

Rail Franchise and Metro Scrutiny

November 9th, 2018

Mark Barry, Professor of Practice in Connectivity at Cardiff University's School of Geography & Planning

Thank you for inviting me to provide my initial views on the effectiveness of the procurement and early implementation of the contract to operate the Wales and Borders franchise and to develop, implement and operate the South Wales Metro, that Transport for Wales (TfW) awarded to KeolisAmey in May 2018.

I have been involved in the South Wales Metro since 2010 in various roles, including:

- Author of 2011 report, "A Metro Wales Capital City Region¹" commissioned by the Cardiff business Partnership and published by the Institute of Welsh Affairs
- Author of, "A Cardiff City Region Metro: transform | regenerate | connect²" in 2012/3 developed with the Metro Consortium and published by the Institute of Welsh Affairs
- Author and led the development, of the Welsh Government commissioned, "Metro Impact Study³" in 2013
- Led development of South Wales Metro for Welsh Government (PT) Nov 2013 – Jan 2016
- Strategic Support (PT) to MTR's bid to develop the South Wales Metro July 2016-Nov 2017.

I have also been (again PT) Professor of Practice in Connectivity at Cardiff University (since April 2016) and have run events and published reports and articles related to Metro, most notably the recent "Metro and Me⁴" report and event held on 8th October 2018 (in partnership with Cardiff University, Capital Law, IWA and Arup).

During 2018 I have also been leading some further work for Welsh Government (WG) to help make the case for rail investment in Wales.⁵

Given my previous work and involvement with the South Wales Metro I will focus my brief comments on the South Wales Metro. Before I do, I think I'd like to set out that I am really pleased and impressed overall with what has been proposed by KeolisAmey and that WG & TfW are to be congratulated for running such a complex procurement so successfully. I am also hugely impressed by the commitment of KeolisAmey and their senior team to the task of operating the Wales & Borders franchise and developing, delivering and operating the South Wales Metro.

This project is long overdue (first set out by Marquand in 1936!) and is a real opportunity for the region. It is also worth noting that ideas do not (generally) come out of nowhere and that work over the last 10-15 years by WG, SEWTA, NR etc also contributed to the foundation upon which to build the Metro.

To note: the views and opinions expressed in this paper are those of Mark Barry and no other person or organisation. I have avoided any comment of some areas due to time/space constraints (e.g. asset transfer, fare policy, ticketing, customer experience, supply chain development, etc); clearly my views are more qualitative in nature as I do not have access to the more detailed, substantive and quantitative work undertaken by TfW during and since procurement. My recommendations are intended to present opportunities to enhance the benefits and/or reduce the risks of the implementation programme.

¹ Barry M (2011), "A Metro for Wales' Capital City Region – Connecting Cardiff, Newport and The Valleys", Cardiff Business Partnership/Institute of Welsh Affairs. <https://www.iwa.wales/wp-content/uploads/2011/02/iwa-metroreport.pdf>

² Barry M & Metro Consortium (2013), A Cardiff City Region Metro: transform | regenerate | connect, Institute of Welsh Affairs. <https://www.dropbox.com/s/9txasx5dbmc7h7u/Metro-Consortium-21-03-13WEB.pdf?dl=0>

³ Barry M & Metro Consortium (2013), Metro Impact Study, Welsh Government. <https://beta.gov.wales/south-wales-metro-impact-study>

⁴ Various, "Metro & Me (2018), IWA, Capital Law, Arup, Cardiff University, Mark Barry, Geraint Talfan Davies <https://swalesmetroprof.blog/2018/10/02/metro-me-october-2018/>

⁵ <https://beta.gov.wales/rail-network-wales>

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Overall vision and objectives

The high-level vision and objectives of the South Wales Metro have been developing since my first report was published in 2011; these were, perhaps, best summarised by WG in “Rolling out our Metro”⁶ published to launch the project in November 2015. A more formal definition of WG’s priorities for the Wales and Border franchise⁷ (inc South Wales Metro) was published in 2017 as part of the procurement process and to reflect the consultations undertaken. For me, the key features of the Metro vision which were, where practical, embedded in the subsequent procurement, are:

- Faster and more frequent services – the need for all places to have at least four services an hour and to reduce journey times between Cardiff and the Heads of the Valleys (HoV)
- Integration - especially the role of buses and active travel
- Extendibility - to enable future extensions and/or add stations to serve those large/dense population centres currently disconnected from the rail network in SE Wales
- Enable development and regeneration – to help stimulate “economic development and regeneration” at all scales, across the network

There are also some other considerations which I will reflect on:

- Network capacity
- Risk
- Policy constraints
- Funding
- Wider regional obligations

I will address each of these in turn below, including a view on the procurement process and the solution presented by KeolisAmey in respect of Metro.

Overall procurement

First, I think we have to applaud WG for taking on and running, via Transport for Wales, the biggest procurement ever undertaken by WG and the most complex in the rail industry since privatisation. The amount of analysis and diligence displayed in that process was immense, requiring different teams to engage with complex details across multiple workstreams; these covered customer service, stations, ticketing, fares, infrastructure management, operations, rolling stock, timetabling, HR, implementation, etc. TfW are to be congratulated on this effort – especially considering the organisation did not exist until 2016! We should also not underestimate the importance of the political support and empowerment of officials provided during this process.

The output-based procurement, with a fixed capital and subsidy envelope, has perhaps helped avoid the pitfalls of over/underbidding on “cost” that has so affected recent DfT awards; time will tell. One perhaps less desirable feature of the “broader” and more complex process, was the time and effort required to run it and to bid. During that process four bidders engaged and expended a significant amount of resource and energy – I would estimate each bidder will have invested between £5-10M in preparing and submitting their bids and the process itself took nearly two years.

⁶ Barry M, (2015), “Rolling out our Metro”, Welsh Government. <https://beta.gov.wales/south-wales-metro-brochure>
<https://beta.gov.wales/sites/default/files/publications/2018-06/south-wales-metro-brochure.pdf>

⁷ Welsh Government (2017), Priorities for the Wales and Borders Franchise
<https://beta.gov.wales/rail-franchise-and-metro-policy-priorities>

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I think a key challenge for TfW now is how to leverage all the intellectual property (IP) developed during procurement so that it can be exploited for the benefits of Welsh passengers. Whilst KeolisAmey clearly had the best proposal across the entire bid, there will no doubt be components of other bids that may have scored “better” in certain areas. How do we secure that IP without risking the integrity of the process? The role of TfW & KeolisAmey must now be to finesse the bid solution in detailed design so that it mitigates risks and maximises the benefits for Wales over the next fifteen years and not be unnecessarily constrained by a solution that may have some components designed with an eye on successfully navigating the procurement process.

This also manifests the need for TfW to evolve from a “procurement machine” to a client and contract management organisation acting to comply with its remit and WG policy. In doing so it perhaps also needs to develop a “thinking/controlling mind” to provide the foundation for the development of Metro to 2033 and beyond. So far, I think it is managing this transition.

Key Features of the Metro Solution

KeolisAmey have presented an ambitious and innovative solution for the South Wales Metro that will deliver faster and more frequent services to most locations (esp. in core valleys) and a network able to provide just over double current capacity on the core valley lines north of Cardiff – these are the headline features which encapsulate the core of the Metro Vision. Inevitably, whilst there is innovation there is also some risk. Key features include:

- New Heavy Rail (HR) Tri-modes on the Rhymney Line (6tph to Caerphilly) & Coryton (2tph) to run onto Vale of Glamorgan (VoG) line (inc Penarth & Bridgend). Introduces innovation and risk especially in development, delivery, cost and operation of new type of HR rolling stock. The battery operation reduces need to install catenary on some sections of the Rhymney Line.
- Tram-train Light Rail (LR) Metro Vehicles (MV) on Treherbert, Aberdare and Merthyr branches through Pontypridd into Cardiff – running to higher frequencies of 4tph to HoV with 12tph through Pontypridd, 10tph on Llandaf branch in Cardiff and 2tph on City Line; new direct services to Cardiff Bay. These vehicles also include batteries and can operate without power for short distances (~2Km) and make use of “smart electrification” – see *below*
- Services on the VoG and core valley lines have been presented as the “Central Metro”
- Several new stations to improve regional accessibility: Crwys Rd, Cardiff Bay, Loudon Sq, Gabalfa and a relocation of Trefforest Industrial Estate to Nantgarw
- Upgraded HR Multiple Aspect Signalling (MAS) on core valley lines - *instead of pure line of Sight (LoS) operation often used for Light Rail systems* – this will allow perhaps 20~22tph through Queen St north junction and Queen St station Vs 16/17tph today.
- “Smart Electrification” 25Kv power supply that includes some unpowered sections to allow application of more flexible clearances between catenary & bridges, etc – an innovative approach that avoids the need for costly and disruptive civils to raise/replace bridges and/or drop track (which typically can only be achieved by operating at lower DC voltages); there are risks though, in development, cost & operation of new bi-mode tram-trains combined with new catenary technology.
- Outer metro (Maesteg, Ebbw Valley, Marches Line, Chepstow/Cheltenham) new Diesel Electric (DEMU) services – still with capacity & frequency constraints on services to Maesteg (1tph), Ebbw Valley (2tph) and on Relief and Marches lines

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- Uplift in capacity through Queen St from the valleys. From my initial review of the proposed rolling stock and network configuration it appears that capacity proposed is about 70% more than that anticipated in the 2019 peak, with a max network capacity (if we double up tram-trains etc) of ~130% more than the 2019 peak. See later: consider whether we feel that a network that can provide just over double the current capacity is enough in 2025 and whether we need to build in flexibility for more headroom into core network and system design.

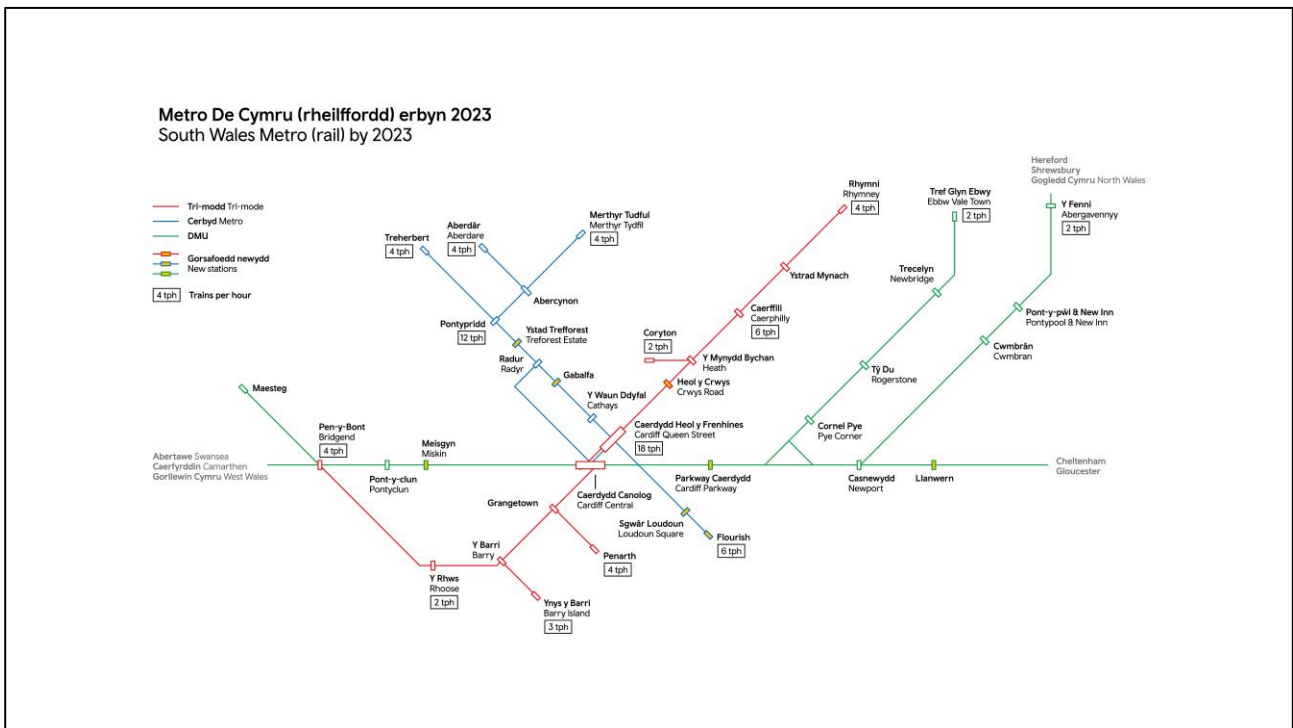


Figure 1 South Wales Metro

What this means for passengers
A really big change in frequency, journey time and capacity

Journey	Trains per hour now	2023 Trains per hour	Journey time now (mins)	2023 Journey time (mins)	2019 AM peak capacity	2023 AM peak capacity	% change
Treherbert > Queen St	2	4	57	46	1206	2570	+113%
Aberdare > Queen St	2	4	57	43	1516	2056	+36%
Merthyr Tydfil > Queen St	2	4	56	44	1326	2313	+74%
Treherbert > Bay	-	2	72 inc. change	50 (direct)	-	-	-
Aberdare > Bay	-	2	72 inc. change	47 (direct)	-	-	-
Merthyr Tydfil > Bay	-	2	71 inc. change	48 (direct)	-	-	-
Pontypridd > Queen St	6	12	26	22	4048	6939	+71%
Rhymney > Central	1	4	61	48	2542	3495	+37%
Caerphilly > Central	4	6	19	16	2542	4452	+75%
Coryton > Central	2	2	18	20 (extra stop)	603	957	+59%
Penarth > Central	4	4	12	11	1856	1914	+3%
Barry > Central	4	5	24	23	2094	2857	+36%

TRAINS PER HOUR IS THE STANDARD WEEKDAY DAYTIME PATTERN. AM PEAK MEASURED 07:30 – 08:59. EXTRA STOP IS AT CRWYS ROAD.


Figure 2 Central Metro Services

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Metro-Vehicles
Electric LRVs for Treherbert/Aberdare/Merthyr Tydfil <-> Cardiff Central/Bay



- 36x40m articulated Metro Vehicles that can be coupled to form 80m trains
- Main power source 25kV overhead line but also operates from battery
- Capacity of 257 with seats for 129
- Capable of on-street line-of-sight 'tramway' operation.






Figure 3 City Link Light Rail Tram-train “Metro Vehicles”

New trains summary - over 50% will be assembled in Wales



Requirement	Fleet Solution	Units	Depot	
W&B	Rural and Suburban	CAF Civity DMU	51 x 2car 26 x 3car	Chester and Machynlleth
	South Wales Metro	Stadler Flirt DEMU	11 x 4car	Cardiff Canton
Central Metro	Rhymney Valley	Stadler Flirt Tri-mode MU	7 x 3car 17 x 4car	Cardiff Canton
	Treherbert, Aberdare and Merthyr Tydfil	Stadler Citylink Metro Vehicles	36 x 3car	MV depot



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Figure 4 New Rolling Stock Proposed

Faster & More frequent

The proposed solution provides almost comprehensive delivery of Metro vision – all points on the core network north of Cardiff Queen St secure faster services and at least 4 services an hour; there are three exceptions:

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- Coryton Line – only 2tph. Given demographics, the routes catchment plus the demand generated from the other new stations elsewhere in Cardiff, and increasing demand across Cardiff (linked to population growth), we should be aiming for at least 4tph and more likely 6tph at peak times (see later ideally using tram-train). This is a significant omission. In reality a 4tph service on this line has more of a case than to Rhymney for example. I am not clear why this target was adjusted down to 2tph during the procurement process (it was always the Metro intent to enable at least 4tph)

I think using projections that extrapolate based on a poor current service is not helpful – a more realistic approach is to use sociodemographic benchmarking which will provide a more realistic estimate of likely demand (latent and induced).

- Similarly, the City line is only 2tph but should be of the order of 6tph at peak times. However, whilst Cardiff West junction (see later) remains a constraint, this will be a continual problem; this will need to be addressed to provide further capacity, network resilience and to enable a future Metro extension to NW Cardiff & RCT and more services on the VoG line.
- Outside the core valleys (and outside of the current procurement) there are still infrastructure challenges on the Ebbw Valley, Marches and Maesteg lines that need to be addressed to enable further frequency/capacity improvements. These issues maybe easier to address if solutions are developed by exploiting tram-train capability (see below) rather than a pure HR approach.

Integration

The entire procurement only lightly touched on integration and as we all recognise, the role of buses, which are fundamental, need to be addressed. However, there are institutional, legislative and commercial challenges to overcome aside from delivering physical interventions.

In my view the delivery of the much-improved metro rail “backbone” demands that we completely redesign our bus networks to overtly integrate with Metro rail services and deliver a completely integrated public transport (PT) network. The initial focus has to be Cardiff Bus, Newport Bus and those operated across the central valleys by Stagecoach as well as NAT, etc

In the first instance, the opportunity to physically integrate bus/rail (to complement integrated ticketing) has to be included in the core Metro network. This will be the case at the new stations proposed at Gabalfa and Crwys rd. which provide an opportunity to do this for x-city bus services in Cardiff. However, I think there are several additional stations that need to be “re-considered” for inclusion in the core project by 2024 to support the integration agenda:

- Pontypridd Bus station – this is the largest bus station in the mid valleys and next to the rail line. A station here should not really be in question; there are also some contingent development opportunities also being explore by RCT
- Wedal Rd – aside from being the nearest point on the rail network to the largest hospital in Wales there is also an opportunity interface with cross city bus services that connect the east and west of the city from Rumney through Roath via Heath Hospital through to Gabalfa (new station), Wanugran Park and Ely
- In future, redesigned bus networks may benefit from rail stations at locations such as Rover Way in Cardiff and Newport West on the Ebbw Vale line in Newport – but acknowledge these are outside the core scope and really for consideration as part of potential interventions elsewhere on the network; similarly, the role of Cardiff Parkway, Llanwern and Miskin needs to be considered and the opportunity for local bus service integration (as well as P&R) assessed at these locations.

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There is also a major activity required re: integration of Active Travel with the Metro. Much of this obligation will fall not to TfW, but to local authorities and the City Region. The key connections are the 0~800m around the stations (and outside the station red-line) which in most cases require a major overall to encourage and enable safe and secure access to stations from their adjacent communities. In some cases, the additional footfall Metro will generate maybe able to support more comprehensive physical developments and regeneration. The new offices on Taff Street in Pontypridd are perhaps the best examples outside Cardiff. There will be others at all scales. The 2013 Metro Impact Study did begin to set out potential interventions.

Extendibility

New routes

A fundamental component of the original Metro vision was to develop a network that could extend, yes more stations and more routes, but also an ability to support more services on the current network as demand increase. The application of tram-train will enable network and service extensions given they enable more cost and engineering flexibility than is possible with a pure Heavy Rail solution. They can operate on tighter curves, steeper gradients, require shorter passing loops as well running “on-street” and operating to Line of Sight protocols.

However, it appears that the full benefits of the Tram-train LRVs maybe being constrained by the maintenance of HR standards on most of the existing network? I am sure there are good reasons for this approach - but I am not sighted on the details. I suspect the timing of the asset transfer of the core valleys from NR to WG could be a constraint and to the extent that remains a risk it does help mitigation to defer any changes to the status of the network until that transfer is concluded.

The ability of tram-trains to facilitate extension (inc “on street”) can deliver further network benefits and/or wider accessibility, regeneration, development and/or economic benefits. Whilst much further planning and development work is required there are a wide range of potential extensions to the core Metro using Tram-train technology. These extensions should be considered and passive provision provided for, in implementation of the core phase. In all cases though, it is better to maintain segregation (even for “on-street” sections) as mixing traffic and other road users with “LRVs” is operationally undesirable and needs to be minimised.

Some examples are set out in the recent “Metro and Me” report, including: North West Cardiff to RCT, Merthyr, Newport, further into Cardiff Bay, Cardiff Bay-Central, Penarth branch, extensions from the Rhymney Line to places like Nelson/Trelewis and Blackwood and new links between valleys and between Caerphilly and Newport. I also think the current challenges of delivering more services on both the Maesteg and Ebbw Valley lines may be best addressed using tram-train.

It should be noted though that extendibility is more easily and affordably enabled by the use of “tram-trains”. The current plans to exclusively use trimodes on the Rhymney lines, Coryton and Penarth branches constrains the opportunity for extensions such as: to lower Penarth, Hengoed-Blackwood, NE Cardiff, beyond Coryton and perhaps over the river to form a Cardiff circle, etc.

Additional Stations

There are more stations on the core network which is very welcome and will generate more demand. There is probably a good case for four or five more. In addition to those with a strong integration opportunity (described above at Pontypridd bus Station, Wedal Rd, etc) we should also asses:

- Upper Boat – the site of a potential major P&R to serve the Church Village area as well as a bus interchange
- Between Pentrebach and Merthyr – to help support further mixed use and especially housing at both the Hoover site and the Abercanaid site

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- Herbert St – an opportunity to provide access to that part of the city centre for services that route directly to the bay (and to take pressure of Cardiff Central & Queen St stations)
- Ely Mill/Victoria Park linked to measures to enhance City Line services
- Cogan on the Penarth branch (more viable with Tram Train operation which is also required to enable an extension further south into Penarth – this will not be possible with the tri-modes)

Given the costs, disruption and procurement overhead for delivering these as later standalone interventions, it would be far more efficient and cost effective to deliver all new stations as part of the core package by 2024. Given the lower likely cost of tram-train stations only requiring a max 90M tram-train platform (Vs more costly HR stations) and given potential latent demand at key locations, they may generate sufficient additional revenue over the franchise to “pay for themselves”. In which case the challenge is more financial engineering than physical engineering.

Aside from being more costly and piecemeal, later introduction on a case by case basis, also risks generating a negative passenger experience from slower journey times once people are used to the new service and journey times. Better to deliver as part of core transformation where journey times will still be much better, even with the additional stations, than the current timetable.

Enabling Development and Regeneration

A key facet of the Metro proposal was its potential to stimulate wider development and regeneration and to improve the urban realm (A key focus of the 2013 Metro Impact Study). In some cases, the application of tram-train could enhance interventions. There are several examples (see “Metro and Me” report for further details) that may merit further investigation as part of a longer term “Metro Development Strategy/Plan” and very much linked to a spatial plan for the region, for example:

- Extension further into Merthyr
- Re-alignment of route to Cardiff Bay via Lloyd George Avenue / Callaghan Square & direct link between Cardiff Bay and Central
- Cathays/Cardiff University/Maindy Campus & potential relocation of station
- Nelson/Treharris extension to enable new development between Tredomen and Trelewis
- On Street in Newport from Cardiff rd. via Royal Gwent Hospital/George Street to city centre

Network capacity

When assessing new network capacity, it will perhaps be useful to explore what future demand for metro services may look like over the next 15 years and beyond. Rather than pivot of current demand patterns we need to try and assess both latent and induced demand given the substantial uplift in the capacity, capability and attractiveness of rail services. The following are examples of data and/or assertions (both qualitative and quantitative) that we should consider when planning over the time frame of the next franchise.

- Whilst the population of the wider region is expecting to grow by perhaps 100k to 1.6M by 2030, over 50% of that growth is expected to be in Cardiff itself with numbers expected to grow from 365k today to well over 400k in the next 10 years (This maintains a trend since ~2000 when the city's population was only 310k)
- Today, nearly 90,000 people commute into Cardiff every day and a further 140,000 from within the city itself making up over 230,000 working in the city

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- Across the region it is likely that in future employment will gravitate toward key hubs (Cardiff City Centre/Bay, Pontypridd, Newport, Merthyr, etc) which will make it easier for people to access those location via public transport – should sufficiently attractive services be available
- There are major issues of road congestion – clearly the main corridors M4 & A470, but now also in our main urban areas, especially across Cardiff, with consequential air quality impacts
- However, according to Welsh Government National Transport Finance Plan public transport makes up under 30% of total movements across the region; rail's share is small at just under 4%. This figure is clearly higher on the valley lines, but even here rail makes up only 10~12% of total movements. There is clearly a large untapped and likely suppressed market.
- Network rail's more conservative projections (Which does not include some of the above factors) anticipated a doubling of demand for rail services before the end of the franchise
- The vastly improved KeolisAmey rail offer vs that provided today will also generate further demand for rail services
- The opportunity to integrate bus & rail services on a redesigned bus networks across the region – and especially in Cardiff; aligned with development of bus/rail hubs in the valleys is also likely to provide people better PT choices and contribute to more demand for rail services
- Similarly, the expansion of P&R facilities across the network will drive more rail demand

Collectively, these factors will likely drive a significant above trend increase in demand for rail services across the region. Therefore, I do not think it unreasonable to test scenarios where 3 to 4 time more people than today want to use "Metro rail services" by 2026 – with significant numbers wishing to travel to/from and within Cardiff itself. Given the low current base a four-fold increase is still less than 50% of total demand on the primary rail corridors. In assessing the extendibility features of Metro this must be a consideration and to do so "easily" and "affordably". We do not want to be in a position in 2026 when we have generated a significant uplift in demand and are faced with early need to retrofit more total network capacity – we must address that question now.

In doing so, we need to address perhaps the most significant constraint on the entire network, this is the "Cardiff West junction" in Canton which limits services to the Vale of Glamorgan and on the City line in the west of Cardiff. The City Line, like the Coryton line, is restricted to 2tph which is a major under provision of Metro services to large parts of Cardiff itself - especially given its growing population, road congestion and air quality issues.

This bottleneck needs be addressed (for example by separating the Vale of Glamorgan and City lines with a "tram-train" flyover) to deliver more network capacity and redundancy north of Cardiff which is also constrained by a theoretical limit of perhaps 22tph that can pass through Queen Street.

Addressing this constraint will also enable more services to operate from east of Cardiff (e.g. Newport, Ebbw Vale, Bristol, etc) to Barry and Rhoose/Cardiff Airport. In parallel, we should seek to introduce the tram-trains on the Penarth branch (instead of the tri-modes), this would enable a further extension into Lower Penarth and another station on the Penarth branch at Cogan.

Freeing up capacity on the City Line will also enable a Metro extension to Pontyclun via NW Cardiff, Creigiau and Talbot Green from near Fairwater on the City line (See Metro and Me). This scheme is vital if we are to provide sustainable transport options for approximately 10,000 houses already starting construction in north west Cardiff at PlasDwr and at the M4's Junction 33. It should also stimulate RCT Council to consider new or reallocated housing at the northern end of the proposed route between Creigiau and Talbot Green to help support the business case for the full scheme. Plenty of work has already been undertaken on route and alignment options over the last few years.

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More strategically and given the interdependencies, the development of a route to Cardiff Central from the Bay along Lloyd George Avenue/Bute St should be developed in conjunction with measures at Cardiff West (and with consideration of a possible extension to north west Cardiff and beyond); this was one of the main recommendations of the 2013 Metro Impact Study.

Risks

From an initial review both innovation and risk has been introduced into the project; these are more of an engineering type and less institutional/regulatory in nature. All these risks can be managed / mitigated and are not untypical for a project of this scale.

Discontinuous 25Kv "Smart Electrification"

Not my area of expertise but this appear to be a new configuration that I am not aware has been implemented before on such a large system. This will have potential construction and operational risks – both in the catenary and the longer-term operations, maintenance and performance of the vehicle, catenary and batteries (and their operational interdependencies). This is an unavoidable risk given it's a key component of the proposed solution and should attract the maximum mitigation measures/effort. This is an area KeolisAmey have significant expertise and experience.

New Rolling stock

Two entirely new vehicles are specified - each with risks re: delivery and operation

- A battery bi-mode LRV Tram-train operation on line through Pontypridd

This is based on an existing vehicle type (cf Sheffield tram-train trial) and maturing LRV battery capability so whilst there are risks related the operation of new tram-train bi-modes and the smart electrification these appear known and manageable (See above).

- Trimode for Rhymney Line.

The tri-mode is a new bespoke vehicle, using three power sources that does not yet exist in this form. Its introduction on the Rhymney Line & Coryton Line complicates fleet management and operations on the core valley lines versus maintaining a single vehicle type (which is more efficient and provides more operational flexibility).

These vehicles will be heavier, cost more to maintain and, at this stage I suspect, have some uncertainties re: their ongoing operational, maintenance, performance and financial profile. *Recent UK experience of introducing new types of rolling stock has exposed previously unknown/unexpected issues & costs. To note, Merseytravel will spend two years evaluating the new Stadler 777 Battery train before committing to full passenger operation possibly in early 2020s given the uncertainties related to opex and performance.*

There is already risk associated with the tram-train bi-mode; the tri-mode adds more (for perhaps marginal additional benefit); in addition, upfront development costs will be passed into the initial fleet. My guesstimate is that the rolling stock costs are higher as a result.

The question it seems to me is to what extent has that choice of stock been designed primarily to satisfy the procurement/policy need to: operate diesel free on the valleys by 2023 and mix with freight, deliver a solution within a fixed capital envelope. All important, but in this case if enforced at the same time may produce a less than optimal and more costly solution with higher delivery risks.

Revenue Risk

A key issue affecting many franchises is the "overestimation" of demand & ticket revenues. The strong growth for rail services that has been experienced across the UK for more than a decade has

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in some areas “tailed off” to a certain extent. However, I am reasonably confident that this will not be a major issue in Wales given the lower levels (vs UK) of rail patronage based on a very depreciated service. A new network with new trains/trams, more capacity and the South Wales Metro has the potential to generate more, not less, demand/revenue and to deliver services more efficiently and to do so with less subsidy per passenger. I would be more concerned about the ability of the network and franchise to support more services and capacity.

Rail Asset Transfer for Core Valleys

It should be noted that a successful transfer of the rail asset (on favourable terms) for the core valleys from NR to WG is essential to the long-term development of the Metro – and the potential to transfer further section (even elsewhere in Wales) in future. WG control will allow application of different operating and development standards to exploit benefits of tram-train capabilities.

Policy constraints

The two main policy positions that I believe impact the South Wales Metro are:

- The need to support freight operations on the Rhymney Line
- The need to operate diesel free north of Queen St

I think there is an opportunity to review both if it is felt that these positions have added unnecessary costs, risk and/or constraints to the bid solution. I think the trimode proposals is partly as a response to these positions (as well as to the capex available as set out during procurement).

For example, there is a strong likelihood (again my view) that there will be no coal freight at all on the Rhymney Line by 2023 (there is none anticipated on the Pontypridd branches) as there is serious doubt as to whether the operations at Cwmbargoed colliery will be extended; and we know that Aberthaw is no longer using this type of coal because of its emissions issues.

Similarly, whilst I support diesel free operation on the Rhymney Line (as will be the case on the Pontypridd branches) enabling a delay of maybe 2-3 years (during which time new DEMUS could operate) would perhaps allow more catenary to be installed (subject to further capex) to allow tram-train operation - which I maintain is the right strategic choice for the Rhymney Line and the Penarth line, as it is on the lines through Pontypridd.

Wider regional obligations & Funding

Now that we have a contractual commitment to deliver the foundation of a South Wales Metro, as well as emerging ideas for its future development, we can also begin to think seriously about how we can use the Metro to help re-imagine and “rebuild” the whole of the region to increase economic activity across south east Wales and enable its more equitable spread.

Given the potential of all these Metro schemes and the likely limits on funds and delivery capacity, we need a robust process to determine its extension priorities over the next 10-20 years - and in a way that explicitly links transport and land use planning as well as reflecting and influencing broader economic development and regeneration proposals. This could be done via a Metro Development Strategy, set within the context of a regional Strategic Development Plan.

Furthermore, perhaps the City Deal could allocate further funds for potential Metro extensions, the city region could also look to establish a Metro development fund, for example by pooling revenues from the Community Infrastructure Levy. I also think the delivery of active travel last mile connections to stations should fall to local authorities. In parallel Cardiff Capital Region local authorities should empower officials responsible for local planning, economic development, regeneration, housing, etc to explore ways in which better connectivity can help sustainably grow the regional economy.

Submission to Economy, Infrastructure & Skills Committee

Rail Franchise and Metro Scrutiny

November 9th, 2018

Mark Barry, Professor of Practice in Connectivity at Cardiff University's School of Geography & Planning

Primary Recommendation

Whilst TfW and TfWRail progress through the Design and Discovery phase there may be scope to consider how a more detailed analysis of the risks, costs and constraints presents opportunity to further optimise and de-risk the bid solution. Within the constraints of that process my recommendations are:

- Rolling Stock
 - Given the risks associated with the development, delivery & operation of the trimode, test the underlying assumptions to try and improve and de-risk the solution. In particular, review their exclusive operation on the Rhymney/Coryton/Penarth Lines.
 - In doing so consider temporary application of DEMU (which could perhaps be done more quickly and at lower cost) pending, and/or more widespread application of tram-train Metro Vehicles to provide more network & operational flexibility & efficiency.
 - Replace the 2 tri-modes per hour proposed for the Coryton line with 4 tram-trains.
 - Further analysis may indicate that the tri-mode could be better suited to deliver other or additional services (eg Cheltenham – VoG/airport, Bristol - Cardiff, etc)
 - The rolling stock procurement programme should provide the contractual flexibility to adjust up/down the numbers of units of each type required
 - Simplifying the fleet strategy will also deliver more economies of scale, greater operational flexibility, more uniform driver training/rostering and more uniform operations north of Queen St as well reducing implementation risks.
- Network Capacity
 - Assess future demand and need for early network capacity measures (especially as Cardiff West/City Line) by undertaking an analysis of latent & induced demand, using trip rate benchmarking Vs similar systems and socio/demographic profiles.
 - To the extent that continued freight operations on Rhymney Line (RL) are a capacity constraint review ability to remove this constraint (as is the case through Pontypridd).
 - Explore opportunity to include some additional stations to the core programme
- Wider tram-train operation
 - Ideally all core valley lines & Penarth operations should utilise tram-train vehicles – this should be the medium/longer term objective; however, I recognise that there are still infrastructure (further electrification) and institutional challenges (running tram-train on NR asset) to operate these vehicles on the VoG to Penarth
 - Focus on working with NR, ORR to secure early approval for tram-train operation on the City, VoG (to Penarth at least) and perhaps the Main/Relief and Ebbw Vale & Maesteg lines; in doing so assess what further capital might be required to convert Penarth branch operation to tram-train.
 - That in doing so, the transfer of the City Line and Penarth branches to WG are considered (and perhaps Ebbw Vale and Maesteg in due course)
 - Tram-trains operating to Penarth could serve all the core valley lines and provide an opportunity to interchange from Barry/VoG services at Cogan at Cogan (if we put a new station on the Penarth branch here), at Grangetown & at Cardiff Central.

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- Implementation Scope and Phasing
 - Test implementation phasing of electrification of Rhymney Line (RL), in whole or part, to explore whether it is possible to accelerate delivery of Penarth/City Line/Cardiff West work and tram-train operation (which is perhaps of greater strategic benefit to the future network) – this approach would have no negative impact on RL passengers.
 - This would require a policy adjustment to allow diesel to operate on RL for longer than desired. I think we must consider this flexibility to deliver the right long-term solution.
- City Region & Local Authority Obligations
 - Encourage the City Region to allocate funds to contribute to further Metro Extensions and to lead (rather than TfW) on the last mile connections between communities and stations right across the region.
 - In many cases this approach should be integrated with local regeneration initiatives – the importance of a coherent placemaking strategy should not be understated – especially to ensure that station approaches dovetail with station enhancements.
 - The need to develop a Strategic Development Plan, anticipated in the Wales Planning Act, is now pressing esp. as regards future housing types and locations. There are still major car-based developments progressing through planning across the region!
- Metro Development Plan to 2033
 - We also need to wrap up all the potential scheme across the region via a robust process so that we can clearly set out a future development programme beyond 2024. A long-term Metro Development Plan should reflect the emerging “strategic regional development plan”
- Bus networks
 - Accelerate work to redesign bus networks as part of comprehensive public transport network – this will mean more feeder services in the valleys (the importance of a new station next to Pontypridd bus station is important in this regard) and more of a grid network (vs hub and spoke) in Cardiff with integration/interchange opportunities exploited at all existing and new stations on the network.

However, the most important consideration is to enable TfW to maintain focus on delivering a core solution; this is a more important consideration than the above. Furthermore, even if none of the above suggestions are realised, the delivered solution will still be a huge improvement over that which we enjoy today.

Mark Barry is Professor of Practice in Connectivity at Cardiff University's School of Geography and Planning. Mark also has his own consulting business M&G Barry Consulting. He led South Wales Metro Development for Welsh Government from December 2013 to January 2016 following the publication of his Metro Impact Study in 2013.



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