Bristol Mass Transit – What's the story? December 2018 (CJD)

There have been many references to Bristol mass transit schemes in recent transport planning documents and political announcements. FOSBR need to understand the options as any mass transit system will affect local rail by providing alternative travel options, through interchange opportunities, and possibly by sharing existing rail corridors.

(1)

The Bristol Transport Strategy was out for consultation until November 2nd 2018.

In the section "Case Study: Exploring underground metro options", the report says:
"Given the restraints on many of our corridors, along with our West of England partners we are currently looking into the feasibility of many options including going underground for mass transit. The feasibility study will explore many options for underground systems, including the **Automatic Light Vehicle (ALV)** system in operation in Rennes, Turin, Toulouse, Lille, Taipei, and other cities outside the UK. This system is the latest generation of Light Automatic Vehicle (LAV/VAL) and is marketed as the backbone of the transport system in medium-sized cities such as Bristol. The advantages of this system are:

- Automated operation with no drivers reduces costs and allows for more frequent trains with very short headways. Trains can be as often as every 60 seconds. This reduces crowding at stations.
- Short trains reduce costs as smaller tunnels and small stations can be used. This would allow the use of modern cheaper tunneling techniques and prefabricated stations.
- The rubber wheels allow for tighter curves, and steeper gradients than conventional metro systems, which is well suited to Bristol's topography.
- Sections of guideway can be elevated or run at a grade to reduce costs, although the system needs to be 100% segregated because there are no drivers."

The document further states that such a system could "cut peak journey times from Aztec West, Emerson's Green and the airport to the city centre to under 25 minutes, with increased capacity and reliability with services every couple of minutes." The cost is estimated at £3-4billion to build a system with three lines, which means Bristol City Council would have to try and find funds from a number of different sources.

Comment:
The segregation of ALV does allow for faster speeds, however, segregation can be obtrusive, requiring barriered off tracks or elevated sections, difficult to imagine on local routes such as the Gloucester Road, Fishponds Road or Church Road. Tunnels are an alternative, but unlikely to be cost-effective, even for intermittent sections – tunneling is expensive even with narrower bore. Both below-ground and above-ground running complicate accessibility through vertical separation. Unstaffed public transport is unpopular with the public.

Finally, ALV is electrically powered via the guideway, but rubber-tyred vehicles produce toxic particulate pollution through wear on tyres and brakes ("Oslo effect").

VAL Lille (above left); OGB Rouen (above right)

(2)

Bristol mayor, Marvin Rees, gave his "State of the City" address on 17th October 2018.

Of mass transit he said the following:

"I announced ambitions for a new mass transit system for Bristol on this night last year. The first feasibility study was positive and we will get the results of the second more advanced study in December. At this point, I should be clear what we are talking about before anyone publishes their own version of the London underground map. We're not talking about the London tube with 200 meter long trains. A key element of what makes it possible and quicker is we may not even need rails or track – some automated systems around the world just run by following a simple white line painted on the floor. But we are clearly planning for a segregated, mass transit system using tunnels and infrastructure appropriate for Bristol's future needs."

Comment:

Marvin deliberately does not favour any system as he is waiting for results of the feasibility study. His comments about "following a simple white line" indicate consideration of **Optical Guided Bus (OGB)** technology. OGB rubber-tyred vehicles follow on-street painted lines, often with articulated vehicles. Rouen offers an example of optical-guided busway, but Rouen also has a light rail system. **Autonomous rail transit (ART)** is a pilot high-tech version of OGB, also following a line on the road.

OGB has the advantage that "optical tracks" are cheap to install and extend leading to low capital costs. OGB vehicles can run in mixed traffic and steer off the optical track to housing or industrial estates. Whilst steering is automatic, a driver is still present so the segregation barriers aren't as necessary as ALV.

OGB technology has some disadvantages as vehicles are known to struggle in wet or icy weather. In comparison to ALV, vehicles run more slowly and at lower frequency and there are additional costs of employing drivers.

As with ALV, rubber-tyred vehicles produce toxic particulate pollution through wear on tyres and brakes, in this case, on road. OGB vehicles can be fossil fuel, biogas or electric powered.

ART pilot Zhuzhou (above left), tram Edinburgh (above right)

(3)

In November the West of England Combined Authority (WECA) issued their Draft Joint Local Transport Plan Version 4 (JLTP4) which is out for consultation until 17th February 2019.

(3a)

Key excerpts regarding mass transit are as follows:

"A feasibility study is underway to explore all options for the greater Bristol area, both above and below ground, to deliver a mass transit network on four core corridors:

- Bristol city centre via south Bristol to Bristol Airport

- Bristol city centre via north Bristol and Southmead Hospital to Cribbs Causeway
- Bristol city centre to East Fringe and east Bristol
- Bristol to Bath
- also Bath corridors and the city centre (under a separate feasibility study)

The ambition is for new forms of mass transit (eg, light rail or trams) where the potential is greatest for high passenger flows. On these major corridors, rail-based mass transit will be considered to accommodate future demand and to maximise mode shift from car-based trips. In some locations, it will be very challenging to achieve on-street running, for example through East Bristol, North Bristol, through some parts of South Bristol and on the Bristol to Bath corridor. In these cases, some underground sections may be required.

Transformational infrastructure in the form of mass transit (eg, light rail, tram, tram-train or underground) is identified for core corridors. This is necessary to provide a step change in the capacity and quality of public transport on the busiest corridors that can respond to the significant forecast increase in trips across the region.

The JTS assumes the four-line mass transit network would cost approx $2.5bn to deliver, and will take 10-20 years to deliver. If there is a need to deliver some sections underground, the cost will rise further." (£3bn-£5bn is quoted elsewhere for delivery of "transformational major schemes").

Comment:
Trams typically run on tracks along public urban streets, some include segments of segregated right of way which reduces lanes available to general traffic. Trams are usually powered by overhead electrical power, fed by a pantograph sliding on an overhead line. They can have dual power systems, electricity in streets and diesel on urban fringes. Tram vehicles are shorter than heavy rail trains. Metal wheels have low rolling resistance so produce less particulate pollution.

Light Rail Transit (LRT) is a type of fast tram system, eg, Croydon, where there is a mixture of on-street track shared with other traffic, dedicated track in public roads, and off-street track consisting of new rights-of-way and former railway lines.

The WECA core corridors are as yet mode-neutral, with emphasis on a tram or light rail system with some underground running, rather than an underground "metro". WECA contend that on-street running is challenging, but transport consultants point out that, with clever road space management, trams in other cities run on narrower streets than those in Bristol.

Trams/LRT systems are expensive but proponents claim they have the lowest whole-life costs of any mass transit system. True tram/LRT systems can be transformational by re-designing streets to give public transport the advantage over the car. Electric trams are iconic, visible, zero-emission, free from "Oslo effect" pollutants and passenger numbers usually beat expectations, eg, Edinburgh.

LRT Croydon(above left), MetroBus Bristol in guided section(above right)

(3b)

As a complementary solution, JLTP4 talks of MetroBus as an emerging **Bus Rapid Transit (BRT)** network: "We are currently delivering an initial 50km MetroBus network that will provide for trips up to around 10 miles in length and with a stopping pattern around every 500 metres. The mass transit network will be complemented by the MetroBus network and both will need to integrate with the local bus network, and walking cycling networks for first and last mile trips. Prior to the delivery of the mass transit network we will continue to expand our MetroBus network, which will see the opening of several new routes across the region."

Comment:

We already have MetroBus M3 and M2 in our midst, with M1 (Cribbs Causeway-Hengrove) about to open in January 2019. WECA are considering 7 new MetroBus routes, separate to the mass transit core corridors (other than Bristol-Bath where MetroBus is proposed as an interim solution):

- Bristol city centre to Avonmouth and Severnside
- Bromley Heath to Yate
- Bower Ashton to Nailsea and Clevedon
- Bristol to Bath along the A4 corridor
- Bristol Parkway to The Mall at Cribbs Causeway via Cribbs Patchway
- an orbital route connecting south Bristol to Emerson's Green via the ring road
- and a network for Weston-super-Mare.

The Bristol MetroBus certainly has many of the features of a true BRT system:

- off-board fare collection – by First mTickets app, TravelWest TravelCards, or iPoints at bus stops
- junction priority – MetroBus are very proud of their bus-only M32 junction
- higher frequency than traditional buses – MetroBus frequency tails off outside peak commuter/shopper times
- longer stop spacing than traditional buses
- level boarding for wheelchairs, disabled passengers and pushchairs – MetroBus drivers lower a flap across the gap to the raised kerb.
- high capacity vehicles – articulated, or double-decker in the case of MetroBus, with multiple doors for entry and exit
- quality vehicles – MetroBus offer additional leg room, on-board wifi and USB charging
- prominent identity – MetroBus development was notorious for cost and project over-runs but the existing MetroBus routes are already popular (all publicity is good publicity?).

The Bristol MetroBus falls short in some ways:

- dedicated lanes - a BRT can use a variety of rights-of-way, including mixed traffic, dedicated lanes on surface streets, and busways separated from traffic but the MetroBus lack of contiguous bus lanes leads to delays during congestion, eg M32 and around Temple Meads
- quality stations - BRT typically feature significant investment in enclosed, staffed stations – MetroBus has the bus stop iPoints, described as "a unique on-street information totem" although anecdotal evidence suggests that the real-time information is not 100% reliable
- limited hours of operation – M2 does not run on Sundays or after 10:30pm
- guided busway - usually a dedicated, bus-only route with automatic steering through kerb/guide bars or by optical/radio guidance – in the case of MetroBus M2 there are 6 short sections of kerb where guide wheels flick out so the driver controls only the speed of the vehicle, theoretically allowing high-speeds but in Bristol the drivers have been told to stick to a busway limit of 20mph
- air quality - the current MetroBus vehicles are diesel engine Euro 6 buses but the MetroBus website claims that within 24 months all MetroBus buses will be powered by carbon neutral biomethane gas generated from food waste
- rubber-tyred buses will still contribute to poor air quality through particulate pollution, but less than if passengers were choosing to drive in their own vehicles

BRT systems are cheaper to build than LRT and have flexibility in route planning, for instance the airport bus A1 now uses the MetroBus corridor as far as the A4174 ring road, but passengers cannot use that service for local journeys.

Supporters of light rail argue that the operating costs of BRT are not necessarily lower than LRT. The typically larger light rail vehicles enjoy reduced labour costs per passenger. Furthermore, light rail vehicles have proven useful lifespans of forty years or more, as opposed to buses that often have to be replaced after less than twenty years.

(3c)

The JLTP4 also covers **local rail** planning:

- integration of mass transit with passenger rail network
- Bristol East junction re-modelling,
- enhanced **regional** rail services
- successful delivery of MetroWest -Portishead, Pill, Ashley Hill & Henbury Spur - Filton North, Henbury
- beyond MetroWest, a 15 minute “turn up and go” service for urban stations
- consideration given to “extending services beyond Henbury and new stations to support the JSP at Charfield, St Annes Park, Saltford, Ashton Gate and Constable Road, and new links to Thornbury and Bristol Airport. We will also work with planning colleagues to review the need to safeguard disused rail lines where they could have a future role to play”
- “We will consider how rail technologies can help deliver rail schemes, including options for light rail and tram trains, and how infrastructure costs can be reduced and affordable modern services can be delivered”

Comment:
The JLTP4 includes some rail projects as “longer-term opportunities”, eg, Thornbury rail, Henbury Loop re-opening. FOSBR consider that these should be given higher priority, particularly as Henbury Loop connects three major employment zones in Avonmouth, Temple Meads and Filton together with Portway P&R and other potential park & ride sites. See FOSBR’s MetroWest Phase 3 masterplan: www.fosbr.org.uk

(4)

In October 2018, Transport Secretary Chris Grayling had meetings with WECA Mayor Tim Bowles and North Somerset Council leader Nigel Ashton about “widening the scope” of the work already underway to re-open the Portishead line.
They hope that including a light-rail option would reduce the cost of re-opening the line using “state-of-the-art trains operating without the need for heavy rail infrastructure”. The possibility of tram trains (TT) similar to those used in other major cities across the UK would also be explored.

Around £70million has already been secured for the Portishead line re-opening from various councils and funding bodies but there is still £47million left to find for the project. Tim Bowles stated "I hope including light rail as an option for Portishead will reduce the cost of reopening the line and also open up other opportunities within the region."

Note: As North Somerset chose to remain outside WECA, MetroWest Phase 1B (Portishead) is managed by the West of England Joint Committee (WECA & NSC).

Comment:
Tram trains are put forward as a way of cutting the cost of infrastructure. Any tram that runs, even partially, on national railway lines can be described as a tram train. In Manchester and Croydon trams run on **former** heavy rail lines. In Sheffield, the Sheffield-Rotherham tram pilot opened in October (3 years late, and £60m over budget) where the tram runs on a section of the national rail network **currently** in use by freight trains and also passenger trains. This “Karlsruhe model” resembles the route between Bristol Temple Meads and Portishead.

The references to tram trains here and in the JLTP4 indicate the underlying thinking that the tram train option would not just be for Portishead but would be the choice for the mass transit system across Bristol. Tram trains would be part-routed along existing heavy rail tracks until their routes diverge onto on-road tram running.

The key advantage that tram trains have is their routing flexibility, for instance in Bristol they could theoretically run off the main-line railway network onto street running on tramway rails through to the city centre. There is also the suggestion that existing local rail services could be made more frequent if tram-trains were introduced on these routes (through rolling stock cost savings).

There are tram train issues that need careful consideration:

- scheduling – local services have to fit around inter-city and regional services
- safety – ATP equivalent & heavier vehicle bodies that can share tracks with freight
- signalling - manual driver intervention likely needed as trains pass from tram network onto the main line network
- power – may need multiple electric voltages and the retro-fitting of overhead lines onto the existing network is likely to be expensive, eg, the Portishead line has 4 tunnels
- platform heights – shared platforms (dual height) or exclusive platforms at shared stations
- new technology (in the UK) - Sheffield-Rotherham may iron out the difficulties in rail-tramway compatibility, eg, new wheel profile

Tram Train Sheffield-Rotherham (above left) – note the dual-height platform at Rotherham Central
Turbo Train Severn Beach Line Bristol (above right)

In summary:

Bristol City Council and WECA clearly have ambitious plans and there will be more clarity on mass transit when the feasibility studies are published. The mix of MetroBus (BRT), local rail and other mass transit in the local strategies is up for debate. The other mass transit on core (and more) corridors could take the form of ALV, OGB, LRT, tram-trains or variations upon these technologies.

Tram trains would have the most impact on the local rail network as they would share existing rail lines. If tram trains are the solution for Portishead, which many doubt, are they the right mode for the rest of the Bristol mass transit network? Having one transport technology can be an advantage in terms of rolling stock, depots and staff training but one solution may not be the best for all corridors.

Large swathes of Bristol are without adequate public transport provision and we have to remain open-minded about the infrastructure needed to achieve modal shift, improve air quality and reduce traffic jams.