
Study of Current Frames

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Abstract. Europe faces in the near future profound changes in its energy structure due to factors related to sustainability, political and energetic issues. The electric vehicle (EV) technology is involved in all these targets and the national authorities are committed to promote the future mobility. To achieve it, they are establishing different strategies like energy prices for EV, standardization and promotion of EV. The objective of this paper is to identify and explain different incentives to promote EV and to compare them in five European countries: Spain, UK, Germany, France and Portugal. The compared parameters are related to regulation, promotion and target features.

Key words
Electric vehicle, promotion, regulation, targets.

1. Introduction

Technological changes associated with the EV have been developing by leaps and bounds: EVs are currently achieving a greater autonomy, better benefits, safer and, especially, with more integration of all communication platforms and comfort. However, it seems that these technological efforts are evolving faster than the regulatory measures or regulations that allow greater viability of EVs supporting their development and mass in a short, medium and long-term. Therefore, it is necessary a deep study of the current standard regulations for the use of EVs. In a first stage, a revision of the existing regulation in several countries about the use and promotion of EV has been developed.

2. Objectives

The main objective of this task is to present in detail the current regulations related to EVs.

In order to deal with this objective, identifying the vehicle electric mobility regulation in different European countries is intended. The countries that have been analysed are Spain, United Kingdom, Germany, France and Portugal. For these countries, it was found that in many cases the established categories proposed were out of a bibliographical revision range. In some cases, there is no background or results to contrast of some of these categories, at least during the period used for collecting the information.

Table I is the scheme of categories used to analyse and compare each country. There are two category proposals without any clear frame in countries analysed as V2G and battery’s second life. But had been detected that will have a big importance in future regulations.
3. Electric Vehicle Frame in Spain

Targets, promotions and regulation for Spain regarding EV are described in this section. This structure is the same in the other countries.

3.1. Targets

The main objective of the strategies applied in Spain is to have 250,000 EV by 2014. This number increases up to a million units considering hybrid vehicles as well [1]. Regarding the infrastructure, it is foreseen that in malls and public parking one of every five places will have EV charging infrastructure, and for fleets one of every ten places. It is foreseen that for 2014, at least 62,000 of charging points will be installed in homes, 263,000 for fleets, 12,150 in public parking, and 6,200 off-road public charging points. By 2014 there will be 160 fast charging points, this means 1 every 400 charging points [1].

3.2. Promotion

This section shows different promotional programs of EV depending on the economic sectors.

Demand impulse program

The program is focused on the natural market for the EV, which is the urban and suburban mobility (representing at least 50% of whole market), in order to support the urban and suburban professional service fleets and private mobility demand. There is a special emphasis in the public administration fleets, for which is proposed to make an immediate transposition and rewarding the operators that make such change. There is a rebate for encourage the EV demand, both for fleets and private mobility, to support economically the purchasers of EV, as well as advantages on vehicle taxes.

The main objective of this program is to dispose of 250,000 EV rolling on 2014, 85% fleets and 15% private vehicles [8]. To achieve that, an estimated rebate of maximum 6,000€/vehicle is supposed to be an enough incentive to overpass the economic barriers of EV costs.

Research and development program

The efforts on R&D will be focused on developing the key technologies for EVs in all areas where the Spanish industry could be strategic. The areas considered are:

- Component constructors, especially batteries and its control systems.
- Energy supply infrastructure and control and communication equipment for managing the recharging systems.
- Security of EV systems.
- Promoting specialized centres on researching, testing, homologating, etc.

3.3. Regulation

Energy billing for electric vehicle is regulated in function of horary consumptions. There are three lines that can be highlighted:

1) A flat cost of consumed energy for all day, where the consumptions on peak hours cost the same as off-peak hours.

Promotion of infrastructure program

There is a differentiation between linked charge infrastructure and energetic recharging services. The former is associated with slow charge in private garages, and the latest is composed by all the rest. Initially the number of charging points installed would be similar to the number of EV in each city, taking account that for fleets there would be less charging points than vehicles. At the beginning, the infrastructure installation initiative must be at the industry hands.

The program foresees for the 2014 at least 62,000 of linked charge infrastructure and 263,000 fleet recharging points, 12,150 charging points located at public parking and 6,200 on-street charging points. From all the public charging points there will be at least 160 fast charging points [1].

Management of energetic demand program

Development of new ways of pricing and contract the energy supply, having as objective to transfer the EV charging on off-peak hours, optimizing the flexibility associated to the use of this vehicles.

The main objective is to guaranty that the economic cost of charging an EV will be less than its equivalent for inner combustion vehicles.

Rebates

Depending on the vehicle type (based on European classification categories) and in function of its autonomy, the rebates would be divided in three groups as follows [3]:

- **Group 1**
  The rebate will be 25% of the sale price before taxes (including batteries), for all vehicles in categories M1, N1, L6e, L7e, L5e and L3e, propelled totally or partially with electric energy obtained from the electric grid.

- **Group 2**
  For minibuses M2 and commercial vehicles N2, the rebate will be of 25% of the sale price (including batteries) before taxes with a maximum rebate of 15,000 €, provided that the autonomy of the electric component is over 60 km.

- **Group 3**
  For buses M3, the rebate will be of 25% of the sale price (including batteries) before taxes with a maximum rebate of 30,000 €, provided that the autonomy of the electric component is over 60 km.
2) A two horary periods discriminated rate, where the consumptions on peak hours cost more than consumes on off-peak hours.

3) A three horary periods discriminated rate, where the consumptions on peak hours cost more than consumes on off-peak hours, and night off-peak hours are cheaper than day off-peak hours.

3.4. Others

Because the electric energy in Spain cannot be resold, a new commerce figure is created for public EV charging (exclusively) points, named Gestor de Carga (Aggregator) [4], its main activities are:
- Act as market agents in the electricity market.
- Access to the electric transport and distribution grid.
- Bill and charge the energy provided as resale services of charging the EV.

4. Electric Vehicle Frame in UK

Almost all the UK initiative for EV implementation is happening in London, although other regions are implementing plans for the promotion of EV, but the gross initiative and developments are being implemented in London. All the programs implemented in London are based on the UKs route for EV or new schemes that will, further, be implemented to all the UK regions.

4.1. Targets

In “The London Plan, Spatial Development Strategy for Greater London” the infrastructure, vehicle and incentive, marketing & communication objectives were ratified as the ones that were stated on the “Electric Vehicle Delivery Plan”.

Vehicles

In matter of vehicles beside the incentives to the purchaser lowering the taxes and total costs of new vehicles, London plans to electrify public vehicle fleet and stimulate a wider EV market as follows:
- Deliver 1,000 electric vehicles in the Greater London Authority (GLA) fleet by 2015.
- Active support to extend the number of EVs in the public sector vehicle fleets e.g., in the boroughs and central Government.
- Work with fleet users and companies to expand the use of EVs in business fleets.
- A further 380 vehicles will be added to London’s car club fleet in 2010/11 which will include the trial of all-electric vehicles.

4.2. Promotion

On May of 2009, the Mayor of London published an electric vehicle plan for London in which its main objective was to promote the “Electric Vehicle Delivery Plan”, where he states [6]:
- The plan will need £60 million for its implementation beside the £20 million fund for infrastructure and £50 million fund to promote low carbon vehicle technology.
- The Department for Transport (DfT) will allocate £230 million for an EV rebate of 25% of total costs with a maximum of £5,000.
- Electric Vehicles are exempt from purchase and annual vehicle tax (totally tax free).

5. Electric Vehicle Frame in Germany

With its National Electromobility Development Plan, the German government and German industry intend to work together to make a good market for electro-mobility. The "National Platform for Electro-Mobility” will bring together different activities of various branches and the research community.

Players from the fields of research, industry and the local authorities involved are working together within the framework of these model projects to establish an infrastructure and to anchor electro-mobility in the public consciousness. A system for the future is needed, financial
Electric vehicles and plug-in hybrid electric cars are exempt from the annual circulation tax for a period of five years from the date of their first registration. In May 2010 the German government announced that it will not provide subsidies to the sales of electric cars but instead it will only fund research in the area of electric mobility [8].

5.3. Others

In addition, the Federal Ministry of Transport, Building and Urban Development is establishing a battery testing centre (with crash tests) and providing funds for the establishment of hydrogen filling stations.

6. Electric Vehicle Frame in France

The major policies and laws pertaining to hybrid and electric vehicles in France relate to tax incentives and building charging infrastructure. The Grenelle II legislation adopted in July 2010 addresses a number of environmental topics, including EV charging.

6.1. Targets

The goal is a fleet of 2 million electric vehicles and plug-in hybrids, or 5% of the fleet in 2020 (and 15% of the market by that time). To reach the circulation of those vehicles, the objective is the development of a network of charging points. Estimates are of 400,000 public terminals and 4 million private terminals in 2020 [9].

6.2. Promotion

The French Government designed an annual eco-label for the average CO₂ emissions of passenger cars on new vehicles with a bonus-malus (tax-deduction/tax-penalty) system that favours low-CO₂ emission vehicles. The national plan establishes tax deductions (bonus) and tax penalties (malus) for new vehicle purchases on the basis of their tank-to-wheel CO₂ emissions [9].

The plan applies to new cars sold on the French market since January 2008, and because the tax deductions are balanced by the tax penalties, no government financing is needed. In 2009 the plan set a new bonus of 5,000€ for new cars and light commercial vehicles emitting less than 60g CO₂/km, which automatically covers all electric vehicles. The bonus applies until 2012 for the first 100,000 low-carbon vehicles purchased [10].

6.3. Others

ADEME (the French Environment and Energy Management Agency) received funding in 2008 under the French Grenelle Environmental Forum. This funding exhibits the abilities of French companies and State laboratories to produce automotive technology that contributes to the goal of CO₂ emission reduction in response to climate change issues. In 2010 the program Investissements d'Avenir ("Investments for the Future") was created under the National Loan plan.
7. Electric Vehicle Frame in Portugal

Portugal is one of the countries that have more and better information for the actual and future user of EV. There is a centralized platform of information for users and researchers on the web: http://www.mobie.pt/en/veiculos, where people can find all the information they need for an EV purchase or simply researching information.

7.1. Promotion

In 2007 Portugal established that all of the EV that is considered by the vehicles regulation as an exclusively electric vehicle would be exempted of the two main taxes imposed to road vehicles:

- Vehicle Tax (ISV)
- Single Road Tax (IUC)

Additionally there is an income tax relief for both individual and corporations purchasers of an EV, where the EV are considered expenses not deductible for tax purposes and can represent amounts from 25,000 € to 50,000 € depending on if the vehicle is considered as powered exclusively by electricity or covered in another EV characterization and if the purchaser is an individual or a corporation.

Portugal has initiated an incentive program for EV purchasers focused directly to the sale price. All private customers that buy one of the first five thousand EV in Portugal will be entitled to a rebate of 5,000 €. This rebate can increase up to 6,500 € in case that the purchaser decides to scrap his old internal combustion vehicle. The incentive will be deducted directly by the EV seller.

As it was mentioned, Portugal has an important centralized centre of information, support and also EV charging network for users, it is called MOBI.E. This platform works as a national charging integrator centre for information recompilation and impulse of EV initiatives.

7.2. Regulation

Portugal's key policy initiative relating to electric vehicles is its support to implement a national mobility network based on the MOBI.E model. In addition, several direct and indirect incentives for EVs have been enacted:

- Establishes provisions relating to the activities of electric mobility covered by the regulation of ERSE.

Establishing technical standards for installation and operation of normal charging points in buildings and other urban operations. [11].


7.3. Others

Portugal was the first country in Europe to establish a direct electric vehicle partnership with the Renault-Nissan Alliance in November 2008, signing an agreement to build a widespread recharging network at Portugal and to promote the benefits of zero emission mobility [14].

8. Comparison

The analysis done shows that each country has its own strategy. Such strategies consider different factors for promoting EV and for monitoring their evolution. For this reason, in order to compare them, the following qualitative factors have been selected:

- EV based objectives. Although some of the countries have a clearly estimated numeric vision of the quantities of potential EV circulating in their roads, not for all of them is possible to find specific numerical data.
- Infrastructure based objective. Data associated to public transport are clearly explained. Private infrastructures should also be taken into account and the performed analysis has considered numerical values along with quality indexes. The factor pretends to explain the quantity of EV charging points.
- EV purchase rebate. This is probably the most promoted factor in all the studied countries, that way we could do a pure quantitative analysis. We did a simple unitary transformation for scaling the factor to other factors rank.
- Other rebates. In this case, although the rebates given by each country are clear, the amount is not that clear because in most of the cases the rebate depends on the taxes (percentage over a cost) or a utilization factor (in function of time use).
- Exclusive regulation. Depending on the quality of the regulation the factor had more or less qualification.
- Other regulation. Same analysis as for “Exclusive regulation”, but considering how was prepared the country to integrate the EV with the surrounding environment.
- Others. It included all the benefits at time of using the EV, all of them focused to help the EV implementation. An example of the elements that could be measured in this factor was the permit for the EV to use the exclusive bus lanes, where is known that normal internal combustion vehicles cannot roll.

The result of this qualitative assessment is shown in Figure 1. It can be seen that the different countries
studied, progress with the implementation regarding the EV. Germany rebates for the purchase of EV are null, in view of other factors is observed Portugal with good regulation for the EV. It is noted that UK has good factors and aid targets.

![Diagram](image-url)

**Figure 1 Result of the comparison for the countries under study**

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References


