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Think piece
Reducing transport emissions and increasing bus ridership

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Introduction

Before considering franchising issues, it is important to consider the starting point for possible future bus use trends in Wales and what is meant by net zero.

What do we mean by 'net zero'?

If a net zero outcome is defined as one across the economy, with residual emissions offset by nature-based carbon sinks and/or carbon capture and storage (CCS), a 'near zero' outcome might be attained for the surface transport sector by 2050. Recent studies by Zemo Partnership outline the scope for measures in UK transport as a whole (Zemo, 2024) and specifically in the Welsh context for goods vehicles (Zemo, 2025). Considerable scope for a shift of light goods vehicles and buses to battery operation is foreseen, with hydrogen operation of coaches and heavy goods vehicles expected in the longer term. Electric power supply to operating depots is seen as critical, supported by 'Local Area Energy Plans' within Wales.

For the bus sector this might involve measures such as:

- **Use of alternative fuels, notably electricity (with battery buses) or hydrogen.** It is important to ensure that 'clean' methods of production are used, such as hydroelectricity and 'green' hydrogen. Energy use associated with greater vehicle weight (in battery buses) and with the storage and distribution of hydrogen also needs to be accounted for. Battery electric buses offer greater advantages for urban services with frequent stops, as they allow for regenerative braking, and for distances that can be covered on a single charge.
- **Operating at sufficiently high average loads so that energy use (and emissions) per bus passenger-km are lower than those per car occupant-km.** Based on existing diesel bus and petrol car fleets, this implies an average of at least 7 passengers per bus, compared with average car occupancy of about 1.55 (from the National Travel Survey for England: UK Department for Transport, 2023, authors' analysis). As both buses and cars transition to electric battery operation, comparisons between these modes become increasingly relevant. On this basis, the required average bus load rises to about 8, assuming car occupancy remains at 1.55 (see Technical note 1 below for more information). Improvements in energy efficiency between 2015 and 2025 assumed in UK Department for Transport Analysis Guidance (TAG) (n.d) also imply a

further need to raise average bus occupancies. For buses in England outside London, the current average passenger occupancy in non-metropolitan areas is 11.0, compared with 8.6 in Scotland and only 7.1 in Wales (UK Department for Transport, 2025a[1]). This implies that following electrification an increase in average occupancy in Wales is needed to ensure buses outperform cars in energy use per occupant-km. The current bus strategy may be seen as implicitly assuming that buses are inherently superior to cars (Welsh Government, 2025).

- **Diverting travellers from other modes of transport, primarily the private car**, in order to improve average loads and reduce car travel, thereby lowering average energy use per person-km. This aligns with the Welsh Government's goal of achieving 45% of journeys by public transport or active travel by 2040. Hence, expansion of bus services might be combined with increased use of active travel modes – in part as feeders to public transport – and possibly a broader role for demand-responsive transport (DRT), although this would require DRT itself to achieve a satisfactory average load. According to 2021 Census data (Office for National Statistics, 2023), only 19.4% of Welsh households did not have access to a car or van, compared with 23.5% in England overall. For households with two or more cars or vans, the respective figures were 38.8% for Wales and 35.2% for England. However, these figures are influenced by significantly lower car ownership levels in London.

The most energy-efficient bus services are likely to be those carrying large numbers of schoolchildren over distances that are impractical for walking – especially statutory services in rural areas. If the alternative were for parents to drive them by car, not only would significantly more energy be used, but substantial congestion would also result. Similarly, for adult commutes, the bus may compare more favourably with car use, due to low car occupancy at those times (only 1.13 in 2022; UK Department for Transport, 2025b) and relatively higher bus occupancies compared to the all-day average.

Technical note 1: Estimates of energy consumption for cars and buses

Calculations are based on values in UK Department for Transport Analysis Guidance (TAG) Table A1.3.8 for a 2015 base year and the formula provided, assuming an average speed of 20 kph for both bus and car. This implies, for a petrol car, about 0.1 litres being consumed per car-km. Taking an average car occupancy of 1.55 in England in 2023, fuel consumption would be about 0.065 litres per car occupant-km. For a diesel PSV fuel consumption is about 0.41 litres per vehicle-km. Hence to achieve the same consumption per occupant-km as car a bus would have to attain an average load of 6.4. For an electric car and an electric PSV in 2015, data in kWh per vehicle-km imply a break-even bus load of about 8.2. TAG forecasts to 2025 (Table A1.3.10) suggest a greater rate of improvement in energy efficiency for cars than for buses (for both petrol/diesel and electric vehicles), raising the diesel bus (versus petrol car) break-even load to around 7.0, and the electric bus break-even load (versus electric car) to approximately 9.1.

[1] Data for average trip length are derived from three-year averages from the National Travel Survey for England (in the absence of local data elsewhere).

Trends in bus ridership in Wales

In the past, the bus market in Wales could have been considered relatively strong, particularly in the industrialised region of the South East. However, it has declined more sharply than in many other parts of Britain, especially since Covid, due to several factors:

1. The decline of traditional heavy industries;
2. A shift to rail on certain corridors, especially into Cardiff, driven by rising road congestion and increased rail frequency (alongside ongoing electrification investment);
3. A lack of targeted incentives to promote bus use post-pandemic – unlike England's £2 fare cap (January 2023 to December 2024, now £3) or Scotland's free travel for those under 22.

Coombes and Rodrigues (2023) note that the decline in bus use in Wales was greater than in England even before Covid. This is linked to lower urban population densities and a sharper decline in bus kilometres operated.

Table 1: Bus trip rates per capita for England, Scotland and Wales for selected years from 2010-11 to 2023-24

Year	England	England outside Met areas	Scotland	Wales
2010-11	87.7	39.7	81.7	38.0
2015-16	82.3	37.0	76.4	33.2
2018-19	77.1	34.4	72.6	32.8
2023-24	62.9	28.2	60.8	22.8
Percentage change from 2010-11 to 2023-24	-28.3%	-29.0%	-25.6%	-40.3%
Ditto, 2018-19 to 2023-24	-19.4%	-18.1%	-11.6%	-30.9%

Source: UK Department for Transport (2025c)

If an overall trip rate is shown for England, another is provided for England outside the metropolitan areas (i.e. London and the six major conurbations), which may be a more appropriate match for the population density and distribution of Wales. Even in this case, the Welsh figure is lower (22.8 trips per head in 2023–24 versus 28.2) and shows a markedly greater decline since Covid (30.9% versus 18.1%).

The Welsh figures are below those for England and Scotland in all years and also display a steeper decline over the whole period – especially since Covid. Substantial regional variation within each country is also expected, with bus use typically higher in larger urban areas. For example, metropolitan areas in England have higher per capita bus trip rates. Within England, such variation can be shown at a local level (counties and unitary authorities), and at a regional level in Scotland, but equivalent data are not currently available for Wales.

These trends could suggest an inevitably low level of bus use in Wales or, alternatively, indicate potential for growth. The latter could be achieved through network revision and measures to stimulate ridership. For example, matching the 2023–24 per capita ridership of England outside the metropolitan areas would imply a growth of 23.7%. Possible means include:

- Improved service levels
- Coordination of services along shared corridors to provide consistent headways
- Integrated ticketing to remove the financial penalty of interchange
- Pricing initiatives

The possible contribution of franchising

Franchising may increase opportunities for measures that help raise bus occupancy and divert users from other modes, as part of a broader package of policies also aimed at encouraging active travel and restraining car use. The most striking example can be seen in Greater London. An estimate by Transport for London (2024a) of daily total trips by each mode can be converted into percentage shares of the market. The share of 'private transport' (primarily car) fell from 47.8% in 2000 to 36.5% in 2019, with a corresponding rise in 'public transport' (rail and bus) from 26.8% to 35.4% over the same period, the remainder being accounted for by walking and cycling. The impact was to partially reverse earlier trends and promote growth in active modes. Nonetheless, by 2023 the private transport share remained significantly below its 2000 level (at 36.8%) and public transport still above (at 33.0%).

Within the public transport share in London, substantial growth in bus use occurred between 2000 and 2010, followed by a decline in per capita terms, with further growth driven by rail. Buses were already operated on a route-by-route contract basis with a flat fare, but services were substantially expanded from 2000 onwards – particularly through increased frequencies (especially in the evenings and at weekends) and through additional services in central London when road pricing was introduced in 2003. Rapid fleet modernisation enabled the earlier introduction of fully low-floor buses than in most other regions. This coordinated expansion would have been far harder to achieve under a 'commercial plus tendered' service regime. The average bus load in London, based on Transport for London (TfL) data, was 13.3 in 2023/24 – higher than in any other region in Britain (Transport for London, 2024b).

More recent trends in bus use in London have been influenced by reduced speeds (partly due to the prioritisation of cycling) and by expansion of the rail network. It is also worth noting that the population grew significantly within the same geographic boundaries, increasing density, while car ownership per capita remained consistently lower than in the rest of Britain. This may partly reflect better public transport provision but also factors such as high housing costs. The existing fare structure, which already included travelcards, facilitated the transition to contactless payment and the integration of bus and rail pricing. One could therefore argue that, in London's case, bus franchising contributed to these outcomes as part of a broader package of policies but would not have delivered them alone.

To date, only one further example of franchising in mainland Britain has occurred – in Greater Manchester – but this only became fully operational in January 2025, so it is too early to draw firm conclusions. However, elsewhere in the British Isles, Jersey offers a notable case of ridership growth under a single franchise. Between 2012 and 2019, ridership grew rapidly, underlying components being described in Villeneuve-Smith and Walker (2019). The latest data show trips of 5.33 million in 2024 (Liberty Bus, 2025), which when divided by the 2023 population of 103,650 (Government of Jersey 2025), gives a trip rate of 51 per head, considerably higher than the 34.4 for England outside metropolitan areas (as shown in Table 1), although this figure for Jersey includes school bus provision.

It should also be noted that education-related travel (mainly school) forms a significant component of local bus use. In larger urban areas, these trips are often made on the general public transport network, since many fall below the threshold for statutory provision of free travel. Such journeys comprised around 20% of local bus trips in England in 2023 (UK Department for Transport, 2025d). Where networks are franchised, this element forms part of the overall service specification and often shapes peak capacity planning. In rural areas, however, statutory provision is more often delivered by dedicated school transport services.

Factors determining bus attractiveness

Although not enabling assessment of factors specific to car users, work by Transport Focus provides valuable insights into qualitative factors important to bus users. A recent study (Transport Focus, 2024) shows that 'timeliness' was the most important factor affecting overall quality rating for a 'good' bus journey, accounting for 65% of the variation, followed by 'bus driver' (11%), then 'bus environment', 'boarding and finding a seat', 'value for money', and 'bus stop amenities'. Recommendations from this study relate mainly to improving speed and journey reliability, including reducing time at stops and providing bus priority measures.

Transport Focus also conducts surveys of users across a large sample of operators (Transport Focus, 2025). In 2024, Wales was included for the first time. Data indicate an overall satisfaction rate in Wales of 84%, similar to England at 83%, and Scotland at 86%. Users of five operators within Wales were sampled, with the highest average score achieved by Newport Bus (89%). While overall satisfaction in Wales was 84%, there were considerable variations for specific attributes – higher for bus driver (88%), but lower for 'value for money' among fare-paying passengers (62%) and waiting time at bus stops (72%). Similar variations were observed in Scotland and England.

Specifically in the case of current car users, who tend to have higher incomes than existing bus users, fare may be a less critical issue, while journey time attributes may be more influential. Further studies examining the impact of specific factors on attracting users to buses include the Department for Transport (DfT) study by Yonder Consulting (DfT, 2023), which highlights both subjective perceptions and quantifiable elements, such as confidence in service reliability, convenience, and value for money.

A fuller discussion, with specific references to Welsh examples, can be found in a review by the author and Professor Stuart Cole of the University of South Wales, published by the Chartered Institute of Logistics and Transport in 2021 (Cole and White, 2021). In particular, this cites a survey by the Federation of Small Businesses (FSB) in Wales that identified factors likely to encourage car users to switch to bus or rail. These included approximately equal importance for reliability, service frequency, range of routes, lower fares, through ticketing, and coordinated timetables, although some respondents indicated that none of these would influence their behaviour.

A noteworthy example of service improvements attracting a large ridership growth and modal diversion from car can be seen in the high-frequency minibus services introduced in the 1980s. In the case of Swansea, a corridor running west from the centre was converted to such operation, generating a passenger growth of 51.2%. Of this net growth, about 50% represented a shift from car (Watts, Turner and White 1990, tables 1 and 4). The high frequency was dependent on being able to recruit drivers at

low wage rates which did not prove sustainable in the longer term. However, future developments, such as driverless vehicles, might enable such a form of service delivery to be revived.

Attributes of franchising which may encourage better outcomes than in a deregulated model

A number of developments may be more easily achieved under a franchising model, although they are not necessarily exclusive to it:

1. **Provision of comprehensive services throughout the day and week.** A limitation of the deregulated model in Britain from 1986 was that, in some cases, Monday to Saturday daytime services were registered commercially, leaving lower-density times to be covered by separately tendered services. Where these were operated by different companies, timetable information and marketing were often separate, and tickets were not inter-available – discouraging use. Daytime and evening markets are interdependent, as many users make 'trip chains' (e.g. home–work–home), with the return leg falling in the evening period. Even before deregulation, National Transport Survey (NTS) data indicated that around 40% of evening one-way bus 'trips' were the return leg of a journey that began during the daytime 'commercial' period (White, 2017: 38). London offers comprehensive day and week coverage on almost all services. In lower-density areas, evening and Sunday provision by full-sized buses may not be viable, and DRT within integrated timetables may be more appropriate.
2. **Co-ordination of headways over common sections of routes.** Where services are irregularly spaced (e.g. at 00, 15, 20, 30, 40 and 45 minutes past the hour), resetting to a consistent headway (e.g. 10 minutes) could reduce waiting times and improve convenience, stimulating demand.
3. **Larger-scale network replanning to establish a simplified network offering more direct journeys for major traffic flows, whilst retaining coverage for other flows.** The creation of improved interurban bus services in many areas illustrates the benefits of offering direct and frequent services, which may create a 'virtuous circle' – with growing demand justifying higher frequencies, which in turn support further growth. In many cases, this has resulted from operator-led commercial initiatives, often using distinctive brand names to promote services. Examples include the 'Excel' service between Peterborough, Kings Lynn, Dereham and Norwich, and express services between Fife and Edinburgh/Glasgow. The Lincolnshire 'InterConnect' network, introduced in 1999, offers an example of a partially planned network developed in conjunction with the local authority, and complemented by DRT services (full details can be found in Luke, Steer, and White, 2018). In the case of the Lincoln–Grantham service (increased to half-hourly), a user survey found that 39% of passengers were making trips previously made by car. Where franchising is used, it may be easier to coordinate feeder services to maximise benefits. However, it is important to note that where additional interchange is introduced, there is a risk of double-counting 'trips' (see Technical note 2 below for more information). Interchange can also be inconvenient for users unless it brings substantial time savings. It is worth noting that the TfL network planning framework generally retains through-services, with many road sections served by several overlapping routes.

4. **Where sufficient demand exists, bus rapid transit (BRT) creates much greater scope for diversion from car**, by offering a radical improvement in speed and reliability, especially if combined with park and ride provision. A striking example is the St Ives–Cambridge scheme, associated with a high proportion of users diverted from car and a very high average bus load of about 30 passengers, producing large reductions in total fuel use and hence emissions (Whelan and White, 2019).
5. **Establishment of a common ticketing structure**, easily understood by users, removes financial penalties for interchange and encourages non-cash transactions to speed up boarding time. This was illustrated first through the introduction of travelcards in the 1970s and 1980s, which induced greater ridership growth than would be expected merely from the net reduction in average fare paid (White, 2017). Subsequently, the use of smartcard technology has enabled 'capping' of daily and period costs, and has generated much better quality data on usage.
6. **Creation of a common brand name and identity to promote the network**. However, there may be risks in losing distinctive brand names associated with specific routes – e.g. some of the interurban services described above. It is important to ensure that scope remains within a franchised network for initiatives enabling experimentation with new services and other products. For example, the 'Superloop' limited-stop interurban services in London have generally been successful in increasing ridership and providing user benefits that can be measured using the assessment framework of TfL – but arguably they might have been introduced earlier with greater flexibility in approach. In terms of establishing diversion from car, there are some cases where direct transfer may be readily identified. However, in the longer run, there is significant 'turnover' or 'churn' in the individuals using any given mode, and it becomes more meaningful to assess aggregate ridership and occupancy rates when comparing energy and emissions between modes.

Technical note 2: Measuring public transport ridership

The most commonly used indicator is 'passenger trips', traditionally aligned with single ticket sales and each boarding event. This corresponds to 'trips' reported by bus operators and to 'boardings' in the National Travel Survey (NTS) (for further information on this issue see Le Vine and White, 2020). However, this may lead to double-counting where interchange occurs within a single one-way journey (e.g. home to work). The NTS collects data from users on both metrics, allowing a conversion factor to be derived. Between 2002 and 2005, this factor was approximately 1.09 for buses outside London (including Wales at the time – see UK Department for Transport, 2006: 35), but may have risen slightly due to newer ticketing systems that reduce the financial disincentive to interchange (e.g. through 'day tickets'). When major network changes increase bus-to-bus interchange, it is essential to adjust this ratio – using, for example, smartcard data – to avoid a misleading appearance of trip growth. An alternative overall indicator is total distance travelled (passenger-km), which avoids this issue and allows calculation of average load (passenger-km/vehicle-km) using NTS trip length estimates.

Incentivising performance under gross cost contracts

The system of gross cost contracting proposed for Wales (as also found in London, Manchester and many cases outside the UK, notably in Scandinavia) has advantages, in that smaller operators may be more willing to bid, as the risks associated with revenue uncertainty are removed. (If only a few routes

are operated, this may be more crucial than for an operator running a large network.) Encouraging more operators to bid may allow the authority to reduce costs. In complex networks, issues of revenue allocation are also simplified. However, it can be argued that incentives to attract passengers are reduced, especially for qualitative factors such as driver behaviour, as noted in the Transport Focus survey (Transport Focus, 2025), as mentioned above. One indicator adopted by TfL is 'excess waiting time' (EWT), which measures additional waiting time caused by deviations from the scheduled average headway. Penalties and incentives can be built into operator contracts to improve this. However, factors such as traffic congestion mean this is not wholly within the control of the operator. A broader set of criteria may be appropriate – perhaps making use of passenger quality ratings.

Conclusion

The move towards net zero in local bus operation may be assisted by franchising, particularly where it leads to increased bus use, higher average loading, and thus more efficient energy use with fewer emissions per person-km.

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