

Mobility and Electric Road Vehicles - Conditions for Success: Portugal First Steps

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Abstract

This paper reports on the Portuguese experience related to the electric vehicle (EV) concept and the evolution that has taken place over the last four years, from the time when the road EV concept was almost unknown to the vast majority of the public in Portugal up till now. It gives an account of the different events that characterise the evolution in this period.

Several lessons can already be drawn at this point. First of all, the successful introduction of the electric vehicle concept is a long-term task, which requires that all the implications, options and policies of mobility and transport be discussed.

Important key messages were also selected: Less pollutant and more efficient vehicles do already exist; EV's are good for the economy and for the environment; EV's have the capacity to cover most of a car's daily circuit in urban use; In a wider discussion the EV concept wins but only if all the alternatives to the internal combustion engine are considered.

Keywords: EV, demonstration, promotion, standardisation

1 - Introduction

Electric vehicles (EV) began to be considered more effectively in Portugal after 1998, in connection with an interesting experience involving mail distribution by EV's in three towns (Evora, Aveiro, Ponte de Lima), developed by a national postal service company, CTT Correios. At the same time, the electricity utility company, EDP – Electricidade de Portugal, included electric automobiles and scooters in its fleet. Monitoring programmes

developed for these vehicles enabled to show their advantages and disadvantages and to outline the economical and technical limits to their use.

The constitution of APVE – Portuguese Electric Vehicle Association in June 1999 and the promotion and demonstration activities that were systematically developed led to that EV's began to attract the press and to be known by the public.

Regular events involving municipalities all over the country have generated a public opinion that is generally favourable towards alternative technologies in transportation and EV's. At the same time several municipalities and companies began to test EV's in their fleets and the support and incentives of DGTT, the Portuguese Directorate General for Inland Transportation, in the promotion of EV's, was decisive.

2 – Relevant facts related to EV's in Portugal

2.1 Experience of EV's use in two public services

Results on the use of battery powered EV's in two public services showed the advantages and disadvantages of this kind of vehicles. Autonomy limitations imposed by the batteries were considered in the assignment of the service, showing that EV's can replace a relevant number of vehicles, used only in urban transport. Furthermore, the performance achieved does not limit the use of EV's in urban mobility.



Figure 1 –EV's at EDP fleet



Figure 2 – Postal Service EV's in Evora

On the contrary, the environmental impact caused by the use of EV's in Portugal can help the country to reach the national objectives set out in the Kyoto Protocol. The battery powered electric road vehicles, which can be recharged from electric mains, make up a solution that presents the clear advantage of not polluting locally. However it should not be considered as a zero-emission vehicle as the real impact on the reduction of pollutant

emissions depends on how the electricity is produced. From this perspective, the Portuguese electricity production system offers advantages to the use of electric vehicles and a 30% reduction on global pollutant emissions can be proved. The only drawback for a real penetration of EV's in urban fleets is related to the initial cost of the vehicle and the apparently limited involvement of manufactures in this propulsion solution.

2.2 APVE activities

APVE - Portuguese Electric Vehicles Association was created on June 1999 as a non-profit private association which objective is to promote the electric vehicles concept and the use of EV's integrated in a sustainable urban mobility and transportation policy through different means, namely information and outreach initiatives, co-operation with national and local entities for demonstration and partnership programmes, infrastructure development, fiscal, monetary and non-monetary incentives, standardisation, etc. Hence all types of cars are within its reach, viz. battery electric vehicles (BEV), hybrids (HEV) and fuel cell electric vehicles (FCEV). On the other hand, APVE promotes not only full function EV's (FFEV), capable of travelling on highways, meeting all standards, and having the same practicability as a conventional passenger car, light-duty truck, or bus on the road, but also City Electric Vehicles (CEV), possess some of the attributes of a FFEV but smaller and with reduced (or lower) performance, and Neighbourhood Electric Vehicle (NEV), i.e. low speed vehicles, not capable of travelling on highways, although considered also a road vehicle. Of course other types of road vehicles, as bikes, scooters, etc. are also within its scope.

Since January 10, 2000, APVE is the national section of AVERE. With a diversified, and balanced membership and with a lot of individual efforts and persistence some results were achieved after four years of activity.

Promotion and demonstration activities that were systematically developed led to that EV's began to attract the press and to be known by the public. Regular events involving municipalities all over the country have generated a public opinion that is generally favourable towards alternative technologies in transportation and EV's. Also, several municipalities and companies began to test EV's in their fleets.

The support and incentive of DGTT, the Portuguese Directorate General for Inland Transportation, in the promotion of EV's has been decisive, translated into several activity agreements entered into by APVE and DGTT.

2.3 The 2000 UIE/EDP International Conference

The International 2000 UIE/EDP Conference organised by EDP, Electricidade de Portugal in Lisbon was also seized as an opportunity to divulge EV's in Portugal. The presence of several specialists in this field and the two special sessions devoted to the subject enabled to intensify the work that was being developed at the time.

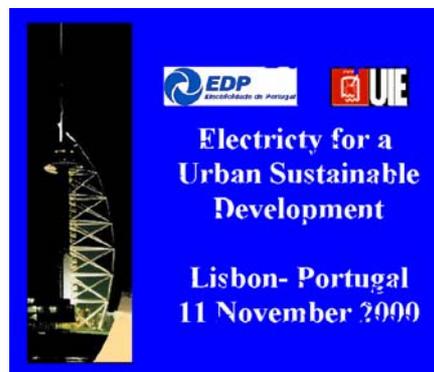


Figure 3 – The 2000 UIE/EDP International Conference

2.4 “Lisbon Undertaking” “Mobility and Technology: what policies for tomorrow?”

On February 22, 2001, APVE promoted a national Round Table, under the theme “*Mobility and Technology: what policies for tomorrow?*” with the participation of six General Directorates (Energy, Planning, Industry, Customs, Road Traffic, Transportation) and the Lisbon Metropolitan Board, as well as some invited foreign entities (IEA, VEV from Mendrisio, Interministerial Group for EV's in France and ATAC/Rome).



Figure 4 – National Round Table for The “Lisbon Undertaking”, 22 February 2001

The success of the Round Table may best be assessed by the fact that the great majority of Government agencies with a bearing on promoting EV under a framework of economic sustainability did manage to participate, but foremost by its main conclusion, the so called “*Lisbon Undertaking*”, a formal statement in which all participants agreed to be actively involved.

The annulment of the “Automotive Tax” on EV’s and incentives for buying are two clear examples of the national authorities’ commitment.

2.5 European Day “In town without my car!” and European Mobility Week

The European Day “In town without my car!” (after 2000) and the European Mobility Week (after 2002) provided an opportunity for APVE to promote its objectives. These events were an opportunity to draw the attention of the press and the public opinion to the need of a sustainable mobility and to show that EV’s are indeed an alternative.

After a pioneer participation on the 22nd September 2000, carried out in seven Portuguese cities (Lisbon, Oporto, Aveiro, Leiria, Beja, Évora and Sintra), an impacting action was carried out in 2001 through the first “National EV Circuit”. Lasting three weeks and with 40 EV’s that covered 410 km and 12 cities, this circuit connected Aveiro-Leiria-Évora and Beja. For the first time, it was possible to present EV’s in several small Portuguese towns. Several national and local responsables for the Portuguese transportation politics participated in shows, videoconferences and other activities. Also involved were responsables from the public transport operators.

For 2002 it was decided to concentrate on one town only, the choice having fallen on Aveiro. A major event was carried out with electric buses, one fuel cell vehicle and two electric boats as attractions. During the European Mobility Week 2002, Aveiro was the Portuguese electric city.

These initiatives complemented by others involving municipalities all over the country attracted the press and generated a public opinion, in general favourable towards alternative technologies in transportation and EV’s.



Figure 5 – First National EV Circuit



Figure 6 – Some EV's involved at the European Mobility Week 2002 in Aveiro

2.6 Demonstration Action “Introduction of Mini-Electric Buses in Public Urban Transportation Fleets

A major demonstration action developed by APVE and funded by DGTT, involving two electric mini-buses that were integrated, for a period of six weeks each, in 15 urban transit services, has been running since September 2001 up till now. Covering more than 70 000 km, these two mini-buses showed the potential of EV's in providing a better urban quality of life.



Figure 7 – Demonstration Action “Introduction of Mini-Electric Buses in Public Urban Transportation Fleets

In September 2003, a first city, Coimbra, set up a new regular line with three electric mini-buses to complement the existing urban transportation network and to meet mobility needs in its historic centre. Several other towns, which are candidates to follow this example, are planning to acquire electric mini-buses during 2004.



Figure 8 –Gullivers arriving in Portugal for the Demonstration



Figure 9 – New Gulliver regular line in Coimbra

This action shows that appropriate opportunity evaluation and activity planning, combined with successful demonstration, is the way to implement EV’s in practice.

2.7 Standardisation Domain and other projects

The creation of the National Technical Committee – TC 146 “Electrically propelled road vehicles” reflecting the CEN TC 301 standard, were the beginning of the EV’s standardisation activities in Portugal. APVE is the national standard organisation for this sector and all the existing European standards have already been translated into Portuguese. A deeper involvement in the field is foreseen Portugal is also involved in

other directions, namely in European projects related to the introduction of fuel cell electric buses. In the beginning of 2004, the city of Oporto will begin tests with three fuel cell buses within the framework of the CUTE (Clean Urban Transportation for Europe) project.

2.8 The 2004 European ELE-DRIVE Transportation Conference & Exhibition

This is the background for the next challenge for EV's in Portugal, the 2004 European ELE-DRIVE Transportation Conference & Exhibition on "Urban Sustainable Mobility is Possible Now! Battery, Hybrid and Fuel Cell Electric Vehicles", to be held in March 2004 at Estoril, Portugal.

This European AVERE Conference & Exhibition aims at filling the gap between two successive European venues of the very successful EVS, Battery, Hybrid and Fuel Cell Electric Vehicle Symposium and Exhibition, the world's largest event on Electric Driven Vehicles that takes place in Europe only every 4-5 years.



Figure 10 – 2004 European ELE-DRIVE Transportation Conference & Exhibition

This European event will be a unique opportunity for car and component manufacturers, energy and infrastructure suppliers, research institutes, municipalities and governmental authorities, public and private actors to present the latest progress in this field and to discuss solutions for an urban sustainable mobility and demonstrate that EV's are an effective solution today, by presenting:

- The state of the art of Battery, Hybrid and Fuel Cell Electric Vehicles
- successful demonstrations developed in several European cities
- market niches
- the vision of the cities as regards sustainable transport systems for mobility and goods distribution

- research and development activities
- the need for a short-, medium-, long-term roadmap for the implementation of Electric Driven Vehicles technology

2.9 Electric Vehicle Characteristics

The following information gives some of the EV characteristics of a car (Citroen Saxo), and a scooter (Peugeot) from the EDP fleet as well as a mini-bus (Gulliver) used in the demonstration actions involving the municipalities.

Citroen Saxo

Motor – maximum power – 20kW from 1600 to 5500 rpm;
 Maximum Torque – 127 Nm from 0 to 1600 rpm;
 Number of seating places – 5; Length 3.72 m;
 Maximum speed – 90 km/h; Acceleration from 0 to 50 km/h – 8.9 sec;
 Urban circuit consumption – 220 kWh/100 km;
 Storing capacity – 12 kWh; Urban circuit autonomy – 75 km;
 Efficiency (Global efficiency from the generation of electricity until the energy is consumed by the vehicle) – 28%;
 Comparative energy consumption – Reduction of about 860 kg oil equivalent/year of the thermal equivalent motor;
 Comparative global CO₂ – Less 3 t / year compared to the thermal equivalent vehicle.

Peugeot - Scoot-Elec

Length – 1755m;
 Maximum speed – 45 km/h; Acceleration from 0 to 100m – 12 sec
 Autonomy – (Sprint) 30km/(standard) 45 km; Batteries – maximum Load – 1.8kVAh.

Gulliver

Capacity – 14 standing + 8 seating places;
 Length 5.30m; Width 2.07m;
 Maximum Speed 33 km/h
 Daily Distance Covered 85 km/day – New line urban route (in Coimbra)
 Consumption (100 km) – 75.5 kWh;
 Batteries autonomy – 4 to 6 hours; Time required for replacing the Batteries – 4 minutes;
 Km cost – Less than 30% of the Diesel Oil equivalent Vehicle;
 Comparative Global CO₂ emission – (Considering the whole chain, from the generation of the electricity to the final application) – Less than 30% of the Diesel Oil equivalent vehicle;
 Manufacturer – Tecnobus; Selling price – 150 000€

3 – Conclusions

Although having started recently, Portugal has taken all the steps needed for being active in the EV's field and in the urban sustainable mobility of tomorrow.

Experiments already developed show that:

- Less pollutant and more efficient vehicles already do exist;
- EV's are good for the economy and for the environment;
- EV's have the capacity to cover most of a car's daily circuit in urban use;

This successful introduction of the electric vehicle concept was possible, first of all, because of the broad discussion of all the implications, options and policies pertaining to mobility and transport. The EV concept wins in a wider discussion but this requires that all the alternatives to the internal combustion engine be considered.

Enjoying a favourable public opinion, with municipalities waiting for opportunities and authorities ready to support possible initiatives, the main issue relating to EV's in Portugal is the lack of electric vehicles on the market that gather the conditions for a successful introduction.