PROSPECTS AND OBSTACLES FOR VARIOUS TYPES OF ELECTRIC CARS

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Abstract

In the last decade a rapidly growing interest in electrification of transport passenger cars could be noticed. The major motivation are the problems related to the use of fossil fuels in the transport sector such as crude oil dependency, greenhouse gas emissions (GHG) and air pollution.

Yet, currently the number of electric vehicles is still very low compared to the total car stock. The major impediments for a broader market penetration of electric vehicles are (i) their high investment costs compared to conventional cars, (ii) limited driving range of EVs, and (iii) limited availability of charging infrastructure.

Electric vehicles (EVs) are often presented as zero-emission vehicles. However, from a lifecycle CO2 perspective, EVs are not zero-emissions vehicles. Total emissions are very different depending on the kind of electricity which is used in vehicles.

When talking about EVs it has to be considered that nowadays several types of electric vehicles exist and just battery electric vehicles (BEVs) and fuel cell vehicles (FCVs) are zero-emission vehicles at the point of use.

In addition to BEVs and FCVs also hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEV) and range extenders (REX) are analysed from an energetic, environmental and economic point of view.

The **core objective** of this paper is to analyse technical characteristics of various types of electric vehicles and related costs and emissions. In addition policies and strategies for the promotion of electric vehicles in different countries will be discussed.

Our **method of approach** is based on a lifecycle assessment of GHG emissions of EVs powered by electricity from different energy sources (fossil and renewable energy sources (RES)). The economic performances of EVs are investigated considering investment, operation and fuel costs. The future market penetration of EVs is analysed considering technological learning and promotion strategies.

The **major result** of our analysis show, that total GHG emissions could be reduced only in the case that electricity used in EVs is produced from RES. In the case that electricity is produced from fossil energy e.g. coal, total emissions are higher than that of the conventional cars. BEVs and FCVs are currently much more expensive than conventional cars, but significant cost reduction could be reached through technological learning and mass production.

The **major conclusion** of this work is that the main barrier be overcome in order to increase market penetration of EVs are:

(i) decrease of battery costs;

(ii) improvement of battery performances regarding driving range;

(iii) build-up of a proper charging infrastructure;

(iv) in addition, it is important to ensure that EVs are using electricity from RES to really contribute to the sustainability of transport;

(v) the use of CO2-based taxes could support use of EVs;

(vi) furthermore, emission-free zones in urban areas are a very important completing policy tool.

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