



Department
for Transport

Zero Emission Bus Regional Areas Scheme – 2021 to 2022 Application Form

Call for Expressions of Interest

Applicant Information

Local transport authority: **West Midlands Combined Authority (WMCA)**

(For joint bids only) Which local transport authority is the lead bidder: **n/a**

Area within authority covered by bid: **West Midlands**

Bid Manager Name and position: [REDACTED]

Contact telephone number: Direct Dial: [REDACTED]

Email address: pete.bond@tfwm.org.uk

Postal address: **16 Summer Lane, Birmingham, B19 3SD**

Submission of proposals:

Applications to the Scheme will be assessed against the criteria set out here and in the guidance document. Please adhere to word limits. We will not accept any additional information unless specifically requested.

Proposals must be received no later than 17:00 on the following days.

- **Fast track process** - 5pm on 21st May 2021
- **Standard process** – 5pm on 25th June 2021.

You will receive confirmation that we have received your proposal within 1 working day.

An electronic copy only of the bid including any supporting material should be submitted to buses@dft.gov.uk.

Please include “**ZEBRA (Fast track Process) Local Transport Authority name**” in the subject line of the email if you are applying under the fast track process.

Please include “**ZEBRA (Standard Process) Local Transport Authority name**” in the subject line of the email if you are applying under the standard process.

Enquiries about the Fund may be directed to buses@dft.gov.uk.

Transparency and privacy

Please refer to the guidance for this scheme before completing the application form to understand how DfT will manage your data.

SECTION A: Mandatory Questions

Areas must satisfactorily answer all of the questions in this section to be eligible to progress to Phase 2 of the scheme. If you would like further information, please contact the Department for Transport at buses@dft.gov.uk.

Areas must provide the information requested in questions A1-A5.

A1. In total, how many new zero emission buses will your proposal deliver?

- 234
- The basis of this proposal split into 3 discrete elements:
 - 10 x single deck electric with OppCharge capability
 - 200 x double deck hydrogen across 2 depots
 - 24 x 18.5m articulated hydrogen buses

A2. Total DfT funding sought (£m)

- £55,492,500

A3. Third party funding contributions (£m)

A4. Funding from other government schemes (£m)

Please set out any funding from other government schemes that is intended to be used alongside funding from the ZEBRA scheme.

- £143,000 – Ultra Low Emission Bus Scheme 2018 (awarded to City of Wolverhampton)
 - No funding is being sought for the pantograph infrastructure at Wolverhampton Bus Station through ZEBRA. This is fully funded through local contributions and the above ULEBS funding. This is not accounted for within this proposal.

A5. Total cost of the proposal (£m):

- £151,550,000

<i>Element</i>	<i>Total (A5)</i>	<i>Grant (A2)</i>	<i>Local Contribution (A4)</i>	<i>Local Funder</i>
Total	£151,550,000	£55,492,500		

Areas must be able to answer yes to question A6-A12 to be able to progress to Phase 2.

A6. If your bid is successful, are you able to invest DfT funding within the time outlined by your scheme?

Yes

A7. If your bid is successful, are you able to capitalise DfT grant funding?

Yes

A8. Have you considered whether additional zero emission buses are needed to replace existing buses?

Yes

- For the single deck electric buses, route analysis by a manufacturer has been undertaken that confirms no additional buses are required to provide the same service levels as diesel bus operation. This is the buses have top-up charging on-route using a pantograph charging system with sufficient charging time windows between layovers.
- For the hydrogen buses, they have a greater range than electric, similar to diesel operations and can achieve 17.5 hours on road before refuelling. The operator assessment is that each route requires the same level of buses, whether diesel or hydrogen operated.

A9. Have you provided a breakdown of infrastructure costs for your proposal?

Yes

A10. Does your proposal have the support of bus operator(s) in the area?

Yes

- For commercial bus services

- For WMCA subsidised bus services, these services will be tendered in the first 12 months of the scheme, so no operator support is required at this time. Further details are provided in C3 on the local operator interest in transitioning to zero emission, but it is not necessary to have defined prior to tender.

A11. Have you spoken with any energy companies when preparing your proposal?

Yes

- WMCA wishes to highlight that a key lesson to learn from the successful development and deployment of the Coventry All-Electric Bus City, as part of the Government’s All-Electric Bus Town competition, is that discussions with energy companies are non-binding and do not form any substantive procurement exercise. An open procurement exercise will still be required to be undertaken and that it should not be a pre-requisite requirement to have held discussions with any energy companies for the preparation of this proposal.

A12. Does your proposal comply with the accessibility requirements set out in the scheme guidance?

Yes

- For commercial bus services – this will be set as a condition on the quality threshold for the vehicles provided.
- For WMCA subsidised bus services – this will be a condition of the tender (contract) for the vehicles.

SECTION B. Defining the place

The defined area is the entire area of the West Midlands Combined Authority excluding Coventry. Coventry is excluded because of the success as the UK’s first all-electric bus city through the Government’s all-electric bus town competition.

The hydrogen buses would be operating out of 2 different depots – located in the defined area.

The electric buses will be on WMCA subsidised services with the operators to be appointed. The 25 bus services for the ZEB operation are also shown spatially on **Figure 1**.

Local bus market

The other bus services will be operated by local bus operators under contract to WMCA as part of WMCA’s subsidised bus contracts. These contracts will be tendered during the first 12 months of the scheme delivery, so it is not possible to define the bus operator at this EOI stage.

Table 1: Full breakdown of annual bus mileage and fleet by operator in the defined area (Note: this is for the West Midlands excluding Coventry)

Operator	Fleet	Market Share (Fleet)	Annual Mileage	Market Share (Mileage)
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National Express	1,377	77.0%	53,131,572	76.4%
Diamond	163	9.1%	7,599,582	10.9%
Claribels	21	1.2%	2,917,169	4.2%
Arriva	31	1.7%	1,586,075	2.3%
Banga Buses	14	0.8%	655,267	1.0%
First Bus	12	0.7%	593,280	0.9%
Johnsons	11	0.6%	566,878	0.8%
Travel Express	18	1.0%	565,372	0.8%
Landflight	10	0.6%	415,541	0.6%
Kevs Cars	19	1.1%	349,729	0.5%
Select Bus	4	0.2%	313,179	0.6%
Thandi (Red)	7	0.4%	188,169	0.3%
Green Bus	44	2.5%	144,657	0.2%
Thandi Coach	15	0.8%	82,752	0.1%
Walsall CT	19	1.1%	81,821	0.1%
A&M Group	2	0.1%	74,167	0.1%
Fastline	4	0.2%	73,755	0.1%
Discount	6	0.3%	71,103	0.1%
Midland Classic	4	0.2%	49,233	0.1%
R.K.Travel	4	0.2%	48,046	0.1%
Corporate Express	1	0.1%	18,636	0.03%
Grosvenor	3	0.2%	8,410	0.02%
Total	1,789	-	69,534,393	-

Transition to zero emission buses

This submission identifies an additional 234 zero emission buses (ZEBs) to be operating in the West Midlands. This complements the 54 ZEBs already planned to be operating in the region by the end of 2021; and the further 300 funded over the next 5 years. This would see 30 per cent of the buses operating in the entire West Midlands as zero emission (at tailpipe).

When the services included in this submission are assessed at a route level, **82% of buses will be zero emission** with **88% of the bus service mileage zero emission**.

The higher proportion of bus mileage being zero emission in this proposal highlights the intensive operation of the services selected to benefit bus passengers and provide air quality benefits over a wider spatial area.

Table 2: Full breakdown of annual bus mileage by operator on routes in the defined area

Operator	Fleet	Market Share on Routes (Fleet)	Annual Mileage	Market Share on Routes (Mileage)
National Express	224	78.6%	10,835,606	86.8%
Diamond	25	8.8%	1,163,741	9.3%
Johnsons	2	0.7%	100,394	0.8%
Walsall CT	19	6.7%	81,187	0.7%
Claribels	1	0.4%	34,782	0.3%
Landflight	1	0.4%	31,650	0.3%
Banga Buses	1	0.4%	29,437	0.2%
Thandi (Red)	1	0.4%	12,928	0.1%
Travel Express	1	0.4%	11,950	0.1%

Subsidised	10	3.5%	153,725	1.2%
Total	285	-	12,455,400	-

For completeness, when assessing the submission against all buses and services in the defined area (West Midlands excluding Coventry)

- *224 buses on commercial bus services = 12.5 per cent of the total bus fleet;*
- *10 buses on WMCA subsidised services = 0.5 per cent of the total bus fleet;*
- *Total 234 buses in the submission = 13 per cent of the local bus fleet in the defined area.*

Bus Service Mileage in the defined area (West Midlands excluding Coventry)

- *20 commercial bus services with an annual mileage of 10,685,390 = 15 per cent;*
- *5 subsidised bus services with an annual mileage of 303,941 = 0.4 per cent;*
- *Total bus service mileage going zero emission in the submission = 16 per cent of the annual bus service mileage in the defined area.*

Figure 1: Map of the defined area with bus service coverage and NO₂ in exceedance of the 40 µg/m³ annual mean limits

SECTION C: Ambition

C1. Public transport ambitions

The proposal for 200 double deck buses would be the ***largest hydrogen bus order ever in the world***. This would make the West Midlands and the UK a real-world leader for hydrogen transportation and decarbonisation. It will provide the platform for greater ambition and even greater investment, which is recognised to be beyond the scope of this ZEBRA scheme.

The order for 24 articulated buses that would operate on the region's first bus rapid transit network, would achieve a key Government (and regional) objective from the National Bus Strategy for the ***UK's first zero emission BRT system***. This would be operated under the region's first EP Scheme to be made in June 2021; providing a blueprint how authorities and operators can work together to "Bus Back Better" for local people.

Strategic alignment with regional and local priorities

Environment is one of the WMCA's corporate priorities, integrated into our ***Local Industrial Strategy***¹ with Clean Growth.

Zero emission buses are key to the regional action plan for transport and the environment.

- ***West Midlands Bus Alliance***, the first of its kind in the UK, brings together local bus operators, WMCA, the local authorities and other partners to deliver improvements in our bus services. Our focus is on making bus travel in the West Midlands cleaner, greener, safer and faster, with a key objective to improve the bus emission standards.
- West Midlands ***Vision for Bus***² sets the benchmark for what we want from bus in the region, where bus forms the backbone of achieving a world-class integrated, reliable, zero emission transport system providing inclusive travel for all.
- ***West Midlands Enhanced Partnership (EP)***, the first metropolitan EP in England to be made in June 2021, covering the defined area with the objective to have zero emission corridors serving the most affected areas of air quality; and an EP Scheme on the Sprint corridor setting the UK's first zero emission bus only operation deadline of May 2030 for larger operators (i.e. National Express) and May 2033 for all operators.
- Double award-winning ***West Midlands Low Emission Bus Delivery Plan***³ sets our high ambition scenario for the future uptake of zero emission buses.
- Birmingham ***Clean Air Zone***, the UK's first CAZ D, to reduce levels of NO₂ to a maximum of 40µg/m³ as soon as possible.

The plans and commitment of the WMCA and West Midlands Bus Alliance demonstrates we are serious about tackling the challenges of poor air quality with a credible strategy and

¹ <https://www.wmca.org.uk/media/3094/west-midlands-local-industrial-strategy-single-page.pdf>

² <https://www.tfwm.org.uk/media/38969/final-strategic-vision-for-bus.pdf>

³ https://www.wmca.org.uk/media/1366/west-midlands-low-emission-delivery-plan_elementenergy-for-transport-for-west-midlands_july2016.pdf

plan in place to achieve our ambitions to improve bus emission standards. Other WMCA and partner projects and programmes directly supported include:

- WMCA #2041 Tackling the Climate Challenge
- West Midlands Ultra Low Emission Vehicle Strategy

Complementary measures to increase public transport usage

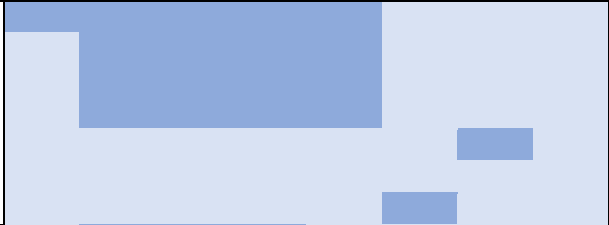

Through the Bus Alliance, we continue to work together to deliver high levels of passenger satisfaction and drive forward investment in our bus services. Our existing Bus Alliance commitments will complement the delivery of the zero emission buses across the West Midlands to maximise bus usage. In addition to the partner investment, other ***complementary bus measures totalling over £185 million*** support this project and £1.8 billion of wider transport connectivity:

- ***Sprint bus rapid transit (BRT) (£88m)***
- Cross-city bus priority (£28.5m)
- Account-based ticketing (£20m)
- New pantograph charging at Wolverhampton Bus Station (£0.3m)
- Dudley Interchange (£24m)
- National Express 29 Electric Double Deck Buses (£14m)
- Birmingham City Council 20 Hydrogen Double Deck Buses (£10m)
- Upgrade of 5 Diamond buses to electric (£0.6m)
- Wolverhampton Interchange (£175m) – new hub for rail, metro and bus with mixed-use commercial development in the city centre
- Midlands HS2 Growth Strategy – Connectivity Programme (£1.6bn)

The new pantograph will provide on-route charging for the subsidised bus services included in the proposal.

The selected routes for hydrogen buses will be on corridors with existing or funded bus priority investment (i.e. Sprint BRT) to maximise the passenger benefits.

Table 3: Commercial services with the complementary committed and planned bus priority investment, alignment to the EP Scheme, wider bus and HS2 connectivity

C2. Community benefits

The data and learnings from operating the hydrogen and electric buses will be shared through the West Midlands Bus Alliance, to encourage the uptake of more zero emission buses, as well as owners of other kinds of fleets for potentially other vehicle types. There are 40,000 goods vehicles registered in the West Midlands. This region has the largest public sector organisations outside London - so there are big fleets of bin lorries, ambulances, fire appliances and gritting trucks here. These heavy-duty vehicles may need to be powered by hydrogen if we are to become a net zero community, and we will want to share the learnings from our project. [REDACTED] would make the hydrogen refuelling facilities available to other operators. This will be further explored through the next design stage for the depot layouts and Phase 2 development.

C3. Support for your proposal and wider vision

Engagement has been held with bus manufacturers to inform the preparation of the bus cost elements. However, it is not required to detail this engagement as operators would still be expected to demonstrate competitive procurement to ensure value for money in the vehicle purchase.

As mentioned, there are no letters of support from operators on WMCA subsidised bus services, as these will be tendered to the electric bus specification. However, there is commitment from local bus operators of all sizes to transition to zero emission and improve bus emissions. This is demonstrated through our Bus Alliance, with the shared goal to improve the bus emission standards and operator engagement in the West Midlands Bus Decarbonisation Forum. There was also interest from 5 local operators to this ZEBRA scheme at an early stage, which for challenges with the capital investment required, existing lease contracts, the timing of the Scheme and suitability of subsidised bus services in parts of the region at this time, has not progressed to this submission. However, local bus operators whole heartedly wish to move towards this zero-emission goal, and the small investment in the 10 subsidised bus services will provide that opportunity with reduced risk because the infrastructure is already secured.

The WMCA wishes to highlight that a key lesson to learn from the successful development and deployment of the Coventry All-Electric Bus City, as part of the Government's All-Electric Bus Town competition, is that discussions with energy companies are non-binding and do not form any substantive procurement exercise. A competitive procurement exercise will still be required to be undertaken by operators to ensure value for money. It should not be a pre-requisite requirement to have held discussions with any energy companies for the preparation of this proposal.

Whilst there is the support of the largest bus operator in the region to the proposal for commercial services, WMCA will have to undertake a competitive, regulated process to secure a bus operator/s to allocate funding to bus operators to deliver the scheme. The proposed process (will follow the same process as Coventry All-Electric Bus City) will be:

1. Formal market engagement with bus operators, (launched with a PIN) to assess the level of interest and acceptance of the proposed commercial structure. ***This will be undertaken concurrently with the Phase 2 business case to enable accelerated delivery if successful.***
2. Bids will be invited for contributions to the costs of new buses and refuelling equipment
3. Bids will be competitive, and as such not all qualifying bidders may receive funds, depending on the number and quality of bids
4. The value of payments allowed will be linked to evidence of capital expenditure
5. Payments will be subject to a range of conditions.

SECTION D: Air Quality

Air Quality Challenge

The principle source of air pollution in the West Midlands is vehicle exhaust emissions from petrol and diesel engines.

The West Midlands has declared a **Climate Emergency** and vowed to take urgent action to cut harmful emissions and address poor air quality, which is a major issue in the West Midlands. This declaration was made by the WMCA Board in June 2019, to safeguard the environment and people's health.

The need for change and intervention to improve local air quality is demonstrated by 5 local authority areas included in the defined area being declared as an **Air Quality Management Area** (AQMA) due to the legal annual mean concentration of NO₂ being exceeded at a number of locations.

- Birmingham AQMA declared on 10th January 2003
- Dudley Borough AQMA on 1st December 2007
- Sandwell Borough AQMA on 26 July 2005
- Walsall Borough AQMA on 1st April 2006
- Wolverhampton AQMA on 22nd March 2005

All these local authorities have been named as areas to take action in the UK's plan for tackling roadside nitrogen dioxide concentrations or supplement to the 2017 Plan and have been required to undertake measures to bring forward compliance on roads with concentrations of nitrogen dioxide (NO₂) in exceedance of the 40 µg/m³ annual mean limits set out in the Ambient Air Quality Directive. Locations in exceedance of these limits are shown in **Figure 1** against the bus routes included in the submission.

Addressing the air quality challenge

As a minimum, the zero emission buses could achieve a 100% reduction in emissions for NO_x and PM_x compared to existing Euro VI diesel buses and 87% CO₂e WTW saving of 23.9 tonnes:

- NO_x savings of 13.9 tonnes per annum
- PM_x savings of 0.18 tonnes per annum.

This assumes maximum emissions to CVRAS / Euro VI standards for Euro VI diesel buses and bus speeds at 17 km/h. The phasing towards this will be reviewed during the Phase 2 business case.

Though work by Zemo, we have been able to quantify that for the hydrogen bus proposal, ZEB certification could be expected to be achieved. This assumes the production of hydrogen is completely carbon free as the electrolyser is directly connected to wind generation, with 3 different size trailers for hydrogen delivery to depot assessed.

Table 4: WTW GHG emissions for a Hydrogen Fuel Cell Double Deck based on with H2 supply chain distribution sensitivities

GHG gas emission performance	Volume of compressed hydrogen distributed by road tanker		
	350 kg	500 kg	900 kg
WTT GHG emissions (gCO ₂ e/MJ)	22.88	17.12	11.15
WTW GHG emissions (gCO ₂ e/km)	233.13	174.44	113.58
WTW GHG emissions savings compared to Euro VI diesel	81%	85%	91%
ZEB qualification (proposed 50% GHG saving vs diesel)	Yes	Yes	Yes

Existing zero emission bus programmes

The West Midlands, through the West Midlands Bus Alliance has a proven track record of delivering zero emission buses and associated infrastructure, as a market leader. Existing bus decarbonisation programmes include:

- West Midlands Bus Alliance Bus Decarbonisation Forum, working closely with Zemo, to inform and accelerate the transition to zero emission buses in the West Midlands.
- England’s largest bus retrofit programme outside London (2021)
- UK’s first diesel bus to battery electric single deck re-power (2021)
- England’s first hydrogen double deck buses (2021)
- UK’s first publicly owned pantograph charger in Wolverhampton Bus Station (2022)
- UK’s first all-electric bus city in Coventry (2021 – 2025)

The project investment and delivery will be protected through an amendment to the **Enhanced Partnership Scheme** that sets minimum operator requirements for vehicles and captures the wider infrastructure investment. This will include the delivery of complementary bus priority measures to be delivered on the corridors of zero emission bus operation across the West Midlands.

SECTION E: Value for Money

- Proforma completed and attached separately.

Details of any other impacts expected from the proposal

- Increased investment in the local economy for a deprived ward from the new [REDACTED] depot construction and [REDACTED] depot upgrade. These wider socio-economic benefits have not been captured at this stage but could at Phase 2.
- KPMG have developed economic models (July 2020) to compare bus user, benchmark levels of demand and identify from bus benefits from this level of investment and market conditions. These independent models show that with each £1 invested it would generate £4.48 in wider social, economic and environmental benefits. It shows that approximately half of the benefits go to the wider community through safety and clean air benefits as well as wider economic and social benefits, and half to bus users. This demonstrates that the analysis through this VfM assessment is likely to have underestimated the benefits of the investment, and the non-monetised benefits described in this section are likely to materialise and could be significant.
- Increased uptake in ticketing due to new, clean vehicles replacing older more polluting vehicles: An increase in ticket sales for buses could be envisaged as the general public perceive the new, clean vehicles as a more desirable way to travel. This would increase revenues for operators providing a direct cost benefit. [REDACTED] estimate a 4% uplift as a minimum in passenger revenue from a new bus; and therefore modal shift . This can be up to 10% if accompanied by good marketing and promotion.
- Attitude change in the local public perception of electric vehicles: This could result in a possible accelerated switch to electric buses resulting in further emissions savings and health benefits for Coventry and the surrounding areas from modal shift. It is known from previous diesel vehicle investment the improved patronage impact can be up to 7% and therefore modal shift from car. The economic case has not considered any possible modal shift that could arise from the fleet investment, so is likely to under-estimate potential benefits.
- Health benefits due to reduced noise emissions: Noise from conventional vehicles affects human health and damages the environment. The World Health Organization (WHO) estimates that the noise impact of road traffic is second only to pollution as the biggest environmental impact of vehicles. Excessive noise pollution is a known annoyance, affecting sleep and potentially affecting those who are vulnerable to dementia or stroke. In the UK, 90% of people hear road traffic noise while at home. 10% of these regard this noise source as highly annoying. Between 10 km/h and 20 km/h an electric vehicle is on average 3.4 dB quieter than a diesel vehicle. While buses don't account for all the vehicles on the road and therefore a 3.4 dB reduction in noise pollution will not be fully realised a benefit will still be seen. The total effect of a change of 1 dB from 60 dB to 59 dB is worth £9.61 per household. In 2016 there was an estimated 50,000 households along the routes. This therefore equates to an annual mitigated cost of £481,000 per dB. A full noise study would have to be conducted in order to quantify the benefits of ZEBs over diesel buses. This study could take as

long as 4 months in order to understand the value that switching to quieter running buses could have on noise pollution on any given road and hence the economic benefits through reduced noise pollution have not been taken into account in this EOI

SECTION F: Deliverability

F1. Method of delivery and timescale for implementation

Commercial Services (200 double deck + 24 articulated hydrogen buses)

As a first project of this size, it is acknowledged that there will be challenges in implementation especially in the timescales, however these can be mitigated through clearly defined scope, robust contract terms, fit for purpose risk mitigation plans, and diligent project management. WMCA has experience working closely with local bus operators to deliver successful, innovative, UK first projects, as demonstrated by the deployment of the Coventry All-Electric Bus City (AEBC).

A competitive, regulated process will be undertaken to secure a bus operator/s to allocate funding to bus operators to deliver the scheme (see C3). This process will be undertaken concurrently during the Phase 2 business case.

The payments will be made under a grant funding agreement, which will give WMCA rights to step into the Operator's supply contract if conditions have been breached. These conditions will broadly cover scenarios where the Operator/s is not using the assets for operations as proposed. The amount of payment made will be linked solely to capital expenditure capped at the grant level and will be set as per the ZEBRA Guidance.

To be eligible for funds bidders will need to meet criteria prescribed by WMCA, which will include Operators demonstrating that they have a viable plan to operate hydrogen buses at this scale. This will include evidence of having advanced towards a supply agreement for the new buses and equipment, access to depots and a business plan for running services.

There will also be a quality threshold for the vehicles and equipment provided, and bidders would be required to provide evidence of the incremental costs being incurred over and above those for conventional diesel vehicles.

Planning and permissions

██████████ a new depot on a brownfield site, which has not yet been secured but should allow for maximum flexibility to meet planning requirements for the refuelling station and maintenance facility.

██████████ depot has a good amount of space to allow for an optimum configuration to be designed with the location in a light industrial location making planning permission easier.

The amount of hydrogen to be stored at site impacts the type of consent that is required. As the design of the stations is not finalised, it has not been possible to confirm the hydrogen storage volumes at this point, but it is expected that it will be below 5 tonnes which is the level at which COMAH applies. If COMAH is required, extra time will be needed in the planning phase. In most cases, challenges around planning can be resolved within the station design (i.e. addition of firewalls). A review of both sites and recommendations around station design for planning consent is underway. It is understood that planning permission for a bus refuelling station of this size has not been sought in the UK before.

A preliminary layout for both depots is provided in the **Appendix**.

Timescales

A detailed programme for the 2 depots is provided.

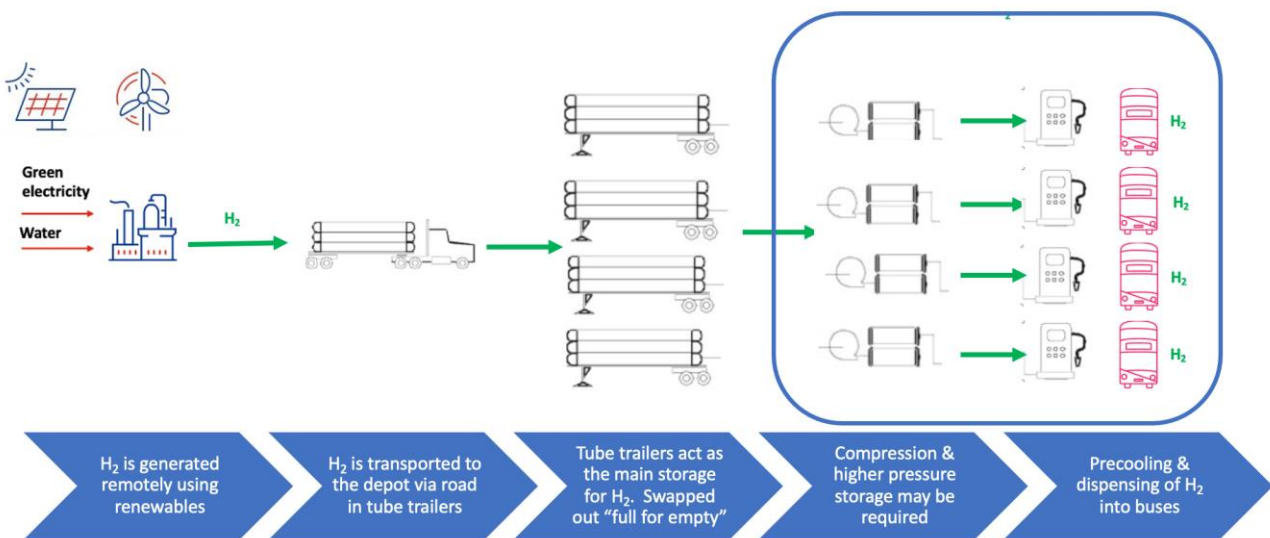
Scalability and Deliverability

The proposal is scalable as the two depots are independent. The buses will have a range of 250 miles, fast fill (c. 7 – 10 minutes) at 350 bar pressure. The hydrogen would be predominantly green, sourced mainly from renewables generated offsite via electrolysis; occasionally supplemented by grid electricity when renewable power was not available.

Although generated from renewables, the hydrogen is planned to be produced in Kent and transported to site incurring the CO2 emissions associated with transport. Transport of hydrogen 625 miles per round trip means transport emissions of 0.865kgCO2/kgH2 or 6.7kgCO2/100km. This estimate has a number of assumptions that would need to be confirmed once the design was agreed and the site storage/number of journeys ratio was understood. It does not include any emissions related to the construction of the tanker. The actual carbon footprint of the hydrogen delivery operation would therefore be dependent upon the frequency of deliveries to site. This cannot be calculated at this time as the configuration of onsite storage is not confirmed.

The infrastructure to refuel the buses at each depot consists of tube trailers, compression, site storage, cooling and dispensing. The tube trailers deliver hydrogen to site but also act as part of the required hydrogen storage volume.

The supply chain is as shown below. The equipment included within the proposal is shown in blue. For clarity, the tube trailers remain the property of the hydrogen supplier and are outside the scope of the funding request.



The specification for the refuelling equipment as well as the refuelling methodology is not yet fully defined and would evolve to an exact specification during the preparation for planning. The specification for the refuelling stations would be expected to include:

- Schematic & layout
- Refuelling window (hours)
- Capacity (kg/day)
- Target reliability (expected 100%)
- Failure mode analysis
- Days storage onsite (and at the production site)
- Redundancy in the fleet (%)
- Footprint (m²)
- Utilities & Civils
- Backup
- Timing
- Business model
 - Roles/structure and relationship of the project partners
 - Funding
 - TCO of hydrogen vehicles
 - Cost of hydrogen at the dispenser
 - Measurement and billing of dispensed hydrogen
 - Contract terms and length

Scale of the refuelling station comes from deploying multiples of smaller modules, which enables minimising some of the technical risks associated with hydrogen projects of this size, as well as providing an inherent level of redundancy within the design. Key to successful project objectives will be in adapting operations at the sites (location and people) to enable smooth roll out of the technology.

The conversion to hydrogen will mean both depots are at or near capacity once the 200 buses are deployed, so the hydrogen volumes are at or near the maximum levels. Nevertheless, a trucked in solution is very flexible from a scale point of view, as any additional hydrogen demand can be managed with increased onsite storage and/or increased number of deliveries to site.

The following immediate next steps planned are:

- Completed analysis of the routes/buses amenable to hydrogen for Walsall and Kitts Green and confirmation of Total Cost of Ownership for the proposal to ensure VfM.
- Detailed specification for the HRS based on the above analysis (including fleet consumption/nameplate capacity of the stations, configuration of hydrogen storage on site, number and frequency of deliveries etc), with critical failure analysis and mitigation planning.

- A level of ‘future proofing’ of the HRS to be incorporated into the specification. This would include dialogue to ensure access for other operators planning to deploy hydrogen transportation.
- Specification for enabling works.
- Define performance clauses within the contract(s) for acceptable levels of hydrogen availability and back-up plan for critical failure in the green hydrogen supply, including technological and logistical risks.
- Planning and safety considerations around the sites.
- Dialogue with regional stakeholders to minimise the time for planning and permitting approvals to be in place.
- Development of a credible procurement strategy to ensure that once the funding is approved the procurement process can commence without delay.
- Development of a detailed technical and commercial risk register.

WMCA Subsidised Services (10 single deck electric)

- Scoping and funding for the pantograph at Wolverhampton Bus Station is complete with a WMCA supplier framework to call off. It is not part of this submission.
- A first order for 2 buses will be placed in September 2021. If funding is secured through ZEBRA, it will reduce the cost pressures for the service viability and provide an exemplar that getting infrastructure correct is key to unlocking more ZEB delivery. These 2 buses would be in service from October 2022.
- If ZEBRA funding is secured, a second order for remaining subsidised services can be placed in April 2022 (subject to a covid-recovery network review); and operational by June 2023. This order would not be placed without ZEBRA funding.

F2. Monitoring and evaluation

A Monitoring and Evaluation Plan (MEP) will be prepared in line with both the DfT Framework and the TfWM M&E Framework at Phase 2. In line with the Frameworks, it could be expected that the project will be required to undertake Fuller Evaluation and Enhanced Monitoring given the size and cost (greater than £50 million). The key elements of Enhanced Monitoring include:

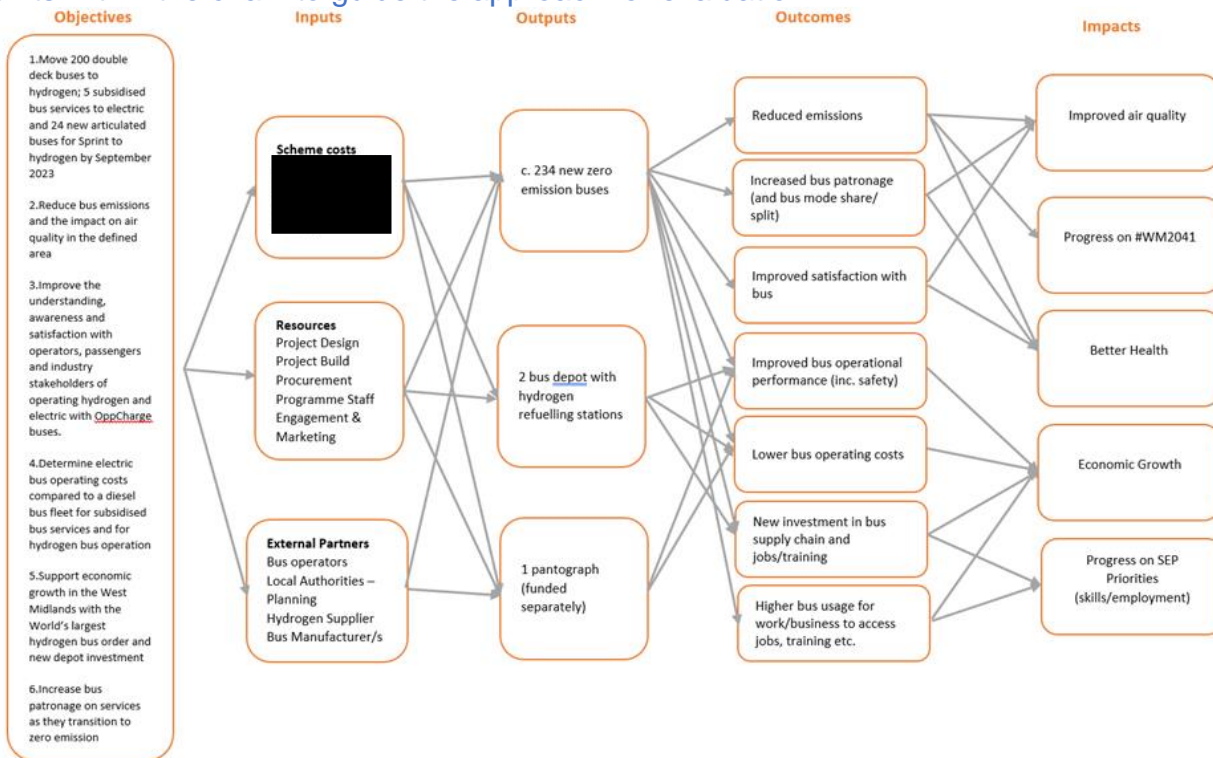
- Project delivery (including the assessment of schedule, stakeholder engagement, risk and benefits)
- Costs
- Actual delivered project (compared with that proposed)
- Objectives
- Bus travel demand (patronage)
- Bus travel times (absolute / reliability)
- Bus operational performance

- Impacts on the economy
- Carbon impacts (including air quality CO₂e, NO_x and PM)
- Accidents involving bus
- Bus operating costs
- Charging usage, costs and performance.

In addition to the above, it is proposed to review the project’s value for money alongside a wider set of outcome monitoring. The proposed approach is therefore more comprehensive than the core requirements and reflects the intent to undertake a robust assessment of the project, both during and post-completion, because it is proposed to undertake a Fuller Evaluation as this is an innovative project.

- **Impact evaluation:** to provide reliable evidence of the extent to which the project has caused the changes in the outcomes and impacts. This would be considered through an outcomes report, which assess the outcomes in relation to the defined objectives identified in the logic map and comparing the post intervention situation with the pre intervention situation.
- **Process evaluation:** to identify what lessons have been learnt during implementation. This is likely to be presented through a series of quarterly progress reports produced during the implementation stage, followed by an end of delivery report to fully assess how the project has been delivered.
- **Economic evaluation:** aimed to establish the benefits of the scheme and relating these to the cost of the interventions.

A draft logic map has been prepared that enables the identification of suitable monitoring points within the chain to guide the approach for evaluation.



Data requirements

The approach to monitoring would aim to minimise data collection costs. Bus operators / TfWM already collect significant data, to supplement new data collection on vehicle operation, performance, costs and infrastructure usage / costs. This would be reviewed at

Phase 2 and seek learning from the MEP being undertaken for Coventry Electric Bus City with DfT.

Resourcing

The MEP will need to be budgeted and resourced across the programme period. Although the majority of data could be expected to be available as part of routine monitoring activities, there should be an expectation and planning for additional expenditure. These include the process monitoring during scheme implementation, additional primary data collection and ongoing collation/analysis of data. These costs would be covered by WMCA.

The MEP would operate a risk register that feeds into the programme risk register and would be subject to the same review process as the scheme risk registers, monthly throughout the evaluation activity period.

F3. Procurement, State Aid and subsidy rules

The organisation has taken advice in relation to the potential implications of the subsidy control regulations and the guidance provided by BEIS.

The organisation operates standard procedures for the consideration and awarding of contracts and grant agreements. These processes take into account the full extent of the legislative framework, the subsidiary control rules and state aid requirements. The organisation will also have regard to the general guidance promulgated on the new regime together with the specific Technical Guidance initially published by BEIS on the 31st December 2020 together with subsequent advice.

As to the issue generally WMCA would apply the following principles:

1. WMCA shall, before any funding is released, provide the Department with such evidence as the Department may reasonably require to confirm that the project complies with any applicable rules relating to subsidy control.
2. WMCA shall comply (and, where applicable, shall secure compliance by each supplier and their subcontractors engaged in the project) with any applicable rules relating to subsidy control including in relation to the receipt of any grant and their application in relation to the Services.
3. During the term, WMCA shall provide evidence that it is still in compliance with any applicable rules relating to subsidy control within 10 Business Days of becoming aware of any change in circumstances that may affect its previous assessment of compliance.
4. WMCA shall ensure that use of the grant or other funds and all associated procurement processes and contractual terms used in connection with the Services shall be compatible with
 - i. ensuring any contract and/or any changes permitted to or in connection with any contract do not give rise to any breach of any applicable rules relating to subsidy control; and

- ii. operating in accordance with the terms of each contract so as to comply with any applicable rules relating to subsidy control.

- 5. WMCA shall secure, and is responsible for ensuring, value for money in all expenditure that is (in whole or in part) funded by the grant in accordance with the Managing Public Money principles as set out at the following link: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742189/Managing_Public_Money_MPM_with_annexes_2018.pdf.

- 6. WMCA shall notify within five (5) working days if it becomes aware of:
 - i. any procurement or subsidy control or other legal challenge;
 - ii. any examination or investigation by any UK authority; or
 - iii. the issue by any UK authority of any decision to recover the Funding or any other analogous decisions,
in respect of the project and shall provide such further reasonable information and/or assistance concerning such challenge, examination, investigation or decision as the Department may reasonably require from time to time.

These principles and the process align with the agreed and approved process for the Coventry AEBC deployment and delivery.