

A model tramway for the smaller city



It is often assumed that only very large cities and urban centres can ever justify a light rail system, but in Europe and beyond, many smaller cities are building new tramways and reaping the benefits.

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Bilbao is the largest and best-known city in the picturesque Basque region of north-eastern Spain – renowned for its culture, cuisine and history – and it opened its first tram line in late 2002. But the Basque capital and seat of government is the much smaller mediaeval city of Vitoria-Gasteiz, about 60km (37 miles) south east of Bilbao, deep in the heart of the Basque Country in the Province of Alava. Vitoria is now served by a two-line tram system rather different to that of its larger neighbour.

While Bilbao once boasted an extensive tram network and trolleybuses, Vitoria never had electric street traction although there were some narrow-gauge inter-urban railways. In December 2008 that changed dramatically.

Mediaeval city

The compact mediaeval quarter is characterised by narrow streets and alleys, churches, palaces and plazas. Stretching

Tram 504 approaches the Honduras stop, heading for Ibaiondo along Calle Honduras. Extensive use is made of grassed tracks as part of the high quality environmental treatment.

out from this centre are the more recent suburbs with many parks, wide boulevards and modern buildings – a complete contrast with the ancient centre. More parks surround the city outskirts. The economy of the region is diverse, with significant facilities and investment from both the food production and automotive sectors.

In the last decade it was realised that efficient and sustainable public transport was needed to link the suburbs with the centre: a system that would be safe, accessible to all, with no carbon emissions and that would reduce traffic congestion. The tramway project was the chosen solution.

Developing the concept

Overseeing the tramway project is Euskal Trenbide Sarea (ETS), a public company owned by the Basque Government Department of Transport and Public Works. The tramway is operated by EuskoTran (BasqueTram)

which also operates the Bilbao tram and the electrified metre-gauge suburban rail network EuskoTren. Buses are operated by TUVISTA, also publicly owned.

Tramway plans were initially developed in 1995, but initially many residents opposed the project and the network had to be re-planned in 2004 to include more neighbourhoods. After its inauguration, the Vitoria tram has become a successful means of transport in the city, demonstrating again that perceived problems are quickly forgotten when the benefits of a tramway can be seen.

High-density residential suburbs have developed rapidly, particularly to the north of the city, and these are now served by the tramway. It links them with the heart of the commercial and retail areas of the city centre and also serves the Parliament building, the Palacio de Congresos Europa and the hospitals at Txagorritxu and Santiago.

A cost-effective green solution

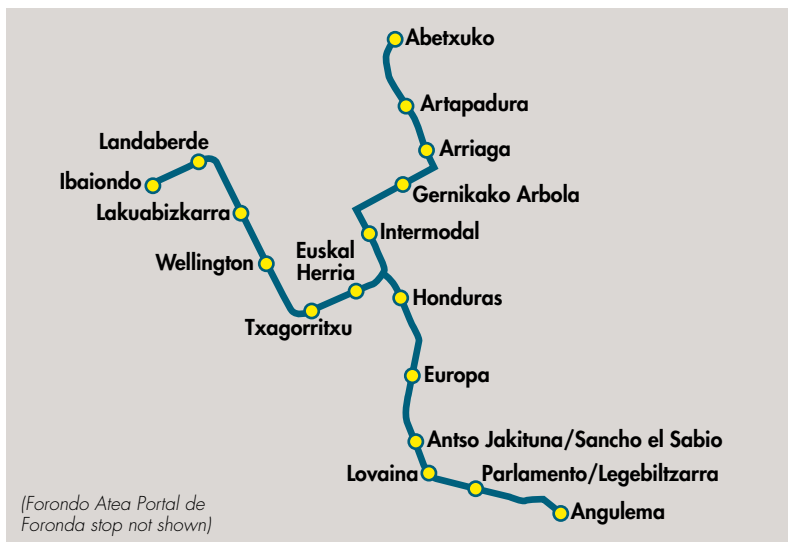
Environmental benefits were high on the agenda when finalising the mode selection, more particular considerations including: Reducing traffic accidents; less oxygen burnt; reduced CO₂ pollution; pedestrians recovering the use of streets; elimination of costs related to traffic congestion; reduction of noise pollution in the urban environment; greater accessibility to public transportation for as wide a section of the community as possible.

The tramway is seen as an efficient and balanced system that incorporates all of these considerations and improves mobility for all without endangering the ability of future generations to meet needs. Household energy consumption is estimated to reduce by between 500 and 600 litres of petrol per annum.

Final approval for the project was given in March 2004 and construction began in September 2006. The first rails were laid just two months later. Changes to the overall project plan were still being made in 2007 as the last two stops on the Abetxuko branch were deleted due to complaints from residents. An additional stop on this line was added at Forondako Atea Portal de Forondo to meet future demands for interchange with four bus lines at Intermodal.

The EUR114m project was funded by the Basque Department of Transport and Public Works (80%), the Provincial Council of Alava (10%) and the city of Vitoria-Gasteiz (10%). The Department's contribution covered 66% of the construction costs and 100% of the rolling stock costs.

Engineering and architecture consultants IDOM were responsible to ETS for the planning and design of the system, including diversion of services, fares and ticketing and the depot. They also assisted the management and start up of operations, using their previous experience on Iberian tramway projects including those in Bilbao, Madrid, Barcelona and Oporto.



“Environmental benefits were high on the agenda when finalising the mode selection for Vitoria-Gasteiz”

Routes and services

The 5km (3.1-mile) double-track metre-gauge route opened with amid celebration on 23 December 2008, which was declared a holiday with entertainments, music and children's events and free travel. The first line links Angulema, close to the mediaeval centre, and Lakua in the north western suburbs. The second line links Angulema with Abetxuko.

Gauging tests on the 2.5km (1.5-mile) Abetxuko branch began in April 2009 and further technical tests to confirm traffic signal priorities were made in early July to enable passenger services to start on 10 July. Again official celebrations were laid on for the opening ceremony, and travel was free for the first day with various attractions and entertainments. The total system length was then 7.5km (4.7 miles).

There are six stops on the common central section, six on the Lakua branch and six on the Abetxuko branch. Each stop has 30m long low-height platforms with passenger shelter, ticket vending machines, smartcard validators and real time information. Initial technical problems with the real time displays have been resolved and the system is now functioning correctly. Most stops have side platforms, but Honduras has an island platform to assist interchange

Below left: The real time display on the platform shows the time in minutes until the next tram to each destination.

Below right: The interior layout on the 100% low floor provides ample space for wheelchairs and pushchairs, with fold down seats.





between the two routes. The terminals at Ibaiondo and Abetxuko also have island platforms, but the Angulema terminal has side platforms with a scissors crossover after the platforms to allow for future extensions.

Each route operates every 15 minutes throughout the day (06.00 to 22.00) giving a combined 7.5-minute headway on the common section between Angulema and Honduras. From 22.00 to 23.00 the frequency reduces to every 20 minutes. The heaviest used stops are Legebiltzarra Parlamento, Europa, Wellington and Honduras.

Maximum permitted speed is 30km/h (19mph) in pedestrian areas and 50km/h (31mph) in urban areas; the journey time is 18 minutes on each route. Unusually, time between stops and total run time is given in minutes and seconds, an indication of the level of reliability expected. Average journey speed is 25km/h (15.5mph), a creditable figure for average stop spacing of only 450m.

In October 2008 the whole bus network was restructured to complement the tramway with ten-minute frequencies on all services and central area parking charges were increased to deter private transport. As a result, public transport patronage increased by a remarkable 14.5%.

Fares, ticketing and patronage

Single fares or day tickets are available from the ticket vending machines (TVMs) but a high proportion of passengers use the BAT contactless smartcard with 74 000 cards issued. These can be recharged at tram stops, transport offices or 65 ATMs around the city and are valid on both trams and urban buses. Needless to say it is a fully integrated fares system.

Free travel was offered from the opening day on 23 December 2008 until 6 January 2009 for passengers with BAT smartcards which were available for only 10 Cents, a

All the terminal stops have scissors crossovers including Angulema in the city centre. These tracks will be extended to serve the University area.

clever marketing device to encourage people to buy them. The normal fare then applied at EUR0.55 per journey for card holders, EUR1 for 50-minute journeys or EUR3 for a day ticket. Concessions are available for those over 65, disabled people, children and families, again encouraging increased patronage.

Tickets must be purchased from TVMs, or BAT cards validated, before boarding. A monthly BAT card costing EUR25 permits travel on buses and trams for 30 days.

Over 650 000 passengers were carried in the first two months of operation, an average of 11 000 passengers/day, with 95% punctuality. This rose to 4.5 million passengers with 97.4% reliability in the first year, considered to be an unprecedented success. By November 2009, monthly patronage reached 550 000, equivalent to 6.6 million passengers/year. On one pre-Christmas Thursday, 26 422 journeys were made.

Of the total patronage, 63% use the tram every day or almost every day - a further 30% use it regularly.

Rolling stock

The CAF-built articulated trams are at first glance very similar to those operating in Bilbao but there are some important differences. The Vitoria trams are longer with more doors, and hence have a higher capacity, and are 100% low-floor instead of Bilbao's 70%. Their respective characteristics are shown in the table overleaf. (Some figures are not available). The first trams were delivered in September 2008.

The cars have 52 seats in mainly 2+2 form, including eight tip-up seats. Total capacity is 240 passengers at 6 passengers/m² or 177 at the more commonly used (in the UK) figure of 4 passengers/m². There are two wheelchair and two pushchair spaces.

Feature	Vitoria-Gasteiz	Bilbao
Car type	Five-section articulated, six-axle	Three-section articulated, six-axle
Layout	100% low-floor	70% low-floor
Cabs	Two (double ended)	Two (double ended)
Gauge	1000mm	1000mm
Length	31.38m	24.40m
Width	2.4m	2.4m
Height	3.35m	3.30m
Distance between bogie centres	11.04m	9m
Floor height	350mm	350/520mm
Doors per side	Six	4
Power supply	750 Vdc OH	750 Vdc OH
Maximum speed	70km/h	70km/h
Emergency deceleration	2.40m/sec ²	2.35m/sec ²
No. seats	52 (incl. eight tip-up seats)	48
No. standing places (4p/m ²)	125	98
Total capacity (4p/m ²)	177	146
Total capacity (6p/m ²)	240	196
Overall weight	40 100kg	34 600kg
Number of trams	10	8



A video surveillance system is also fitted with five internal and six external cameras, front anti-entrapment system and strobe lights.

Depot

The maintenance depot is located on a 1.6ha site at Landaberde, just beyond the terminal stop at Ibaiondo. One building houses the control centre – which monitors and controls the operation of the tramway with constant communication with drivers and other staff – the other provides maintenance facilities including workshops, washing plant, five tracks for tram maintenance, a stabling area for the system's trams on five tracks, and stores.

The design takes full account of energy optimisation and environmental efficiency measures such as natural light, solar heating and sound insulation. The latest technologies are incorporated to ensure a high standard of maintenance.

Future expansion

The tramway has proven to contribute to the economic development of the city and will be expanded; studies of possible extensions were already underway during construction and priorities will be determined on social

Above left: Clearances along Calle General Alava in the old centre are tight. A novel feature is the provision of bollards which light up red when a tram is approaching.

Above right: A headshunt is provided at the Abetxuko terminus where tram 508 reverses before heading back to Angulema.

and economic criteria. The University area to the south of the city centre, which would also serve the railway station, and Forondo airport, 8km (5 miles) to the north, are prime destinations.

More schemes are planned under the Basque Government's Tram Programme set out in the EuskoTren XXI Plan.

In addition to extensions in Vitoria and Bilbao, EUR22m has been earmarked for the new Leioa-UPV tramway near Bilbao – another small town system – showing that the proven benefits of the Bilbao and Vitoria systems are admired across the region

The Vitoria-Gasteiz tramway was built in just over two years at a cost of around £14m/km. It is wholly publicly funded and operated. The tramway has been an instant success, despite some early concerns, and is already seen, just over a year after its inauguration, as an essential part of the economic life of the city.

With a population of only 240 000 Vitoria is about the size of Southampton, Reading or Derby in UK terms and considerably smaller than Leeds, Liverpool, Belfast, Cardiff or Bristol – there must be a lesson for the British in there somewhere! **TAUT**