing a clean and green district**

- Our recycling rate for 2019/20 increased by 1.3% to 46.3%, which was supported by our Recycle More campaign which included weekly food waste collections for 2,000 households, the introduction of battery and mobile phone recycling at the kerbside and a recycling trolley trial for 250 residents.
- We are working with the National Forest to develop a Heart of the Forest masterplan; a first draft was prepared during the quarter and was circulated to partners.
- A total of 365 Air source heat pumps have been installed in tenants' homes and overall tenant satisfaction remains high.
- Electric charging points have been installed in our car parks in Castle Donington, Thringstone and Whitwick. Feasibility studies are being undertaken at other sites in the district.
- We have commenced a review of employee travel and allowances to help deliver our Zero Carbon ambitions in future years.
- As part of the Council properties home improvement programme, we have updated boilers and central heating systems and several properties have been identified for loft and cavity wall insulation improvements.

3.0 Performance Indicators

3.1 The use of both qualitative and quantitative measures (indicators) to supplement the delivery of actions in the Council Delivery plan provides a picture of how we are performing against the expected outcomes. Progress against the Council's key indicators is detailed under each group of actions.with explanations of the progress against each of the key tasks identified for quarter 1. The overall performance against the indicators was significantly impacted by the COVID-19 pandemic - 14 were on target, 5 were within a 5% variance of the target and 9 were not achieved. The report also details the performance indicators, along with explanations where the targets have been missed. Members will see that many of the Councils activities have been significantly impacted by the COVID-19 pandemic.

Policies and other considerations, as appropriate	
Council Priorities:	This report documents the progress against all of the priorities in the Council delivery plan as agreed by Council in November 2020.
Policy Considerations:	The actions cut across a number of policy areas – developing Coalville and wider regeneration

	considerations, Community support, post COVID-19 recovery and our climate agenda are some examples.
Safeguarding:	No specific considerations.
Equalities/Diversity:	No direct impacts
Customer Impact:	Detailed in the report.
Economic and Social Impact:	Detailed in the report
Environment and Climate Change:	Detailed in the report
Consultation/Community Engagement:	Not applicable
Risks:	As detailed in the corporate risk register.
Officer Contact	Bev Smith Chief Executive bev.smith@nwleicestershire.gov.uk Mike Murphy Head of Human Resources and Organisation Development mike.murphy@nwleicestershire.gov.uk

Supporting Coalville to be a more vibrant, family friendly town

Our aims

Coalville is a vibrant town – Local people choose to spend their time and money in Coalville town centre – Coalville is a good place to do business

Key tasks 2021/22	Quarter 1 Performance
Commence delivery of the Coalville Regeneration Framework to enhance the town centre	Through the preparation of a Levelling Up Fund bid for Coalville several plans and drawings illustrating how the retail core of the town is proposed to be regenerated have been produced. Further illustrations demonstrating proposals for other regeneration areas around the town are being commissioned and these will build to form the Regeneration Framework. Reports that seek approval to begin implementing regeneration projects in the town are proposed to be taken to Cabinet throughout Q2 and Q3 2021/22
Seek external funding, including the new national Future High Streets Fund to support town centre regeneration, and recovery post COVID19	An external funding bid has been submitted to the Government's new Levelling Up fund. NWLDC bid to the national Welcome Back Fund was successful.

Seek a cinema operator for Coalville	An application for government funding for an arts and skills Lyceum which includes auditoria for showing films has been submitted. Occupiers and operators have been identified.
Deliver a community events programme, where appropriate in line with the current COVID19 guidance	We have delivered three events over a period of 54 days attracting over 6000 visitors to the town centre, the events included a Drive in Cinema, open-air gallery of artworks and traditional funfair.
Start the implementation of Marlborough Square redevelopment	The Marlborough Square project construction contract will be tendered during Q2 and Q3 2021/22.
Complete the new indoor market on Marlborough Square	An opening date is being targeted at early September, several leases and licences have been issued but not yet signed/returned.
Work with partners to make the most of our heritage to bolster the town's identity and sense of place	The Many Faces of Palitoy project (a National Lottery Heritage Fund and council fund project) continues as Covid restrictions are relaxed, work with communities and schools commences. Our partnership working with Snibston Colliery Park includes the installation of a selection of artworks from the open-air gallery on Oliver's Walk and promotion of Coalville Celebrates Snibston.

Provide grants to at least ten businesses in Coalville to improve the fronts of their buildings, creating a better street scene	As part of the Coalville Frontage Improvement Scheme, In Quarter 4 of 2020/21 one new frontage improvement was completed Work is ongoing for the remaining 5 potential frontage improvement projects in Coalville town centre.
Consider how the Councils accommodation and property ownership can assist with the delivery of regeneration and reduce environmental impacts	The Council has engaged with potential suppliers to provide quotation for an energy efficiency / carbon evaluation and opportunities, arising from the existing estate. Once taken forward, the recommendations will form the basis of a programme of upgrade works.
Continue to provide support and funding for Coalville Market traders to grow their business	Several leases and licences have been issued but not yet signed/returned. Significant support has been provided to the market traders in the existing building and a vibrant feeling has developed amongst the traders and staff at the hall. The market officer operates an open-door policy and is available to traders to deal with any queries and offer one to one support. A monthly newsletter is circulated to all traders and regular meetings will be conducted when Covid19 restrictions permit. The market has traded successfully in line with the various pandemic lockdown criteria. Some virtual sessions were delivered before the end of this year to support the various traders' business plans and some face-to-face sessions will be implemented when restrictions allow. 22 new traders have joined us at the market during the past year selling a variety of products ranging from homemade foodstuff, artisan gifts, fashion, and

	accessories. Traders have commented on the vibrancy of the market and the support provided from the team.
Begin priority projects in the Regeneration Framework for Coalville	Reports that seek approval to begin implementing regeneration projects in the town are proposed to be taken to Cabinet throughout Q2 and Q3 2021/22.
Enable and initiate new developments and public realm projects, supporting the district's high aspirations for design quality	Officers continue to work closely with developers to ensure that major housing developments permitted by the Council accord with detailed master plans and design codes that support the districts 82 high aspirations for design quality. Examples include decisions made on planning applications at south east Coalville and on-going work to ensure the housing developments at Money Hill, Ashby, Park Lane, Castle Donington, Standard Hill Coalville, and the Councils own housing development at Cropston Drive, Coalville are of the highest standard of design possible.
Support the redevelopment of key housing sites in Coalville	A planning application has been submitted for the redevelopment for housing on the Wolsey Road regeneration site in Coalville supported by NWL.
Work with the Belvoir Shopping Centre to make it a more attractive destination and reduce the number of vacant shops	We are delivering a programme of initiatives designed to improve high street vibrancy using Welcome Back Funds provided by Government. During Q2 we plan to carry out enhanced street cleaning, a programme of street entertainers and introduction of a local retailing loyalty card.

Ensure that links to the new leisure centre are maximised focusing on Hermitage Recreation Ground and the future of the leisure centre building	V4 Services have been engaged to support officers in developing options to create more of a visitor destination at Hermitage Recreation Ground that links to the new Whitwick and Coalville Leisure Centre and to the building currently housing Hermitage Leisure Centre. Options are also being developed for the decommissioned Hermitage Leisure Centre. All options are being developed in response to previous consultation undertaken with residents, community groups, sports clubs and children and young people. Options are due to be presented for consideration after the summer with members via Community Scrutiny and stakeholders including Whitwick Parish Council which will be fully engaged prior to them being refined into a final version that will be presented to Cabinet for approval later this year.

Performance Indicators - Supporting Coalville to be a more vibrant, family friendly town

Coalville is a vibrant town – Local people choose to spend their time and money in Coalville town centre
Coalville is a good place to do business

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Number of people attending Coalville events organised	6000	9000	▲	Several Coalville Events have been held during Q1. Events during Q2-Q4 expected to deliver remaining outputs.
Number of events delivered in Coalville	3	2	★	Three events were delivered in Q1: April – Drive in Cinema (five days attracting 750 people) May/June – Coalville Outdoor Gallery (39 days engaging over 2500 people) May/June – Coalville May Fair (10 days attracting over 3000 people)
Number of visitors/tourists spending is increased by 2% across the District	N/K	2%	N/A	With High Streets still under Covid Restrictions during Q1 it has not been appropriate to collect this information.
Shop vacancy rates in the Belvoir Centre are more positive than the national average	13.7%	9.8%	▲	In July 2021 the High Street Retail Vacancy Rate in Coalville stood at 13.7% (28 vacant units) down tom 14% (29 vacant units) recorded in April 2021.

Our communities are safe, healthy, and connected

Our aims

Put our customer sat the heart of all we do – Increase connectivity (physically and virtually) throughout our communities – Support safer neighbourhoods

Key tasks 2021/22	Quarter 1 Performance
Ensure that our communities recover from the impacts of COVID19, including the continued delivery of the 'hub' for our shielded and vulnerable residents	The Hub continues to support vulnerable residents by signposting them to alternative support services for shopping, Test and Trace information, financial advice, or a combination of all three. In quarter 1, the Hub took on 49 new cases, processed 35 Covid Winter Grants, referred 20 clients for food parcels and supported 5 with getting financial advice. As the Hub is due to cease at the end of September, focus is very much on implementing an exit strategy and ensuring adequate referral mechanisms are in place to continue to support vulnerable residents. For example, long term cases are signposted to partner providers such as Morrison's Doorstep Delivery for shopping, Age UK or Enrych for befriending calls, and The Red Cross for prescription pick-ups, whilst clients with more complex support needs are referred to First Contact Plus. The exit strategy was supported with Contain funding and £1,800 has been allocated to partners to support residents with food and essential shopping requirements with a view to integrating them back into doing their own shopping. 11 residents have benefitted from this service. Similarly, the

	Marlene Reid Centre was supported with almost £3,000 of Contain funding to establish a Social Supermarket initiative which allows residents access to low-cost food and essential items rather than having to go to a foodbank. As part of the exit strategy, the Hub team has also organically reduced in size from 5 to 2 by the end of July. As well as supporting the Hub, the team have also supported other council services such as Housing, Finance, Waste, and Environmental Protection with Covid related activities.
Develop and deploy an 'agile' working policy and approach	The hybrid working model has been agreed by CLT following the consultations. Managers are now considering how this will be implemented in their teams with a view to commencement in September 2021.
Make sure our customers can interact with us in a way which meets their needs, improving our services, promoting self-serve and digital options as well as providing face-to-face support compliant with COVID19 guidance	Digital Services continue to be a key focus for the Authority with more forms being made available for the public and in house services to provide efficiency. In the past quarter, 13,210 digital forms were created with 1,956 online accounts being created. Face to Face services resumed with an appointment basis in May 2021 and customers have been coming back in to use these services, with digital still the preferred method of communication alongside traditional contact methods through phone and email.

	In the future, we will continue to drive the efficiency with digital in Q2 and Q3 with the Housing system going live this year providing self-service options around rent and repair management, further digital forms for all customers, and testing of blended media options in the call centre, prioritising emails alongside phone calls to provide efficiencies.
We intend to work with our partners to deliver the proposed Obesity Strategy for Leicestershire and support the Leicestershire Weight Management service by providing physical activity for their clients as part of the integrated Health and Wellbeing Strategy	Data research has been undertaken by the Integrated Neighbourhood team to understand the key issues in North West Leicestershire that all partners can help to impact on positively. The priorities that have provisionally been identified are. • Healthy weight • Mental health • Palliative care • Covid recovery Mapping exercises are now being undertaken to understand current service provision, from which areas for improvement will be identified and a Healthy Communities Action Plan will be developed. It is anticipated that the action plan will be in place for 2022/23.
Work with our leisure partner to start the construction of the new Whitwick and Coalville Leisure Centre	Work on the new Whitwick and Coalville Leisure Centre continues to progress very well on site and is in accordance with the contract programme with completion still due in July 2022.

	Alongside this, various interventions and innovations have been introduced at both Ashby and Hermitage Leisure Centres. These include. • The introduction of cross site fitness memberships • Fitness memberships reduced to £29.99 and no signing on fee. • New outdoor pool offering through 'Ashby by the Sea'. • Taster open day at Ashby Leisure Centre and Lido (31 activities) as part of the re-launch under the new name. • Outreach events such as the Ashby Open Day on 3rd July. Over 100 contacts and expressions of interest received. • Outsourced the Holiday Activity programme Whilst usage levels are still lower than would be expected at this time of the year due to the Covid restrictions that have been in place during Q1, both fitness membership and swimming lesson levels are performing well at Ashby Leisure Centre and Lido are on course to match pre-Covid levels by the end of the year.
Working with local schools, parish councils and leisure centres, improve the community leisure facilities in Castle Donington and at Ibstock and Measham Leisure Centres	The projects led by our community partners at Measham Leisure Centre and Ibstock Leisure Complex continue to progress. Building of the new fitness room at Ibstock will commence in April and, whilst work can't commence at Measham until later in the year due to the site being used as a vaccination centre, the project is still being refined and value engineered in preparation. Community access to the grass

	pitches at Castle Donington College is likely to commence in September. In addition, a consultant has been procured to undertake a pre-feasibility assessment on having a full sized 3G pitch on the school site which, if applicable, will be used to try and secure funding from the Football Foundation. As well as that, the school have submitted a Strategic School Improvement Fund (SIF) bid to enhance the fitness room development to include changing rooms, a studio and meeting/teaching space. The outcome of these bids will determine how the fitness room development will be progressed as it will impact on potential locations and the infrastructure requirements.
Develop our tourism offer to encourage inward investment, dwell time and connecting visitor attractions	During Q1 we have delivered an open-air gallery of artworks in Coalville designed to attract new visitors to the town centre.
Encourage and support town and parish councils to write and prepare their own Neighbourhood Plans (NP)	During Q1 the Planning Policy Team hosted the final stage of public consultation on the Hugglescote & Donington le Heath Neighbourhood Plan and arranged the Examination into the Plan. The team also confirmed the designation of the Lockington cum Hemington neighbourhood plan area and continued to support the preparation of 4 further NPs in the district.
Adopt the partial review of the Local Plan	Local plan Partial Review adopted at Council on 16 March 2021.

Develop a network of locations for mobile CCTV	Three mobile CCTV cameras will be installed at Castle Donington in Q2. The exact locations are still to be determined but will be located at hotspots in the area as part of the safer streets' initiative. Work with both Ibstock and Measham on possible mobile units is also under way.
Stabilise and reduce, if possible, our sickness absence levels through a combination of measures in our People Plan	The sickness absence levels were above target during the quarter. More information is detailed in the Appendix to this report.
Work towards increasing participation levels at Coalville and Ashby Leisure Centres by 58% by 2026	See response to "Work with our Leisure partner to start the construction of the new Whitwick and Coalville Leisure Centre"
Achieve accreditation from the Surveillance Camera Commissioner for our CCTV system	The new control room in the council offices is now fully complete and operational and places the service in a strong position to achieve this target in 2021/22.

Performance Indicators - Our communities are safe, healthy, and connected

Put our customer sat the heart of all we do – Increase connectivity (physically and virtually) throughout our communities
Support safer neighbourhoods

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Number of online accounts	34,999 (cumulative)	22,500 (annual)	★	Digital Services continue to be a key focus for the Authority with more forms being made available for the public and in house services to provide efficiency. In the past quarter, 13,210 digital forms were created with 1,956 online accounts being created. Face to Face services resumed with an appointment basis in May 2021 and customers have been coming back in to use these services, with digital still the preferred method of communication alongside traditional contact methods through phone and email. In the future, we will continue to drive the efficiency with digital in Q2 and Q3 with the Housing system going live this year providing self-service options around rent and repair management, further digital forms for all customers, and testing of blended media options in the call centre, prioritising emails alongside phone calls to provide efficiencies.
Number of online forms submitted (transactions)	13,210	1875	★	

Percentage of customer satisfaction (Customer Services)		N/A		92%		N/A		This is an annual indicator so no performance figures will be available until March 2022.
Percentage of high risk ASB cases recorded and actioned within 48 hours		All		100%		★		All High risk cases are logged are actioned within 48hours (100%) Please note that High risk cases are rare, and we only have small numbers.

Local People live in high quality, affordable homes

Our aims

Increase the number of affordable homes in the district
Improve the quality of our council housing – Improve the quality of private rented accommodation

Key tasks 2021-22	Quarter 1 Performance
Get planning permission and start building new council homes in Whitwick and Measham and pursue other sites where viable	Planning permission has been secured for 2 units at Cedar Grove, Moira and a decision is anticipated early in Q2 for 7 units at Queensway in Measham. Once the Measham permission is secured we will tender for a contractor on both sites for construction work to commence on site later in this financial year. Offers have been accepted for section 106 units on three sites delivering a total of an additional 16 homes. The majority of these are expected to complete in 2021/22.
Ensure residential development takes place on brownfield sites in Moira and Measham	Planning decision is pending for Measham site, and the scope of work to the Moira site has been revised, requiring additional feasibility work prior to bringing forward a proposal later this financial year.
Ensure all new housing in the district meets the standards of the NWLDC Good Design Guide.	All major housing schemes approved in Quarter 1 have scored positively against building for life criteria and the Councils Good Design SPD.

Invest up to £5 million to upgrade tenants' homes and their neighbourhoods	Q1 continued to be affected by Covid 19 restrictions on working practices, particularly relating to internal working, to ensure we kept our staff and tenants safe. Despite these restrictions a total of £384K work was completed in Q1, and plans developed to increase the level of investment as restrictions are lifted later in the year. Plans to complete all the deferred work from 2020/21 continues to be modelled, with the current proposal being to complete this over the next 2 years by integrating it into the ongoing programme for completion by the Inhouse Repairs Team (IRT) who are completing all other improvement work. This is being kept under ongoing review as the Covid safe working practice environment changes and affects our ability to forecast the amount of work we can complete.
Alter tenants' homes where there is an assessed medical need, by spending up to £300,000 on level access showers, stair lifts and other aids and adaptations	The need for aids and adaptations are assessed by Occupational Therapists (OTs) or Trusted Assessors before a referral is made to the council. Due to Covid-19, the OTs/Trusted Assessors have been continuing to focus on end of life/hospital discharges rather than standard requests. This has resulted in a reduction in the number of referrals received and we are working with LCC colleagues to understand how we can assist with their backlog. Completion of works has continued where approved during Q1.
Invest £770,000 in estate improvements including off-street parking, improvements to footpaths and roads and mobility scooter stores	The estate improvement programme has been largely on hold due to Covid-19 reduced resources. However, external car parking improvement schemes in Ashby and Castle Donington were completed in Q1 providing much needed additional parking capacity for residents at a cost of £350k. Following the successful appointment of a new Housing Assets Team

	Manager who started in Q1, a root and branch review of the investment programme is being completed. This will lead to the production of a new asset management strategy for the Councils Housing Stock. Current investment activity is focussing on the completion of essential compliance works as a priority, and estate improvements will be commenced later in the financial year.
Carry out proactive, targeted enforcement so all eligible landlords have a Houses in Multiple Occupation (HMO) License	The team have been working proactively and several actions have been carried out this year including: • Following up unlicensed HMOs to ensure compliance • Communicate with agents reminding them of the requirements for HMOs • Reviewed the Kegworth HMO campaign and identified the next target area as Ellistown Further work in respect of rolling out the campaign and continuing to follow up unlicensed HMOs will build on this work in 2021/22
Commence delivery of the redevelopment of Appleby Magna Caravan Park	Planning permission has been successfully obtained for works to the caravan site, and a contractor appointed following a process that included site resident involvement. Start on site is forecast for later in Q2 after the completion of detailed design with completion in Q3,
Provide at least 15 new council homes through new build or by acquiring through agreements with developers and market purchase	Planning Permission has been obtained for two new homes in Moira and is currently waited for a further 7 homes at Measham and 15 homes in Whitwick, making a total new build programme of 24. Once Planning Permission is obtained, we will procure development contractors to build the properties, with start on site expected to be later in the financial year. The Whitwick proposal has been delayed slightly as it has been redesigned

	to achieve an EPC A rating for energy efficiency as an exemplar scheme.
Maximise the number of private empty properties that are brought back into use	Due to Covid-19 restrictions on face-to-face meetings, limiting travel and internal visits, this has resulted in a delay in the progression of some casework. This will be reinstated in 2021/22 including more formal action on several properties.
Selectively buy back long-term empty properties	Opportunities to buy back properties previously sold under the Right to Buy (RTB) continue to be evaluated as we are notified of them by sellers, with criteria established to assess each property. No acquisitions were undertaken in Q1.
Work with local housing associations to supply 300 new affordable homes	This is a three-year rolling target to allow for the often-uneven delivery profile of the affordable housing programme. 24 units have been delivered in quarter one with the forecast for the rest of the year predicting to exceed the target. Q2 is forecast to see the completion of the 60-unit Springfield Extra Care scheme in Ashby which will account for half the annual target alone.
Invest up to £14 million to improve council homes	The HRA capital programme provides funding for a range of works to improve tenant's homes and estates. Overall spend against this budget to the end of quarter one was £598,000. The key elements of this budget are: • The Home Improvement Programme, £384,000 spent, which includes 'Decent Homes' improvement work to tenant's homes, which are now being completed by our In-house Repairs Team (IRT). • £108,000 was spent on parking improvements. • £55,000 on improving empty properties before they are relet • £51,000 on major aids and adaptations

Performance indicators - Local People live in high quality, affordable homes

Increase the number of affordable homes in the district – Improve the quality of our council housing
Improve the quality of private rented accommodation

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Percentage of major residential development schemes scoring / performing positively	100%	90%	★	All major housing schemes approved in Quarter 1 have scored positively against building for life criteria and the Councils Good Design SPD.
Percentage of major planning applications determined within 13 weeks	100%	75%	★	100% of major planning applications have been determined within 13 weeks which is comfortably above the specified target.
Percentage of minor planning applications determined within 8 weeks	88.7%	80%	★	88.7% of minor planning applications have been determined within 8 weeks which is above the specified target.
Percentage of other planning applications determined within 8 weeks	95.3%	85%	★	95.3% of other planning applications have been determined within 8 weeks which is above the specified target.
Percentage of all repairs completed within target	97.2%	97%	★	Although performance has just exceeded target, Covid mitigations to ensure the safety of our staff and tenants continued to impact

								performance. Consequently, 2 out of the 4 repairs priorities, that make up this measure are below target performance. Whilst we have concentrated our resources to meet our core repairing obligations and fulfil promises made to tenants, prolonged covid mitigations together with sustained number of staff self-isolations will continue to challenge the team in to Q2.
Average length of time taken to re-let a Council property when it becomes vacant		25		22				During Q1, 60 properties have been let in an average of 25 days each. This is an improvement of 6 days over the Q1 position last year, although performance continues to be impacted by Covid 19 related changes to working arrangements.

Support for businesses and helping people into local jobs

Our aims

Match local people with skills and jobs – Support new and growing businesses to create jobs – Help young people into work

Key tasks 2021-22	Quarter 1 Performance
Working in partnership with the National Forest Company, carry out an options appraisal for Moira Furnace as part of an application for Resilient Heritage funding to the Heritage Lottery Fund	An options appraisal for Moira Furnace has been completed. A business plan based upon the recommended option is to be developed during 2021/22
Provide targeted support for local business who may be impacted by HS2	There have been no further updates or engagement business engagement activity regarding the proposed HS2 route in quarter 4.
Deliver the aspirations of the North West Leicestershire Economic Growth Plan 2019-21	The aspirations of the 2019-21 Growth Plan met. The council's Growth Plan is currently being updated.

Working with our new leisure partner, increase local employment, training, and apprenticeship opportunities with a key focus on local supply chains in the construction of the new Whitwick and Coalville Leisure Centre	Works to ensure maximum social value is achieved because of the delivery of the leisure centre are ongoing with all key parties engaging well in the process. Metnor Construction, the contractor responsible for the project on site, is actively engaging with the council to track social value performance and to help identify other opportunities to create jobs and increase local spend.
Work with food establishments to further reduce the number that have a hygiene rating of 0, 1 or 2	The pandemic has had a significant impact on our ability to complete our programme of food hygiene inspections at food establishments within the district. During the various stages of the pandemic many food businesses have not been trading and food inspectors have been redeployed to carry out Covid-19 compliance work. During periods of the year when trading was permitted, we have been working with businesses on their reopening plans to ensure that their new ways of working are safe for their staff and the customers. In summary we were able to complete approximately 30% of the planned food inspection programme. The number of food businesses rated 0, 1 or 2 fell from 20 to 16 between 1 April 2020 and 31 March 2021.
Ensure that we minimise the negative impacts and maximise the positive of COVID19 on our business community	We have successfully rolled out an economic recovery plan designed to support aid our businesses to respond to the impact of Covid 19. Up to 28 June 2021 the Council have issued 565 Restart Grants to eligible local businesses totalling £4,114,711.

	In addition, the council have awarded 7 Growth Grants to eligible local businesses totalling £288,887 up to 28 June 2021. A further 15 Growth Grants will be made in Quarter two totalling a further £567,035 of grant payments
Play our part in readying our businesses for the effects of BREXIT	The Economic Development team continued to offer 1-to-1 support, communicate the latest information on the new rules on trading with the EU, identifying support options available through local partnerships including LLEP, Chamber of Commerce & UK Government including the SME Brexit Fund.
Encouraging the public to support local businesses as part of our recovery from COVID19	We are delivering a programme of initiatives designed to improve high street vibrancy using Welcome Back Funds provided by Government. During Q2 we plan to carry out enhanced street cleaning, a programme of street entertainers and introduction of a local retailing loyalty card.
Maintain 12 apprentice placements each year	The number of apprentices had fallen to 5 at the end of the quarter, a number have gained employment with the Council or with other employers, and we have 3 new starters scheduled to start during Q2 and we are actively recruiting to the vacancies.
Provide a £250,000 programme of grant funding and business support	The final two grant payments from the Councils Enterprising 3 Business Grants programme were paid to applicants Sew Essential in Moira and The Priory Health Club in Breedon. In total the programme provided over £170,000 of grants to 14 growing local business creating an estimated £1.25million of private sector investment and creating over 70 new local jobs.

	In addition to the Councils Enterprising grant fund, Council officers continue to support local business with over £2.4million of Covid support Additional Restrictions Grant funding.
Promote North West Leicestershire as a key location for business growth and support £1 million of new business investment and 4,000 new jobs	We continue to work with businesses seeking to locate on the district's major distribution sites E.G. SEGRO.
Work with partners and public transport providers to enhance transport connectivity so local people can access new job opportunities throughout the district	Through the Access to Work Partnership, the Economic Development Team are continuing to support the new Airway 9 bus service providing public transport connections between the employers at East Midlands Airport and SEGRO through Melbourne, Ashby, Swadlincote and Burton. Despite a reduction in patronage on the service due the pandemic, passenger numbers have seen a steady climb throughout quarter 1 moving into quarter 2. It is anticipated that patronage figures will achieve pre-Covid figures by the end of Q2. Further promotional activity with key employers and job seekers to showcase the Airway 9 service will take place in Q2 to coincide with the relaxing of restrictions on movement and increasing consumer confidence to use public transport.
Work with three schools / colleges and local businesses on skills development with a focus on career advice	Due to Covid restrictions no interactions have taken place with local schools in Q1. It is anticipated that these engagement activities will recommence in the new school year.

Provide face-to-face business and environmental health advice to 20 growing businesses each year	This work-stream has not been delivered because of pandemic restrictions. This process has now recommenced in 2021-22.
Work closely with Kegworth Parish Council and other partners to engage the public and businesses and deliver a scheme that focuses on improving the village's infrastructure, stimulating economic growth and supporting businesses.	Work continues and first construction activity is expected in Q3.

Performance indicators - Support for businesses and helping people into local jobs

Match local people with skills and jobs – Support new and growing businesses to create jobs – Help young people into local work

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Number of jobs in the tourism sector is increased in the District	0%	3.8%	▲	Evidenced by external statistics information and comparisons. *note - figure reduced by 59% from Dec 2019 due to Covid- 19.

Number of food businesses improving hygiene standards		39		11		★		The pandemic has had a significant impact on our ability to complete our programme of food hygiene inspections at food establishments within the district. During the various stages of the pandemic many food businesses have not been trading and food inspectors have been redeployed to carry out Covid-19 compliance work. In summary we were able to complete approximately 30% of the planned food inspection programme. The number of food businesses rated 0, 1 or 2 (poor compliance) fell from 20 to 16 between 1 April 2020 and 31 March 2021. The number of businesses achieving a very good rating of 5 increased from 574 to 609.
Number of business enquires received and supported		86 new business enquires from a total of 108 enquiries in Q1.		25		★		There have been an increased number of business support enquires in Q1 due to Coronavirus impact on local businesses.
Value of Coalville shop fronts grant awards		Nil		£40,000		●		No additional grant awards were made in Q1. Design work is still ongoing for Alison's Café, Fast Cash, Bolstridge and Metro Stores.
Number of businesses supported - Market Towns business support programme		34		20		★		Working with the Leicestershire Growth Hub, the Council delivered a programme of digital training for high street businesses. The training

								launched in April and delivered 6 sessions until June. 34 local businesses drawn predominantly from the high streets of Coalville and Ashby participated in the free to access Digital Growth training programme, helping them to create, expand and revitalise the digital side of their businesses. The sessions cover websites, social media, online advertising, and search optimisation. To underpin the digital training, the Council have also launched a closed grants programme so that the businesses taking part in the training are also able to apply for grants of up to £1,000 to support them in putting the digital training into action and for support towards accessing some tailored 1:1 support. To date 3 grant awards of £1,000 have been made.

Developing a clean and green district

Our aims

Lead by example by reducing our own carbon footprint – Reduce littering and fly tipping – Promote the work of the National Forest

Key tasks 2021-22	Quarter 1 Performance
Increase recycling rates by at least 1% every year through our Recycle more… campaign	In April 2021, Defra confirmed the district's household recycling rate for 2019/20 had increased by 1.3% to 46.3%, partly supported by Recycle more which included a weekly food waste collection trial for 2,000 households, the introduction of battery and mobile phone recycling at the kerbside and a recycling trolley trial for 250 residents.
Continue our Free Tree Scheme	We had planned to deliver the scheme in November 2020 but deferred it to February 2021 but with lockdown three we have taken the decision to relaunch the scheme in November 2021. Our partners The National Forest Company are on board with this decision and the nursery trees will simply remain planted until they are needed later this year.
Support towns and villages to develop an identity associated with the National Forest	We have continued to work with the National Forest to develop the Heart of The Forest masterplan. A first draft has been circulated to partners for comment by the National Forest. Wider consultation is due to commence in Q2. We have supported Timber 2021 (a three-day camping festival in the Heart of the National Forest – music, forest, arts and ideas through a sponsorship agreement, the event is able to

	proceed this year in line with Covid regulations and is scheduled to take place on 2, 3 and 4 July to a sold-out audience.
Support private householders to improve the energy efficiency of their homes and help those in greatest need to access Government grants for affordable warmth	Year to date we had a promotion of the LCC Warm Homes Scheme in August including Updating the information our Customer Services Team have available to them and the information on Council webpages. We also sent out information through a range of forums including our Community Focus Team for distribution to Community Group contacts, the Landlord Forum and Landlord support group contacts. Information also distributed among key internal contacts.
Complete the installation of air source heat pumps in council homes and assess tenant satisfaction	A total of 365 Air Source Heat Pumps have been installed in tenants' homes through this programme and overall satisfaction has been high. The next step in increasing the number of ASHP heating systems is being taken through our Green Homes Grant programme of works, which we see an additional 56 homes fitted with these heating systems with works due for completion by the end of Q2.
Undertake feasibility studies for 4 EV charging points across the district	Electric vehicle charging points have been installed in NWLDC car parks in Clapgun St at Castle Donington, The Green at Thringstone and Vicarage St at Whitwick, supported by funding from the Office of Zero Emission Vehicles, OZEV. Feasibility studies have been undertaken at Coalville and an installation has been approved for Margaret Street car park, again with funding support from OZEV. This is planned for Q3. Electric vehicle charging points have been installed at Lindon Way depot to support electric vehicle trials.

Continue the delivery of our Zero Carbon Roadmap	We have installed electric vehicle charging points in our council car parks in Whitwick, Thringstone, Castle Donington and we are undertaking feasibility studies in Coalville. We are undertaking a fleet strategy review to inform and influence our vehicle replacement strategy. Housing is rolling out a home improvement programme to improve energy efficiency of some of our housing stock with the support of Green Home Grant funding. Leisure Services has commissioned a cycling & walking strategy. Planning is reviewing our Local Plan and considering climate change impacts, including renewable energy, and building standards.
Review our employee travel and allowances to help deliver the Zero Carbon Roadmap	A report has been considered by the Corporate Leadership Team. Consultations with trade unions will commence during Q2.
Support the Litter Strategy for England through our partnership working within the Roadside Litter Working Group	A taskforce has been set up and has met on several occasions. To date the taskforce has: • Reviewed the litter picking procedure and implemented new methods for communities to request litter picking equipment and litter picking waste collections • Distributed over £5,000 of kit from the allocated budget for litter picking equipment to parish councils and individual litter pickers • Refreshed the litter picking volunteer guidance and reissued • Held 6 campaigns which resulted in 16 littering cases being investigated and 10 FPNS being issues • Issuing 2 FPNs for fly tipping • Held educational talks with workers at Tulips, Coalville to advise them not to drop cigarette ends during breaks.

	Monitoring at this site will continue to check for compliance The taskforce is currently drafting a zero-litter campaign document that will be presented to Scrutiny and Cabinet later this year.
Work in partnership with local haulage companies to tackle layby litter	This was not possible due to Covid-19 restrictions and will be embraced within a new action in 2021/22 entitled “Litter taskforce”.
Achieve 50% recycling rates by 2023	In April 2021, Defra confirmed the district’s household recycling rate for 2019/20 had increased by 1.3% to 46.3%, partly supported by Recycle more which included a weekly food waste collection trial for 2,000 households, the introduction of battery and mobile phone recycling at the kerbside and a recycling trolley trial for 250 residents.
Reduce carbon emissions at the new Whitwick and Coalville Leisure Centre and Ashby Leisure Centre by 20% by 2024	In progress with Everyone Active and adaptations to Hood Park as well as the replacement of Hermitage with the new leisure centre.
Replace lighting in NWLDC buildings with LED lighting to reduce energy consumption	Due to Covid-19 and the impact on available resources, the planned improvements to sheltered housing schemes was placed on hold. The improvements will see the communal lighting changed to LED sensor lighting to reduce energy consumption.
Reduce vehicle emissions from licensed Hackney Carriage and Private Hire vehicles	This policy has been deferred until September 2021.

Help 250 fuel poor households to receive funding for loft and cavity wall insulation and replacement boilers	As part of the Home Improvement Programme for 2020/21, 40 properties benefitted from new boilers and a further 6 had full central heating replacements. A further 76 properties have been identified for loft and cavity wall insulation though a free scheme being led by E-on. This work was placed on hold in December due to local restrictions introduced due to Covid-19 resulting in the work being delayed until 2021/22. Also, in 2021/22 56 more properties have been identified for a variety of improvements under the Green Homes Grant (GHG) scheme which could include insulation, including External Wall Insulation, PV Panels, Air-Source Heat Pumps. Both the E-on and GHG scheme are subject to an eligibility criterion which includes the property needs to have an Energy Performance Certificate rating of below D and be able to achieve a C. There is also a household income threshold for the GHG scheme.

Performance Indicators - Developing a clean and green district

Lead by example by reducing our own carbon footprint – Reduce littering and fly tipping – Promote the work of the National Forest

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Number of trees delivered to the local community to expand the district's National Forest area	0	13,000	▲	The agreement with the National Forest Company has been signed and a target of 10,000 trees has been agreed in principle so we are able to manage demand safety when it comes to collection day. If we can extend that to 13,000 then we will. Residents will be able to apply for their free trees in September/October 2021 with the collection date in November 2021.
Percentage of fly tipping in district is reduced by 3% over the year	112.7% (Increase)	3% (reduction)	▲	Due to multiple reports of the same fly tip over 50% of these cases where in fact duplicates. There was also huge increase in waste being left by volunteer litter pickers, these were also logged as fly tips leading to this misrepresenting increase. Moving forward, a new system has been introduced for the volunteer litter pickers which enables them to log their waste collections separately to fly tipping reports and a new process is in development which will dramatically reduce the number of duplicated cases being logged.

Percentage increase on yearly recycling rate by 1%	1.3% for 2019/20	1%	▲	*Please note this is the recycling rate for 2019/20 confirmed by Defra in April 2021. The recycling rate for 2020/21 will be confirmed by Defra in December 2021.
Amount in kgs of household waste sent to landfill per house, per year	130.45Kgs	125kgs	●	Based on actual domestic waste tonnages for April and May 2021 as the tonnages for June are not yet finalised. Household waste levels are still relatively high as people continue to work from home due to Covid-19, generating additional waste in a residential setting.

Value for Money

It is our ethos to manage our budgets carefully and sensibly. This allows us to provide excellent value for money in our services; investing in key schemes and infrastructure that make a real difference in our communities, whilst balancing the books and planning for the future.

Performance Indicator 2021-22	Actual	Target	RAG	Commentary
Amount of income generation from the sale of Legal Services	£21,275 for Q1	£11,000 per month £33,000 per quarter	★	Although this figure remains below target, it is a significant increase on the equivalent quarter last year when we generated £8,641. This demonstrates that we are on track with our recovery from the effects of COVID and team vacancies. The new monthly billing processes have now been implemented along with our new marketing strategy, which

								we hope will enable us to bring in more external work.
Percentage of rent loss		N/A		0.75%		▲		The amount of rent loss for Q1 reflects an increase in the total number of properties that have become empty in 2021/22, which is 76 compared to 62 for the same period last year. Covid restrictions have continued ito influence performance due to restrictions in the number of operatives conducting repairs in a property at any time, and increased flexibility needed for tenancy start dates.
Amount of spend on agency workers is reduced to £1m in 20/21		N/A		£250,000.00		N/A		The spend level on agency workers is still high because of the impacts of COVID-19 and isolation requirements in the workforce. No specific target has been set for the 21/22 financial year, but we will be continuing to seek to reduce our reliance on agency workers.
Percentage of Council Tax Collected (in year target)		28.4%		28.2%		★		Performance may be impacted this year due to arrears that are being pursued. Last year due to COVID-19 restrictions prevented cases being progressed to liability order hearings
Percentage of National Non-Domestic Rates (in year target)		29.0%		25.9%		★		In June retail discount awarded was adjusted as this had changed from 100% to 66% for period July to March. Additional charge raised and resulted in payments becoming due from July

Number of days taken to process new claims	15.0	19 days		The speed of processing new claims has been impacted by having a backlog as we moved into the new financial year. The assessment staff have also been dealing with a significant increase in the number of claims for Test and Trace support payment and alerts from the DWP arising from the ever-increasing number of households in receipt of Universal Credit.
Percentage of rent collected from commercial tenants	98%	98%		We have achieved the % rent target from commercial tenants.
Percentage of commercial units occupied per annum	89%	90%		Virtually met target, shortfall was due to suspending considering further leases in Whitwick Business Centre whilst the accommodation programme was put in place.
Amount of annual income achieved by the In-house Repairs Team at least £5.2 million	£946,000	£1,300,000		The annual income is based on the approved budget for all work undertaken by the in-house team which did not take account of disruptions to service or mitigations that reduced productivity due to the Covid Pandemic. Both of those factors continued in to Q1. In addition, the actual sum expended also does include over £300k of work that

				was completed towards the end of the quarter that had not reached the stage in the system that would include this as accrual. If it has this would have increased the expenditure to £1,246,000. Options are being progressed to accelerate expenditure during the remaining part of the year now that Covid risk mitigations have eased

Performance Indicator 2021/22	Actual	Target	RAG	Commentary
Number of targets achieved	17	32 (*29)	★	(* 3x N/A due to covid-19 regulations or annual target)
Number of targets within 5% variance of target (10% financial)	2	0	●	
Number of targets Not achieved	9	0	▲	**Awaiting 1 return**

Sickness Report Q1 2021-22

1.1 In Q1 (2021/22) there were 1352 FTE days lost due to sickness. This equates to 2.65 days lost per full time equivalent employee (FTE). The rate of sickness in the corresponding period, in 2020/21, was significantly lower (by 806 FTE days). This was due to the Covid-19 measures taken by the council at the onset of the pandemic. In Q1 last year there were 67 clinically vulnerable members of staff who were unable to work for part or all of the quarter; a further 31 employees were quarantined in this period due covid-19 related symptoms, as well as 11 employees who were under shielding measures.

1.2 Projecting ahead, based on Q1 results, the annual absence rate will be 10.6 days lost per FTE against a corporate target of 8.0 days. Absence due to Covid-19 is not included in the sickness figures unless the employee tests positive or become unwell after receiving a vaccination. This approach is in line with National Joint Council guidance.

1.3 Community Services (4.30 days/FTE), Housing (2.49 days/FTE) and Planning and Regeneration (2.07 days/FTE) were the work areas with the highest levels of sickness in this Quarter.

1.4 Almost all sickness in Community Services (80%) and Housing (67%) was the result of long-term sickness. Long term sickness is defined as any period of sickness lasting 10 days or more.

1.5 The teams with the highest levels of sickness include, Waste Services, which amounted to over 50% of all sickness, followed by Repairs and Investment (17%) and Environmental Protection (11%). The most common reasons for sickness in Waste Services was Stress, accounting for over a third of all sickness, followed by Covid19 related sickness (22%), Musculoskeletal (17%). Repairs and Investment also experienced high prevalence of absence due to stress – 44% of the sickness in the team was as result of work-related stress and 23% personal stress.

1.6 Across the organisation stress accounted for 39% of all sickness (22% personal stress and 17% work related) - this was the most common reasons for sickness. Musculoskeletal (18%) and Covid19 related sickness (15%) were the other most common reasons.

1.7 The table below illustrates total sickness as a percentage by reason:

Sickness reason	Percentage of sickness by reason
Stress - depression - anxiety - psychological (non-work related)	21.78%
Back pain - sprain - strain - musculo- skeletal	17.95%
Stress - depression - anxiety - psychological (work related)	17.30%
Covid 19 – Vaccination side effect	8.32%
Operation / Post Op	6.48%
Covid 19 - Positive Test	6.34%
Stomach - bowel - gastric – intestinal	6.14%
Headache - migraine – neurological	2.88%
Cold and Flu	2.73%

1.8 Out of a total of 190 instances of sickness in the period 26 were due to stress, of which 11 were work related (mainly in Repairs and Investment (5) and Waste Services (3)). Where relevant these cases have been referred to Occupational health for medical guidance and to understand if any adjustments are necessary.

1.9 On average each stress related sickness resulted in 19 FTE days lost. This is reflected in the figures where 26 instances (out 190) have contributed to 39% of the overall sickness figure.

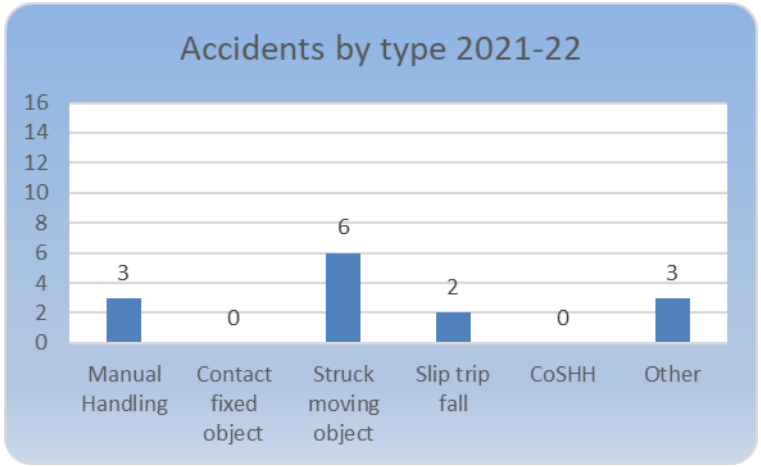
1.10 The Senior HR advisors closely monitor and manage long term cases in conjunction with Occupational Health and their line managers. Where needed, employees have been referred to the 24/7 Everyday Advice Line, the council's employee assistance plan.

1.11 Completion of return-to-work interview forms across the Council was a rate of 89%.

Health and Safety

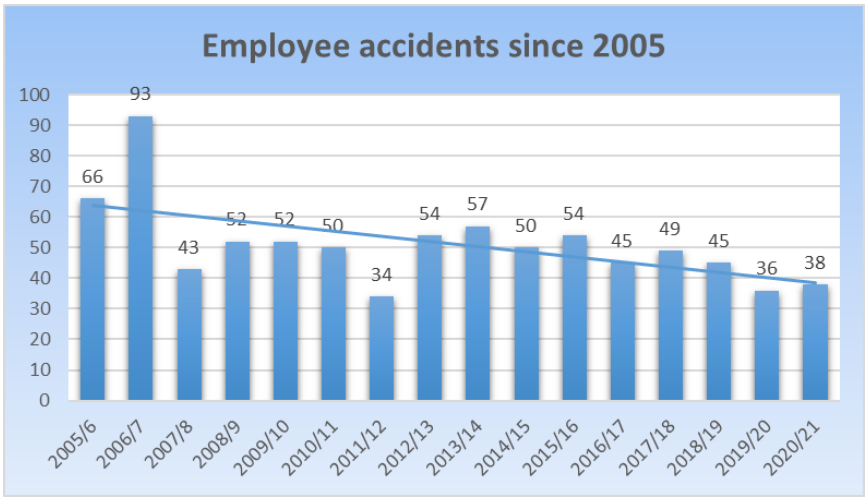
Accidents in the period

- There were 14 accidents to employees reported in the quarter, there were no RIDDOR reportable accidents to employees that led to periods of absence from work, although one incident aggravated a previous injury leading to absence.
- We also had 3 near misses reported. All accidents and near misses were investigated and measures put in place to minimise re-occurrence.



Historic accidents statistics graph 2005 - 2021

As can be seen in the graph below the average number of employee accidents have, since 2005, been stable at 51.13 annually or approximately 1 per week.



- **Training –** In house face to face training has been limited during the quarter due to the COVID restrictions, we are working on a suite of compulsory safety modules on Learning pool – our e-training package. Training has been undertaken virtually wherever possible and essential.

- **Legionella** Stringent procedures and testing was undertaken during the first quarter of the year, to ensure there were no reports of any bacterial ingress. Regular testing takes place, the regime includes the Main Council Offices, Sheltered Housing, Parks and sports pavilions throughout the district. A revised policy for Legionella was devised by the Property Services Team.

- **Fire**, A fire evacuation of the Council Offices took place in March. The nature of the evacuation highlighted some areas of training, and revision of procedures which were put in place to mirror the reduced number of staff working in the building. Following a Fire Risk Assessment at Linden way some remedial actions were completed, and a revised evacuation plan was devised.

- **Risk assessments -** To ensure full legal compliance, we must ensure we have *in written form*, suitable and sufficient risk assessments for any task they expect their staff to perform and to communicate safe systems of work

to those who are at risk. In 2021, so far 53 assessments were produced and reviewed on our Health and Safety software, SHE. In addition, we continue to review personal Covid related risk assessments in line with the changing government guidance. Training on SHE for users continued during the period.

- **Asbestos** –If there is any suspicion of asbestos being present in Council buildings, operatives are instructed to immediately report to their line manager. Following this specialist contractors are used to manage arrangements for handling Asbestos according to agreed procedures.

Customer Feedback

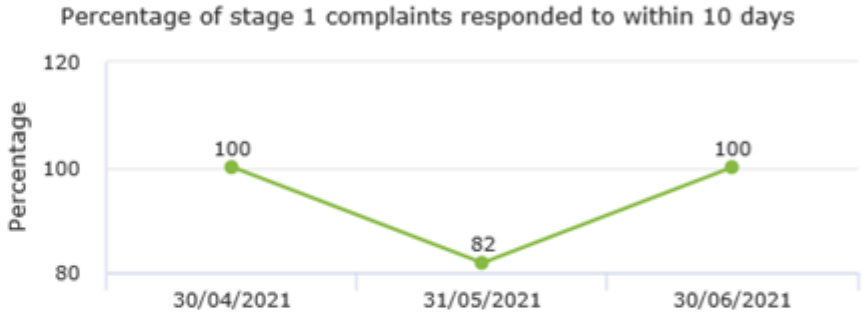
The number of complaints has been increasing over the past quarter which is indicated in the graphics below. The Authority welcomes feedback and have put in additional measures because of the increased feedback to ensure we capture opportunities to learn. These have included:

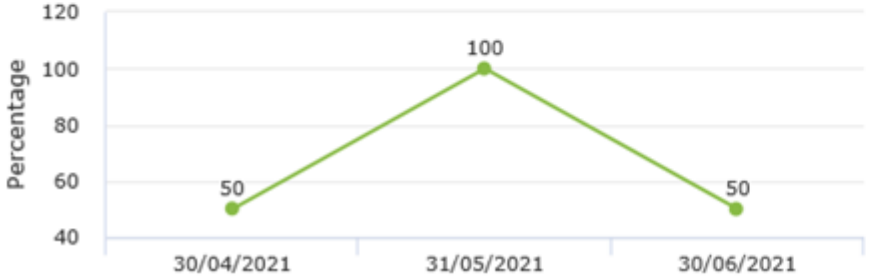
- Lessons learnt meetings where complaints have often been multi-disciplinary
- Improving our feedback database to us get more detailed analysis bringing forward a new dashboard of information
- A new back-office system which will be rolled out in Quarter 2 2021/22 which will enable complaints to feed directly into the information above, giving officers more time to react, respond and learn from the actual feedback rather than a focus on administration.

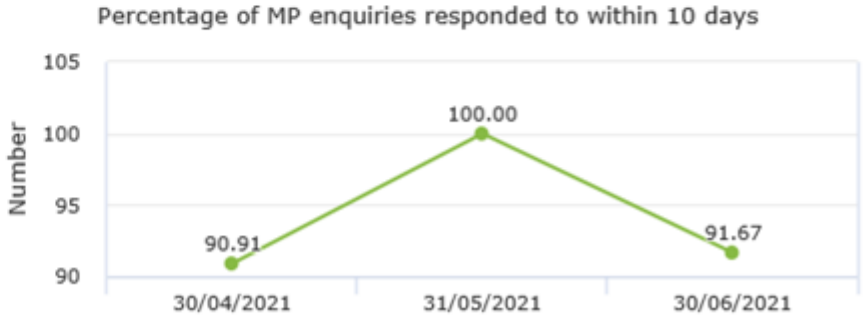
In addition to the above, information will be provided to Team Managers in a live data environment which will show where delays are being received and improve on our response rates.

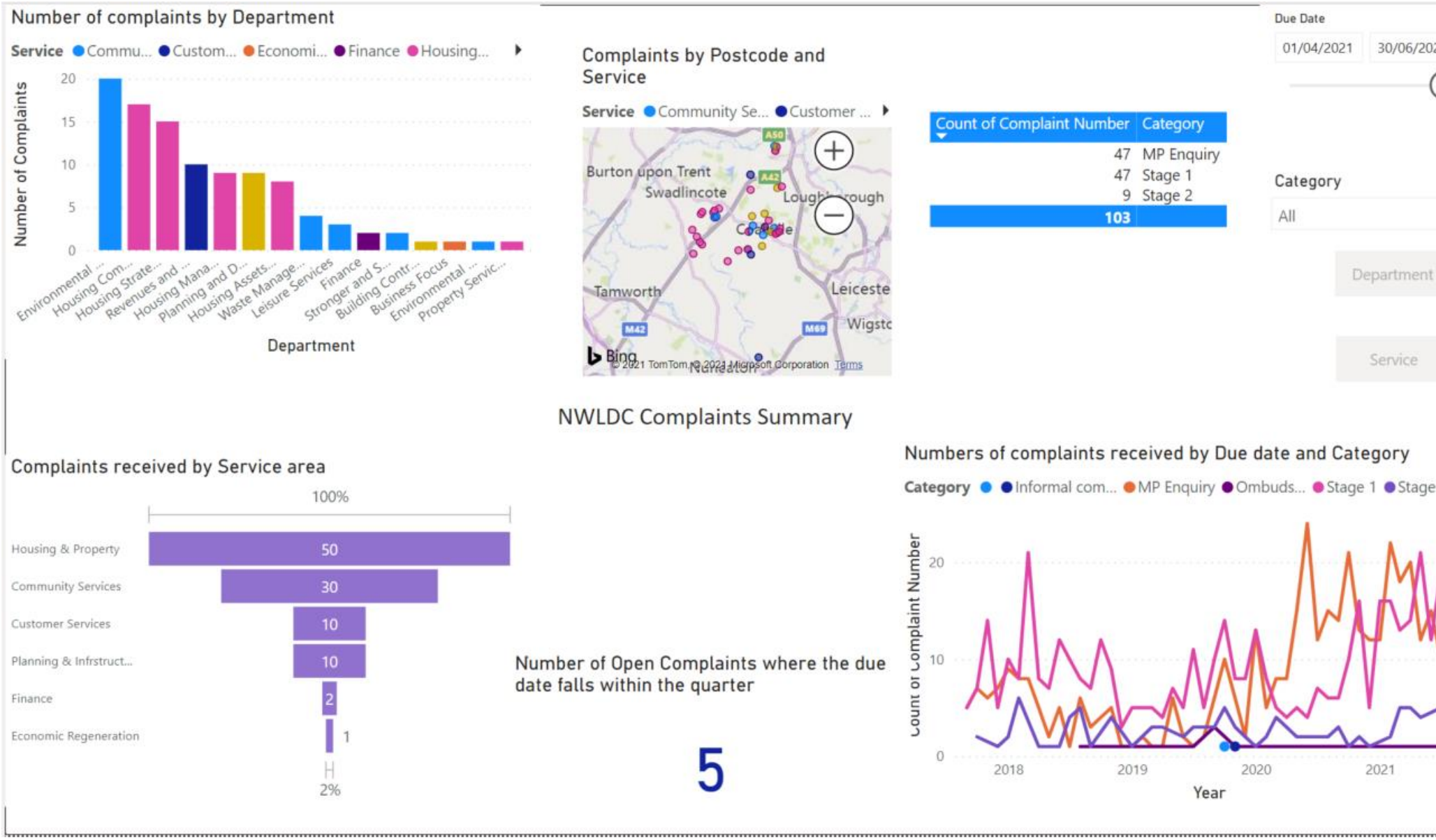
Customer Feedback Graphs

Performance Indicator	Community Services	Customer Services	Economic Regeneration	Finance	Housing and Property	HR and Organisation Development	Legal and Commercial Services	Planning and Infrastructure
*PI003 - Number of compliments received	25	12	2	1	46	4	0	5
*PI004 - Number of ombudsman cases received	0	0	0	0	0	0	0	0








Number of complaints by Department
Service Commu... Custom... Economi... Finance Housing...
Number of Complaints
20
15
10
5
0
Environmental ...
Housing Com...
Housing Strate...
Revenues and ...
Housing Mana...
Planning and D...
Housing Assets...
Waste Manage...
Leisure Services
Finance
Stronger and S...
Building Contr...
Business Focus
Environmental ...
Property Servic...
Department
Complaints by Postcode and Service
Service Community Se... Customer ...
Burton upon Trent
Swadlincote
Tamworth
A50
A42
M42
M69
Bing
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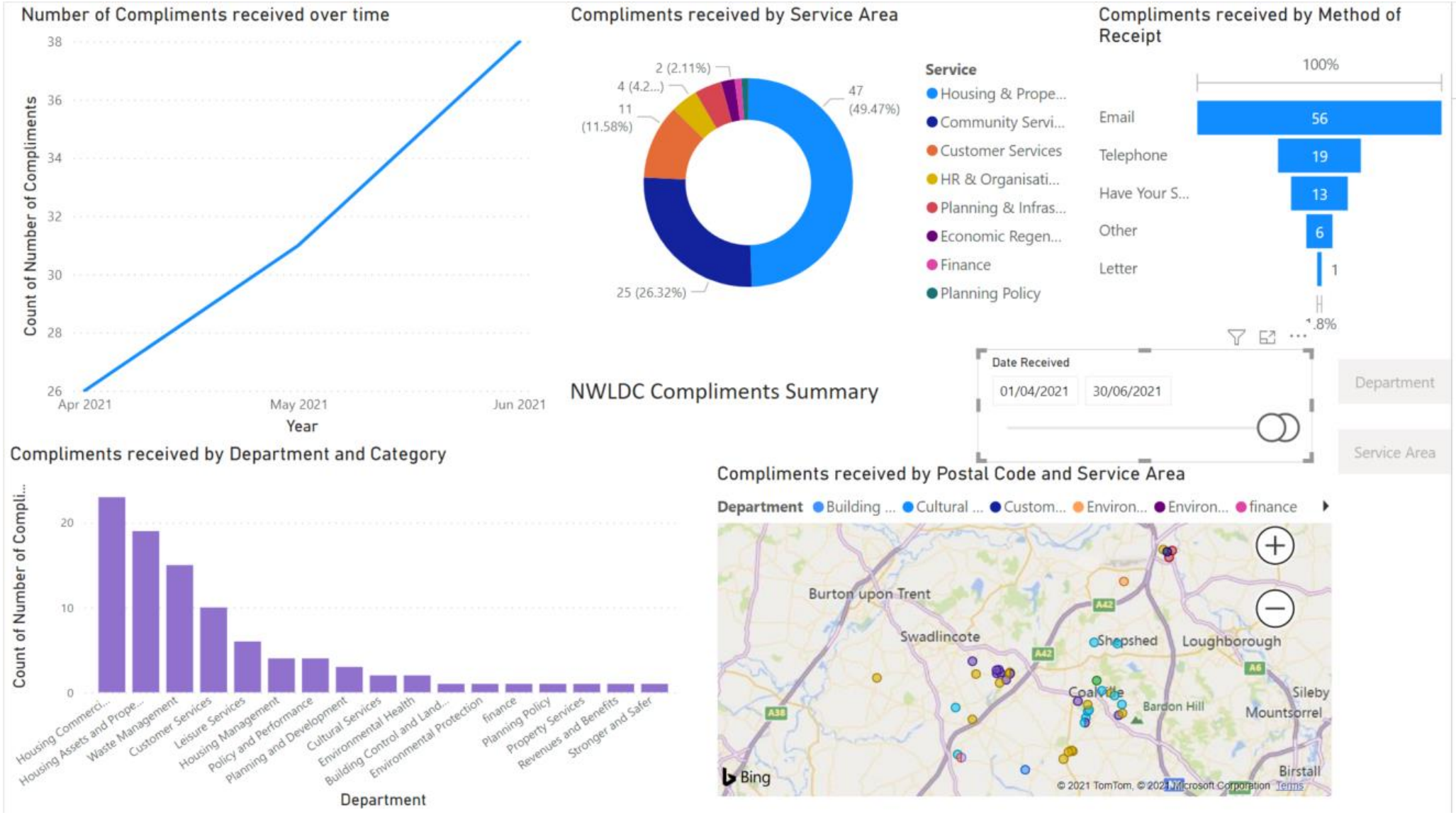
Count of Complaint Number Category
47 MP Enquiry
47 Stage 1
9 Stage 2
103
Due Date
01/04/2021
Category
All
Department
Service
NWLDC Complaints Summary
Complaints received by Service area
100%
Housing & Property 50
Community Services 30
Customer Services 10
Planning & Infrstruct... 10
Finance 2
Economic Regeneration 1
2%
Number of Open Complaints where the due date falls within the quarter
5
Numbers of complaints received by Due date and Category
Category Informal com... MP Enquiry Ombuds... Stage 1 Stage
Count of Complaint Number
20
10
0
2018
2019
2020
2021
Year


Number of Compliments received over time
Count of Number of Compliments
38
36
34
32
30
28
26
Apr 2021
May 2021
Jun 2021
Year
Compliments received by Service Area
2 (2.11%)
4 (4.2...)
11
(11.58%)
47
(49.47%)
25 (26.32%)
Service
Housing & Prope...
Community Servi...
Customer Services
HR & Organisati...
Planning & Infras...
Economic Regen...
Finance
Planning Policy
Compliments received by Method of Receipt
100%
Email
56
Telephone
19
Have Your S...
13
Other
6
Letter
1
.8%
NWLDC Compliments Summary
Date Received
01/04/2021
30/06/2021
Department
Service Area
Compliments received by Department and Category
Count of Number of Compli...
20
10
0
Housing Commerci...
Housing Assets and Prope...
Waste Management
Customer Services
Leisure Services
Housing Management
Policy and Performance
Planning and Development
Cultural Services
Environmental Health
Building Control and Land...
Environmental Protection
finance
Planning Policy
Property Services
Revenues and Benefits
Stronger and Safer
Department
Compliments received by Postal Code and Service Area
Department
Building ...
Cultural ...
Custom...
Environ...
Environ...
finance
Burton upon Trent
Swadlincote
Shepshed
Loughborough
Coalville
Bardon Hill
Sileby
Mountsorrel
Birstall
A42
A38
A6
Bing
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Customer Services Call Centre Statistics

Quarter 1 has seen call volumes increase by approximately 3000 more calls than the same period last year yet despite this, Customer Service have answered more calls, 89.08% in contrast to 82.31%. The volume of calls can be attributed to continued service disruptions and reinstated debt recovery whilst the ability to respond and answer is supported by face-to-face customers being seen by appointment.

Abandoned calls over this Quarter 1 period are higher when compared to 2020-21, however this is due to the volume of calls received overall. Customer Service received 3,000 more calls and answered 5,000 more calls than the same period last year, making this quarters' performance a better result generally.

Call waiting times have also increased due to call volumes and length of conversations. Waiting times have only increased by an average of 38 seconds yet the Customer Service team saw an increase of demand by 11.69%. The team answered 20.88% more calls for the quarter compared to last year with a slight uplift in handling time of 43 seconds.

Average amount of minutes a visitor had to wait before they are seen by Customer Services:

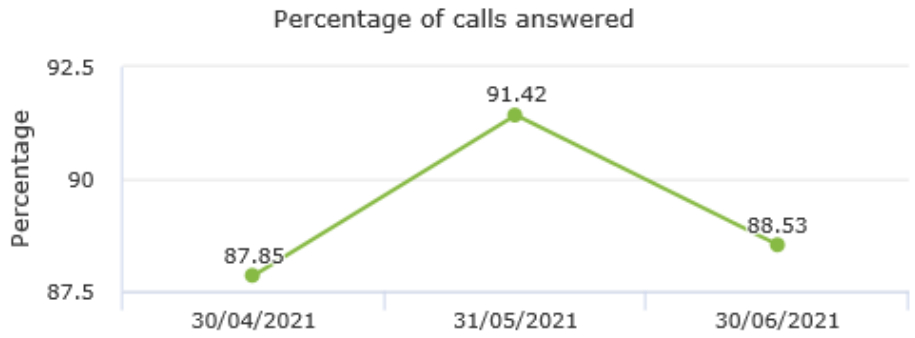
This measurement needs to be revised/amended as currently customers are seen by appointment rather than on demand therefore no waiting times are presently recorded.

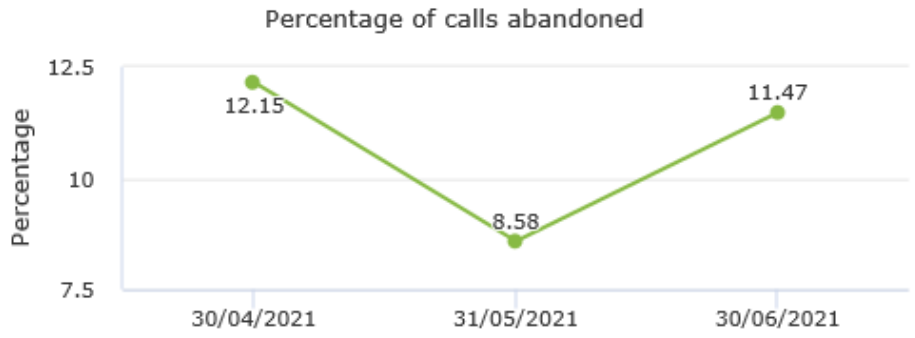
Customer Services Call Centre Statistics Graphs

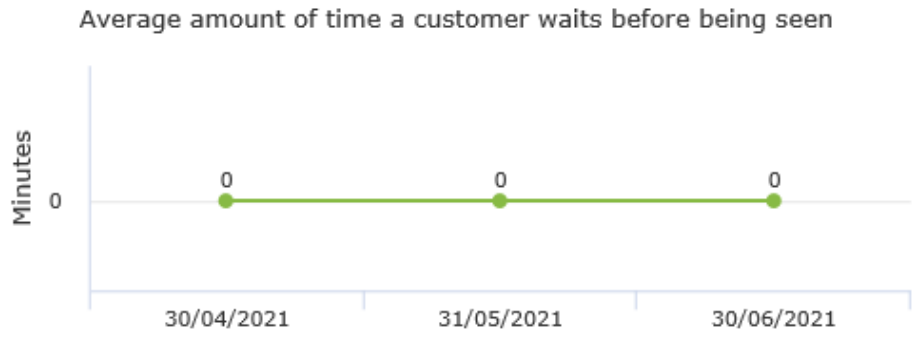
Dates

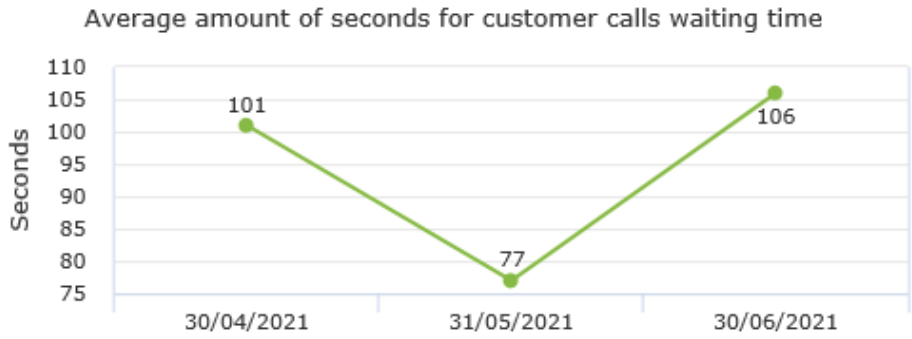
30/04/2021 | 31/05/2021 | 30/06/2021

Measure Name		Apr 2021	May 2021	Jun 2021
PI029 - Percentage of calls answered in the call centre	Actual	87.85	91.42	88.53
PI030 - Percentage of Call centre rate of abandonment	Actual	12.15	8.58	11.47
PI032 - Average amount of minutes a visitor has to wait before they are seen by Customer Services	Actual	0	0	0
PI235 - Amount of seconds for customer call waiting time average	Actual	101	77	106









Finance

General Fund	Annual Budgeted Position	Q1 Annual Forecast Position	Forecast Variance	
Budgeted Surplus/(Deficit)	£1,102,000	£244,000	£858,000	

The general fund forecast outturn is currently £858,000 lower than the budgeted position, which is predominantly due to the additional £720,000 expenditure on leisure services, due to plans to provide additional financial support to the leisure contract as a result of the pandemic, which is subject to Cabinet approval.

Other significant variances include:

- Environmental protection forecast overspend of £156,000. This is predominantly due to lower than anticipated income from: car parking (£63,000); the new market (£41,000); and off-street parking enforcement fines (£27,000). There are also additional legal costs of £38,000 from public protection work.
- Waste service costs are forecast to be £83,000 over budget. This is largely due to higher salary and vehicle costs, totalling £548,000 but is offset by a £481,000 increase in recycling income.

Housing Revenue Account	Annual Budgeted Position	Q1 Annual Forecast Position	Forecast Variance	
Budgeted Surplus/(Deficit)	£35,000	(£99,480)	(£134,480)	

The HRA forecast deficit of £99,000 is largely the result of income being £78,000 lower that forecast and additional forecast staffing costs within housing management because of staff absences.

If spend on the HRA capital programme remains below forecast, it may be possible to reduce the revenue contribution to capital outlay to bring the HRA back to a surplus. This will be monitored over the course of the year.

Special Expenses	Annual Budgeted Position	Q1 Annual Forecast Position	Forecast Variance	
Budgeted Contribution to/(from) Reserves	(£113,000)	(£64,000)	£49,000	
The forecast contribution from special expenses reserves has fallen as a result of the pandemic continuing to prevent events from going ahead, saving £29,000 and due to income from burials increasing by £17,000.				
General Fund Capital Programme	**Annual Budgeted Position**	**Q1 Annual Forecast Position**	**Forecast Variance**	
Budgeted Expenditure	£20.7 million	£20.7 million	£0 million	
Total spend on the general fund capital programme in quarter one was £3.3 million, which was mainly due to spend on the new leisure centre. There are two significant reviews of general fund capital projects that are likely to change the capital programme in the future: • Accommodation review. There is currently £2.0 million budgeted for improvements to the current council offices which will be replaced by new budgets if Council approves the latest accommodation plans in September. • Fleet review. Officers are currently developing a fleet strategy to reduce carbon emissions from our vehicles. This is likely to result in changes to the vehicle replacement budgets, which total £2.5 million.				
Housing Revenue Account Capital Programme	**Annual Budgeted Position**	**Q1 Annual Forecast Position**	**Forecast Variance**	
Budgeted Expenditure	£14.4 million	£11.9 million	(£2.5 million)	
Total spend on the HRA Capital Programme in quarter one was £855,000 against a capital programme of £14.4 million.				

The forecast outturn for the year have been revised down by £2.7 million. This variance largely due to lower anticipated spend on the New Supply programme in the year, as the forecasts reflect the status of the new build sites which were due to start this year.

There is a small adverse variance on the new housing finance system reflecting a later completion date for the project that initially planned, which is currently forecast to spend an additional £120,000 over budget.

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NORTH WEST LEICESTERSHIRE DISTRICT COUNCIL

CORPORATE SCRUTINY COMMITTEE – WEDNESDAY, 1 SEPTEMBER 2021

Title of Report	**SPECIAL EXPENSES POLICY**	
Presented by	Dan Bates Head of Finance	
Background Papers	Coalville Special Expenses Working Party Draft Minutes - 15 June 2021	**Public Report:** Yes
Financial Implications	Special Expenses do not bring any additional income to the Council as they are a means of redistributing who pays for an element of the council's costs. However, instead of being paid by all Council Taxpayers, the service is paid for only by those Council Tax payers in the are receiving specified Special Expense services.	
	Signed off by the Section 151 Officer: Yes	
Legal Implications	Insert any legal implications to be considered	
	Signed off by the Deputy Monitoring Officer: Yes	
Staffing and Corporate Implications	Insert any staffing and corporate implications to be considered	
	Signed off by the Head of Paid Service: Yes	
Reason Agenda Item Submitted to Scrutiny Committee	For the Corporate Scrutiny to review the draft Special Expenses Policy and provide any amendments/comments before approval at Council.	
Recommendations	**THAT THE CORPORATE SCRUTINY COMMITTEE PROVIDE ANY COMMENTS ON THE DRAFT SPECIAL EXPENSES POLICY.**	

1. BACKGROUND

1.1 Special Expenses were introduced at the Council to solve the problem of concurrent functions and avoid double taxation. The subject of concurrent functions and double taxation is extremely complicated.

1.2 Special Expenses have been in place for several years at the council, however there is no policy in place. Therefore, a policy has been drafted to formalise the Council's current position on Special Expenses.

2. CONCURRENT FUNCTIONS

2.1 Concurrent functions are services provided in some parts of the district by the district or county council and in other areas by a parish council, where this occurs parish taxpayers may be charged twice. The existence of concurrent services does not in itself mean that double taxation is occurring; this has to be determined through assessing the funding and financial arrangements. Concurrent functions can arise in wholly parished districts as well as partially parished ones. This is often historic, for example, due to functions or local facilities being transferred following the 1974 local government reorganisation.

2.2 Government guidance issued in May 2002 provided a list of facilities/functions across the country that were exercised concurrently, and hence may be the cause of double taxation. These are detailed in Appendix A. This should not be relied on a definitive list, the deciding factor is that the function must be carried out by the Billing Authority in only part of its district, and the same function must be carried out in another part of the district by one or more Parish/Town councils.

3. SPECIAL EXPENSES

3.1 This makes use of provisions under the Local Government Finance Act 1992 which provide for different amounts of council tax to be calculated for different parts e.g. parished and unparished areas, of a district, depending on what, if any, special items relate to those parts. A special item is an item which relates to only part of the district council's area. Where functions are provided in part of a billing authority's area by a parish council, sections 34 and 35(1)(a) of that Act ensure that only council taxpayers in that parish pay towards the cost of the precept issued by that parish council. A local precept is one 'special item'.

3.2 'Special Expenses' are another 'special item'. The five different types of special expense are listed in section 35(2). Section 35(2)(d) provides that "any expenses incurred by a billing authority in performing in a part of its area a function performed elsewhere in its area by the sub-treasurer of the Inner Temple, the under-treasurer of the Middle Temple, a parish or community council or the chairman of a parish meeting are the authority's special expenses unless a resolution of the authority to the contrary effect is in force."

3.3 In order for expenses incurred in performing any function of a district council to be special expenses under section 35(2)(d), the function must be carried out by the district in only part of its area, and the same function must be carried out in another part of the district by one or more parish councils. The detailed identification of concurrent functions is therefore essential for using this special expense provision. The district council first calculates an average council tax across the whole of its area under section 33 of that Act. Included in that will be the amounts the district council has to pay to parish councils under their precepts, plus the amounts the district will spend on performing functions which are performed in parts of its area by parish councils.

3.4 Special Expenses are currently in place for the following areas:

- Appleby Magna
- Coalville
- Coleorton
- Hugglescote and Donington-le-Heath
- Lockington cum Hemington

- Measham
- Oakthorpe, Donisthorpe & Acresford
- Ravenstone
- Stretton-en-le-Field
- Whitwick

4. SPECIAL EXPENSES POLICY

4.1 Special Expenses have been in place for several years at the council, however there is no formal policy in place. A policy has been developed and is attached at Appendix B for review.

4.2 The policy has been considered by the Coalville Special Expenses Working Party on the 15 June 2021 and a link to the draft minutes is included within the background papers above.

4.3 For information, the policy will be going to the Cabinet on the 21 September before approval by Council on 16 November 2021.

Policies and other considerations, as appropriate	
Council Priorities:	Not applicable
Policy Considerations:	Not applicable
Safeguarding:	Not applicable
Equalities/Diversity:	Not applicable
Customer Impact:	Not applicable
Economic and Social Impact:	Not applicable
Environment and Climate Change:	Not applicable
Consultation/Community Engagement:	Coalville Special Expenses Working Party – 15 June 2021 Cabinet – 21 September 2021
Risks:	Not applicable
Officer Contact	Anna Wright Finance Team Manager and Deputy S151 Officer anna.wright@nwleicestershire.gov.uk

Appendix A

List of Concurrent Functions

Allotments
Boating pools
Bus shelters
Car parking (off street)
CCTV(installation and maintenance)
Cemeteries and burial grounds
Christmas lights and trees
Closed cemeteries and burial grounds
Commons and common pastures
Community centres
Crematoria
Entertainment and the arts
Footway lighting
Grants to bus operators
Grass cutting
Information services (transport, tourism)
Highways maintenance
Leisure facilities
Litter and dog waste bins
Museums
Open spaces
Parks
Playgrounds
Playschemes
Playing fields
Public clocks
Public conveniences
Public seats adjoining highways
Recreation grounds
Sports pitches
Street cleansing
Subsidies for uneconomic post or telecommunications services
Taxi fare concessions
Tourism promotion
Traffic calming
Village greens
Village halls
War memorials

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North West Leicestershire District Council

Special Expenses Policy

Issue 1.0

North West Leicestershire District Council

1. Overview

1.1 Special expenses are applied when North West Leicestershire District Council (NWLDC) provides a service in a parish (or unparished area) which is provided in other parishes by a town or parish council.

1.2 The cost of this service has to be met by the council taxpayers of the town or parish where (NWLDC) is providing the service so a special expense is charged to the council tax payers of that parish.

1.3 It should be noted that special expenses are not additional spending over and above the budget set by the Council but a classification within the overall budget. The Authority's budget includes Special Expenses, and some Council Tax calculations are based on the total including Special Expenses.

1.4 The district consists of 31 parished areas, and one unparished area. Parish councils exercise certain functions in their respective areas, which the District Council must exercise directly in the unparished area. These are known as concurrent functions.

2. Legislation

2.1 Section 35 of the Local Government Finance Act 1992 (the Act) specifies the items which are to be treated as special items for the purposes of calculating the Council Tax. Essentially, there are three areas within the provisions of Section 35 of the Act that it is considered apply to the Council:

i. A precept relating to part only of the Council's area e.g. parish precepts;

ii. The whole of the expenses (or only some) of those incurred by the Council in performing in a part of its area a function performed elsewhere in its area by a Parish Council are its special expenses.

iii. Any net expenses which arise out of the Council's possession of property held in trust for a part of its area are Special Expenses.

2.2 The first two items above can only be treated as a special expense if the Council has made resolutions to that effect.

2.3 In practical terms this is done by the Council at the time of setting the Council Tax in February each year as the report presented to the Council is in the form of a resolution which sets out the calculations required under Chapter III of the Act.

3. Special Expense Items

3.1 The Council levies Special Expenses in respect of the following services:

i. All Cemetery provision

ii. Parks, Open Spaces and Recreation Grounds

- Closed churchyards
- Open spaces, parks and play areas that are maintained by NWLDC in parished areas;
- Open spaces, play areas, parks, pavilions and sportsgrounds in Coalville;

iii. Coalville Town Centre Support:

- Coalville in Bloom
- Support given to 'Local' events

- Christmas Lights and Trees
- Community Art

iv. Highways Maintenance

3.2 The whole of the net expense (inclusive of any income) is to be included in the definition of the special expense.

3.3 Those debt charges will be included for all projects which fall within a special expenses only to the extent that it would be for prudential borrowing, capital receipts or revenue finding, and debt charges on historic capital expenses would not be included.

4. Calculation of Special Expenses

4.1 NWLDC will calculate an average council tax across the whole of its area under section 31B of the Local Government Finance Act 1992. Included in that will be the amounts payable to parish councils under their precepts, plus the amounts NWLDC will spend on performing functions which are performed in parts of its area by parish councils.

4.2 Under section 34 of the Local Government Finance Act 1992, NWLDC must then deduct the total of any special items. For each part of its area, NWLDC must then add back amounts for any relevant special items for that part of its area. The amount added back is calculated by dividing the special item (i.e. the authority's estimated cost of performing the function in that part of its area) by the tax base for the part of the area in which the authority performs the function.

4.3 Treating expenses as special expenses does not affect the overall amount that NWLDC needs to raise through council tax, and does not, therefore, affect the average amount of council tax across the whole of the district. It simply means that, compared with what would happen if the expenses were not treated by NWLDC as special expenses, the council tax is:

- relatively lower for areas where the parish council performs the concurrent function, as it includes the parish's costs but not NWLDC's costs of performing the function elsewhere; and
- relatively higher for areas where NWLDC performs the concurrent function, as all NWLDC's costs of performing the concurrent function must be met by taxpayers in the area where NWLDC performs it.

4.4 Special Expenses are estimated for the year approaching (in line with all other budget estimates). Special Expenses budgets in future years include previous under or overspends.

4.5 If work is undertaken through the Authority's capital programme, any effect from depreciation and funding does not have any effect in the revenue budget until the following year where an estimate is included where the capital expenditure is known, otherwise there is a time lag and it falls into the year after. If the item falls within the special expenses policy then the special expenses budget for future years is amended to include the relevant costs.

5. Review

5.1 The list of concurrent functions included within the Special Expenses Items will be reviewed from time to time and the policy updated as necessary.

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