Government spending allocations to UK local authorities for 2001-6 have signalled the go ahead for new busway systems. *John Austin*, who recently visited Australia to assess progress on the existing Adelaide O-Bahn and the developing South-Eastern Brisbane (unguided) Busway, believes such systems have a significant future here, although used in a rather different way from overseas.

Busways have a future in the UK, but should learn lessons from Australia and elsewhere overseas

With three significant projects given the go ahead (or provisional funding) in Chester, Manchester and Sussex, joining the Leeds system in operation since 1995, guided busway schemes proved one of the main beneficiaries of the government's recently unveiled 2001-06 Local Transport Plan Settlement. But the debate still continues over whether busways really offer a cheaper and more flexible option than light rail, or a simply a way of avoiding a commitment to a more costly full rail-based alternative.

In some parts of the world "Bus Rapid Transit" has been pursued as the preferred option, particularly in Australia, Canada, the USA and South America. In Pittsburgh and Ottowa, long stretches of non-guided busway (26 km and 31 km respectively) are used to provide a total rapid transit network. Australia, which already has the Adelaide system, is following this with the part-underground Brisbane south-east busway, an element in a larger city busway strategy now partly operational, with Sydney proposing a 90 km bus rapid transitway network for its western suburbs. In New Zealand, a busway transit route is being planned to link the northern suburbs with Auckland

But in many countries overseas, the nature of current urban public transport use and operations is very different from the UK, with diverse land use patterns and population densities to serve, and alternative regulatory and funding regimes. It can be argued persuasively therefore, that a range of complementary solutions is needed for different countries. In its submission to the recent investigation of Light Rapid Transit Systems by the House of Commons transport sub-Committee, FirstGroup argued that Light Rail was most appropriate where the following occurred:

- High levels of existing or potential passenger flows:
- High-density passenger flows between a relatively small number of nodes
- High density housing within half mile of the corridor
- Very large traffic generators within half mile of corridor
- Maximum scope for providing off-road track on the corridor
- Minimum need for track provision on existing congested stretches of road
- Scope for incorporating stops with safe level boarding arrangements

FirstGroup also argued that, in contrast, guided bus solutions were most appropriate for

- Relatively high-density housing spread over a wider area with the corridor as the spine linking the traffic generators

- Large traffic generators, in some numbers located in various areas around the corridor which provides the "spine" linking them.
- Scope for providing bespoke sections of guideway either along most of the corridor, or at key bottlenecks on the corridor allowing the bus to bypass traffic congestion pinch points.

The world's longest guided busway is currently the Adelaide kerb-guided busway (or O-Bahn, reflecting its German origins) which has been operating since 1986, and it is worth looking at for the lessons it can teach the UK. It is helpful to view it not as a network, but rather as a corridor solution for a particular segment of Adelaide city, the capital of South Australia, which has a population of 1.1 million.

The O-Bahn is designed to provide both a flexibility and a permanence which assures the user that the service will endure - often cited as one of the greatest attributes of light rail. The strongest impression of the busway is that it effectively turns the bus into a train. Even with comparatively old but level-floor vehicles, the fixed track provides the sense that you are on a train journey, particularly when another bus in the opposite direction is passed at quite a high speed.

The first stage if the O-Bahn opened in 1986, with completion of the full 12km route in 1989. It has three stations, two of which are interchanges with other bus routes. Buses can leave the O-Bahn at both ends and at one of the stations en-route, and operate conventionally on other roads. Travel at speeds of up to 100 km per hour is possible on the busway, and it is claimed that buses are able to travel safely on the corridor at 20 second intervals. Actual service frequency is 50 seconds in peak hours, and the O-Bahn is used throughout the day seven days a week.

Introduction of the O-Bahn led to immediate substantial increases in public transport patronage along the corridor (including 9.4 % following the opening of the second stage). Patronage levels since 1991 have remained stable in the light of falling demand elsewhere on Adelaide's public transport network, (which includes rail on other corridors. The South Australia Passenger Transport Board is currently considering plans for a southern O-Bahn on the opposite side of the city.

The system does not use any signalling procedures, being operated using a standard safe minimum distance between vehicles, but Barrie White, Operations Manager of O-Bahn operator SercoBus, believes that signalling procedures would be necessary if there was more than one operator using the system. Costs of tyre wear are higher on the O-Bahn than elsewhere, including those resulting from scrubbing of rear end tyres if the vehicle goes too fast round corners.

Even though the O-Bahn itself is strongly marketed, with dedicated O-Bahn bus stops in the city centre, the success of the corridor could potentially be improved by the addition of on-street bus lanes on the section of road between the city end of the busway and the city centre itself. The lack of these adds significantly to journey times during the peak.

Indeed, when considering a rapid transit scheme, many experts now agree it is important to consider the whole way in which the service is being improved. Professor David Hensher, from the Institute of Transport Studies, University of Sydney, measures public transport quality through a Service Quality Index, which provides a means of establishing overall service effectiveness. This concept is valuable because it focuses attention on the various combinations of elements that make any rapid transit project a success. In her report on infrastructure costs for light rail, busways and guided bus, Professor Carmen Hass-Klau pointed out that although any of the main public transport modes can secure expanding demand, a high density, high quality service is vital, along with complementary measures to discourage car use. Though the widely-quoted Superoute 66 in Ipswich includes a short 200-metre section of kerb-guided busway, it has been particularly successful in generating patronage because of a variety of different enhancements, including bus priority, route extension and increased frequency, real-time information both at-stops and via phones, and next-stop information on the vehicles.

In Leeds, the Scott Hall Road kerb-guided busway scheme, opened in 1995, is similarly part of a wider pro-public transport policy. It is 2 kms long in total, and includes sections on the approaches to a congested roundabout, with the length of the guideway matched to that of the maximum observed queue. Also in West Yorkshire, a project of similar size to Scott Hall Road is currently underway in Bradford, where the Manchester Road Quality Bus scheme, with street investment covering a length of 3.5 km includes a guided busway of 2 km, expected to be opened at the end of 2001.

The York Road / Selby Road scheme in east Leeds, with 2 km of guided busway in total out of a corridor length of 4 km is another total quality partnership scheme involving improvements to the whole service, including buses and street furniture. The most important benefits will be in reliability of service. Planned for opening this summer, the scheme has its own website at www.elite-eastleeds.com.

Of the other busway schemes currently in the planning stage in the UK, with the major exception of Northampton (see below), all are part of longer corridor improvements. They are taking longer to progress than the schemes mentioned above, not just because they are larger, but also because, not being wholly on local-authority owned highway land, they require the award of special powers under the Transport and Works Act 1992 if in England.

In Edinburgh, the planned 9 km £50m kerb-guided busway between the airport and the city centre, promoted by the City of Edinburgh Council, received its powers under a special Act of Parliament in 1998, but its future is now uncertain. Competition from Lothian Buses along the corridor of the proposed busway was cited by the FirstGroup-led ConCERT partnership as its reason for pulling out of the scheme last week. This highlights the difficulties involved in getting such large schemes off the ground in the UK, where there is more than one major operator in an area or where the major operator is not the preferred operating partner.

In Chester, the Chester Deeside Transport System, just awarded provisional funding by the DETR, would provide a segregated guided busway, 2.6 km long, along the former Mickle Trafford to Shotton railway line, between a new Park & Ride site, adjacent to Junction 12 of the M53, and Chester City Centre. At the city centre it would link into existing roads, with extensive bus priority, to enter the main shopping area. A TWA public inquiry has already taken place and if powers are granted, Cheshire County Council hopes construction could begin this autumn with opening in 2003.

A similar scheme, along an abandoned railway track between Leigh and Ellenbrook, is being promoted by Greater Manchester PTE as part of major improvements to the Leigh - Manchester corridor, also awarded DETR provisional funding. This busway would be of similar length to that in Adelaide. Currently out to public consultation, the scheme has been designed for kerb-guided buses but the TWA application will be flexible enough to allow the use of different technologies which may be proven by the time the busway is constructed.

In Northampton, the UK's only proposed mass transit network of guided busways, promoted by Rapid Transit International (RTI) in conjunction with Stagecoach, plans to use kerb-guidance as a tried and tested technology. Here, guided busways are held to offer a combination of speed and flexibility, without the heavy costs of construction and disruption that a light rail system would bring to some of Northampton's narrow city centre streets.

Other schemes currently being proposed include a route linking the suburb of Trumpington to the city centre in Cambridge. Also being promoted by RTI and Stagecoach this would act as a testbed for a newer guidance technology. Two schemes in London, proposed by the former London Transport, but now endorsed by the new Mayor in the draft Transport Strategy for London, are the Waterfront line linking Greenwich to Thamesmead, and East London Transit in the Ilford, Barking and Romford areas, but the technology for these is yet to be decided. Gatwick Airport and the local authorities are promoting guided buses for the corridor between Horley and Crawley, in the third scheme just accepted by the DETR in the Local Transport Plan settlement. Proposals have also been mooted for schemes in Oxford and Luton. Finally, guided bus is being seriously considered as one of several options for the Cambridge-Huntingdon corridor currently being evaluated by consultants in the CHUMMS multi-modal study for DETR.

The raft of busway schemes at the planning stage in the UK, together with the speed at which small-scale schemes are being built as part of major public transport corridor improvements, seems to show that busways have a future in this country. More creatively-designed schemes, with busways as one element in an overall corridor improvement, are, however, likely to be predominant here, rather than the larger busway network concepts which have been implemented overseas. But courage and political will are also required, not only to make the TWA process faster and easier, as MPs have recommended, but also to make available the finance to fund schemes, and involve the co-operation of operators as funding partners.

Types of busway defined

There are several different types of busway which can be used by an operator. Busways can be constructed on busy sections of route, rather than needing their own infrastructure along the entire length of their route, as light rail schemes do. One of the advantages of busway solutions to transport needs is that some of the less complicated options are cheaper to construct than light rail. But the type of busway to be used will depend on the differing operational conditions and the market to be served for each project.

A 'simple' busway, using normal buses on its segregated, purpose-built roads, can be marketed as a network (e.g. Runcorn, in the UK, prior to bus deregulation). Speed depends on design: if two-way running is allowed, speed may be comparatively low. The roads may be grade-separated, and off the busway buses can travel on normal roads. One of the advantages of this type of system is that any bus can use the busways without technical modifications, but special signalling systems may be employed. Depending on the way in which the 'brand' is marketed, special, high-quality vehicles may be used, but these may not be a consistent feature of the system.

A kerb-guided busway system allows high-speeds off-road, because of the guidance and fixed track. However, this is dependent on the length and curvature of the guideway. The system uses a purpose-built-track off-road. When off the track, the bus travels on normal roads, like any other bus, but the bus itself requires technical modifications, with kerb-guidance wheels mounted on the front axle. This system is already in use in Leeds and Ipswich in the UK.

A third type of system uses essentially normal buses, albeit with minor modifications, and uses its electronic guidance on otherwise normal roads. A pair of wires carrying an electronic signal is laid in the road surface, with an antenna mounted under the front of the vehicle picking up the signal and on on-board computer controlling the steering to follow the route of the wires.

It is possible for vehicles to enter or leave guidance at any point, which may only be used on part of the route: where it is not used, the bus travels on normal roads like any other bus.

Electronic guidance can give buses access to roads where curves are too tight for manual guidance. No bus applications exist yet, as far as is known, though the system is in operation on specially-built vehicles in the service tunnel of the Channel Tunnel. However, this was the proposed technology for the Merseyside Rapid Transit scheme currently being re-evaluated by its promoters in the light of last year's rejection of an application for TWA Powers. The system was also planned for one of the Millennium Transit services to the Millennium Dome, but did not enter service because of technical difficulties relating to reliability.

Finally, there are ore advanced systems, which come close to replicating the feel of a rail-based light rapid transit system, such as Civis and Bombardier's Guided Light Transit (detailed on the panel, right).

High tech solutions

Some guided busways, such as those is use in Leeds and Ipswich in the UK, are essentially based on existing bus technology, with vehicles very similar to their non-guided counterparts. However, there are more advanced options available, which give a journey experience closer to that of a rail-based light rapid transit system, the so-called "tyred tram" approach.

Two advanced systems developed so far, and detailed below, are Civis, from manufacturer Irisbus, and Bombardier's Guided Light Transit. The differences between the two systems illustrate the range of technological solutions which may be appropriate in meeting the needs of different market and operational conditions.

Civis

Civis is a low-cost alternative to light rail transit designed to satisfy capacity needs of 3,000 or more passengers per hour per direction. Produced by Irisbus, it is a reserved right of way rapid transit system but can also be used on normal roads with other traffic. In 1999 the French cities of Clermont Ferrand and Rouen signed a contract for the Civis system, and last year a similar memorandum of understanding was signed for Las Vegas, USA. Lyons and Grenoble, in France, have contracted for the similar but unguided Cristalis electric trolley-bus and dual mode vehicles.

The Civis guidance system is optical – two parallel lines painted on the road define the route and an on-board image processing system enables the vehicle to follow these markers. An optical sensor located under the centre of the vehicle generates a signal based on its position relative to the centre of two closely spaced painted lines in the middle of the lane.

Propulsion power is obtained from overhead contact wires or by motor / alternator. The vehicle can operate on batteries over a short distance, and is also offered as a hybrid diesel-electric. Irisbus is also designing natural gas versions of the hybrid vehicles.

Another key feature of Civis is that the driver cab position can be either in a central-front location, if no on-board fare collection is planned, or in the traditional offside location. A 'space-age' driver compartment gives the driver maximum comfort. Also of significance is the large internal space available in the vehicle. With the use of special super wide tyres, only 6 tyres are used for the articulated 3-axle version: this allows a wide gangway throughout.

Full details of the planned Rouen Civis system are contained in a paper by John Marino, presented at the 2nd UITP Asia-Pacific Congress at the end of last year.

Guided Light Transit

Bombardier's Guided Light Transit (GLT) system is installed and currently awaiting commissioning in the French city of Nancy, and the system is currently being constructed in Caen. also in France, for full opening in 2002. In Caen it is now known as TVR (Transport sur Voie Réservée)

The system is similar in part to the Civis system in that it can operate on roads under both guided and non-guided mode, but the guidance system is mechanical. It also uses essentially light-rail vehicles rather than specially designed "concept" vehicles as .Civis does. The guidance system uses a central rail laid flush with the road surface which is followed by a double flanged wheel which operates the vehicle steering system. The system can operate on segregated and shared alignments

The vehicle is electrically propelled, and four sources of power for the drive motors are offered – overhead pantograph, overhead trolley wires, batteries, or a motor/alternator set.

John Austin*, from Cambridge-based public transport consultancy Austin Analytics, was awarded a Churchill Fellowship to visit Australia, Hong Kong and Singapore in October and November last year to study public transport.*

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