

MetroBus (Rapid Transit): Preferred Option for Vehicle Specification

Purpose

1. To endorse the preferred specification for the MetroBus vehicle for engagement with operators.

Background

2. The MetroBus vehicle has a key role to play in delivering the BRT Vision for the network agreed by JTEC in December 2011. The vehicle will need to deliver a level of passenger quality and comfort consistent with a clear uplift above a conventional 'Showcase' bus corridor, as well as being distinctive and an integral part of the stakeholder engagement, branding and marketing of the MetroBus service.
3. However, it is of paramount importance that aspirations are balanced against delivery constraints. In particular, it is proposed that vehicles will be bought and maintained by operators, with no other identified funding stream for their provision. The framework for the provision of MetroBus services is based primarily on commercial operation, with operating standards (including vehicle requirements and characteristics) specified through a Quality Partnership Scheme (QPS). It is also expected that no significant revenue support will be provided. The specified vehicle therefore must be commercially affordable.
4. Within this context, an assessment of vehicle options has been undertaken and is set out in Appendix 1 to this report. Single deck, double deck and articulated vehicles have been assessed against a range of criteria, informed by operational modelling and discussion with operators, manufacturers and procurement consultants.
5. A more prescriptive specification would be possible if the vehicles were to be purchased and then leased back to operators. However, as noted above vehicle funding is not currently identified and so this option has not been assessed. Similarly, scheme infrastructure budgets do not provide for any vehicle-related infrastructure (e.g. depots or power source) or development costs that are typically required to support emerging new 'clean' technology options, including electric vehicles. This reality has also been reflected within the assessment.
6. The key points arising from the assessment are highlighted below. The overall conclusion is that a single deck, twin door, hybrid drive (electric/diesel) vehicle should be the minimum specification for MetroBus to be taken forward in discussion with operators.

Vehicle Requirements

Capacity, Single and Double Deck Options (Appendix 1 paragraphs 7 to 15)

7. Overall, the MetroBus vehicle will need to provide sufficient seating and standing capacity for peak passenger forecasts, with due regard to disabled access and passenger comfort. Whilst double deck and articulated vehicles provide most capacity, single deck vehicles perform well in terms of accessibility to seating and the proportion of seating to standing space. Whilst more single deck vehicles are needed to accommodate demand, the higher frequency itself will also attract more passengers. Single deck vehicles may also offer better passenger security and lower dwell times compared to double deck.

Passenger Boarding and Alighting Times (Appendix 1, paragraph 9)

8. A significant proportion of journey time on conventional bus routes is spent stationary at stops. There is a need to reduce dwell time on MetroBus through a combination of rapid ticketing and the provision of two sets of doors per vehicle.

Vehicle Age and Engine Technology (Appendix 1, paragraphs 12 to 13)

9. MetroBus provides the opportunity to cut emissions, particularly through the specification of a hybrid drive (combination of conventional and electric propulsion) to further reduce fuel consumption and carbon emissions. Higher purchase cost has meant that investment in hybrid drives in the UK has, thus far, been part funded by state grant. Expected increases in fuel costs, and potential reductions to Bus Service Operators Grant after 2015/16, would suggest that hybrid drives may now be commercially affordable over the life span of the vehicle (8 to 10 years), although this has yet to be demonstrated in practice with UK bus fleets. Hybrid drive vehicles for MetroBus would also assist marketing and branding.
10. Electric vehicles emit zero emissions at source. There are relatively few electric buses in the UK, but recent advances may create opportunities for partnership with manufacturers and operators to deliver some electric vehicles in certain circumstances. Compared to a hybrid drive vehicle, electric vehicles may be lower passenger capacity and/or have a restricted range between charging that could make them impractical for the MetroBus network. Whilst hybrid drive vehicles represent the minimum specification, the councils will press for all-electric vehicle propulsion where this is commercially affordable and/or operationally practical.

Purchase Cost, Streetcars & Articulated Vehicles (Appendix 1 paragraphs 10-11)

11. The Streetcar concept involves an articulated vehicle with distinctive styling and décor. However, purchase cost is high and capacity more reliant on standing than seating space. Streetcars are therefore not recommended. Similarly conventional articulated vehicles are also not recommended due to reliance on standing space to meet capacity requirements. However, it is not intended to exclude either specification should a MetroBus operator propose it.

Marketing and Consistency of Specification

12. A single vehicle specification (rather than a mix of different vehicle types) is proposed to better facilitate the marketing of MetroBus. Operators will be required to provide a specific vehicle livery, agreed between the councils and operators and consistent with stop, interchange and information branding.

Complementary Services

13. Some services from North Somerset and the Airport Flyer will be given access to BRT alignments to reduce journey times. The acceptable minimum vehicle specification for these services has not been confirmed; it will not mirror the MetroBus specification, but quality will be high. The specification will permit double deck vehicles for these services.
14. Further information on the process to finalise vehicle options is included in Appendix 1.

Environmental Impact Assessment

15. The MetroBus schemes are designed to reduce car dependency and associated emissions. Full environmental impact assessments have been, or are being, undertaken to support the necessary applications to build and operate the schemes.

Risk

16. The established Project Boards and Programme Assurance Board for the MetroBus schemes have a consistent approach to project management, risk management and governance. The Programme Entry schemes have been progressed by the Project Boards using this approach.
17. The vehicle specification will be confirmed in the Quality Partnership Scheme. It is proposed that the vehicle specification must be affordable as a commercial investment. There is a risk that a reduction in specification, whilst making the vehicle cheaper to purchase, will fail to meet the necessary quality criteria to satisfy the Vision for the network endorsed by JTEC in December 2011. Alternatively, by setting too high a standard, there is a risk that either the service becomes unaffordable as a commercial investment and will not be provided by operators, or the investment is funded through higher fares, or funded through revenue support from the councils. The recommended specification is intended as a balance to address these risks.

Resources (financial and personnel)

18. Resources to develop the Programme Entry schemes have been identified through the Project Boards and Programme Assurance Board.
19. The vehicles will be purchased, funded and maintained by the MetroBus operators. However, as noted in paragraph 17, with a very high specification there is an increased risk of the need to subsidise the service if the specification is not

deliverable as a commercial investment, both in terms of vehicle purchase and on-going fuel and maintenance costs.

Equalities Implications

20. The MetroBus network is proposed to improve accessibility to a range of employment, retail, leisure and residential destinations.
21. The vehicle specification plays a significant part in this process. Areas where accessibility will be maintained or improved over and above a conventional bus service include low floor, accessible vehicles (docking with raised platforms at stops), space for wheelchairs on board, information provision in accessible formats, and opportunities for staff training to cater for passengers with specific needs. Confirmation of these specific elements will follow in due course. Engagement has been undertaken with equalities officers in Bristol City, North Somerset and South Gloucestershire Councils, as well as meetings with the Bristol EqIA Forum, and this engagement will continue as part the pre-planning consultation, including further suggestions for more detailed aspects of the vehicle specification.

Recommendation

That members endorse a single deck, twin door, hybrid drive vehicle as the preferred specification for MetroBus for engagement with operators

Appendices

Appendix 1 Vehicle Options and Recommendation

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APPENDIX 1

West of England Bus Rapid Transit - MetroBus Vehicle Options and Recommendation

Introduction

1. The West of England Bus Rapid Transit (BRT - MetroBus) network will incorporate a clear uplift in the quality and reliability of public transport travel. Key elements include an emphasis on segregation from general traffic where this can be delivered, high profile stops and interchanges, and emphasis on marketing and branding, maximising cashless transactions on the vehicle and new, high profile vehicles.
2. A key element of the MetroBus network is the specification of the vehicle proposed to operate the service. The vehicle will need to be of a specification and quality which meets the Vision and objectives for the network, whilst still representing a viable commercial investment for operators who will be required to purchase and maintain the vehicle fleet. The vehicle specification will also complement other aspects of scheme design including stop and interchange specification, ticketing requirements, marketing and branding.
3. Necessary attributes for the vehicle will include the following:
 - Affordable as a commercial investment by operators, in terms of purchase, maintenance, fuel costs and depreciation/residual value;
 - A high quality on-board specification, comfortable and providing additional features for passengers;
 - Enabling rapid boarding and alighting for passengers;
 - Fully accessible for disabled and mobility-impaired passengers;
 - Include equipment to facilitate cashless ticket purchase;
 - Providing sufficient capacity for forecast passenger loadings, both seated and standing;
 - Low emissions;
 - Sufficiently flexible to be deployed as a standard across the BRT routes; and
 - A distinctive appearance complementary to the branding for the network.
4. Other BRT routes elsewhere in the UK have successfully used different vehicle types, with different specifications and branding, as part of the BRT concept. Examples include:
 - The use of 'Ftr' Streetcars and complementary infrastructure in Swansea and Leeds;
 - The use of conventional single and double deck vehicles on the Cambridgeshire Guided Busway; and
 - The use of high specification single deck vehicles on the 'Eclipse' BRT route in Hampshire.
5. This note summarises the results of technical assessment and supporting modelling on vehicle specification to enable a recommendation on a preferred option which meets the above criteria. The assessment has included meetings with vehicle manufacturers and operators and operational modelling of network proposals assuming a range of different vehicle types. The recommendation will also inform the necessary documents and studies which will deliver the powers to build and fund the BRT network, and be incorporated into the Quality Partnership Scheme (QPS) for the services.

Vehicle Options

6. A range of vehicle options have been investigated and assessed at a strategic level. This assessment has included the provision of detailed information on typical purchase costs,

vehicle dimensions, running costs and fuel economy. All are self-powered (i.e. not requiring overhead wires). Illustrations of main vehicle types are shown below:



High quality single deck vehicle used on the 'Eclipse' service in South Hampshire



High quality double deck vehicle operating on the Cambridgeshire Guided Busway



High quality, standard articulated vehicle operating on the Nantes Busway



First 'Ftr' articulated Streetcar operating on the 'Hyperlink' service between Leeds and Bradford

7. Key elements from the assessment are summarised in the following table:

Vehicle Type	Affordable? (no. of vehicles required)	Sufficient Capacity (seated/standing)	Rapid Boarding?	Distinctive	Flexible / reusable	Depreciation?	Running & staff cost per passenger
Midibus	√	X	X	X	√	√√√	√
Single deck	√√	√√	√√	√√	√√√	√√√	√√
Double deck	√√√	√√√	√	√	√√√	√√√	√√√
Triaxle double deck	√√	√√√	√	√√	√	√√	√√
Standard Articulated	√√	√√√	√√√	√√√	√	√√	√√
Articulated Streetcar	√	√√√	√√√	√√√	√	√	√√

8. In the above table ticks indicate a positive assessment (i.e. lower cost, more beneficial) and crosses negative. This initial scoping process has raised a number of issues which have also informed the short-listing process, including the following:
- The clear non-suitability of smaller (midibus) vehicles due to insufficient capacity (and need for significantly higher frequencies, and more vehicles and drivers) and slower boarding times;
 - The need to purchase and operate more single deck vehicles to meet capacity requirements compared to higher capacity options;
 - Recent developments in, and the improved availability of, hybrid drive options;
 - A requirement for twin doors to minimise dwell times;
 - The limited market availability of articulated vehicle types following their removal from London, higher maintenance costs, more rapid depreciation of articulated vehicles and less opportunities for re-deployment (primarily due to the need for longer stop platforms on the background bus network or elsewhere in the UK);
 - A reliance on standing space on articulated vehicles to deliver passenger capacity;
 - Extended boarding and alighting times for double deck vehicles to accommodate passengers on the upper deck; and
 - Perception of passenger security on the top deck of a double deck vehicle, particularly for vulnerable passengers at night (although this may be partially mitigated by provision of on-board CCTV).
9. The provision of more than one door is seen as an important requirement. Whilst the provision of a second door will reduce seating capacity slightly, its role in minimising dwell times at stops is considered to outweigh this issue, particularly if passengers can also board at the rear door. Even if this is not the case, and whilst the issue of driver interaction has yet to be confirmed, a single door vehicle (particularly at busy stops) is less likely to 'process' waiting passengers sufficiently rapidly to meet the requirements of the MetroBus network.
10. The Streetcar concept essentially comprises an articulated vehicle augmented by higher specification bodywork, interior materials and segregation of the driver from passengers. Use of this concept in the UK has been limited (although the investment to date has been provided commercially). The appearance can be very striking and can certainly assist the marketing of the service, and an increase in patronage is likely as a result. In Swansea and Leeds conductors (or 'customer hosts') issue tickets, which would be a further cost pressure (although would also be likely to generate additional patronage and reduce dwell times at stops).
11. However, a risk is the potential for a 'permanent prototype' situation and a consequent rise in maintenance costs. Vehicle production runs would be likely to be limited, with purchase costs (at around £320,000 per vehicle) substantially higher than for a conventional articulated bus. On cost grounds overall, therefore, the Streetcar concept has not been short-listed, although it should not be ruled out if proposed by an operator.
12. Vehicle options have therefore been short-listed to the following for more detailed assessment. The requirement for hybrid drive, its cost and consequent emissions benefit is a key factor in balancing commercial considerations with other aspects of vehicle uplift and the potential to reduce emissions. All options have been assessed as a hybrid drive option to meet the requirement to minimise fuel consumption and emissions:
- Standard dimension (two axle) single deck vehicle, twin door;
 - Standard dimension (two axle) double deck vehicle, twin door; and
 - Articulated single deck vehicle, twin door.

Detailed Assessment

13. Operational modelling has been undertaken on the above short-listed options based on the MetroBus network incorporated in the Best and Final Bid (BAFB) submissions to the Department for Transport (DfT). This assessment has also taken account of the number of vehicles (and augmented frequencies in some cases) required to meet forecast passenger loadings. The table below summarises its key findings:

Vehicle Option	Peak Vehicle Requirement	Service kms (m pa)	Operating Cost Hybrid (including depreciation (£m pa))	Capital cost (incl. spare bus allowance, £m)
Single Deck	49	3.6	£7.8	£14.6
Double Deck	40	3.2	£7.2	£13.2
Articulated	36	3.2	£8.3	£15.8

14. The attractiveness of the articulated option, whilst scoring best of the short-listed options in terms of distinctiveness in the initial scoping process (and admittedly more difficult to quantify), is diminished by its relative purchase and operating costs, as well as the reliance on standing accommodation to meet capacity requirements. This latter issue will inevitably impact on passenger comfort (particularly at higher speeds on the M32 corridor). For these two reasons (cost and seating), it is considered that articulated vehicles are not the best performing type for the service. Recommendation of this option would also be likely to attract considerable objection from operators during consultation on the QPS on these grounds.

15. The above table suggests that the double decker option appears a strong performer when assessed on cost grounds alone. However other factors need to be taken into account. These include:

- The attractiveness of a more frequent service provided by single deck vehicles to meet forecast capacity (whilst acknowledging higher purchase and running costs when taking account of total fleet size). The modelling work has estimated that this will increase patronage further by approximately 5%;
- The availability, perceived security and level of utilisation of the upper deck for passengers compared to the more consistent offer provided by a single deck vehicle;
- Potential longer dwell/loading times for a double deck vehicle for passengers to access/egress the top deck (unless provided with two staircases, with a consequent impact on seating capacity), although it should be noted that research to support this view has not been identified;
- A higher proportion of accessible seats in a single deck vehicle for passengers with a mobility impairment; and
- A general perception by potential passengers that a double deck vehicle will provide more of a standard bus-based journey 'experience' compared to a single deck vehicle. It is likely that a single deck vehicle will be better suited and more flexible to bodywork and styling modifications to assist the branding of the service.

16. For the above reasons, a single deck vehicle, with two sets of doors, is considered to be the best, overall performer in meeting the requirements for a rapid transit vehicle, and is proposed as the preferred option.

Recommendation

17. The preferred option for the MetroBus vehicle should be a single deck, hybrid drive vehicle with two sets of doors to enable rapid passenger loading and disembarking at stops. This specification should be incorporated into the QPS and/or Voluntary Partnership Agreement (VPA) to ensure that only MetroBus operators compliant with this vehicle specification will be able to access BRT infrastructure.
18. It is possible that operators may challenge the vehicle specification if they maintain it renders the provision of the service unaffordable, or that an alternative vehicle would still meet the requirements of the service. It may be necessary to undertake further assessment to support the recommendation or highlight shortcomings in other types of vehicles (e.g. quantification of the advantages / disadvantages of double deck vehicles).
19. Complementary on-board facilities are already coming on-stream on 'Showcase' bus routes which will need also need to be incorporated as standard. These include on-board WiFi, modern internal lighting and colour schemes and higher quality seating. In addition, marketing and branding will play a key role in terms of livery, logos and associated detailing to consistently emphasise that this vehicle is providing a higher quality than that provided by conventional, and 'Showcase' bus services.
20. For complementary services using MetroBus route alignments from further afield (primarily from North Somerset), it is proposed that a double deck, Euro V (or potentially Euro VI) emissions standard will be acceptable upon opening. Ticketing and stopping arrangements on these services are still to be confirmed. This specification will need to be reviewed at an appropriate stage following completion of the scheme, and again specified in the QPS.
21. Whilst the vehicle specification will also inform the detailed specification and design of infrastructure, particularly at stops and interchanges, it also needs to be emphasised that this infrastructure will also need to accommodate flexibility in terms of future vehicle requirements. For example, there may still be a requirement following completion of the network, and taking account of the impact of possible, further, future development and regeneration proposals yet to be specified on patronage, to still provide for articulated vehicles in stop and interchange design. It may also be the case that a future operator provides articulated vehicles which still meet the MetroBus specification in any case. This option should not, therefore, be 'designed out' at this stage and stop platforms in particular will still need to be capable of accommodating articulated vehicles.