

## SPAIN

## Zaragoza Tramway



Image: "Tramway through Plaza Lanuza in Zaragoza" by Thierry Llansades / CC BY-NC-ND 2.0

## OVERVIEW

**Location**

Zaragoza, Aragón, Spain

**Sector**

Transport – Rail

**Procuring Authority**

Municipality of Zaragoza

**Project Company**

Sociedad de Economía Mixta Los Tranvías de Zaragoza, S.A.

**Project Company Obligations**

Design, Build, Finance, Operate and Maintain

**Financial Close**

30 November 2010

**Capital Value**

€350 million  
(USD \$465.7 million – 2010 exchange rate)

**Contract Duration**

35 years

**Key Events**

Delayed financial close and early construction before financial close was reached

## SUMMARY

Zaragoza is the fifth largest city in Spain. As was typical in other important cities in Spain, Zaragoza had a tramway since 1885. In the 1960s, investment in the tram system declined, and in 1976, the last tram line in Zaragoza disappeared, with the public transport service changed to city buses.

In June 2009, the Project Company, Sociedad de Economía Mixta Los Tranvías de Zaragoza, S.A., was awarded the PPP contract with the Procuring Authority, the Municipality of Zaragoza, to build a new tramway system, procure the rolling stock, and operate and maintain both the tramway and the rolling stock. The tramway system is 12.8km long, has 25 stops, two inter-modal parking garages and two depots, one of which is used as a main central terminal building. The 25 stops are served by both double and simple/single platforms.

Included in the PPP contract is the delivery, operation and maintenance of the rolling stock. The rolling stock is of the type Urbos 3, manufactured by Spanish company, Construcciones y Auxiliar de Ferrocarriles (CAF), who is also an equity investor in the Project Company. Each unit has five coaches, with a total length of 33 metres. An interesting design feature of the tram system is that it uses an on-board energy storage system, which accumulates the energy recovered during braking and can also charge during the 20 second stops, allowing the tram to run without an overhead power supply.

The project reached two different dates for commercial close. The first date is the provisional award and the second is the definitive award. That was the process to follow according to the Spanish law at the time, allowing one month for legal objections. This presents a last chance for any third parties to raise objections to the contract award or any irregularities that could have occurred during the tender and awarding process.

This project has won several awards, the latest being the Global Light Rail Award "Best Environmental & Sustainable Initiative", awarded in London in October 2016.

### SUMMARY LESSONS LEARNED

- Having specialised staff dedicated to stakeholder engagement can provide opportunities to improve the service based on feedback received.
- Taking a holistic approach to addressing environmental and urban issues, as well as including the public in the decision-making process, can benefit all stakeholders and improve the overall outcome of a project.
- Collaboration can facilitate the development of innovative solutions.
- Having clear, measurable and achievable KPIs, regular independent monitoring, and facilitating data gathering in performance monitoring are all critical elements of the operations phase.

### PROJECT INCEPTION

#### Goals and Objectives of the Project

The Zaragoza Tramway project has its origins in the Zaragoza Sustainable Mobility Plan. The objective of the Zaragoza Sustainable Mobility Plan is to meet all transport needs of the city, while respecting the environment, the urban landscape and the cultural heritage of Zaragoza.

It arose from the need to equip the city with a complete transport network in response to its continued development, in addition to supporting the growing population, geographical expansion, and satisfying the needs of the people of Zaragoza in terms of travelling around the city in a safe, comfortable and efficient way.

With its daily service, the tram system is envisaged to meet the objectives of the Sustainable Mobility Plan. The co-existence of various means of transport in Zaragoza and the various links between them has led to a new form of multi-modal transport, which has offered improved comfort and flexibility for the users relying on public transport in their day-to-day activities.

The objectives of the Sustainable Mobility Plan are being achieved owing to the benefits of the project. The objectives are summarised as follows:

- Making Zaragoza a reference point for sustainability in Spain, thanks to the Sustainability Mobility Plan started by the Zaragoza Municipality.
- Bringing the city in line with other European cities that have opted to implement sustainable transport plans.
- Promoting the link between the different forms of transport in the city, thanks to its compatibility and ease of access to other means of urban transport.
- Improving alignment between different transport links, with concurrent stations or stops.
- Encouraging public participation in the use of public transport.
- Respecting the aesthetics, environment and traditional values of Zaragoza despite the changes that may occur on the streets of the city due to the introduction of a new tramway system.

This project has won 13 national and international awards. Municipalities from all around the world have visited this tram network to learn from it. This success comes from a commuter-friendly route design, which runs through the most central and populated areas, and is supported by a robust traffic demand study. Another key element in this success was the support of the shareholders (Zaragoza Municipality, CAF, TUZSA, Grupo Avanza, FCC Construcción, Acciona, Ibercaja y Concessia) and the rest of the stakeholders.

### MANAGEMENT OF THE PPP CONTRACT

#### Construction Phase

The design was developed using an existing outline design provided for the tender process. One of the key factors contributing to the project's success is the design of the different areas and routes covered by the tram. The right of way was defined in the outline design. This selected route allows for a high number of users, who are provided with a transport link to and from areas of high demand.

The first 15 months of the construction phase were financed directly by the Project Company's equity investors, with some funding also provided by the Procuring Authority during these initial stages. The delay in reaching financial close is discussed in more detail below under the heading "Key Events".

The programme for construction anticipated two years for the first construction phase and another two years for the second construction phase. Substantial completion of the first phase of works was achieved six months in advance

of the date for final completion for that phase, with only minor works outstanding. At that point, as substantial completion for the first phase had been achieved, tram operation for the first phase and the corresponding milestone payment was made to the Project Company.

The construction phase also involved significant effort by the Procuring Authority and the Project Company in stakeholder management. Civil works in urban areas are complex, affecting a large number of public services and causing disruption to the daily lives of citizens and businesses in the area. To manage these public relationships with stakeholders, the Project Company employed a specific communications director. There were also information offices set up in several places around Zaragoza, so any individual or business could seek information about the project or any issues arising related to the construction phase.

### Operations Phase

As the construction programme anticipated two years for the first construction phase and another two years for the second construction phase, the operations phase under the PPP contract allows 33 and 31 years for the operations, for construction phases one and two respectively. This allowed the Project Company to start operations of the first constructed phase at the same time it was undertaking the construction of the second phase. This meant the Project Company was incentivised to finish the construction phase as soon as possible, to receive the relevant milestone payment and start operating and receiving the user-fee project revenue.

A customer service office was set up from the beginning of operations and is required to be operational during the entire operations phase as set out in the PPP contract.

### Performance Monitoring and KPIs

During construction, the Procuring Authority carried out intense monitoring of the works. This was a key element in the successful delivery of the works on budget and on time. A joint team comprising representatives of the Procuring Authority and the Project Company was created to supervise the works.

KPIs during the operations phase are also considered one of the key factors for success of the project. The key performance indicators in the PPP contract are called "Quality and Availability Indexes". There are around 15 indexes related to several aspects, like delays, cleanliness, etc. For every index, there is an associated payment deduction. The Payment Per Demand or Availability (PPD) is the amount paid by the Procuring Authority to the Project Company for the quality and availability of the tram's service.

These KPIs are thoroughly monitored by the Procuring Authority, which has four people full time in charge of controlling the quality of service.

Some KPIs associated with delays, for instance, are automatically generated by the software that controls the operation of the trams, which controls all aspects of the service (times of arrivals and departure in all stations, speed, location of the trams, etc.). Other KPIs are monitored via inspections carried out by the Procuring Authority.

KPIs seem to be working for both the Procuring Authority and for the quality of the service. From the Project Company's point of view, this monitoring is perceived to be too strict. However, undoubtedly this high level of monitoring is supporting the excellence in service and maintenance of all assets.

### Payment Mechanisms

In the construction phase, lump sum payments were made upon the completion of pre-defined construction milestones. Not achieving these milestones in the time specified and to the required quality was subject to deductions of up to €12 million (10% of the total subsidy payable by the Procuring Authority). This incentivised the Project Company to complete the milestones on time.

In the operations phase, the Project Company has three sources of revenue. The first is an availability payment (PPD) to the Project Company for the quality and availability of the trams' service. This payment depends on fulfilment of the KPIs described above under the heading "KPIs and Performance Monitoring".

The second source of income is a Payment Per User (PPU). This source has two parts; the first PPU income is received from the users as direct fares, and there is a second part that comes as a shadow payment, as the Procuring Authority pays an agreed amount for each user. The third, and final, source of revenue available to the Project Company is park and ride fares and advertising. This final source represents a small proportion of the total revenue sources.

The demand risk is shared between the Procuring Authority and the Project Company. The parties agreed a specific baseline level, and if the actual project revenue from user fees is more than 10% below the baseline level, the losses are shared 50-50 between the parties with no limit. If the revenue from user fees is over 20% above the baseline level, the Project Company retains 10% of the gains and the Procuring Authority the remainder (i.e. 90%).

For indicative purposes, the total of current income and revenue of the Project Company consists of 15% from quality and availability payments, 84% from payment per user revenue and 1% from park and ride fares. The stakeholders interviewed expect that these percentages will change in the future, when the tram will have a higher number of users, changing the percentages to 10%, 89% and 1% respectively.

In addition, the Project Company is required by the PPP contract to create a reserve account prior to starting the 10th year before handback. Then, every year until handback, starting with the 10th year before the handback and including the year of the handback, the Project Company must deposit in this reserve account 5% of the availability payments that the Project Company receives from the Procuring Authority. Any rolling stock improvements are expected to be covered by the reserve account.

### Change Management

As the design and construction risk was fully stepped down from the PPP contract to the construction contractor under the construction contract, claims for cost overruns and time delays were submitted in the first instance by the construction contractor to the Project Company. The Project Company would review and assess the validity of each claim made by the construction contractor and submit a corresponding claim to the Procuring Authority for its review and approval. No specific challenges have been identified by the stakeholders interviewed in relation to change management.

### Environmental and Urban Issues

Environmental aspects of the project were given a high priority from the beginning of the project. Considerable improvements of the existing green areas of the construction site have been undertaken.

For every tree that had to be removed for the construction of the tramway, two trees have been planted elsewhere. Also, the selection of the trees was carried out through a participative process, where neighbours and business owners were involved in the final selection of the tree species.

There is a stretch of 2km in the old town where an On-Board Energy Storage System (OESS) in the trains is used; this system avoids the need for overhead catenaries or any other system to charge the trams when they are rolling on this section. The OESS mounted on the trams are only charged while they are stopped at stations. Additionally, this system allows a reduction in the trams' electricity consumption when they are operated under catenary sections by means of storing the braking energy. The application of this innovative solution has a positive effect on total energy consumption and the visual impact of this infrastructure in a sensitive urban environment.

This project was also conceived as an opportunity to renovate the areas of the town affected by the construction of the tramway. The Project Company refers to the work in different streets of Zaragoza as a façade-to-façade intervention, providing a holistic approach to construction, instead of focusing solely on the infrastructure itself.

The Procuring Authority's approach in taking advantage of the construction of new infrastructure to improve the town's appearance is a good lesson on environmental integration and public engagement.

### Managing Disputes

The project did not have any disputes and any disagreements were generally handled through personal discussions between the senior management of the Project Company and the Procuring Authority.

In Spain, there are often no specific provisions for dispute resolution. All public contracts are regulated by the "*Ley de Contratos del Sector Público*" (Public Sector Contracts Law). This law regulates all contractual relationships between public administrations and private companies. If there is no agreement between the parties, the dispute goes directly to court.

### KEY EVENTS

#### Delay in reaching financial close

Financial close was delayed due to the economic crisis in Spain in 2009, which affected the negotiation between the Project Company and its lenders, and delayed an agreement. However, the Project Company chose to begin the design and construction works in August 2009, before financial close had been reached. Financial close didn't occur until November 2010, so this meant that the design and construction for both the tramway and the rolling stock were mainly financed by the Project Company's equity investors for the first 15 months, although some financing was also provided by the Procuring Authority in these early stages. The first phase of the tramway system was inaugurated in April 2011.

The decision to start construction works and take the risk for the costs of the construction phase for more than a year demonstrates the scale of risk taken by the equity investors and their commitment to the project.

### LESSONS LEARNED

#### Having specialised staff dedicated to stakeholder engagement can provide opportunities to improve the service based on feedback received.

During the construction phase, the Project Company's employment of a communications director responsible for the stakeholder communication strategy was considered successful for stakeholder engagement and management. During the operations phase, the existence of a customer service office is also a good way to manage communication with end users and the general public, and an opportunity to improve the service based on feedback received.

**Taking a holistic approach to addressing environmental and urban issues, as well as including the public in the decision-making process, can benefit all stakeholders and improve the overall outcome of a project.**

Environmental aspects of the project were given a high priority from the beginning. For every tree that had to be removed for the construction of the tramway, two trees have been planted elsewhere. Also, the selection of some of the trees was carried out through a participative process, where neighbours and business owners were involved in the final selection of the tree species.

Adopting a broad perspective towards this kind of infrastructure development in urban areas, and an openness to innovation, has generated benefits for all stakeholders and improved the overall outcome for the city. Taking advantage of the construction of the new infrastructure to improve the town's appearance is a good lesson on environmental integration and public engagement.

**Collaboration can help the development of innovative solutions.**

Collaboration, having an open mind about innovation, and adopting a strategic view about the introduction of an On-Board Energy Storage System (OESS) in the trams in specific areas of the town (with specific social and cultural interests) provided benefits to both parties and users.

**Having clear, measurable and achievable KPIs, regular independent monitoring, and facilitating data gathering in performance monitoring are all critical elements of the operations phase.**

Regular and independent monitoring of the quality of the services provided by the Project Company contributes to the satisfaction of the users and enables transparency and accuracy in the final payments to the Project Company.