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ZEBRA Programme
Monitoring and Evaluation

Pre-Implementation
Process Evaluation Report

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Lot 1

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Executive summary

Experience of stakeholders involved in the ZEBRA process

- Feedback from Local Transport Authorities (LTAs) was generally positive, which may reflect the success of these schemes in securing funding. This is especially the case for fast-track schemes, which had more developed projects to start with. Those involved in the standard process were more likely to have mixed views.
- The Expression of Interest (EoI) and Business Case processes were both largely implemented as planned and were felt to have gone well, with a higher-than-expected number of bids received.
- The guidance was generally thought to be clear and useful, and both processes were thought to provide the Department for Transport (DfT) with sufficient evidence to make informed decisions about which schemes to progress. However LTAs would have preferred to have further guidance and communication in specific areas, such as use of the Greener Bus Model.
- There was a mix of resourcing approaches for both processes, with some LTAs using consultants and bus operator inputs to increase capacity and expertise when producing their bids.
- The EoI process was generally felt to be proportionate, whereas the Business Case process was felt to be more onerous, particularly for smaller LTAs. The findings highlight opportunities to streamline and standardise the process of preparing future EoI and Business Case documentation,

Successes and challenges of LTAs pre-implementation activities

- The LTAs generally reported a positive experience of working with the various delivery partners. The various partners bought specific areas of expertise and advice to the process which was used to inform the development of the scheme and the Business Case**.** In particular, the bus operators were crucial in shaping the scheme proposals, identifying which routes to convert, the vehicle specification required, and the infrastructure requirements, as well as obtaining costs and establishing a delivery programme. Additionaly, engagement with the bus manufacturers, infrastructure providers, and energy suppliers was often led by the operator. Manufacturers were often willing to host visits to see the vehicle options available, which helped inform the vehicle selection process.
- However, the sheer amount of engagement which needed to be undertaken for the EoI and especially the Business Case stage created a challenge for LTAs. It also raised expectations about potential partners future involvement which needed to be managed**.**
- Other challenges relating to the partnership working included:
  - Some operators were more engaged than others. For fast-track schemes, discussions had already been happening and relationships were often better established. Some operators became less engaged over time, and some became more engaged.Some bidders highlighted challenges in terms of identifying the right teams and individuals to engage with within the bus company.
  - For LTAs working with several operator partners there were additional practical challenges, especially in terms of protecting each operator's commercial information. Operator preferences around choice of vehicle and approach did not always match LTA aspirations.
- LTAs also sought a mix of internal and external legal advice relating to subsidy control, procurement and identification of an operator partner, and transfer / use of grant funding. The main challenge involved ensuring that subsidy control requirements were being met for at a time the legislation was changing from the EU to UK government.

Effectiveness of partnership-based approach

- Overall the co-development approach is felt to have resulted in better quality and more consistent Business Cases overall, which should minimise delivery risks at implementation stage. The DfT felt that the approach resulted in better Business Cases which meet their requirements. DfT's Consultants also felt that the process worked well once LTAs were engaged.
- Feedback from the LTAs on the co-development approach was mixed. DfT's Consultants were seen as providing a reviewer or critical friend role, focused on ensuring that the Business Cases reflected the guidance. Having a dedicated individual to ask questions as and when required was seen as a benefit. The level of engagement was seen as about right.
- There was some uncertainty and scepticism about DfT's Consultants role initially, although most LTAs commented that trust was quickly built. LTAs were unclear about whether the Consultants were working for DfT, the LTAs, or both, and felt the role of the Consultants could have been better explained from the start.

Factors associated with successful bids

- The successful bidders (at both EoI and Business Case stage) generally had a number of factors in common: they were all able to meet the match-funding requirements for both vehicles and infrastructure; they had a clear view of what they wanted to achieve, based on previous experience developing or trialling battery electric bus schemes and a defined roadmap to achieving a fully zero emission fleet; and they had strong partnerships with operators that had already committed to transitioning to a ZEB fleet.
- They tended to already have strong political backing for ZEBs; they had existing material that could be used for the bid; they had the right skills in house, or from delivery partners (especially operators), or rapid access to the right consultancy expertise to draft the bid; and simpler schemes, which focused on one operator and one location, tended to be more successful as bidders needed to do less work to prepare the Business Case.
- Based on feedback from the DfT, Zemo Partnership, and DfT's Consultants, schemes that were unsuccessful at either EoI or Business Case stage had the following characteristics in common: they often came from smaller authorities, with less expertise to draw on and less capacity; and they were characterised by a lack of clarity on key decisions such as number of ZEBs, where and why, technology approach and why. Hydrogen fuel cell bids also tended to be less successful: they typically scored poorly on value for money due to high purchase and operating costs; and in many cases it was unclear why a hydrogen-based approach was being proposed as the zero emission technology.
- In addition, some of the unsuccessful bids had a lack of engagement or commitment from the bus operator, or a change in engagement over time. Complex schemes also tended to be less successful. Bidders which proposed more expensive vehicles or infrastructure had to do more work to justify the approach.

Rationale for the preferred option

The preferred scheme option was generally based on the following factors:

- engagement with the bus operators (most schemes were strongly influenced by the operators);
- local route and service characteristics;
- age of existing vehicles and scope to upgrade them;
- feasibility of upgrading the depot, including space and proximity to electricity sub-station, or presence of an existing bus or hydrogen depot;
- potential to address local air quality problems;
- experiences from previous trials;

- approach to risk and complexity – Some bids discounted hydrogen due to the substantially higher cost involved and because the technology is still at an early stage, and excluded high mileage routes which may require opportunity charging which is perceived to be less popular with operators.

Lessons for the design of future ZEB funding schemes

A total of 14 lessons / recommendations have been made following the findings of the Pre-implementation Process Evaluation. These can be split into the following areas:

- **Theme 1 – Overall process (Lessons / Recommendations 1-6)**: consider the strategic priorities for future funding opportunities, and how these can best be achieved; make the bidding process more efficient (e.g. by changing the balance of requirements between the EoI and Business Case phase); retain fast-track and standard processes; require larger schemes to set out a lower cost 'scaled down' scheme; ask bidders to outline how their schemes are future-proofed to enable future ZEBs to be introduced more efficiently; and allow multiple bids from LTAs.
- **Theme 2 – Additional guidance and structure (Lessons / Recommendations 7-8)**: streamline and standardise the process of preparing EoI and Business Case documentation; and provide additional guidance to address areas of weakness or challenge.
- **Theme 3 – Role of DfT (and technical partners) (Lessons / Recommendations 9-14):** continue to apply partnership (co-development) approach to the Business Case phase; more communication; provide feedback on assessment scores to both successful and unsuccessful; provide centralised legal advice on subsidy control regulations and a standardised Grant Transfer / Grant Funding Agreement letter; DfT (or Central Government) to engage with the Ofgem/BEIS and DNOs to determine the process for seeking costs for energy capacity upgrades; and share lessons learnt and relevant experience.

1. Introduction

1.1. Background

The **Zero Emission Bus Regional Areas (ZEBRA)** programme seeks to implement place-based schemes that will allow areas, led by local transport authorities (LTAs), working in close partnership with bus operators and other stakeholders to deliver zero emission buses (ZEBs) and supporting infrastructure.

The ZEBRA programme has the following aims:

- To support the government's commitment to **decarbonisation** and to reduce the transport sector's contribution to CO_2 emissions.
- To support the roll-out of the **4,000 ZEBs** that the government committed to in February 2020.
- To support bus manufacturers in the development of **ZEB technology**.
- To support **partnership working** between Local Transport Authorities, bus operators, and other local stakeholders as set out in the National Bus Strategy.
- To understand better the **challenges of introducing zero emission buses** and supporting infrastructure to inform future government support for ZEBs.

The DfT ran two funding application processes (fast-track and standard), and received 35 Expression of Interest (EoI) applications for ZEBRA funding. 23 LTAs were invited to submit a full Business Case. In total, the government awarded £270 million to 17 LTAs to deliver up to 1,278 ZEBs.

The breakdown of the successful schemes by typology is as follows:

- Typology 1: Battery electric buses, with depot charging (3 fast-track, 8 standard schemes)*;*
  Typology 2: Battery electric buses, with depot charging and opportunity charging (using pantographs or plug-in rapid chargers located on bus routes to 'top up' the battery charge) (2 fast-track, 3 standard schemes – *all but one using pantographs*);
- Typology 3: Hydrogen fuel cell buses (1 scheme).

Further detail on the successful ZEBRA schemes is provided in Appendix A.

1.2. Programme-level evaluation

The DfT, LTAs and delivery partners have a shared interest in evaluating the effectiveness of ZEBRA funding and measuring the impact on local areas, bus operations and patronage.

A long-term evaluation programme is in place comprising the following elements:

- A **Process Evaluation** of the pre-implementation, implementation, and operational phases of the ZEBRA schemes - *What can be learned from how the intervention was delivered?*
- **Impact Monitoring and Evaluation** to determine the effectiveness of the ZEBRA programme in achieving the anticipated outcomes - *What difference did the intervention make?*
- A **Value for Money Evaluation** - *Was the investment a good use of resources?*

The purpose of this report is to document the findings of the **process evaluation of the pre-implementation phase** of the ZEBRA schemes. It focuses on what can be learnt from the bidding and pre-implementation phase of the programme by examining what worked well and less well, and why.

The key objectives are:

- To provide evidence on the fast-track and standard application processes.

- To provide evidence on LTA activity in the pre-implementation period, and to identify any lessons for other LTAs.
- To identify lessons that will contribute to the design of future Departmental zero emission bus funding programmes

Process evaluations of the implementation and operational phases will be undertaken and reported in 2023 and 2025 respectively.

1.3. Methodology for pre-implementation process evaluation

The process evaluation is based on semi-structured interviews with the following stakeholders, undertaken in May and June 2022:

- **DfT officials** – Responsible for designing and managing the ZEBRA programme.
- **Zemo Partnership**[1] – Appointed to provide the DfT with technical support, industry knowledge and real-world operational experience of ZEBs; particularly at EoI assessment stage. Previously the Low Carbon Vehicle Partnership, the organisation supported DfT on the Green Bus Fund, the Low Carbon Emissions Bus certification, and contributed to the design of the Low Emission Bus Scheme and the Ultra Low Emission Bus Schemes.
- **DfT's Consultants** - Appointed to act as an interface between DfT and the LTAs on the development of the Phase 2 Business Cases, act as a critical friend to LTAs, and undertake an independent review of the final Business Cases, on behalf of the DfT.
- **LTA officers**, responsible for overseeing the development of the Phase 1 EoI applications and the Phase 2 Business Cases. Interviews were undertaken for all five of the fast-track schemes and a sample of seven of the standard schemes selected to represent a broad spectrum of schemes with different characteristics of interest (see Tables A.1 and A.2 in Appendix A).

  Delivery partners were also invited. Bus operators attended the interviews for two of the schemes.

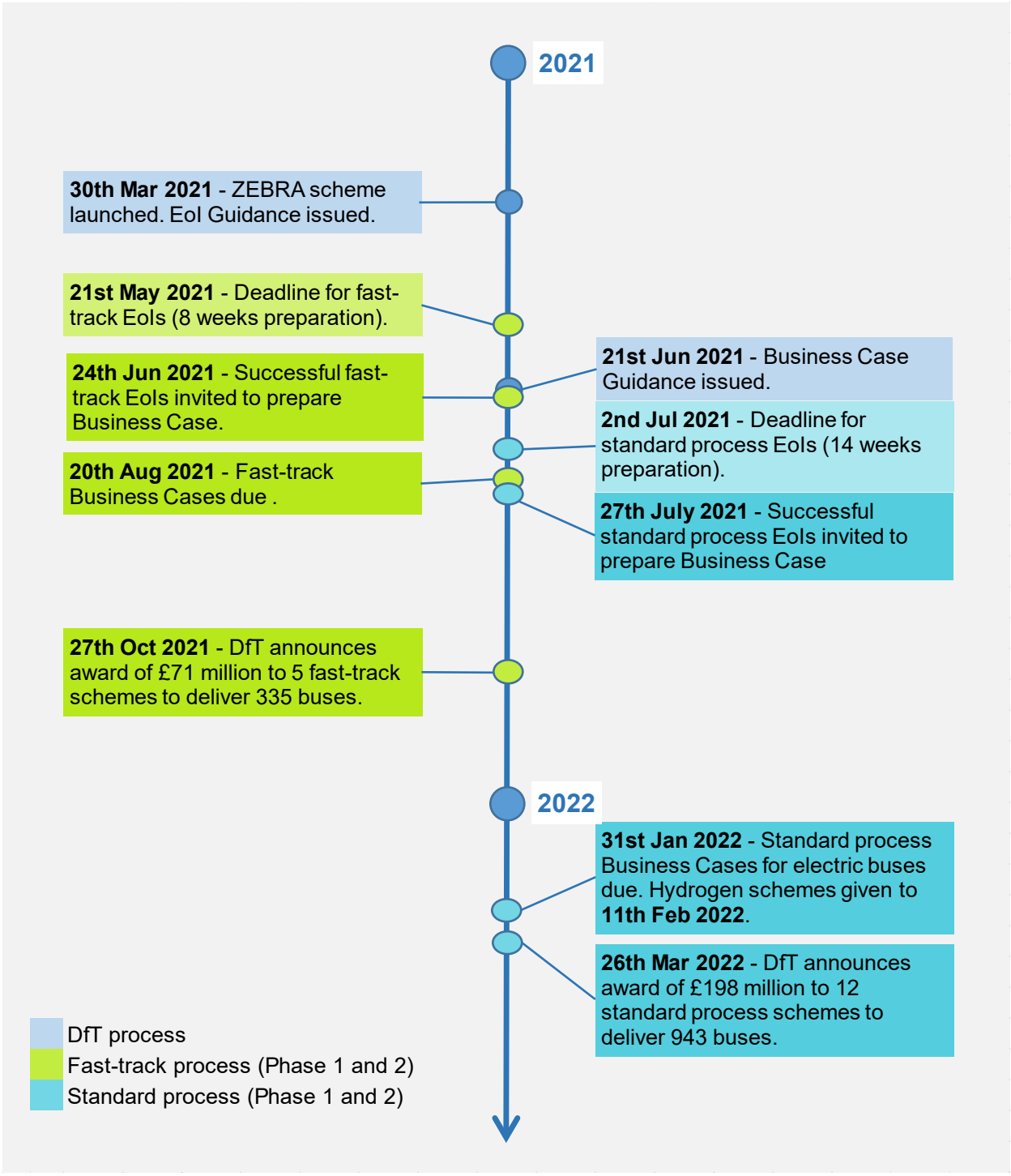
[1] The Zemo Partnership is a not-for-profit, independent partnership, jointly funded by government and its members from industry. Zemo Partnership's Bus & Coach Working Group consists of manufacturers and operators, design engineering companies, passenger transport executives and local authorities. Its role is to develop policies to accelerate the roll-out of Zero Emission Buses and Coaches in the UK.

2. Characteristics and design of ZEBRA

2.1. Overall approach

The ZEBRA scheme was launched in March 2021. It involved two phases, comprising an EoI and a Business Case.

Figure 2-1: Timescales for ZEBRA EoI and Business Case process



Phase 1 involved submitting an initial EoI which was assessed by the DfT to identify the schemes that showed the most potential against the criteria set out in the guidance. Bidders were required to complete an Application Form and a Value for Money proforma:

- The Application Form required:
  - responses to 12 mandatory pass / fail questions covering size of scheme, cost and funding sources, ability to deliver to required timescales, and support of local partners; and
  - making the case for the scheme against five assessment criteria: Defining the Place (10%), Ambition (25%), Air Quality (10%), Value for Money (35%), and Deliverability (30%).
- The Value for Money proforma set out the key metrics for the scheme, including vehicle and infrastructure cost estimates and bus mileage estimates, and was used by the DfT to complete the Greener Bus Model (GBM) and estimate an initial Benefit Cost Ratio (BCR) for the proposal.

For **Phase 2, shortlisted areas from Phase 1, were invited to produce a full Business Case** based on the HMT Five Case Model. The Business Cases formed the basis for the DfT's final investment decisions.

Guidance on preparing EoIs was published on the launch of the scheme, and covered scope of the competition, eligibility, assessment process, and application process. Guidance on preparing Business Cases was published on 21st June 2021, and covered the process, the requirements for each of the five cases, monitoring and evaluation and equality impact assessments.

Bidders were able to choose whether to follow a **'fast-track' application process** or a '**standard' application process**, depending on how well developed their proposal was and how quickly they could complete the process:

- **Fast-track process:** Under this process, bidders were required to produce an EoI by 21st May 2021 (an 8-week timescale) and complete a Business Case by 20th August 2022 (two months later). LTAs that followed this process were eligible to receive funding under the ZEBRA scheme at an earlier date. Funding was announced for successful schemes on 27th October 2021.
- **Standard process:** Under this process, bidders were required to produce an EoI by 2nd July 2021 (a 14-week timescale) and complete a Business Case by 31st January 2022 (~7 months later). An extension to 11th February 2022 was granted for the three hydrogen fuel cell schemes to allow for local transport authorities to provide information on the hydrogen fuel supply.

The key timescales for the ZEBRA EoI and Business Case process are summarised in Figure 2-1.

2.2. Role of DfT, and supporting experience and capacity

The DfT led the design of the ZEBRA scheme, the development of the formal guidance, communications, and the formal assessment of EoIs and Business Cases.

The scheme was designed by the Zero Emission Bus and Coach Delivery Team within the DfT's Local Transport Directorate, with specialist input from analysts, legal, finance, and commercial teams. Specific advice was sought from the Joint Air Quality Unit (JAQU) on air quality issues, and the Department for Business, Energy and Industrial Strategy (BEIS) on energy infrastructure. Approval came from the DfT's Investment Board, HM Treasury, and Ministers.

The following external organisations were bought in to provide additional experience and capacity:

- The **Zemo Partnership** was bought in to provide the DfT with technical support, industry knowledge and real-world operational experience (not available within the DfT). They were involved in reviewing the bids at EoI stage to help ensure scoring consistency, advising on the technical quality of bids, and sharing best practice and up-to-date knowledge on industry

developments. They were not specifically involved in the Business Case stage, but have an ongoing role in overseeing the progress of schemes and helping with problem solving.

- A **professional services consultancy** (subsequently referred to as **DfT's Consultants**) was appointed to act as an interface between DfT and the LTAs on the development of the Phase 2 Business Cases, act as a critical friend to LTAs, and undertake an independent review of the final Business Cases on behalf of the DfT.
- The **Green Finance Institute** were asked for their views on financing arrangements for schemes proposing to lease vehicles.

2.3. Design of the ZEBRA scheme

The design of the ZEBRA scheme was influenced by lessons from previous funding rounds, developments in technology, and the wider policy agenda.

The key elements and the factors that influenced them can be summarised as follows:

- The **two-stage process** (EoI + Business Case) reflects the scale of the expected schemes and the likely funding commitment, which was felt to warrant higher levels of consideration and scrutiny compared to other funding opportunities. With the exception of the All-Electric Bus Town/City (AEBT/C) scheme, previous bus funding programmes have been based on a one stage application process only.

  In the past, some schemes have experienced significant delivery challenges. The requirement to prepare a full Business Case should help prepare project partners to develop schemes in detail and minimise the risk of the scheme going over budget, being delivered late, or to a reduced scope.
- The **fast-track and standard processes were** introduced following a soft launch event, in response to demand for faster roll out of vehicles amongst some authorities and operators, many of whom failed to win AEBT/C funding.
- Both **hydrogen fuel cell** and **battery electric buses** were eligible for grant funding. This will allow direct comparison of the two technologies based on their current state of development.
- The intention was to prioritise schemes that would **deliver at scale in a particular area** in order to maximise the outturn benefits. However, the guidance **does not require whole scale conversion of all buses in a single area**. This reflects experience from the AEBT/C process, which required proposals to convert every single bus in an area. Feedback from the authorities involved was that this was extremely challenging to achieve in many areas due to the need to work with multiple operators, alongside technical limitations of zero emission buses, particularly on longer routes or routes with high top speeds and high average daily mileage. A more flexible approach was therefore adopted for ZEBRA.
- **Only LTAs could apply for funding, rather than bus operators**. This reflects the need for schemes to contribute to the wider recovery of the bus industry and to align with the National Bus Strategy. Bidders were therefore required to articulate a clear vision for the long-term transition to a zero emission fleet in their areas, and demonstrate for the scheme fits alongside existing plans that the area has to transform and improve its bus services.
- DfT will contribute up to **75% of the cost difference** between a ZEB and a standard conventional diesel bus equivalent of the same total passenger capacity. For infrastructure, DfT will contribute up to 75% of the capital expenditure incurred as a result of its purchase and installation. This is in line with previous funding schemes. The upfront capital costs of ZEBs and supporting infrastructure means that operators are often unable to introduce ZEBs without such a contribution.

3. Process Evaluation Findings

The following sections summarise the findings of the pre-implementation process evaluation. Lessons and recommendations are presented in Section 3.7, and cross-references to these are provided at relevant points in the preceding sections (e.g. *see* ***Recommendation X***).

3.1. Experience of stakeholders involved in the ZEBRA process

RQ1. What was the experience of stakeholders involved in the divergent fast-track or standard processes? What worked well and less well for stakeholders?

Consideration of (i) Fast-track vs Standard processes, and (ii) EoI, Business Case, and (iii) Funding Award phases.

3.1.1. Summary

Feedback from the LTAs was generally positive, which may reflect the success of these schemes in securing funding. This is especially the case for fast-track schemes, which had more developed projects to start with. Those involved in the standard process were more likely to have mixed views.

The EoI and Business Case processes were both largely implemented as planned and were felt to have gone well, with a higher-than-expected number of bids received.

The guidance was generally thought to be clear and useful, and both processes were thought to provide DfT with sufficient evidence to make informed decisions about which schemes to progress. However LTAs would have preferred to have further guidance and communication in specific areas, such as use of the GBM.

There was a mix of resourcing approaches for both processes, with some LTAs using consultants and bus operator inputs to increase capacity and expertise when producing their bids.

The EoI process was generally felt to be proportionate, whereas the Business Case process was felt to be more onerous, particularly for smaller LTAs. The findings highlight opportunities to streamline and standardise the process of preparing future EoI and Business Case documentation.

3.1.2. EoI phase

a) DfT perspective (including DfT's delivery partners)

The EoI process was largely implemented as planned and was felt to have gone well. Key issues raised about what worked well and less well are summarised below.

What went well, or was a success?

☑ Overall, the **number of EoIs received** (35) was much higher than expected given the impact of COVID on the bus industry.

☑ The EoIs provided **sufficient evidence** for the DfT to make an informed decision about which schemes to shortlist. This was based on the following process:

- Schemes underwent a pass / fail assessment against the mandatory questions and were scored and ranked against the weighted criteria set out in the guidance.
- EoIs were reviewed by both the DfT and the Zemo Partnership and collectively scored. Input was also sought from JAQU on air quality issues, and BEIS on energy infrastructure.

Based on the above process, 23 schemes were shortlisted and the successful schemes were invited to prepare a full Business Case.

☑ **Publicity** was felt to have gone well. A pre-event webinar was held which was well attended by LTAs and industry represented. There were also several virtual 'drop in' sessions, to allow bidders to discuss their proposals and ask questions.

☑ The **Zemo Partnership** is considered to have played a key role in the successful delivery of this phase of the ZEBRA programme, in terms of bringing experience from previous funding programmes and sense-checking scheme proposals based on their industry knowledge and real-world operational experience.

While the DfT has previous experience in running funding programmes for zero and low emission buses from which it can draw on (e.g. the All Electric Bus Town or City (AEBT/C) competition – 2021; the Ultra Low Emission Bus Scheme (ULEBS) – 2018/2019, 2019/2020, 2020/2021; Low Emission Bus Scheme (LEB) – 2016/17, 2017/18), many of the staff involved are relatively new in post and do not have first-hand experience of these previous programmes. The Zemo Partnership is able to cover this by providing continuity of thinking and experience across the various programmes, and bringing new staff up to speed.

What went less well, or was a challenge?

☒ Nearly every EoI went over the **word limit** set for each section, and some bidders provided a lot of **unnecessary detail**, including supporting appendices (particularly in the context of 'Defining the Place'). It was felt that more guidance on DfT's specific requirements and use of standardised tables or proforma to capture key information required about local bus operations would have helped streamline the 'Defining the Place' aspect of the bids. *(See **Recommendation 7** - Streamline and standardise the process of preparing EoI and Business Case documentation)*

b) LTA (and local delivery partner) perspective

Both the fast-track and standard process bidders were **generally positive about the EoI phase**.

There was a **mix of approaches in terms of use of resources** to prepare the EoIs:

- Most LTAs prepared the EoI in-house with some input from operators but no consultancy support.
- A minority relied on consultants to co-ordinate and draft the EoI, and along with ZEB-related input from operators. Consultants helped address capacity requirements as well as providing expertise in preparing funding bids.

  "We relied on consultancy support to lead and co-ordinate the bid, and write the majority of the document. We were working on the National Bus Strategy requirements at the time so wouldn't have had capacity to lead ZEBRA as well." (Standard process, Officer quote)
- One LTA employed a hydrogen specialist to peer review the EoI, and to scrutinise the operator proposals to ensure they were achievable.

Some bids, particularly those following the fast-track process, relied on work undertaken previously for unsuccessful AEBT/C and ULEBS funding bids. This meant that previous work could be used to inform ZEBRA bids.

Operators often led the market engagement exercise. One LTA commissioned a consultant to engage with suppliers.

What went well, or was a success?

☑ The **guidance** was generally felt to be clear in terms of broad requirements and assessment criteria. The word count limit was felt to be helpful in terms of providing an indication of the level of detail required, but some bidders would have welcomed more information on exactly what to cover in each section.

☑ Various bidders highlighted that the **pre-engagement event** with DfT provided a useful opportunity to discuss ideas at an early stage, while others commented that the **webinar-based guidance workshops** arranged by the DfT were useful in helping to understand requirements.

☑ Many fast-track and standard process bidders felt that the **process was proportionate** in terms of level of effort required and the time available to prepare the EoIs. Views tended to be more mixed amongst those following the standard process (see below for the various issues highlighted), and even those that agreed that the process was proportionate highlighted that the timescales were nevertheless challenging to meet.

What went less well, or was a challenge?

A number of specific challenges were highlighted, especially by standard process bidders who were generally at an earlier stage of scheme development.

☒ The **timing of the EoI process** created challenges for some LTAs. The guidance was published just before Easter which resulted in some bidders losing up to two weeks due to key staff being on annual leave. In addition, some felt there was relatively little notice given prior to publication.

Several LTAs highlighted that the timescales were challenging to meet, especially as the EoI phase coincided with requirements around the National Bus Strategy. This was published in February 2021 and required LTAs to commit to establishing Enhanced Partnerships or begin the statutory process of franchising services by the end of June 2021 and to submit Bus Service Improvement Plans by the end of October 2021 (i.e. similar timescales to the ZEBRA EoI submissions and often involving similar individuals).

"It was a busy time getting the EoI together" (Standard process, Operator quote)

"The only way we were able to meet the deadline was to get people working overtime, in their own time" (Standard process, Officer quote)

☒ **A significant amount of engagement was required in a limited time**. Authorities had to notify and liaise with relevant operators and constituent authorities very quickly to determine level of interest and identify a scheme to progress. Most authorities undertook an exercise which involved inviting local operators to express interest and propose a potential scheme, in order to identify a preferred operator to partner with. In many cases, only one (dominant) local operator was able to make the required commitment in terms of funding contribution and were in a position to deliver within the required timescales. However, some authorities had to go through a sifting process, which required additional time.

☒ While the schemes generally had political support, the **governance and political approval process** required to 'sign-off' scheme proposals takes time, as does financial 'sign-off' from the Section 151 Officer.

☒ Concerns were raised about the need to **commit to technical decisions and detailed costs at an early stage.** The EoI process required a lot of decisions to be made very quickly about number of vehicles, routes, depots, technology approach, costs, etc., with limited time to gather evidence. These decisions then need to be justified at Business Case stage when additional information available might change things. In particular, bidders felt that it was too early to commit to detailed costs, which are highly likely to change at Business Case stage. *(See **Recommendation 2** - Make the bidding process more efficient).*

"The only challenge was the level of detail required, especially on costs" (Standard process, Officer quote)

"DfT were asking for costs which [we] could not provide at the time. Did not want to do the EoI alongside procurement." … "Fear that if we put the wrong number in the EoI how do we justify it when we go to the main bid if its twice as much?" (Standard process, Officer quote)

There was a specific challenge around obtaining costs from energy providers, i.e. the distribution network operators (DNOs). *(See **Recommendation 13** - DfT (or Central Government) to engage with the Ofgem/BEIS and DNOs to determine the process for seeking costs for energy capacity upgrades)*

☒ As highlighted above, there were mixed views about whether the **process was proportionate**.

"Was more detailed than expected" (Standard process, Officer quote)

One of the two bus operators interviewed also highlighted that it was more detailed than expected, and very data and resource intensive.

☒ LTAs also highlighted the **practicalities of preparing the EoI**.

"The most time-consuming aspects of the EoI stage were getting the required data from bus operators, trying to find data in terms of air quality, and getting things represented visually in terms of maps" (Standard process, Operator quote)

3.1.3. Experience of Business Case phase

a) DfT perspective (including DfT's delivery partners)

The Business Case process was also largely implemented as planned and was felt to have gone well.

Overall, the number of Business Cases received (17 in total) was higher than envisaged at the start of the EoI process. This reflects the number of EoIs received and the increase in funding from £120m to £270m.

Key issues raised about what worked well and less well are summarised below.

What went well, or was a success?

☑ **Virtually all schemes which were successful at EoI stage went on to submit a Business Case**. There was one exception. In this case, the operator was unable to cover 25% of the cost difference between the proposed ZEBs and the equivalent diesel buses, and the LTA was unable to identify match-funding. Without this, the necessary match funding requirements were not met, so LTA did not submit a Business Case.

☑ The Business Cases provided **sufficient evidence** for the DfT to make an informed decision about which schemes to award funding to. This was based on the following process:

- Each of the 5 parts of the Business Case were assessed and scored (out of 4); all weighted equally. Different teams assessed different cases, and specialist input was sought for certain sections (e.g. economists assessed the economic case).
- DfT's Consultants also assessed the bids, and scores were then compared and moderated. Clarifications were sought from LTAs, where required.

The highest scores were typically awarded for the Strategic and Management Cases. Factors contributing to lower scores for the other cases are covered in the sections below.

Based on the above process, 17 schemes were awarded funding across both the fast-track and standard processes.

☑ DfT's Consultants shared **supplementary guidance** in the form of FAQs; and also produced a **Business Case template** for standard process schemes, which was used by some LTAs and helped provide more consistent Business Cases that were easier to assess. *(See **Recommendation 7** - Streamline and standardise the process of preparing EoI and Business Case documentation)*

☑ The **GBM** tool (which LTAs were required to complete as part of the Economic Case) was improved from the version used for the AEBT/C bidding process, and provided the evidence needed to compare Economic Cases. The tool was updated part way through the process to reflect Government's changes to the value of carbon. *But see also challenges identified by DfT and LTAs.*

☑ The DfT felt that their Consultants performed a vital role in providing **Business Case advice to LTAs** *(see Section 3.3 for further detail). (See **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase)*

What went less well, or was a challenge?

☒ The timescales for the standard process Business Cases were extended slightly to give bidders more time, and hydrogen fuel cell schemes were given an additional 2 weeks. This reduced the **time available for DfT to assess and score the bids**, although ultimately the deadlines were met and the process was not compromised.

☒ Assessment scores were typically lower for the **Economic Case** than for the other cases.

The DfT reported that the **LTAs found the GBM challenging to use**. A guidance webinar was held and a high-level user guide was produced, but there was no dedicated technical resource provided by the DfT to support LTAs. DfT's Consultants advised on the Business Case process, but not specifically on the GBM as this was not covered within their areas of expertise. It was suggested by the DfT that it would have been helpful for LTAs if specific technical support on completing the GBM tool had been made available, alongside the broader Business Case support provided by DfT's Consultants. DfT's Consultants reported that **non-monetised benefits** were poorly covered in some bids. Both of these factors contribute to lower scores for the Economic Case.

*(See **Recommendation 8** - Provide additional guidance to address areas of weakness or challenge, and **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase)*

☒ DfT's Consultants observed a lack of clarity in the guidance around the application of optimism bias and contingency (resulting in different approaches being adopted and adjustment during moderations of business cases for consistancy), and coverage of long-term financial sustainability; although relevant guidance is available in DfT's Transport Analysis Guidance. *(See **Recommendation 8** - Provide additional guidance to address areas of weakness or challenge)*

☒ DfT's intention was to provide **feedback to LTAs on interim draft Business Cases** to allow any concerns to be addressed in the final submission. While this generally worked well, some LTAs didn't provide drafts or had missing sections, which limited the value of the process.

☒ In general, **the DfT had capacity constraints** and had to rely on their Consultants more than intended. However, the Consultants were unable to respond to policy queries, and the DfT needed to find time to do this. *See Section 3.3 for further detail.*

While not necessarily a weakness or challenge, it was highlighted that the Zemo Partnership was only involved in the EoI phase. Both they and the DfT feel that the Zemo Partnership would also have been able to add value at the Business Case stage, in terms of advising the DfT on the technical robustness of the various schemes. *(See **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase)*

b) LTA (and local delivery partner) perspective

Both the fast-track and standard process bidders were **generally positive about the Business Case phase**.

The **Business Case process was felt to be a lot more onerous** than the EoI.

*"There's a big step up from EoI to Business Case stage, in a short-time. DfT might want to review whether more is required at EoI stage, so that it is less of a step up; or make clearer to LTAs about the step up in requirements." (Standard process, Officer quote) (see **Recommendation 2** - Making the bidding process more efficient)*

In terms of **resourcing**, there was again a mixed approach across the 12 LTAs interviewed:

- Four LTAs delivered both the EoI and Business Case in-house without the use of consultants, although some made use of external legal advice.
- Five LTAs bought in additional consultant support for the Business Case stage, having delivered the EoI in-house.
- Three LTAs used consultants for both the EoI and Business Case stages.

- Most bought in external legal advice. Only a couple of LTAs had internal legal teams that were able to provide the support and advice they required.

Consultants helped address capacity requirements as well as providing Business Case expertise. In some cases they were asked to take responsibility for drafting and co-ordinating the whole of the Business Case. In other cases they focused on specific chapters, generally the Strategic and Economic Cases, but also the Commercial Cases. LTA experience of writing Business Cases varied widely. Some (a minority) had very little experience of writing a Business Case and were reliant on the expertise of the consultants; others had much more experience but welcomed the additional Business Case experience consultants can bring and / or lacked sufficient capacity in-house.

ZEB-related expertise was generally provided by the operators rather than consultants. However, the LTA responsible for the successful hydrogen-based scheme bought in a management consultancy firm with experience in hydrogen-based economies to demonstrate how the scheme would be a catalyst for the hydrogen economy in the region and to strengthen the Strategic and Economic Cases.

No specific issues were raised by LTAs regarding challenges in getting the right consultants involved or regarding the practicalities of managing the consultancy input.

One of the fast-track schemes commented that they made the decision to prepare the Business Case in-house because they had the required ZEB and Business Case expertise and felt that bringing in external support at this stage would have created more of a challenge given the tight timescales involved.

Operators generally continued to lead market engagement / discussions with bus manufacturers, infrastructure providers and the energy suppliers during the Business Case stage.

Key issues raised about what worked well and less well during the Business Case process are summarised below.

What went well, or was a success?

☑ The **guidance** was generally felt to be clear in terms of broad requirements and assessment criteria; and additional clarity was sought through questions to the DfT and their Consultants.

☑ There were mixed views on whether the process was **proportionate** in terms of the levels of effort required and the time available. Larger authorities with larger schemes were more likely to agree that the process was proportionate.

"Ultimately, given the money involved, the process is proportionate" (Standard process, Officer quote – Large scheme)

Some authorities commented that the requirement to prepare a full Business Case had been helpful in providing a **sound base for project delivery**.

Between the fast track process and the standard process one large scheme was asked to re-submit a scaled down bid. This suggests that consideration should be given at the outset as to whether authorities should be able to submit scaled down bids. *(See **Recommendation 4** - Require larger schemes to set out a lower cost 'scaled down' scheme)*

☑ The **feedback that LTAs received from the DfT and their Consultants** on Business Case drafts was welcomed and was felt to have improved the quality of the Business Cases overall *(see Section 3-3 for more information)*.

What went less well, or was a challenge?

☒ LTAs identified a number of areas where **more guidance** would have been useful. This included more advice on how to use of the GBM, and more detail on expectations around the scale of the BCR (i.e. the fact that the BCR is likely to be low) and the importance of identifying qualitative benefits. For some bidders, the low BCR calculated caused uncertainty about how favourably the Business Case would be assessed.

In terms of experiences using the GBM, fast-track bidders, in particular, commented that there were updates to the GBM tool during the process, there was little detail provided on how the GBM worked and that guidance was provided after the tool was issued, and that the outputs ran to several pages. Bidders following the standard process also highlighted this as a challenging element of the Business Case process.

"The GBM got updated part way through which meant that we had to re-run the model and the financial case" (Standard process, Officer quote – Small scheme)

*(See **Recommendation 8** - Provide additional guidance to address areas of weakness or challenge)*

☒ Bidders involved in **smaller schemes** were less likely to agree that the process was ***proportionate***, as the Business Case requirements and level of effort required was the same regardless of the amount of funding being requested.

"What did not work so well for us was proportionality. We only have [x] buses and yet we still had to go through the full five cases Business Case" (Standard process, Officer quote – Small scheme)

"This was a very intense process for a moderate amount of money. Very similar process to TCF, but we got [more than 8 times as much] for that" (Standard process, Officer quote – Small scheme)

"Did seem very intensive, but understand that DfT needed as much assurance as possible" (Standard process, Operator quote – Small scheme)

*(See **Recommendation 1** - Consider the strategic priorities for future funding opportunities and how these can best be achieved, and **Recommendation 2** - Make the bidding process more efficient)*

☒ **Extensive engagement** was required with a wide range of parties, which was a challenge, particularly for schemes involving more than one operator *(see Section 3.2.1 for more information)*.

☒ Following on from the issue raised at EoI stage, similar concerns were again raised about the **risks associated with committing to technical decisions and detailed costs**. Scheme costs and details had to be updated and confirmed at Business Case stage, but in many cases they were still indicative as the delivery partners had not been formally procured or appointed. There were also risks that external factors (including inflation and the patronage impacts of COVID) would impact on future delivery.

"Locking ourselves into the right figures, when we were seeing regular increasing costs across suppliers" (Standard process, Operator quote)

One LTA highlighted that the **Business Cases did not meet the FBC requirements set out in the Green Book**, or their own internal assurance requirements for Business Cases, because details, suppliers and costs were still indicative. This means that there is **still a lot to do following funding approval before ZEBs can be rolled out**. This results in a very long process, from EoI stage through to ZEBs actually entering into public service).

*(See **Recommendation 2** - Make the bidding process more efficient)*

☒ LTAs were required to sign a Memorandum of Understanding, which effectively passed over legal responsibilities for the scheme to the LTA. This required the LTAs to do a lot of internal work to ensure that they had **confidence in the proposals and decisions being made by the operators**. For LTAs without internal expertise this was a challenging process and required a lot of work to be undertaken by the LTA, and in some cases their consultants.

"Had to sign a MoU with DfT, which passed over legal responsibilities to the LTA. Had to do a lot of work to ensure we were happy with [the operator's] choice of vehicles, suppliers, etc. Something where we had to learn a lot obviously" (Standard process, Officer quote)

*(See **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase – including involvement of Zemo Partnership)*

☒ **Timescales for the fast-track schemes** in particular were a challenge, as the process coincided with the summer holidays when resource availability was limited.

☒ **Communication from DfT,** before, during and after the bid was submitted, was identified as a key area for improvement. Some LTAs felt that they heard about time extension late in the day. LTAs would have welcomed more direct engagement with DfT through the Business Case process (see Section 2-4 for more information). *(see **Recommendation 10** – More communication)*

In addition, the involvement of DfT's Consultants as a **'middleman'** between the DfT and the LTA was highlighted by some LTAs as adding delay and complexity to the process (*see Section 3.3.2 for more information).*

☒ Practical issues were also raised around the **structure of the documents** in terms of repetition across the 5 cases.

"Lots of overlap between the different sections – had to present the same information several times in slightly different ways. Had to spend a lot of time making sure there was still a strong over-arching narrative" (Standard process, Officer quote).

*(See **Recommendation 7** - Streamline and standardise the process of preparing EoI and Business Case documentation)*

3.1.4. Experience of Funding Award phase

Funding announcements were made approximately 6 weeks after the submission of the final Business Cases.

a) DfT perspective (including DfT's delivery partners)

For the DfT and their Consultants, this was a very busy time, especially given the number of standard process Business Cases submitted.

b) LTA (and delivery partner) perspective

Bidders would have welcomed more communication in the period while awaiting a funding decision, i.e. updates on when decisions were due to be announced. During this period, schemes were on hold and unable to progress the scheme. *(See **Recommendation 10** - More communication)*

Successful schemes would have welcomed feedback from DfT on their assessment scores, to understand the relative strengths and weaknesses of their Business Cases. Feedback was only provided to unsuccessful schemes. *(see **Recommendation 11** - Provide feedback on assessment scores to both successful and unsuccessful)*

3.1.5. Experience of the fast-track and standard process

The fast-track process was introduced at the request of LTAs, operators, and other bus industry stakeholders in order to speed up the roll out of ZEBs.

Except for the different timescales, the process was kept the same for both the fast-track and standard processes. This maintained a level playing field across the two sets of schemes but did mean that gaps in the guidance were not addressed between the two phases. Economic appraisal assumptions were kept the same across the two phases, despite updates to TAG during the process, to ensure that economic cases were comparable.

a) DfT perspective (including DfT's delivery partners)

At times, the two processes were running in parallel but at different stages. This made the process very complex for the DfT to manage.

b) LTA (and delivery partner) perspective

The fast-track bidders, with 'ready to go' schemes, welcomed the opportunity to progress more quickly. *(See **Recommendation 3** - Retain fast-track and standard-track processes)*

Other bidders followed the standard process, because either the authority or the operator needed the additional time to develop the proposal.

Some bidders reported that they would have preferred to follow the fast-track process. In most cases, the EoIs submitted under the fast-track process were unsuccessful and they were required to re-submit another EoI under the standard process.

The Business Case for the hydrogen fuel cell scheme was initially submitted under the fast-track scheme but was unsuccessful, and the LTA was invited to submit another Business Case under the standard process, and subsequently submitted a scaled-down proposal which was successful in securing the funding requested. During this period, a management consultancy firm with experience in hydrogen-based economies was bought into demonstrate how the scheme would be a catalyst for the hydrogen economy in the region. This involved undertaking a lot more engagement with key stakeholders and potential providers across the region and beyond to make the strategic and economic case for a hydrogen-based scheme.

3.2. Successes and challenges of LTAs pre-implementation activities

RQ2. For the successful schemes, what were the successes and challenges of LTAs' pre-implementation activities?

Including partnership formation between LTAs and bus operators, the production of EoIs and Business Cases at pace, legal and financial arrangements, and LTAs' own procurement processes.

3.2.1. Summary

The LTAs generally reported a positive experience of working with the various delivery partners. The various partners bought specific areas of expertise and advice to the process which was used to inform the development of the scheme and the Business Case**.** In particular, the bus operators were crucial in shaping the scheme proposals, identifying which routes to convert, the vehicle specification required, and the infrastructure requirements, as well as obtaining costs and establishing a delivery programme. Additionally, engagement with the bus manufacturers, infrastructure providers, and energy suppliers was often led by the operator. Manufacturers were often willing to host visits to see the vehicle options available, which helped inform the vehicle selection process.

However, the sheer amount of engagement which needed to be undertaken for the EoI and especially the Business Case stage created a challenge for LTAs. It also raised expectations about potential partners future involvement which needed to be managed**.**

Other challenges relating to the partnership working included:

- Some operators were more engaged than others. For fast-track schemes, discussions had already been happening and relationships were often better established. Some operators became less engaged over time, and some became more engaged.Some bidders highlighted challenges in terms of identifying the right teams and individuals to engage with within the bus company.
- For LTAs working with several operator partners there were additional practical challenges, especially in terms of protecting each operator's commercial information. Operator preferences around choice of vehicle and approach did not always match LTA aspirations.

LTAs also sought a mix of internal and external legal advice relating to subsidy control, procurement and identification of an operator partner, and transfer / use of grant funding. The main challenge involved ensuring that subsidy control requirements were being met for at a time the legislation was changing from the EU to UK government.

3.2.2. Partnership working

Partners involved in developing the bids included bus operators, bus manufacturers, infrastructure providers, energy companies, and other relevant local stakeholders (e.g. constituent local authorities).

What went well, or was a success?

☑ The LTAs generally reported a **positive experience of working with the various delivery partners**. Most engaged with a wide number of potential delivery partners. Potential partners generally recognised the opportunities that ZEBRA funding would provide them and were therefore happy to engage in the process.

The **various partners bought specific areas of expertise** and advice to the process which was used to inform the development of the scheme and the Business Case (including confirmation of costs).

What went less well, or was a challenge?

☒ However, the **sheer amount of engagement** which needed to be undertaken for the EoI and especially the Business Case stage created a challenge for LTAs. It also **raised expectations** about potential partners future involvement which needed to be managed.

3.2.2.1. Bus operators

Most LTAs are working with one operator but a small number are working with up to three operators. In most cases, the **preferred bus operator(s) is one of the big operators nationally or the local municipal operator**. For most schemes, the operator will procure, own and operate the vehicles and the infrastructure assets.

The bus operators **were crucial in shaping the scheme proposals** – identifying which routes to convert, the vehicle specification required, and the infrastructure requirements, as well as obtaining costs and establishing a delivery programme. In most cases (for 12 of the 17 schemes overall), operators are providing the majority of the match funding required, and therefore have a strong influence regarding the design of the scheme.

The LTAs typically engaged with all the bus operators in their areas at the outset of the process to determine interest in participating, including ability to provide the necessary financial contribution, ability to roll out vehicles in the required timescales, and their proposed approach. A **preferred operator (or operators)** was then selected as a partner for the bid. In many cases only one viable operator was identified, who will be the confirmed operator at implementation stage. Others have sought legal advice to ensure that their process for selecting an operator cannot be challenged, or are conducting a competitive regulated grant application process to allocate the Grant Funding to a bus operator. The latter process is generally being followed in locations where there is considerable competition between operators and where there are potentially a number of operators with the capability to transition to ZEBs, are able to provide the required match-funding, and could support the delivery of wider scheme objectives (e.g. because they operate routes in areas of poor air quality).

Kent was the only LTA not to partner with an operator at bidding stage. This is because the Kent scheme is linked to the Fastrack BRT service which is a tendered service. However, around 10-15 operators were consulted during the process, which enabled them to gather a wide range of views on vehicle types, infrastructure options, and overall strategies, which fed into their scheme design.

What went well, or was a success?

☑ **Some operators were more engaged than others**. For fast-track schemes, discussions had already been happening and relationships were often better established. Some operators became less engaged over time, and some became more engaged. As highlighted in Section 3.4, strong partnerships (often already established) with operators that had already committed to transitioning to a ZEB fleet was a key factor associated with successful schemes.

☑ The operators **often played an important role in providing access to suppliers**, and in many cases, the operator led the engagement with the supply chain including infrastructure and energy providers. Most operators were large companies which had experience in delivering ZEBs elsewhere, and sometimes had dedicated ZEB teams they could draw on.

"Without our partnership with [X], our bid would not have been successful. We were having weekly calls with them and never felt out of touch with where things were," (Standard process, Officer quote)

"A lot of what went into our final bid was provided to use from bus operators. First invited us down to a test event of their Arrival bus. We worked with the bus operators and with the local depots". (Standard process, Officer quote)

Ultimately the bus operators, as well as the LTAs, need to get internal approval for the scheme. The bus operators' relationships with the manufacturers and infrastructure providers were crucial in

providing them with the information they needed to build their internal total cost of ownership model, and develop an internal Business Case that would get internal approval.

What went less well, or was a challenge?

☒ Some bidders highlighted challenges in terms of **identifying the right teams and individuals to engage with** within the bus company. Decisions local teams made had to get sign off at group level as well, which wasn't necessarily apparent to LTAs at the start of the process.

"In hindsight we were engaging with one part of the bus company, [but] it's about working with the different teams in the bus operators". (Fast-track, Officer quote)

In some cases the operator didn't allocate a dedicated staff resource to the scheme until the bid had been successful.

☒ For LTAs **working with several operator partners** there were additional practical challenges, especially in terms of protecting each operator's commercial information.

"It was a bit like 'herding cats' with a number of different project partners". (Fast-track, Officer quote)

☒ Obtaining **costs and data** (e.g. to input into the GBM tool) in the timescales available created pressures for some LTAs.

☒ **Operator preferences around choice of vehicle and approach** did not always match LTA aspirations. As highlighted above, in most cases, operators are providing the majority of the match funding required, and therefore have a strong influence regarding the design of the scheme. This approach may result in a favourable outcome for the dominant/largest operator in the area, rather than necessarily the best technological solution in the long run.

3.2.2.2. Bus manufacturers and infrastructure providers

Engagement with the bus manufacturers and infrastructure providers was often led by the operator, with LTAs differing to operator choice regarding both of the scheme elements. In other cases the LTAs undertook initial market research during the bidding process, and some are undertaking full market research post award of fundings. One LTA employed a consultant to undertake this activity.

Many of the bidders spoke to several manufacturers who were often willing to host visits to see the vehicle options available. This helped inform the vehicle selection process. Many operators are trialling (or likely to trial) vehicles once funding has been awarded to aid the selection process.

3.2.2.3. Energy suppliers

Engagement with the energy suppliers was generally led by the operator, but sometimes the LTA. One LTA employed a consultant to do this.

Distribution network operators (DNOs) are responsible for the electric power distribution systems which deliver electricity to most end users, including those installing vehicle charging infrastructure. They require a formal application to be made, along with an administration fee, in order to provide firm costs and timescales. Under the current system, the energy capacity required is reserved once the LTA / operator has agreed to pay the identified amount. This must be done within 90 days of receiving the original quote; a much shorter timescale than that required to complete the ZEBRA funding application and award process. Note, however, that this process might change from 2023 onwards with new socialised cost regulation from Ofgem (the energy regulator for Great Britain).

Currently, if the LTA / operator is unable to go ahead with the works within the defined timescale, then the process needs to start again. This puts the scheme to the back of the queue and there is a possibility that another party (e.g. a developer) might take the available power supply.

What went well, or was a success?

☑ One operator commissioned **energy consultants** to advise on whether they were getting good value for money from the DNO, which they felt was very helpful in terms of helping to identify opportunities for achieving cost savings.

"We also have a couple of consultants who've been focused on our grid connections across the business and have really helped sort of value engineer those. Through that consultancy work, we were able to identify that Ofgem were putting a sort of grid capacity improvement scheme across the UK and that they were keen to hear from potential projects happening in areas. This reduced our grid connection cost in one area by about half a million pounds by providing justification for Ofgem to invest and strengthen the grid in that area." (Standard process, Operator quote)

☑ The same operator had success in future proofing the energy supply through the proposed scheme, to support further roll out of ZEBs in future. *(see **Recommendation 5** - Ask bidders to outline how their schemes are future-proofed to enable future ZEBs to be introduced more efficiently)*

"From previous funding rounds, particularly the OLEV work we did in [X], we know that if we just request the amount of power we need for the number of vehicles we're deploying at that point we end up having to go back in and dig up the road and put bigger cables in for the next round and in [X] in particular we're now on our third substation upgrading in eight years. All of which isn't necessarily the best use of public funds. If we'd had the foresight and the understanding of everything eight years ago, we could have put in the connection we needed.

Taking that learning into these bids, and based on the longer-term expectation of putting smart charging into the sites (at a cost to [us]) we were able to work out the power consumption we would need to electrify the full fleet. So, for future upgrades we'll only see on-site civils costs and not the grid connection costs, which are often more disruptive." (Standard process, Operator quote)

What went less well, or was a challenge?

Some bidders paid during the bidding process to get a firm cost to ensure the scheme costs were as accurate as possible, accepting that this is likely to expire before the scheme is delivered. Others relied on high level advice and costs instead.

In both cases **bidders are at risk in terms of understanding what the actual cost will be and whether or not the required energy supply will actually be available**. *(See **Recommendation 13** - DfT (or Central Government) to engage with the Ofgem/BEIS and DNOs to determine the process for seeking costs for energy capacity upgrades)*

3.2.3. Production of EoIs and Business Cases at pace

Those LTAs that were able to produce EoIs and Business Cases at pace (i.e. the Fast-track schemes) had a number of factors in common:

- operators committed to zero emission bus deployment with targets and resources to invest in new buses and infrastructure;
- operators that already had trialled ZEBs, had already developed strategies for a long-term transition to ZEBs, and had already bid for ZEB funding – so already had much of the information needed to prepare a bid and had political backing for ZEBs;
- established relationships (e.g. established bus partnerships) with bus operators that had already started thinking about local priorities in terms of the transition to ZEBs; and
- had the right skills in house, or from delivery partners (especially bus operators), or rapid access to the right consultancy expertise.

See Section 3.4 for further information.

Standard schemes required a longer time to develop their thinking and reach a similar position.

Pre-implementation activities which created challenges included:

- managing the scale of engagement required to inform the EoI and Business Cases;
- obtaining required information from operators and the supply chain;
- committing to technical decisions and detailed costs at EoI stage;
- understanding and completing the Economic Case requirements.

See Section 3.1 for further information.

3.2.4. Legal and financial arrangements

LTAs sought a mix of internal and external legal advice relating to subsidy control, procurement and identification of an operator partner, and transfer / use of grant funding.

The main challenge involved ensuring that **subsidy control requirements** were being met for at a time the legislation was changing from the EU to UK government.

"There were lots of issues about spending public money correctly and about subsidy control, and in that period the UK government's alternative to the EU arrangements on state funding etc were still being developed. Our legal people had to do a lot of work to predict how and to what extent the UK regulations would mirror those of the EU." (Standard process, Officer quote)

A number of LTAs commented that previously the DfT has provided advice on state aid / subsidy control issues[2], and similar advice would have been welcomed this time. However, it was also acknowledged that every scheme is different and the LTAs may still need to get internal sign-off as part of their internal due diligence process. *(see **Recommendation 12** - Provide centralised legal advice on subsidy control regulations)*

"It would have been more helpful if the DfT could have provided a considered opinion on state aid at the programme level to give us a better starting point. We ended up paying for a lot of advice at a high price that really just reiterated what the law was." (Standard process, Officer quote)

3.2.5. LTAs' own procurement processes

Most LTAs are not procuring the vehicles directly, so LTA procurement teams had a relatively limited role.

Some LTAs asked their procurement teams to review the operator procurement processes which operators were intending to use.

Where vehicles and infrastructure are being procured by the LTA, some have been able to make use of their own existing local procurement frameworks for purchasing fleet vehicles and charging infrastructure for wider purposes. These frameworks have already been used to shortlist potential suppliers and can provide a more efficient approach than developing a separate procurement process. One LTA was able to make use of an existing procurement framework set up for the AEBT/C bid. Other LTAs are using the Crown Commercial Services framework or other frameworks such as the Yorkshire Purchasing Organisation framework, which are intended to support the public sector.

There could be benefits of using an existing local framework especially if the cost per bus / charging unit is better than available elsewhere, but in at least one case the local framework was limited in terms of the number of buses that can be purchased, necessitating the use of an additional framework for the purchase of additional buses / infrastructure.

[2] For the ULEB scheme, the DfT sought state aid approval from the EU for the entire programme. Post BREXIT approval / advice relating to subsidy control would need to come from the BEIS.

3.3. Effectiveness of partnership-based approach

RQ3. How, or how not, did the partnership-based approach adopted by ZEBRA contribute to success in bidding for funding?

3.3.1. Summary

Overall the co-development approach is felt to have resulted in better quality and more consistent Business Cases overall, which should minimise delivery risks at implementation stage. The DfT felt that the approach resulted in better Business Cases which meet their requirements. DfT's Consultants also felt that the process worked well once LTAs were engaged.

Feedback from the LTAs on the co-development approach was mixed. DfT's Consultants were seen as providing a reviewer or critical friend role, focused on ensuring that the Business Cases reflected the guidance. Having a dedicated individual to ask questions as and when required was seen as a benefit. The level of engagement was seen as about right.

There was some uncertainty and scepticism about DfT's Consultants role initially, although most LTAs commented that trust was quickly built. LTAs were unclear about whether the Consultants were working for DfT, the LTAs, or both, and felt the role of the Consultants could have been better explained from the start.

3.3.2. Context

Phase 2 was intended to involve the **co-development of the Business Case** between LTAs, their partners and the Department. The purpose of the co-development approach was to maintain an on-going dialogue to increase the likelihood of the final proposal being acceptable to all parties.

The DfT appointed a professional services consultancy to provide extra capacity to support this process by:

- acting as an interface between DfT and the LTAs; and
- acting as a critical friend to LTAs.

The co-development approach involved:

- reviews of interim draft Business Cases by the DfT;
- regular meetings between the Consultants and the LTAs (once or twice a week for fast-track schemes, weekly or fortnightly for standard process schemes which were working to a slower timescale), with additional ad-hoc discussions and emails in between.

3.3.3. Stakeholder perspective

Overall the co-development approach is felt to have **resulted in better quality and more consistent Business Cases overall**, which should minimise delivery risks at implementation stage. Some bidders felt that they are likely to have achieved a similar quality anyway, due to experience in preparing Business Cases and internal scrutiny processes; others were more dependent on the feedback provided by the DfT and their Consultants. *(See **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase)*

Feedback from both Zemo Partnership and various LTAs suggests that the input from DfT and their Consultants was largely a review role, rather than actively advising or steering the Business Cases, which might be inferred by the term 'co-development'.

"I interpreted it as technical support. Effectively it was proof reading and suggesting where we could provide evidence. I did not perceive them as being with us." (Standard process, Officer quote)

DfT perspective

The DfT felt that the approach resulted in better Business Cases which meet their requirements.

DfT's Consultants perspective

DfT's Consultants also felt that the process worked well once LTAs were engaged. They felt that they were able to advise on what evidence was required for different sections and how messaging would land with the DfT, help with understanding of the economic model (albeit they were not experts in the use of the GBM tool), and maintain progress and pressure to deliver a high-quality bid. However, some LTAs felt that the messaging around their role was not particularly clear at the outset, and consequently some LTAs were slow to engage.

The Consultants also had weekly meetings with DfT, which enabled them to provide strategic direction to the process.

LTA (and delivery partner) perspective

Again, feedback on the co-development approach was **mixed**.

"The feedback was consistent and made sense. This did result in a high-quality proposal, and we got efficient results. The involvement was just about right" (Standard process, Officer quote)

"I think it was a good process. Regular meeting with [DfT's Consultants], and DfT really helped fine tune the bid" Standard process, Officer quote)

Comments from the DfT on the Business Case drafts was felt to be the most useful feedback received. LTAs would have welcomed more direct engagement with DfT, and quicker responses to questions. *(see **Recommendation 9** - Continue to apply partnership (co-development) approach to the Business Case phase)*

DfT's Consultants were seen as providing a reviewer or critical friend role, focused on ensuring that the Business Cases reflected the guidance. Having a dedicated individual to ask questions as and when required was seen as a benefit. The level of engagement was seen as about right.

Some LTAs found their involvement more useful than others. Some saw the process as *"another hoop to jump through"* which did not necessarily make the process more efficient.

"You'd get [DfT's Consultants] comments; deal with those. Then it would go to DfT, and obviously you have passed the '[Consultants] Test', but then there is another load of stuff coming back from the DfT" (Standard process, Officer quote)

Two specific areas for improvement were identified:

- There was **some uncertainty and scepticism about DfT's Consultants role initially**, although most LTAs commented that trust was quickly built. LTAs were unclear about whether the Consultants were working for DfT, the LTAs, or both, and felt the role of the Consultants could have been better explained from the start. Some LTAs initially thought that the Consultants were going to actively help write the Business Case, and in one case this delayed the LTA seeking additional consultancy support.

  "I felt we were misled at the beginning about the role of [DfT's Consultants]. Even in this topic guide you refer to their role as 'co development'. This is at best misleading. It's just not true" … "At an early seminar with DfT it was suggested that [the Consultants] would work with LTAs to write the submission. Then in the follow up meeting with [the Consultants] alone it became clear that their role was more of a critical friend." … "This caused [us] to think very hard and fast about whether [we] had the resource in house to take the bid through. Some other bidders (not us) might have been put on the back foot by that." (Standard process, Officer quote)

- The involvement of DfT's Consultants as a **'middleman'** between the DfT and the LTA was highlighted by some LTAs as adding delay and complexity to the process, and it was felt that some discussion points got mis-interpreted during communication from the LTA to the

Consultants to DfT, and back through the same route. It was noted that the Consultants struggled to contact DfT on occasions which added to the delay in receiving a response. The opportunity to engage directly with the DfT on some points would have been welcomed at times, but it was felt that this was discouraged.

"It was a blessing and a curse … [DfT's Consultants] performed well and were quick at responding to queries and reviewing documents, however the middleman scenario did create some problems" (Fast-track, Officer quote)

As a result of the critical friend role undertaken by the Consultants as part of the Business Case development process, one LTA has continued to procure the same Consultants directly to provide them with on-going financial support during the scheme implementation phase.

3.4. Factors associated with successful bids

RQ4a) What were the common factors that led to successful or unsuccessful bids for funding?

3.4.1. Summary

The successful bidders (at both EoI and Business Case stage) generally had a number of factors in common: they were all able to meet the match-funding requirements for both vehicles and infrastructure; they had a clear view of what they wanted to achieve, based on previous experience developing or trialling battery electric bus schemes and a defined roadmap to achieving a fully zero emission fleet; and they had strong partnerships with operators that had already committed to transitioning to a ZEB fleet.

They tended to already have strong political backing for ZEBs; they had existing material that could be used for the bid; they had the right skills in house, or from delivery partners (especially operators), or rapid access to the right consultancy expertise to draft the bid; and simpler schemes, which focused on one operator and one location, tended to be more successful as bidders needed to do less work to prepare the Business Case.

Based on feedback from the DfT, Zemo Partnership, and DfT's Consultants, schemes that were unsuccessful at either EoI or Business Case stage had the following characteristics in common: they often came from smaller authorities, with less expertise to draw on and less capacity; and they were characterised by a lack of clarity on key decisions such as number of ZEBs, where and why, technology approach and why. Hydrogen fuel cell bids also tended to be less successful: they typically scored poorly on value for money due to high purchase and operating costs; and in many cases it was unclear why a hydrogen-based approach was being proposed as the zero emission technology.

In addition, some of the unsuccessful bids had a lack of engagement or commitment from the bus operator, or a change in engagement over time. Complex schemes also tended to be less successful. Bidders which proposed more expensive vehicles or infrastructure had to do more work to justify the approach.

3.4.2. Successful schemes

Based on feedback from the DfT, Zemo Partnership, DfT's Consultants and LTAs (including operators attending interviews), the successful bidders (at both EoI and Business Case stage) generally had a number of factors in common.

☑ They were all **able to meet the match-funding requirements** for both vehicles and infrastructure, i.e. at least 25% of the cost difference between the proposed ZEBs and the equivalent diesel buses and at least 25% of the capital costs associated with the infrastructure requirements. For 11 of the successful schemes the percentage of match funding was at least 40%, and as high as 54% for one scheme. In most cases (for 12 of the 17 schemes overall) operators provided the majority of the match funding required.

☑ They had a **clear view of what they wanted to achieve**, based on previous experience developing or trialling battery electric bus schemes and a defined roadmap to achieving a fully zero emission fleet. This was particularly the case regarding the majority of the fast-track schemes:

Examples: Fast-track schemes

- Kent has been looking at introducing ZEBs for a number of years and submitted a bid for the AEBT/C scheme in 2020.
- Leicester had previous experience in the electrification of Council-supported bus routes, had been successful in securing funding for a TCF scheme involving ZEBs, and had a supporting bus strategy in place.

- Milton Keynes' scheme builds on the successful implementation of the Milton Keynes Electric Bus Demonstration Project (2014 to 2019), which delivered the UK's first inductive charged all-electric bus service (Route 7) with support from DfT under the Green Bus Fund initiative. The project involved a leasing model through an Enabling Company structure broadly similar to the approach proposed for the ZEBRA scheme.
- Warrington submitted a bid for the AEBT/C scheme in 2020, so already had a scheme in mind, bid material to draw on, and was able to make use of an existing procurement framework set up for the AEBT/C bid.

In terms of standard process schemes, the York scheme illustrates this well:

Example: York (standard process scheme)

York developed a ZEB roadmap in 2012, and has been following this for the last 10 years, resulting in one of the largest battery electric bus fleets in the UK operating in the city. The York ZEBRA scheme will deliver Phase 2 of a four-phase transition to electric power:

- Phase 1 (completed late 2020) was the conversion of York's Park & Ride fleet, 33 vehicles serving five sites.
- Phase 2, which the ZEBRA scheme supports, sees electrification spread to York's high frequency non-park and ride network. This is seen as an essential component in the transition of the York network to zero emission vehicles.
- Phase 3 of the process seeks to convert non-frequent routes in York and those which are urban / rural in character. This phase will involve nearly all of York's operators.
- Phase 4 will convert the inter-urban routes, but there is currently considerable uncertainty around the availability of suitable ZEB technology to serve these routes.

All of these bidders were better able to demonstrate 'Ambition', and scored better on 'Deliverability'. They were able to provide more detail and be more convincing, because they had more experience to draw on and understood the issues, challenges and risks involved.

"It was the right scheme at the right time" … "We went into it knowing what we wanted" … "We were already working towards this and had a lot of the data" (Fast-track, Officer quote)

☑ They had **strong partnerships with operators that had already committed to transitioning to a ZEB fleet**. A number of operators had already made a commitment to transition to zero emission fleets, and had already started to develop partnerships with manufacturers and suppliers, identify areas to prioritise, and / or had participated in ZEB trials.

For example, First had already been running battery electric buses in York, and were trialling hydrogen fuel cell buses in Aberdeen. National Express had already trialled hydrogen fuel cell vehicles in the West Midlands. This helped inform decisions about choice of technology for the various ZEBRA schemes they were involved in.

"We had had success with previous bids in England and Scotland, so had already started to build up 'total cost of ownership' model. Had established good relationships with suppliers which enabled us to get costs. Our property team had quite a good understanding of depot requirements. We had already been thinking about vehicles, routes, depots. (Standard process, Operator quote)

In some cases, the LTA and operator had already worked together on previous bids.

This meant that they were able to quickly identify a potential scheme that met the ZEBRA requirements, had an understanding of what is involved in implementing and operating ZEB schemes, and had access to data on costs and technologies to inform their bids.

☑ They tended to already have **strong political backing for ZEBs**. In some cases, Councils had declared a climate emergency, and the ZEBRA programme fitted well with political priorities. This helped in terms of the LTA officers being able to secure the resources and funding to prepare a bid and helped secure Council funding to contribute towards match-funding requirements for some schemes.

In some cases, the LTA had an internal **ZEB champion** who played a key role in driving the scheme forward.

☑ They had **existing material that could be used** for the bid, e.g. from the AEBT/C competition, TCF bids, and other funding streams, or from local strategies, policies or roadmaps.

"It was an editing job from a previous bid. We had a debrief of why it was not successful and therefore addressed those [issues] for this bid." (Fast-track, Officer quote)

☑ They had the **right skills** in house, or from delivery partners (especially operators), or rapid access to the right consultancy expertise to draft the EoI. Larger authorities tend to have more capacity and experience to draw on, and Combined Authorities often have dedicated teams to write Business Cases; however, two of the best Business Cases were each written by one person (observation from DfT's Consultants). Similarly, **larger operators** are more likely to have a central team that can input into such bids.

In-house ZEB expertise was not necessarily a requirement; but where this did not exist, successful schemes relied heavily on operators to provide this, or consultants.

☑ In addition, **simpler schemes**, which focused on one operator and one location, tended to be more successful as bidders needed to do less work to prepare the Business Case. *(See **Recommendation 6** - Allow multiple bids from LTAs)*

3.4.3. Unsuccessful schemes

Based on feedback from the DfT, Zemo Partnership, and DfT's Consultants, schemes that were unsuccessful at either EoI or Business Case stage had the following characteristics in common.

☒ They often came from **smaller authorities**, with less expertise to draw on and less capacity (observation from Zemo Partnership). *(See **Recommendation 2** - Make the bidding process more efficient)*

☒ They were characterised by a **lack of clarity** on key decisions such as number of ZEBs, where and why, technology approach and why.

☒ **Hydrogen fuel cell bids were less successful**. They typically scored poorly on value for money due to high purchase and operating costs; and in many cases it was unclear why a hydrogen-based approach was being proposed as the zero emission technology. The overall quality of the bids was often lower, which may reflect a lack of LTA and operator experience with hydrogen fuel cell buses. Financial support for hydrogen buses from operators was typically low, and the LTA contribution was typically high.

The West Midlands scheme was the only successful hydrogen-based proposal; two other proposed hydrogen fuel cell schemes were unsuccessful at Business Case stage. Success was based on a clear rational for choosing hydrogen as a technology *(see Section 3.5)*.

☒ **Lack of engagement or commitment from the bus operator**, or a change in engagement over time. For one scheme, the operator was unable to cover 25% of the cost difference between the proposed ZEBs and the equivalent diesel buses, and the LTA was unable to identify match-funding. Without this, the necessary match funding requirements were not met, so LTA did not submit a Business Case.

☒ In addition, **complex schemes** tended to be less successful. Schemes which proposed more expensive vehicles or infrastructure had to do more work to justify the approach. Schemes which spread the vehicles across several areas and/or involved several operators had to do more work, essentially preparing multiple Business Cases, which made it more difficult to set out an overarching strategic case.

Nevertheless, some more complex bids were successful. For example, the Leicester scheme involves three operators across three projects, and a mix of commercial and tendered services. The West Yorkshire scheme involves three operators, across four depots, and routes serving three

districts. In these cases, the schemes had the right resources in place to drive the scheme forward, combined with other success factors described above. *(See **Recommendation 6** - Allow multiple bids from LTAs)*

3.5. Rationale for the preferred option

RQ4b) What was the rationale and factors affecting the preferred option?

3.5.1. Summary

The preferred scheme option was generally based on the following factors:

- engagement with the bus operators (most schemes were strongly influenced by the operators);

  "To some extent we were mirroring the decisions they [the operator] had made because they were the ones who had to get the buses running, had to make an economic case" (Standard process, Officer quote) … "Yes, it wouldn't work with us, just being told what bus to get. A recipe for disaster" (Standard process, Operator quote)

- local route and service characteristics;
- age of existing vehicles and scope to upgrade them;
- feasibility of upgrading the depot, including space and proximity to electricity sub-station, or presence of an existing bus or hydrogen depot;
- potential to address local air quality problems;
- experiences from previous trials;
- approach to risk and complexity – Some bids discounted hydrogen due to the substantially higher cost involved and because the technology is still at an early stage, and excluded high mileage routes which may require opportunity charging which is perceived to be less popular with operators.

3.5.2. Battery electric - depot charging

The majority of schemes (11 out of 17 successful Business Cases) involve battery electric technology and depot charging only (i.e. without any opportunity charging). Battery electric is at a more developed stage of commercial deployment compared with hydrogen, and offers a cost advantage compared with hydrogen. For shorter mileage routes where battery range is not an issue, depot charging offers an attractive option for operators as it means limited changes to existing operations compared with opportunity charging approaches.

Example: York

Depot charging was selected for the following reasons:

- York is a compact area, so battery range is not an issue.
- Deport charging allows use of cheaper electricity by taking advantage of overnight low demand tariffs, and removes the cost and ongoing maintenance requirements of opportunity charging locations.
- York is a medieval city with limited space for opportunity charging due to narrow roads and heritage / aesthetic issues. In addition, opportunity charging limits the potential for changing routes and diverting buses, and risks exacerbating journey delays.

<u>Selection of routes and vehicle type</u>

An initial shortlist was drawn up based on the expected range of the electric vehicles and the local operating environment (e.g. topography), plus the commercial performance of the services. Capacity analysis using pre-pandemic 'normal world' data showed that the proposed routes could all be serviced with high-capacity single deck vehicles (which are cheaper to procure and operate). The current routes use a mix of double and single deck vehicles.

In addition, all the proposed ZEBRA bus routes pass through the city centre Air Quality Management Area, and there is potential for bus priority measures to be implemented on some sections of the routes.

3.5.3. Battery electric - opportunity charging

Five of the 17 funded Business Case scheme are proposing to use opportunity charging to supplement depot charging. These schemes will use new and existing pantographs or plug-in rapid chargers located along bus routes to 'top up' the battery charge; all but one of these schemes are using pantographs.

No scheme proposed using opportunity charging alone. The vehicles all operate on routes which involve high daily mileage (either inter-urban routes, and/or routes with long operating hours).

Example: Kent

The Kent scheme involves the introduction of ZEBs on the Fastrack tendered Bus Rapid Transit network, which will operate 24 hours a day. The service is also characterised by high levels of patronage and frequent stops, placing a high demand on the vehicle. Opportunity charging (which is expected to be the primary method for charging the vehicles) was selected for the following reasons:

- The Council trialled the approach in 2018 and found it to worked very well.
- Opportunity charging ties the infrastructure to the network, rather than a particular operator's depot, so it could be used by other operators in the future. This was an important consideration given the contracted nature of the service, and the potential for a change in operator.
- The presence of pantographs on the side of the road is a very visible indication to the public that the service is using 'green', electric vehicles. Feedback from the public is that they would be more willing to use public transport if it was cleaner and greener and the pantographs enable the service to be clearly advertised in this way.

3.5.4. Hydrogen fuel cell technology

Only one of the successful Business Case schemes (West Midlands) is based on hydrogen fuel cell technology. Some LTAs considered hydrogen at optioneering stage, but discounted it because of:

- lack of direct experience;
- additional costs and risks compared with well-established battery electric technology;
- absence of dedicated hydrogen supply, storage or distribution infrastructure in the area.

For the West Midlands, hydrogen was selected as an alternative to an electric opportunity charging solution for routes with long operating hours and high daily mileage.

Example: West Midlands

The West Midlands scheme is intending to deliver 100 double deck hydrogen fuel cell buses based on Walsall, and 24 articulated hydrogen fuel cell vehicles to operate on the Walsall to Solihull Sprint Bus Rapid Transit System (BRT).

Hydrogen was chosen because of the intensive nature of the operation of bus services in the area; many services operate for up to 20 hours in the day, and there are a lot of high frequency services with high Peak Vehicle Requirements.

A review of existing commercial services found that, based on the current average ranges of battery electric buses, around 4 in 10 routes would not be suitable for battery electric vehicles supported by depot-based charging. An alternative option was therefore required. Opportunity charging using pantographs was one option, but local bus operators were known to have a strong preference for depot charging. Hydrogen buses were therefore felt to be the best solution.

In addition, there are already 20 hydrogen buses in the region, operated by National Express out of the Walsall Garage. The performance of these vehicles has been well received by the operator, fuel consumption has been favourable, and the operator is keen to build the fleet. Assuming National Express is the selected partner, the entire Walsall depot will become hydrogen powered.

The scheme fitted with wider ambitions to build a strong hydrogen economy in the West Midlands.

3.6. How did the successful schemes compare with expectations?

3.6.1. Scheme costs

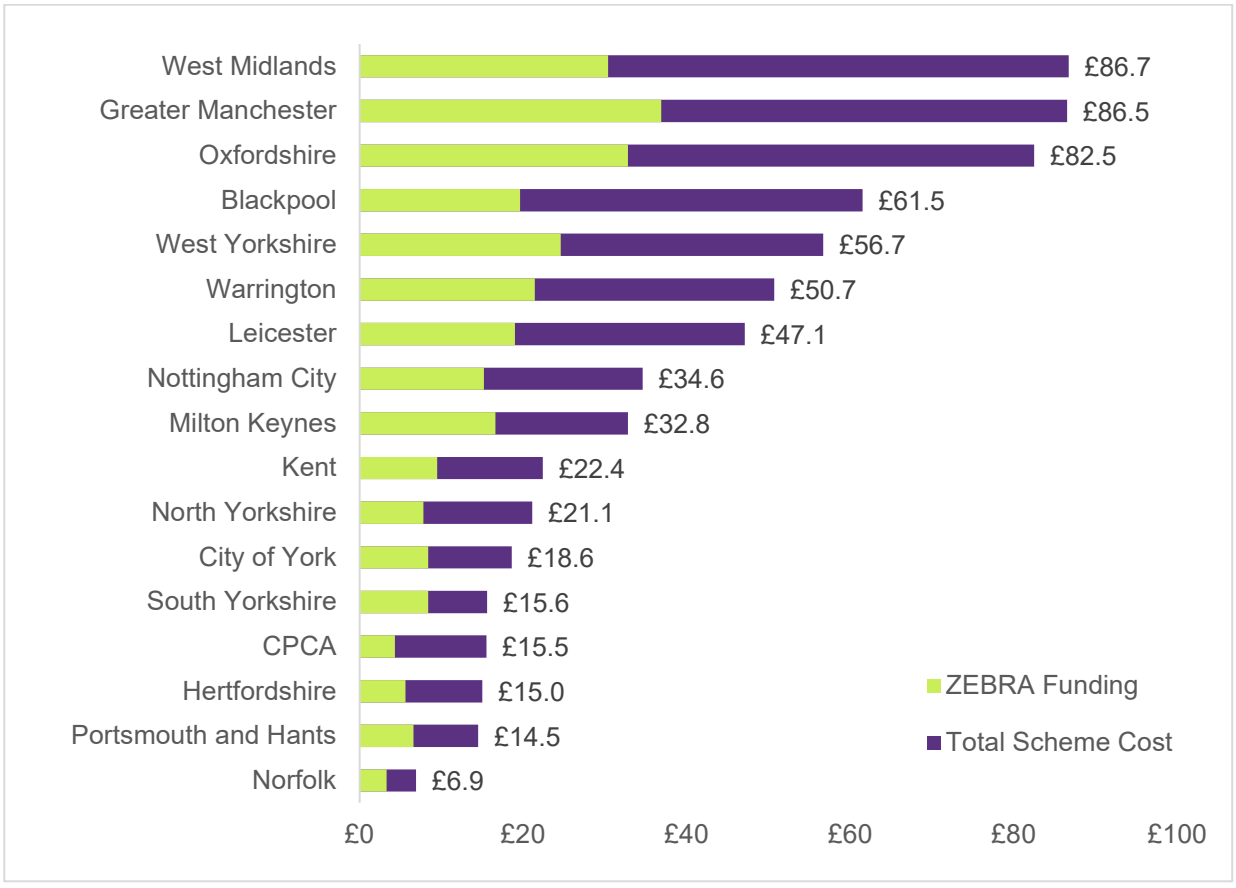
Initially, up to £120 million capital funding was made available to support ZEBRA schemes. This was estimated to support 500 ZEBs. The original intention was to award funding to at least three large schemes. The EoI Guidance stated that there was no minimum or maximum size for bids, but that the DfT expected to see schemes requiring approximately £25m-£35m of grant funding.

The October 2021 Spending Review announced that a further £150 million would be available to support ZEBRA schemes, taking the total funding available to £270 million. The increase in funding allowed the DfT to **fund a much larger number of schemes**, 17 in total.

In addition, the **range of grant funding requests was much broader than originally expected** , varying from £3.3m to £32.8m. Only two schemes (West Midlands - £30.4m, and Oxfordshire - £32.8m) fit in the £25-£35m bracket that DfT originally intended.

Across the successful bids, total scheme costs varied widely from £6.8m (Norfolk) to £82.5m (Oxfordshire), £86.5m (Greater Manchester) and £86.7m (West Midlands).

Figure 3-1: Forecast scheme costs for successful schemes (£m)



3.6.2. Number of ZEBs funded

The successful schemes are proposing to deliver 1,278 ZEBs. This is **substantially higher** than the 500 ZEBs originally expected (based on £120m), and is more than the 1,125 ZEBs which might be expected from the increase in funding from £120m to £270m.

3.6.3. Range of technologies

The successful schemes are **all based on battery electric vehicles, except for one hydrogen fuel cell scheme**.

The schemes include **different charging strategies** for battery electric buses and **battery sizes** for vehicles.

There were no specific expectations at the outset about the likely **split between electric and hydrogen**; rather, the bidding process itself was a seen as a means of assessing how the two technologies compare at the current point in time. The output of the process suggests that hydrogen technology is still at an early stage of commercial deployment. The substantially higher costs, and apparent lack of operator support relative to electric, meant that many potential hydrogen schemes were not sufficiently robust to secure funding. Many electric schemes considered hydrogen at optioneering stage, but felt that electric provided a more established (and less risky) option.

Overall, about 10% of ZEBs funded will be hydrogen fuel cell.

3.7. Lessons for the design of future ZEB funding schemes

RQ5. What are the lessons that will contribute to the design of future Departmental zero-emission bus and infrastructure funding programmes?

3.7.1. Summary

A total of 14 lessons / recommendations have been made following the findings of the Pre-implementation Process Evaluation. These can be split into the following areas:

- **Theme 1 – Overall process (Lessons / Recommendations 1-6)**: consider the strategic priorities for future funding opportunities, and how these can best be achieved; make the bidding process more efficient (e.g. by changing the balance of requirements between the EoI and Business Case phase); retain fast-track and standard processes; require larger schemes to set out a lower cost 'scaled down' scheme; ask bidders to outline how their schemes are future-proofed to enable future ZEBs to be introduced more efficiently; and allow multiple bids from LTAs.
- **Theme 2 – Additional guidance and structure (Lessons / Recommendations 7-8)**: streamline and standardise the process of preparing EoI and Business Case documentation; and provide additional guidance to address areas of weakness or challenge.
- **Theme 3 – Role of DfT (and technical partners) (Lessons / Recommendations 9-14):** continue to apply partnership (co-development) approach to the Business Case phase; more communication; provide feedback on assessment scores to both successful and unsuccessful; provide centralised legal advice on subsidy control regulations and a standardised Grant Transfer / Grant Funding Agreement letter; DfT (or Central Government) to engage with the Ofgem/BEIS and DNOs to determine the process for seeking costs for energy capacity upgrades; and share lessons learnt and relevant experience.

3.7.2. Theme 1 – Overall process

Lesson / Recommendation 1: Consider the strategic priorities for future funding opportunities, and how these can best be achieved

For future funding opportunities, the DfT needs to determine how it wishes to prioritise delivery. This might include:

- focusing on rolling out ZEBs as quickly as possible;
- targeting areas which do not currently have ZEBs, including consideration of rural and inter-urban services;
- supporting operators that can deliver at scale vs. supporting smaller operators;
- delivering value for money;
- ensuring schemes support the delivery of a sustainable bus network, i.e. meets the needs of the LTA (including the local BSIP and Local Transport Plan) as well as operator priorities; and / or
- encouraging innovation (e.g. innovative electric bus technology and acceleration of hydrogen fuel cell deployment).

For subsequent bids, one contributing factor to achieving good value for money is likely to be the inclusion of depots that have already been converted and have capacity to accommodate additional ZEBs without substantial further infrastructure investment. However, this needs to be balanced against the benefits of supporting a broader range of schemes which will ultimately give a broader range of operators' confidence to invest in zero emission fleets.

ZEBRA is better suited to larger schemes and larger operators, due to the efficiency benefits of delivering at scale, the substantial funding commitment required from operators, as well as the

intensive nature of the bidding process. Recommendations to make the bidding process more efficient will help smaller schemes (e.g. ***Recommendation 2***) however, additional approaches might be required, such as a simplified process and separate funding pots for smaller and larger schemes.

Finally, allocating funding directly to operators would likely result in faster roll out of ZEBs and would avoid putting risks on LTAs (e.g. that operator plans change), but is less likely to provide wider strategic benefits than LTA-led schemes and may result in less accountability and audit regarding spend of public money.

Lesson / Recommendation 2: Make the bidding process more efficient (e.g. by changing the balance of requirements between the EoI and Business Case phase)

The two-stage process (EoI + Business Case), along with the need to confirm suppliers post funding award, results in a very long process – up to 18 months before an order for ZEBs can be placed. In addition, the intensive nature of the bidding process is likely to be a barrier to participation for some LTAs and operators. Opportunities to streamline the process should be considered in order to accelerate the roll out of ZEBs and reduce the burden on bidders.

This might involve reducing the level of detail required at EoI stage. For example, ask bidders to identify which cost band their scheme fits in, rather than requiring detailed costs for vehicles and infrastructure.

Alternatively, make the EoI process more detailed in order to allow more robust decisions to be made about which schemes to shortlist; and then require procurement processes to be completed before submission of the full Business Case (as per HM Treasury Green Book requirements). This would enable schemes to go straight into delivery phase following confirmation of funding.

There are also lessons that can be learnt from funding schemes in Scotland, such as providing a standard expected purchase cost for battery electric and hydrogen fuel cell buses based on the number of vehicles to be delivered, to simplify the EoI process (suggested by Zemo Partnership).

The two-stage process is perceived to have resulted in higher quality and more consistent bids, but it is too early to say whether this will result in better delivery on the ground.

Even if the process is made more efficient, the Business Case process is likely to remain a significant task and this should be emphasised in the guidance.

Lesson / Recommendation 3: Retain fast-track and standard processes

This will help accelerate the roll out of ZEBs in areas where proposals are more developed.

Lesson / Recommendation 4: Require larger schemes to set out a lower cost 'scaled down' scheme

This would avoid the need to ask bidders to re-submit a separate Business Case for a scaled-down version of the scheme.

Lesson / Recommendation 5: Ask bidders to outline how their schemes are future-proofed to enable future ZEBs to be introduced more efficiently

Some schemes future-proofed the energy supply to depots, at marginal additional cost, to allow additional ZEBs to be introduced at lower cost in future. Others didn't do this, and kept their cost lower. To provide a level playing field, all bidders should be asked to consider the scope for future proofing their schemes.

Lesson / Recommendation 6: Allow multiple bids from LTAs

This will avoid the need for schemes based on multiple areas and operators, which adds complexity; and the potential for one element of the scheme to undermine the value for money of other parts of the scheme. For example, combined authorities could submit one bid covering one district and another for a second district.

3.7.3. Theme 2 – Additional guidance and structure

Lesson / Recommendation 7: Streamline and standardise the process of preparing EoI and Business Case documentation

a) Be clear that word limits must be adhered to; but also provide more guidance on what information is required / not required and what 'good' looks like, to help bidders frame their responses succinctly. Do not allow supporting appendices – to ensure a level playing field.

b) Provide a more structured Business Case template; again with more guidance on what information is required / not required and what 'good' looks like. This would help reduce the amount of unnecessary information (e.g. Defining the Place), reduce the overlap between the different sections, and make the assessment process more efficient. Include more direct questions, especially for the Management and Financial Cases.

c) Provide standardised table or proforma to capture key information required about local bus operations, to reduce the tendency for lengthy commentary to be provided in Strategic Cases.

Lesson / Recommendation 8: Provide additional guidance to address areas of weakness or challenge

a) Provide more guidance on using the GBM tool, e.g. a step-by-step guide so that the tool can be used by a range of audiences. Share the GBM tool with bidders at EoI stage, to allow it to be used to inform optioneering. Be clear on value for money and BCR expectations, i.e. the fact that the BCR is likely to be low.

b) Provide more specific guidance on the application of optimism bias and contingency, long term financial sustainability, and the importance of non-monetised benefits. These topics are all covered in the DfT's Transport Analysis Guidance but some LTAs are less experienced at preparing Business Cases than others.

c) Make it clear that there is a significant step up in terms of the effort required between the EoI and Business Case stage, so that LTAs and their delivery partners are fully aware.

3.7.4. Theme 3 – Role of DfT (and technical partners)

Lesson / Recommendation 9: Continue to apply partnership (co-development) approach to the Business Case phase

Overall the co-development approach is felt to have resulted in better quality and more consistent Business Cases overall, which should minimise delivery risks at implementation stage. However, the term 'co-development' was felt, by many stakeholders, to be mis-leading and an alternative description (focused on a review and critical friend role) should be considered.

The approach should continue to involve:

- reviews of interim draft Business Cases by the DfT (particularly valued by LTAs);
- regular meetings and discussions with LTAs, led by relevant technical experts on behalf of DfT.

The purpose of the process and the role of DfT and any technical partners should be clearly articulated at the outset, so that LTA expectations are clear (i.e. is it about reviewing draft material, addressing technical queries, and/or actively helping LTAs to shape their schemes and Business

Cases). Technical support should include expertise in Business Cases and use of the GBM tool. Timescales and expectations regarding formal interim reviews of Business Cases should be clearly set out.

Consideration should be given to involving the Zemo Partnership in this process, primarily to advise the DfT on the technical robustness of ZEB proposals in a real-world context, and potentially to provide direct feedback to bidders.

Consideration should also be given to providing more opportunity for bidders to engage with DfT directly, especially on policy issues, and ensuring the DfT has capacity to respond to queries promptly.

Lesson / Recommendation 10: More communication

a) Outline intentions for future funding opportunities at an early stage to allow potential applicants to start preparation.

b) Maintain communication with bidders during the bid preparation process (e.g. reminders about deadlines for draft Business Cases, changes to or new guidance).

c) Keep bidders informed between phases, particularly around timescales for funding announcements so that they are ready for the next stage. Notify bidders informally of any funding decisions, so as not to stall schemes longer than necessary.

Lesson / Recommendation 11: Provide feedback on assessment scores to both successful and unsuccessful

Following the assessment of the Business Cases, formal feedback was provided to unsuccessful schemes only, but would have been welcomed by successful schemes as well. Providing feedback on both successful and unsuccessful schemes will help bidders to understand the strengths and weaknesses of their bids. It will provide transparency about why schemes have progressed or not and will help to improve future bids.

Lesson / Recommendation 12: Provide centralised legal advice on subsidy control regulations and a standardised Grant Transfer / Grant Funding Agreement letter

a) A number of LTAs commented that previously the DfT has provided advice on state aid / subsidy control issues. Similar advice would have been welcomed this time. Many of the schemes are based on similar commercial models, and some advice on requirements and issues to consider would streamline this process for LTAs, even if they still need to get internal sign-off.

b) In addition, a standardised Grant Transfer / Grant Funding Agreement letter would be useful, and reduce the requirement for each LTA to seek separate legal advice on this matter.

Lesson / Recommendation 13: DfT (or Central Government) to engage with the Ofgem/BEIS and DNOs to determine the process for seeking costs for energy capacity upgrades

This will allow guidance to be provided to LTAs / operators on the level of cost information required at EoI and Business Case stage, and when to request formal quotes (which will reserve the energy capacity). It will also allow discussions with the DNOs about how to manage this process more strategically through future rounds of funding. For example, sharing potential scheme locations with DNOs at EoI stage might enable these areas to be included in energy upgrade projects.

Lesson / Recommendation 14: Share lessons learnt and relevant experience

Share lessons learnt from previous schemes, the findings from this programme-level evaluation, and relevant case studies and supporting information. Provide a forum for LTAs / operators to share experiences.

3.8. Lessons for other LTAs developing future ZEB bids

The following lessons were identified by the DfT, Zemo Partnership, DfT's Consultants, and LTAs (and their delivery partners):

- Start planning now and have a scheme in mind for when funding is available.
- Develop the strategic case for the scheme:
  - Think about how the scheme fits with wider plans to decarbonise the bus fleet, and demonstrate that it is part of a plan for the overall fleet. Develop a roadmap to achieving a ZEB fleet.
  - Make sure the scheme contributes to DfT objectives and supports wider local objectives, including the BSIP. Make sure it's the right scheme for the LTA (and the local area) as well as the bus operator.
- Engage with operators early - the relationship with the operator(s) is fundamental; and make sure other delivery partners are lined up.
- Engage with the right teams within the operator company. For the larger operators, sign-off for financial contributions is likely to be required at both local and group level.
- Engage with the energy suppliers (DNO) at an early stage and before deciding whether to submit an application for a formal cost estimate (which will also reserve the energy capacity for a fixed timescale).
- Make sure the right skills and resources are in place, including technical, legal, financial, procurement.
- Use the GBM to inform the optioneering process, and understand what drives the BCR.
- Simpler schemes (involving one area, one operator, a simple commercial model, and established technology) are easier to justify and require less work than more complex schemes.

4. Update of ZEBRA scheme implementation

4.1. Introduction

Although the focus on this report is on the pre-implementation phase, the LTA interviews have collected useful feedback on the early phases of implementation. This evidence highlights some useful lessons which could inform other LTAs' implementation activities.

4.2. Key activities since funding approval

Activities undertaken by LTAs and operators since funding approval include the following: (noting that fast-track schemes have progressed more than standard processes schemes):

- Section 151 Officer sign-off.
- Issue of press releases and public communications.
- Setting up of governance structures to oversee scheme delivery.
- Review of procurement approaches, where the LTA is procuring vehicles or infrastructure directly; and subsequent drafting and issuing of procurement documents. In some cases the preferred supplier(s) has been appointed.
- Due diligence work around approach for appointing a preferred operator, or around the competitive regulated grant application process to identify risks around different approaches.
- Drafting of Head of Terms agreement[3] with the operator, and drawing up of Grant Transfer / Grant Funding Agreement letters for the transfer of ZEBRA funding from LTAs to operators (where operators are procuring and owning vehicles and infrastructure). Many LTAs have sought / are seeking external legal advice on this, to ensure that the LTA is not overly exposed to risk and to reassure their internal legal teams. *(see **Recommendation 12** - Provide centralised legal advice on subsidy control regulations and a standardised Grant Transfer / Grant Funding Agreement letter)*
- Subsequent signing of agreements with operators.

  Example challenge: One LTA reported challenges in terms of signing a legal agreement with the selected operator for the transfer of grant funding, due to problems agreeing responsibilities and concerns around where ownership of risks lie as the LTA is part funding the buses.
- Finalisation of vehicle and infrastructure specification / value engineering of infrastructure works.
- Drafting and issuing of procurement documents by operators, where the operator is procuring vehicles and infrastructure. In some cases the preferred supplier(s) has been appointed.
- Due diligence around the choice of preferred bus manufacturer.
- Legal advice for other specific issues.

  Example: One LTA has sought further legal advice due to energy price complications, with power to be transported from a solar farm to the depot via two separate companies. Due to current global market issues, the prices are constantly fluctuating, and engagement is ongoing to understand the legal ramifications of the energy transfer arrangement and the price of selling and purchasing energy from the grid.
- Drawing up of detailed plans for changes in the operation of depots, such as vehicle washing and refuelling paths and bus parking area layouts.

[3] A non-binding document outlining the main issues relevant to the agreement.

5. Glossary

AEBT/C	All Electric Bus Town / City scheme
AQMA	Air Quality Management Area
BCR	Benefit Cost Ratio
BEIS	Department for Business, Energy and Industrial Strategy
BSIP	Bus Service Improvement Plan
DfT	Department for Transport
DNO	Distribution Network Operator
EoI	Expression of Interest
GBM	Greener Bus Model
JAQU	Joint Air Quality Unit
LEB	Low Emission Bus
LTA	Local Transport Authority
OLEV	Office for Low Emission Vehicles
RQ	Research Question
TCF	Transforming Cities Fund
ULEB	Ultra Low Emission Bus
ZEB	Zero Emission Bus
ZEBRA	Zero Emission Buses in Regional Areas

Appendix A. Successful ZEBRA Applications

A.1. Summary of successful applications

Overall, the DfT received 35 EOIs applications for ZEBRA funding (Phase 1).

Initially, 6 LTAs were selected to produce Business Cases under a **fast-track process**. On 27th October 2021, the government announced that £71 million of funding had been awarded to 5 of the 6 LTAs to support up to 335 ZEBs.

The 5 LTAs awarded fast-track funding were:

- Cambridgeshire and Peterborough Combined Authority
- Kent County Council
- Leicester City Council
- Milton Keynes Council
- Warrington Borough Council

In August 2021, a further 17 LTAs were invited to develop a full Business Case under a **standard process**, submitting Business Cases in February 2022 (allowing ~7 months to develop the scheme). In addition, the unsuccessful fast-track scheme (West Midlands) was also invited to re-submit under the standard process.

The 18 LTAs invited to submit a Business Case under the standard process were:

- Blackpool Council
- City of York Council
- Hertfordshire County Council
- Liverpool City Region Combined Authority
- Norfolk County Council
- North Yorkshire County Council
- Nottingham City Council
- Oxfordshire County Council
- Portsmouth City Council & Hampshire County Council
- Sheffield City Region Combined Authority
- Southampton City Council
- Swindon Borough Council
- Tees Valley Combined Authority
- Transport for Greater Manchester
- Transport North East
- West Midlands Combined Authority
- West Yorkshire Combined Authority
- Worcestershire County Council

These LTAs were required to submit a Phase 2 Business Case by 31st January 2021 at the latest; although an extension to 11th February 2022 was granted for the three hydrogen fuel cell schemes to allow local transport authorities to provide further information on the hydrogen fuel supply.

On 26th March 2022, the DfT announced the award of £198.3 million of funding to 12 LTAs, supporting 943 buses and associated infrastructure. The successful authorities were:

- Blackpool Council

- City of York Council
- Hertfordshire County Council
- Norfolk County Council
- North Yorkshire County Council
- Nottingham City Council
- Oxfordshire County Council
- Portsmouth City Council & Hampshire County Council
- Sheffield City Region Combined Authority (South Yorkshire)
- Transport for Greater Manchester
- West Midlands Combined Authority
- West Yorkshire Combined Authority

A.2. Characteristics of the fast-track and standard schemes which informed the process evaluation

The process evaluation was based on interviews with LTAs for all five of the fast-track schemes and a sample of seven of the standard schemes selected to represent a broad spectrum of schemes with different characteristics of interest.

The characteristics of these schemes are shown in Tables A.1 and A.2.

Table A.1. Summary of fast-track schemes included in pre-implementation process evaluation

	LTA type	Characteristics	Technology / No. Vehicles	Charging / Refuelling	Preferred Operators	Key features
Cambridge and Peterborough (Cambridge) *Typology 2: Battery electric buses, with depot charging*	Combined Authority	Small (<50 vehicles); partial fleet replacement; urban routes	Battery electric (30 double deck)	Depot charging + Opportunity charging (using plug-in chargers at P&R side rather than pantographs)	Stagecoach	P&R routes + one city route. The two plug-in rapid chargers at the P&R site (for 'top up' opportunity charging*) will be powered by the Babraham Solar Farm which is being installed above parking spaces at the P&R as part of a separate green project. **Generally on colder days when the vehicles require more energy and in future years when battery capacity has reduced.*
Kent (Thameside / Dover) *Typology 2: Battery electric buses, with depot and opportunity charging*	County Council	Small (<50 vehicles); entire fleet replacement; urban routes	Battery electric (33 single deck)	Depot charging + Opportunity charging (using pantographs)	Subject to procurement process for tender	Tendered Bus Rapid Transit (BRT) service on existing Thameside network and new Dover network. On-route pantograph opportunity charging as main form of charging, supplemented by overnight depot charging.
Leicester *Typology 1: Battery electric buses, with depot charging*	Unitary Authority	Medium (50-100 vehicles); partial fleet replacement; urban routes	Battery electric (96; 22 double deck, 74 single deck vehicles)	Depot charging	First Arriva + one smaller operator, Centrebus, who will operate buses procured by the Council	Three operators across three projects. Mix of commercial and tendered services, serving the city centre.
Milton Keynes *Typology 1: Battery electric buses, with depot charging*	Unitary Authority	Medium (50-100 vehicles); virtually entire fleet replacement; urban routes	Battery electric (56 single deck)	Depot charging	Arriva	High capacity battery buses, to cater for long routes and higher average speeds. A Special Purpose Vehicle (Enabling Company), financed by equity investors, will own the vehicles and lease them to the commercial operator.
Warrington *Typology 1: Battery electric buses, with depot charging*	Unitary Authority	Large (>100 vehicles); virtually entire fleet replacement; urban routes	Battery electric (120; 26 double deck, 94 single deck vehicles)	Depot charging	Warrington's Own Buses (WOB)	Municipal bus operator. The vehicle assets and infrastructure will be procured and bought by the Council, who will then sell them to WOB.

Table A.2. Summary of standard process schemes included in pre-implementation process evaluation

	LTA type	Characteristics	Technology / No. Vehicles	Charging / Refuelling	Preferred Operators	Key features
Blackpool *Typology 1: Battery electric buses, with depot charging*	Unitary Authority	Large (>100 vehicles); entire fleet replacement; urban routes	Battery electric (115; 57 double deck, 58 single deck vehicles)	Depot charging	Blackpool Transport Services (BTS)	Municipal bus operator. The vehicle assets will be procured and bought by the Council, who will then sell them to BTS. Possibility of energy supply from the planned solar farm at Blackpool Airport.
City of York *Typology 1: Battery electric buses, with depot charging*	Unitary Authority	Small (<50 vehicles); almost entire fleet replacement; urban routes	Battery electric (44 single decker)	Depot charging (including mobile charging units)	First	First is investigating the potential for third parties to use the charging infrastructure during the day.
Norfolk (Norwich) *Typology 1: Battery electric buses, with depot charging*	County Council	Small (<50 vehicles); partial fleet replacement; urban routes	Battery electric (15 single decker)	Depot charging	First	Smallest scheme.
North Yorkshire (Harrogate) *Typology 2: Battery electric buses, with depot and opportunity charging*	County Council	Small (<50 vehicles); entire fleet replacement; inter-urban and urban routes	Battery electric (39; 19 double deck, 20 single deck vehicles)	Depot charging + Opportunity charging (using new and existing pantographs)	Transdev	Opportunity charging, inter-urban operation. Lease back and managed service arrangement for vehicle batteries and chargers.

Portsmouth and Hampshire (Portsmouth, Fareham, Gosport) *Typology 1: Battery electric buses, with depot charging*	Unitary Authority / County Council	Small (<50 vehicles); partial fleet replacement; urban routes	Battery electric (34 single deck)	Depot charging	First	Only ZEBRA scheme being delivered jointly by two authorities.
West Midlands (Walsall and Solihull) *Typology 3: Hydrogen fuel cell buses*	Combined Authority	Large (>100 vehicles); will result in entire fleet replacement; urban routes	Hydrogen fuel cell (124; 100 double deck, 24 articulated)	Hydrogen refuelling systems (HRS) infrastructure, supplied by green hydrogen from electrolysis.	National Express	Only successful scheme involving hydrogen buses. There are currently no articulated hydrogen buses operating in the mainland UK. Intended that others will be able to use the refuelling station.
West Yorkshire (Bradford, Leeds and Wakefield) *Typology 2: Battery electric buses, with depot and opportunity charging*	Combined Authority	Large (>100 vehicles); partial fleet replacement; mixed routes (including longer distance route to Leeds Bradford Airport)	Battery electric (111; 47 double deck, 64 single deck)	Depot charging + Opportunity charging (using pantographs)	Arriva First Transdev	Three operators across three metropolitan districts. Opportunity charging on Airport route (using pantographs). Lease back and managed service arrangement for vehicle batteries and chargers.. First is considering the future potential for shared use of depot charging equipment.

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