

An overview on charging tariff schemes and incentives: the eCharge4Drivers project

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Abstract – This paper aims to provide an overview of the charging tariffs and e-mobility schemes adopted in different EU cities based on a survey conducted within the EU project eCharge4Drivers. The outcomes of the survey are presented and analysed in order to extract a generalised tariffication formula which allows any eMSPs or CPOs to explore different options to overcome the issues that might be affecting their current CP management strategy

1. Introduction

There is a need for substantial changes in the transport system of a city in order to achieve the transition to more sustainable and green urban mobility towards reducing city road congestions, direct emissions, noise pollution as well as improving accessibility. Tariff structures define and model the behaviour of charging station users as well as define the main source of income for eMSP's. Despite the fact that in some areas tariff structures are simple due to premature development of EV sector or due to a specific willingness of keeping it simple to users, these can have a large impact in the habits of users and influence the way in which these behave. For this reason, tariff structures play a crucial role in the charging ecosystem. In this direction, the design and establishment of new charging tariffication and incentives schemes for charging in a public charging network should be carefully considered either for the promotion of the e-mobility concept in cities with premature level of EV deployment or to ensure the sustainability of the investment in new infrastructures which will serve the increasing charging needs.

This paper analyses the outcomes of an extended survey, conducted within the framework of the EU project eCharge4Drivers, on charging tariff schemes and e-mobility incentives implemented in the different EU countries (Spain, Greece, France, Belgium, Italy, Luxembourg, Austria) and Turkey. The survey outcomes are analysed and a generic pricing formula which can be adopted by any CPO/eMSP is extracted.

2. Methodology

The survey on the pricing policies and incentives being adopted in different cities and countries was conducted in two stage. Initially, a benchmark analysis conducted to identify the variety of incentive mechanisms for the purchase and the usage of EVs and/or the installation of charging stations implemented in different countries and regions. The incentives depends on national regulations, degree of maturity of the market, cultural values, etc., thus, different practices are adopted at regional level to best serve the charging expectations of local society. Afterwards, a survey was conducted as regards the tariff structures used by the local MSP's and CPO's in the project pilot areas. The scope of this survey was to better understand the motivation of the parameters used to define the pricing schemes and how the CAPEX and OPEX of the charging network is reflected in these pricing profiles.

For the scope of the survey, dedicated questionnaires have been developed and bilateral meeting have been scheduled with CPOs and eMSPs in order to understand and analyse in depth their pricing strategy. The ultimate goal of this analysis is to conclude to a generic formula that any eMSP or CPO is able to define a tariff structure according to their users behaviour, constraints and revenue expectations.

3. Results and Discussion

Regarding the incentive's schemes analysed in the eCharge4Drivers project, the benchmark that was conducted concludes that most countries and cities apply factors to incentivise the purchase and use of EV's. These incentives are based mainly on purchase subsidies, on registration taxes, ownership tax, company tax and in some cases on a reduction of the VAT applied. Despite these are the general

incentives mostly applied by states, some other measures have been taken by municipalities such as free kerbside parking, toll reduction or free access to limited traffic zones.

Regarding tariff structures in the analysed areas, these depend on several parameters such as subscriptions, type of chargers, average power, initial fees, location of the CP's, types of vehicles, time of the day in which the charging event takes place, minimum charges, and changes in tariffs according to certain thresholds. In some areas, tariffs respond to a need to facilitate and incentivise users to charge instead of generating high revenues to make profit from it. There is a high diversity of opinions on whether energy should be charged per time or per kWh. In any case, most of the accessory tariff parameters that are included aside from the real charging tariff are made to incentive the proper use of charging points. These stand for initial fees, minimum charges, charges for excess of time or energy and others such as differentiating the fee according to the time of the day.

Generalised Formula:

$$C_{i,j}^s = C_{i,j}^{cs} + T_{i,j}^f + m_{i,j} \cdot \max[(d_s - f_d), 0] + n_{i,j} \cdot \max[(e_s - f_e), 0] + p_{i,j} \cdot \max[(d_e - f_p), 0] + T_{i,j}^{excess}(t, e)$$

$C_{i,j}^{cs}$ is a booking fee that may be charged when booking, $T_{i,j}^f$ is the minimum charging (time or energy), $m_{i,j} \cdot \max[(d_s - f_d), 0]$ where m is the value that determines the cost of the charging session that depends on the time duration, $n_{i,j} \cdot \max[(e_s - f_e), 0]$ where n is the value that determines the cost of the charging session that depends on the amount of energy charged, Finally, there could be an additional charge regarding the parking time (d_e). As well as for the previous expressions, a minimum parking stay could be charged (f_p).

4. Conclusion

Based on the benchmark analysis of the e-mobility incentives, making incentives available at the time of purchase, appear to be an effective solution to increase EV market share. The current financial incentives should not be removed in the short-term to keep encouraging potential buyers. Another crucial incentive for buyers is the availability of charging infrastructure. Governments should expand the scale of charging points to increase density as a key measure to incentivise EV's. As regards tariffication, all possible tariff structures have been defined through a generalized formula which will be further detailed in the full paper. This formula and the recommendations made, allows any eMSPs or CPOs to explore different options to overcome the issues that might be affecting their current CP management strategy

Keywords electric vehicles, charging tariffs, incentives, tariffication

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