

Case study

Improving air-quality in the City of Barcelona through the use of innovative fuels in the bus network



TRANSFORM

Background

In recent years, following the environmental policies promoted by the City of Barcelona, TMB (main public transport operator of Barcelona) has made great efforts to develop and implement a plan of improvement and progressive replacement of the bus fleet to clean fuel, approaching the ultimate goal of zero emissions.

Within this Strategic Plan of Innovative Fuels, TMB is working in different action lines:

- Use of CNG fuel vehicles
- R&D project related with the conversion of Diesel and CNG vehicles to hybrid technology
- Test of 100% electrical vehicles
- Improvement of current actual vehicles with Particle s' and NOx 's filters installation

The implementations of various fuels' technologies are applied in vehicles that, because of their technical characteristics, are offering different services or products on the conurbation of Barcelona's bus network.

In addition to conventional lines, two additional products are distinguished:

- **The New Bus Network (NXB)**
It is a bus network that meets the criteria of a Bus High-Level Service (BHLS). For these services large capacity vehicles are used, such as articulated vehicles of 18 meters, and now, 3 bi-articulated hybrid vehicles with 24 meters in length.
- **Neighborhood Bus (Bus de Barri)**
It is a service dedicated to neighborhoods that, by their nature, are difficult to access. For these services minis buses (7 meters) And in some line, midi buses are used (9 meters)

The case study at hand aims to replace the current mini bus fleet with 100% electric vehicles.

Project definition

Neighborhood Bus was created as the bus transport service approach that transports local residents to the shopping areas, health centers and other attractions, as well as facilitates access to basic network of public transport through the network connection points with regular bus, metro and railways. This service takes advance of the integrated fare system established in 2001 and the free transfer with a single travel document can make the trip from home to anywhere in the city and the metropolitan region.

These lines have shorter routes and move into a smaller area, generally within a neighborhood by itself. The design of the routes is a result of close cooperation between neighbors (through neighborhood associations), the City hall and TMB.

The vehicles are designed especially for routes in narrow streets and hilly areas, inaccessible to standard buses. The fleet consists of 47 vehicles: 42 minibuses, 6.5 meters long and 5 midibuses of 9.8 meters, all accessible for disable people.

Many of these lines are ring routes, without terminal stops. That increases the numbers of roads where the line runs. The user can take the bus in any place this ring route and the only restriction is that is not allowed to give more than one full turn in the route of the line.



Bus de Barri's conventional Diesel Mini bus

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Motivation

The idea to acquire the best electric midi bus solution was proposed by TMB and the Cityhall of Barcelona beginning 2014. The solution is not only related with the vehicle but also with charge stations that require some infrastructure. The way this Infrastructure should be in the future developed and who is responsible for this, is a question that has to be clarified before starting the sounding market.

Actions to preprocurement

After analyzing in detail the different experiences carried out with various options for electric vehicles by TMB and other European operators, either within the European project ZEuUS (Zero Emission Urban Bus System), or by other UITP (International Public Transport Association) members, the findings identify some technological barriers, regulations and costs, recommending develop these aspects in more depth, not only on the vehicle side, but also related to the infrastructure required.

The solutions currently offered by the market are not sufficiently tested, preventing the minimum level of reliability and robustness met. Additionally, the prices offered for the product itself and the Life Cycle Cost are highly above of competitive markets.

Conclusions

The delay in the market sounding is due to the fact that the technical evaluation of the procurement process standard electric buses and infrastructure has been much more complex than expected. The offered solutions, especially in the infrastructure side, were very heterogeneous and difficult to compare objectively between each other. This delay of the Evaluation Committee of this purchase project obliges a delay in the market sounding process for the proposed project since it affects mainly the chosen infrastructure solution.

Leasons learnt

In projects where electric vehicles and their respective infrastructures are involved, is highly recommended to study closely the development of this promising technology and participate actively in the requirements definition, design involvement and subsequent testing of the developed solutions in real-alike environments where the results can be measured in an objective way.

The evolutions of projects co-financed by Europe as the ZEEUS project are excellent indicators to analyze the emerging technology of electric vehicles.



First Irizar i2e electric bus of the project ZEEUS

