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Think piece
Bus franchising for the net zero agenda in Wales

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Introduction

This think piece is designed to inform forthcoming legislation on bus services and to provide an evidence base to support Transport for Wales (TfW) in making key implementation decisions around contracting and awarding franchised bus services as a contribution to net zero. The major message is the need for TfW to design and oversee a well-planned and well-managed transition to bus franchising for net zero in Wales. This requires a holistic approach that recognises both the elements affecting the demand for bus services, which can be leveraged to influence travel behaviour, and considerations relating to the supply of vehicles and associated infrastructure. It is important that TfW, as the regulator, maintains good communication not only with the Welsh Government but also with local authorities through the Corporate Joint Committees, operators, and the travelling public (users and non-users). Technical advances enabling the transition away from conventionally fuelled vehicles must be accompanied by the introduction of measures to influence behaviour change and the travel choices that people make. New approaches to network planning and a vision for integration – as represented by TfW's 'One Network, One Timetable, One Ticket' – need to be introduced alongside electrification and incorporated within the contract.

Background and context

The 1985 Transport Act deregulated local bus services in Great Britain outside London. In brief, the Act provided for a bus service to be operated on a route-by-route basis as a 'commercially provided service', not regulated in terms of fares or other conditions, and without subsidy. Gaps in services, which were not provided commercially but were determined as socially necessary by local authorities, could be subsidised following a competitive tendering process, thereby creating a more complete network of services. In London, by contrast, local services were deregulated through competition for the market – referred to as franchising – to provide a planned, integrated network including both services that could survive competitively and those that could not. Services were offered for competitive tender in groups and were subject to regulation in terms of frequency, fares, and quality standards. Once the tendering process was complete, these groups of services provided an integrated network for the whole of the London area.

Outside London, falling patronage has led to legislative attempts to equip local authorities with the capacity to develop more integrated bus networks. These include Statutory Quality Partnerships (SQPs)

– voluntary agreements between local authorities and operators – and their mandatory equivalents, as well as Quality Contracts (QCs). Although first introduced in 2009, these latter measures have not been widely implemented and were strengthened in 2017, when metropolitan mayors in England were given powers to franchise bus services under the Bus Services Act 2017. The proposal to give franchising powers to TfW mirrors developments in the metropolitan areas of England.

A well-designed and well-used public transport system is the backbone of any transport policy aimed at promoting sustainability, reducing environmental impact, and contributing to the net zero agenda. Travel in Britain has long been characterised by high levels of private car use and, compared to mainland European neighbours, low levels of new infrastructure (Docherty and Shaw, 2019). Although the importance of adopting a more sustainable approach to travel has been recognised, the Welsh surface transport sector in 2019 accounted for 19% of Welsh emissions. This is a smaller percentage of the total emissions compared to the UK as a whole (at 21%) reflecting the greater role that agriculture, manufacturing, and construction play in Wales rather than the transport sector being more carbon efficient (Wales Centre for Public Policy, 2023). The net zero agenda entails reducing emissions so that no net emissions remain in the atmosphere (United Nations, n.d.). Public transport has a key role to play in creating outcomes that reduce carbon emissions and is essential to achieving net zero. Wales is committed to achieving net zero emissions by 2050, through strategies that include reducing carbon emissions and, in the context of this think piece, decarbonising transport. Net zero in the bus context has largely been associated with policies aimed at reducing emissions from the transport services provided (Logan et al., 2022). Significant emphasis has been placed on transitioning from conventionally fuelled vehicles to low-carbon electric or hydrogen public transport, and on the use of renewable electric power sources, as outlined in the Welsh National Transport Delivery Plan 2022–27 (Welsh Government, 2023, Section 4.2: Bus). Equally important is the need to consider the role of behaviour change and the measures that can be introduced to influence the travel choices that people make.

Motorised transport activities are, by their nature, carbon-producing. **Contributing to the net zero agenda requires recognition of both demand-side and supply-side considerations.** On the demand-side, a shift in mode from private and individualised transport to shared or public services is necessary. On the supply-side, decarbonising public transport requires attention not only to vehicles and associated infrastructure but also to service planning to minimise patterns of economically inefficient operation.

This think piece is structured as follows. The first section highlights key policy aspects of a holistic approach to bus franchising to support the net zero agenda in Wales. This is followed by a brief overview of demand-side considerations within the net zero context (Welsh Government, 2023), identifying ways to reduce car dependency and encourage greater uptake of public transport; more detailed policies to promote mode shift are addressed elsewhere in this series of think pieces. This is followed by a section on supply-side considerations, which explores contracting, vehicle and infrastructure issues in relation to franchising, with specific reference to decarbonisation.

Demand-side considerations

Globally, the challenge of making the bus an attractive option has been heavily influenced over the past 60 years by the reality of competing with the private car in terms of convenience, comfort, and cost at the point of use. Making journeys by bus effortless and seamless has often been promoted as a way of retaining patronage, and in a net zero context, smart ticketing not only offers ease of access but also reduces energy consumption through lower dwell times and shorter overall journeys

(Widanapathiranage et al., 2013). Although the ITSO (Integrated Transport Smartcard Organisation) was established in 2002 and provides the widely adopted technical standard for smart and integrated ticketing, there are very few examples of successful multi-operator smart ticketing systems outside London, which is generally attributed to a lack of partnership working. It should also be noted that while smart cards and contactless payment encourage a simplified fare structure that is easy to use, they do not readily facilitate the introduction of ticketing incentives.

To encourage greater use of public transport, operators and authorities must, at the very least, focus strongly on designing and delivering a network of integrated services that are passenger-focused and (ideally) financially sustainable (Nelson, 2024). Good quality information has long been recognised as an important factor in encouraging mode shift. Mulley et al. (2017) showed that public transport users seek different information at different stages of the journey, and that preferences and usage vary between customer segments. Appropriate messaging enables passengers to use the public transport system with ease and confidence (Halpern, 2021).

From an operator's perspective, understanding current and potential customers is key to improving the attractiveness of public transport (see also the role of segmentation below). These principles align with TfW's 'One Network, One Timetable, One Ticket' vision.

Segmentation has increasingly been used in transport planning to address the unique needs and behaviours of different user groups. The basic idea is to understand the type and composition of a user group, highlighting diverse motivations and barriers. This supports targeted strategies to reduce car dependency and encourage mode shift, while acknowledging that some car users will not give up their vehicle, regardless of incentives (Anable, 2005). The introduction of shared services can play a role in encouraging mode shift away from private car use and shared car schemes with electric vehicles, as with TrydaNi in Wales, can make an additional contribution to the net zero agenda.

Travel Demand Management (TDM) measures, described by Meyer (1999) as an 'action or set of actions aimed at influencing people's travel behaviour in such a way that alternative mobility options are presented and/or congestion is reduced' (p. 576) are often implemented as a 'package' of measures characterised as 'sticks' (or 'push' measures) and 'carrots' (or 'pull' measures) to directly encourage mode shift. Furthermore, 'window of opportunity' factors – such as lifestyle and household changes, changes to work and commuting patterns, and changes in transport and mobility as well as respondents' social and environmental considerations – influence travel behaviour and may provide opportunities for targeted interventions.

The rural environment differs markedly from its urban counterpart. Over 80% of Wales is rural, with a third of the population living in rural areas. The ageing bus fleet and the prevalence of smaller operators pose particular challenges for fleet decarbonisation. From a transport planning perspective, it is important to recognise the pivotal role the car plays in ensuring accessibility. This reliance on the car in rural areas presents challenges for public transport operators and authorities, who should consider integrating car use into the transport offer – as a potential shared or collective vehicle. This is a challenge that could be addressed by the Corporate Joint Committees (CJCs) in Wales.

Supply-side considerations

1. Franchise contracting design: key issues for net zero

   A contract is a statement of the allocation of different types of risk between the operator and the contracting authority. A successful contract will demonstrate an understanding of principal-agent

theory. It should identify clear responsibilities, incentives and penalties to reduce potential disputes and ensure efficient and undisrupted service delivery. The *Roadmap to Bus Reform* (Welsh Government, 2025) identifies the proposed regime in Wales as an incentive-based gross-cost model, in which TfW, as the contractor, will bear the revenue risk and pay the operator a fixed sum to operate the specified service or services. In contracting services, TfW will specify the route – based on the new principles for network planning – the service frequency (distinguishing between the core network and secondary and feeder services), fares, and quality standards. **Incentives embedded in a contract, whether based on gross or net costs, transfer some of the operational risk to the bus operator** in meeting the specified targets or KPIs, such as on-time running, customer satisfaction metrics, service quality metrics, and accident rates. Incentives within contracts need to be achievable, well-specified, and measurable, and require clarity on KPI levels, the process of monitoring, and penalties for failure to meet expectations.

The framework of incentive-based contracts provides a series of levers for creating lower-carbon bus networks. The existing fleet in Wales is likely to be heterogeneous in both age and Euro engine status, with variations from one extreme – e.g. Newport Bus, with a high and growing percentage of electric vehicles – to the other, such as smaller bus operators with older diesel vehicles. The *Roadmap to Bus Reform* (Welsh Government, 2025) identifies a commitment for TfW to own all vehicles in the future. The procurement of these vehicles is an important part of the contractual landscape, particularly the extent to which operational risk (e.g. maintenance) is transferred to the operator. In the short term, the distribution of ownership impacts the setting of common emission standards as part of the KPI suite, as targets need to be proportional to fleet composition. The setting of KPIs must be accompanied by appropriate reporting, performance monitoring and penalties for non-compliance to avoid perverse outcomes (Sheng and Meng, 2020). The introduction of a benchmarking process alongside franchising will ensure the ongoing potential for performance improvement through learning from good practice.

The franchising process must be closely linked to the proposed transition towards longer-term TfW ownership of the full fleet, recognising that this transition may remove the incentive to upgrade vehicles. However, in the short term, operators could be offered financial incentives (e.g. subsidies or grants) if they transition to zero-emission vehicles of a suitable standard that aligns with TfW's future fleet, thereby speeding up decarbonisation. In other regimes – for example, Transport for New South Wales, Australia – operators procure from a shortlist of approved vehicles.

The *Roadmap to Bus Reform* (Welsh Government, 2025) also includes a commitment to creating a mix of franchise package sizes to ensure opportunities for operators of all sizes to exist within the market. In terms of franchise package structure, each should aim to cover journeys to work or the wider labour market to avoid border issues. It is also necessary to consider the size of franchise packages and the density of potential passengers: too small a package in urban areas may create boundary issues, while too large a package in rural areas may exclude existing smaller operators. This is particularly relevant in areas of low density. Dialogue with operators is important, especially during the transition period and particularly with smaller operators, who may coordinate a joint bid for an area. The design of franchise packages must also consider the potential emergence of spatial monopolies, while recognising that larger packages offer scope for operators to include cross-subsidy within their tenders.

2. Network planning issues: essential elements for net zero planning

A successful franchise package depends on a sound network plan with associated timetables. The *Roadmap to Bus Reform* (Welsh Government, 2025) outlines key planning principles, which are illustrated and extended (Nielsen et al., 2005) in detailing the 'ready-made network'. A policy decision will be necessary regarding where to position the network on the spectrum between spreading services thinly and concentrating them to provide high frequency on core routes, as it is not possible to do both within a fixed budget. While not made explicit in the *Roadmap to Bus Reform* (Welsh Government, 2025), network planning principles are based on simplicity – centred on a frequent core network, with local and demand-responsive services built around it. The key to the core is frequency, arguably the single most important quality factor for increasing patronage (Currie and Wallis, 2008).

This network strategy also relies on interchange, which increases the number of reliably accessible destinations by exploiting the 'network effect', whereby improvements or expansion provide greater value in combination than in isolation (Nielsen et al., 2005). Ideally, gaps in the network should be filled by demand responsive transport services (DRTs) which should be designed to complement not duplicate the fixed route network. DRT services work particularly well in less dense areas but also have been successful in urban areas: experience with the Fflecsi service could be extended to fulfil this role. **Facilitating interchange should be a priority**, particularly in more urban areas, and should form part of future infrastructure plans. In the context of decarbonisation, these network principles need to be aligned with new and existing infrastructure relevant for storage of fuel (hydrogen vehicles) and charging (electric vehicles). In practice, depots must be treated as integral elements of the network planning process, achieving the same status as patronage generators, to avoid inefficient 'dead running'. **Network planning must be carried out in in conjunction with franchise size decisions and the development of infrastructure plans for the industry.**

3. Zero emission fleets: key challenges

The decarbonisation pathway for the supply of bus services has largely been associated with the greening of the fleet. In 2023, 6,354 battery electric buses were registered across the EU27 plus Norway, Iceland, and Switzerland (Sustainable Bus, 2024). A substantial body of literature exists on the technical and economic aspects of zero-emission buses (ZEBs). While battery-electric buses offer a less capital-intensive option than hydrogen vehicles, their economic viability is challenged by high battery replacement costs and uncertainty regarding energy efficiency and degradation. Although electric buses perform well in life-cycle analyses (assuming clean energy sources), they may experience efficiency issues in colder climates (Onat et al., 2015).

Zero-emission (at the tailpipe) vehicles will require supporting infrastructure in terms of depots capable of charging or refuelling with access to sufficient fuel supplies from clean sources and, in the case of electric vehicles, the possible need for storage of fuel so as not to overwhelm the grid. For hydrogen-powered vehicles, which may be required for steeper gradients, a robust delivery supply chain is essential – something that is not yet well established.

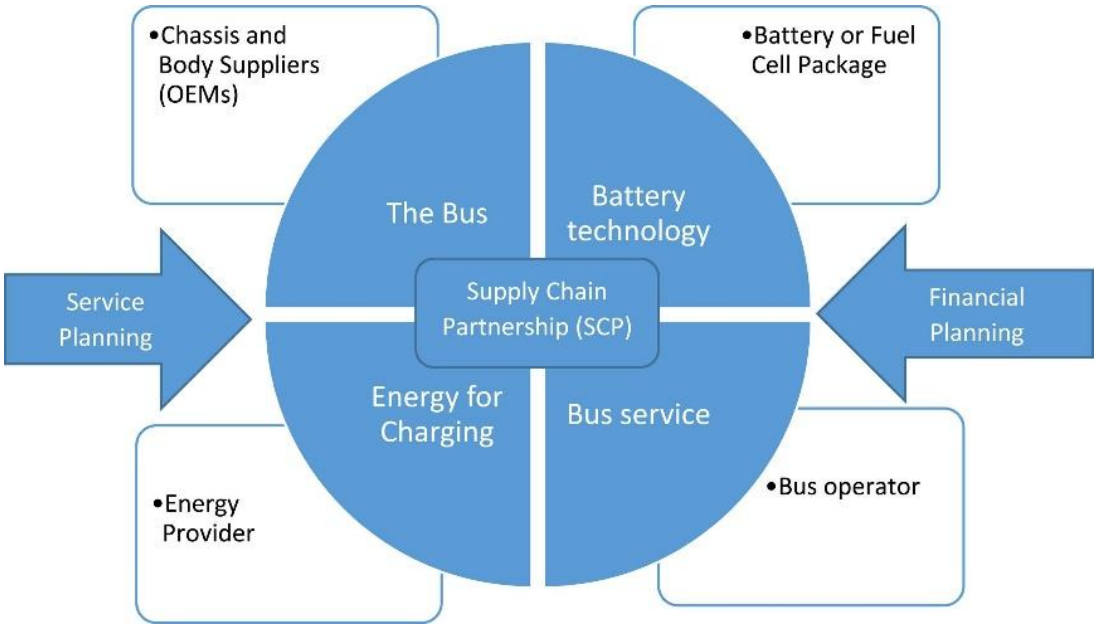
There is relatively less peer-reviewed literature on the introduction of electric buses compared to that on private cars. Rodrigues and Seixas (2022) identify a number of barriers to implementation while emphasising that context is key. It should also be noted that the technology is advancing rapidly, affecting vehicle and component costs, which are likely to decline for a given battery configuration. The key implications for TfW are considered below.

- **Range:** batteries provide a range of 200–250 km, although this depends on climate and road conditions; manufacturers have developed rapid on-route charging technology that can be used at bus terminals. Range limitations add complexity to operator routing and scheduling.
- **Vehicle cost**: the price varies considerably and is sensitive to the procurement process. Vehicles are more expensive than their diesel counterparts: in Europe, a range of €350k to €500k compared to €200k to €250k (2019/20 prices, cited by Rodrigues and Seixas, 2022).
- **Impact on power grid:** how charging is carried out has implications for battery size (and cost) and can negatively impact the grid if load demand occurs at peak times. This remains the subject of significant ongoing research.
- **Fire safety:** battery fires are a very low risk but high impact, requiring a fire prevention strategy. If a fire occurs, it can be difficult to extinguish due to the nature of the battery.
- **Passenger perceptions** around the world have been notably positive, with significant indications of a willingness to pay higher fares for electric vehicles over diesel.
- **Operator perception** is also important. A recent survey in Australia (ABC, 2025) found that 92% of operators have no plans in place to support the ZEB transition, do not intend to formulate any, or are waiting until they purchase their first ZEB. This presents a potential risk to the ZEB transition if replicated in a Welsh context and this should be investigated, perhaps by the Confederation of Passenger Transport (CPT) Cymru, noting that ownership and fleet size can be an indicator of operator perception.

Hensher (2021) gives examples of how contracting environments have responded to the greening of fleets. In England, the government is investing in vehicles working in partnership with local authorities and operators so that operators alone assume little risk. A system of bidding for capital grants is being put in place that covers vehicles and depot infrastructure. In the Netherlands, operators typically purchase vehicles and organise their own depots, but even larger operators have found the risks increasingly high, leading to interim changes to contracts and new arrangements for amortisation (Hensher 2021). In Australia, the situation is less clear, although there is a commitment to ensure all tendered contracts in metropolitan areas are zero-emission by 2030. In Sydney, the recent tender for Region 9 was won by a joint venture between a transport operator (Transdev) and an infrastructure network design specialist (John Holland), signalling an understanding of the supply chain required to operate ZEBs. A subsequent partnership between infrastructure companies and transport operators has emerged for depot upgrades, although ownership of the depot passed from private to state hands as a result of the contracting process.

Hensher (2022) suggests that the allocation of risk during contract preparation becomes more significant if the government is unwilling to absorb that risk. In particular, **the distribution of risk between energy providers, depot upgrade specialists, and operators is unclear, with a significant mismatch between asset lifespan and contract length.** Stakeholder discussions suggest that energy providers see a business opportunity, hinting at the emergence of a competitive market in supply. Nevertheless, there is a clear need to build trusting partnerships between government, operators, and private sector supply chain stakeholders. Hensher (2022) concludes that a supply chain approach should be adopted, within the contracting regime as shown in Figure 1, and this supply chain should be competitively tendered, with various suppliers bidding for specific roles in partnership with a bus operator. This would feed into the operator's cost prior to the submission of the tender for service to the authority.

Figure 1: Supply Chain Partnership Contract Procurement Model



Source: Hensher (2022), Figure 1

The *Roadmap to Bus Reform* (Welsh Government, 2025) envisages a mix of public and private depot ownership, with depot investment being critical to decarbonisation. It is likely that TfW will lead on new depots (as is the case in New South Wales, Australia), while operators will lead on depot conversions. The location and provision of infrastructure – depots in particular – will impact on the franchise package size, as infrastructure needs to be provided so as to limit 'dead running'. This is necessary not only to avoid the inefficiency of empty bus movements but also to ensure effective network coverage between charges, given the different range profiles of electric buses compared to older diesel fleets.

Maintenance skills will also need to evolve, with a focus on battery issues (electric buses) and fuel cell technology (hydrogen buses). Upskilling of maintenance staff needs to be programmed alongside the transition to these vehicles to ensure a well-managed fleet. In New South Wales, Australia, this is being achieved through close collaboration between the bus industry association and further education institutions to develop vocational courses in ZEB maintenance**.**

For a successful outcome, strong collaboration is required between operators, energy suppliers, and manufacturers in a supply chain approach – particularly as new technology brings with it uncertainty. In a mixed regime of infrastructure ownership, responsibilities must be clearly defined and the risks for each party are well understood within the contract, adding to its complexity.

4. Transition issues, contract complexity and disruption costs

The transition period provides the potential for adding additional complexity in the contracting process if changes in the allocation of risk and the costs to operators occurs mid-term due to the introduction of new vehicles. This is especially pertinent as decarbonisation using new technology vehicles carries uncertainties around operating costs, maintenance, skills (particularly of maintenance staff), vehicle breakdown frequency, and therefore increased risk to the operator.

In most cases, this will result in a need to revisit the contract before its end date, based on an agreed reallocation of risk, as seen in the case of the Netherlands identified above.

Contracts, by their nature, are always incomplete (Hensher et al., 2016a). With competitive tendering, there is a balance between, on the one hand, creating a contract length (usually a minimum of 5 years, often 7–10) that provides stability and encourages the franchisee to invest (in staff training, for example), and on the other hand, recognising that market conditions are likely to change over the contract period, making it nearly impossible to specify every commitment precisely. This is no less important in greening the fleets to meet net zero targets, especially during a transitional period of switching from diesel to emission-free vehicles. The Thredbo conference series (**https://thredbo-conference-series.org/**) has provided thirty years of experience on contracting-related issues. Perhaps the most important contribution in this respect is the recognition of the role of trusted partnerships between operators and tendering authorities (Sheng and Meng, 2020).

The transition to zero emission vehicles and the introduction of franchising for the first time will lead operators to move up a learning curve, meaning these costs should be considered from the outset. Disruption costs broadly fall into two categories: costs to the operator in submitting a tender and costs to the tendering authority – in this case TfW. The private transition costs incurred by the operator might be expected to be internalised. However, the disruption costs borne by the tendering authority – for example, issues with staff at takeover, disruption as the new operator gains service experience, and service changes which affect passengers – are not typically accounted for (Hensher et al., 2016b). These costs apply whether it is a new operator or an incumbent facing a new service plan, as is the case with franchising for the first time. Hensher et al. (2016b) identified these as significant but quantifiable and strongly linked to how evaluators of tenders recognise the inherent risks of operator change. To minimise costs accruing to the authority, it is important to consider the quality of the tenderer in the assessment process. The Singapore experience, where the lowest tender was not accepted and wider considerations were included in an analytical tendering approach, is very similar to that proposed by TfW (Goh et al., 2015).

Conclusion

This think piece aims to support Transport for Wales (TfW) in designing a bus franchising system that contributes to Wales's net zero goals, providing an evidence base for legislative and implementation decisions related to contracting and awarding bus services as franchises. Achieving net zero in the transport sector requires both supply-side measures (such as low-emission vehicles and infrastructure) and demand-side strategies (such as reducing car use and encouraging public transport uptake). A holistic approach to service planning and behavioural change which recognises network planning as integral for net zero planning is required. Effective franchise contracts must allocate risk clearly, embed measurable and achievable incentives, and include robust monitoring and penalties to ensure service quality and reduce emissions. The shift to franchising and decarbonisation introduces contract complexity through uncertainty around risk, operating costs, and workforce skills. Disruption costs, for both operators and TfW, should be considered in tender evaluation, with quality and risk mitigation factored in such that the lowest tender may not always be the best.

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