

## Impact of Electric Vehicles on Energy Consumption and Environment

**Authors :** Amela Ajanovic, Reinhard Haas

**Abstract :** Electric vehicles (EVs) are considered as an important means to cope with current environmental problems in transport. However, their high capital costs and limited driving ranges state major barriers to a broader market penetration. The core objective of this paper is to investigate the future market prospects of various types of EVs from an economic and ecological point of view. Our method of approach is based on the calculation of total cost of ownership of EVs in comparison to conventional cars and a life-cycle approach to assess the environmental benignity. The most crucial parameters in this context are km driven per year, depreciation time of the car and interest rate. The analysis of future prospects it is based on technological learning regarding investment costs of batteries. The major results are the major disadvantages of battery electric vehicles (BEVs) are the high capital costs, mainly due to the battery, and a low driving range in comparison to conventional vehicles. These problems could be reduced with plug-in hybrids (PHEV) and range extenders (REXs). However, these technologies have lower CO<sub>2</sub> emissions in the whole energy supply chain than conventional vehicles, but unlike BEV they are not zero-emission vehicles at the point of use. The number of km driven has a higher impact on total mobility costs than the learning rate. Hence, the use of EVs as taxis and in car-sharing leads to the best economic performance. The most popular EVs are currently full hybrid EVs. They have only slightly higher costs and similar operating ranges as conventional vehicles. But since they are dependent on fossil fuels, they can only be seen as energy efficiency measure. However, they can serve as a bridging technology, as long as BEVs and fuel cell vehicle do not gain high popularity, and together with PHEVs and REX contribute to faster technological learning and reduction in battery costs. Regarding the promotion of EVs, the best results could be reached with a combination of monetary and non-monetary incentives, as in Norway for example. The major conclusion is that to harvest the full environmental benefits of EVs a very important aspect is the introduction of CO<sub>2</sub>-based fuel taxes. This should ensure that the electricity for EVs is generated from renewable energy sources; otherwise, total CO<sub>2</sub> emissions are likely higher than those of conventional cars.

**Keywords :** costs, mobility, policy, sustainability,

**Conference Title :** ICEEP 2018 : International Conference on Energy Economics and Policy

**Conference Location :** Cape Town, South Africa

**Conference Dates :** November 15-16, 2018