CE Delft

Committed to the Environment

Summary 'Green Power for Electric Cars'

Introduction

Contrary to the trends in most other sectors, greenhouse gas emissions of the transport sector are still increasing, and are predicted to grow further in the coming years, at current policies. As there is no simple solution to the challenge of achieving significant CO_2 reductions in transport, it has become clear that a large range of efficient and effective CO_2 reduction measures will have to be taken.

In the coming decades, electric and plug-in hybrid vehicles could play a significant role in this move towards sustainable transport. If these vehicles run on renewable electricity, they could substantially cut CO_2 emissions and improve local air quality.

Electric vehicles might even help to make the electricity sector more sustainable, if the batteries in the vehicles could be used to manage the variable output of an increasing share of wind and solar-based power generation. However, the extent to which these advantages can be harvested under current policies is open to question.

T&E, Friends of the Earth Europe and Greenpeace European Unit have therefore jointly commissioned this study to look into how the full potential of electric cars can be realised. The study aims to analyse the potential impact of the electrification of road transport on EU power production and to develop policy recommendations to ensure that this development will lead to the growth of renewable electricity in Europe.

Electrification of road transport

Electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) provide very promising opportunities for the future development of a sustainable transport sector. However, many questions regarding their potential share in the car fleet, their energy efficiency, charging patterns, annual mileage, cost and cost structure have not yet been answered.

Compared to internal combustion engine technology (ICE), battery electric drive trains have a number of benefits for the transport sector, such as:
The potential to use a large range of energy sources, including all types of renewable energy, in combination with high energy efficiency.
The potential for sustainable and carbon neutral (CO_2-free) mobility if powered by renewable energy sources.
Less or no air pollution (depending on the type of power production) and lower noise levels.

The well-to-wheel environmental impact of EVs and PHEVs is largely determined by the type of electricity production used to charge the batteries. If electricity is produced from lignite or coal, well-to-wheel CO_2 emissions are typically higher than or equal to the emissions of a

Oude Delft 180
2611 HH Delft - The Netherlands
t +31(0)15 2 150 150
www.ce.nl ce@ce.nl
Besloten Vennootschap (Ltd.)
KvK 27251086 Chamber of Commerce

comparable ICE car. When the electricity comes from gas-fired power plants, emissions are significantly lower. Electricity from renewable sources, such as wind, solar or hydro energy, would result in zero CO_2 emissions per kilometre.

In order to assess the potential impact of these vehicles on the electricity sector, three scenarios were developed for 2020. Even though some of these scenarios were clearly quite ambitious (with up to 31 million EVs and PHEVs in the EU-27), the additional energy demand from these vehicles will remain limited in the coming decade compared to the current electricity demand: less than 0.3% of current consumption in the moderate scenario, and 2.9% and 2.6% in the fast and ultra-fast uptake scenarios. Demand may, of course, increase further after 2020, depending on the success of this technology.

Effects on the EU power supply sector

The effects of these scenarios have been analysed on a general level for the EU power sector, and more specifically for three case studies: France, Germany, and the UK. It was concluded that the extra power demand in these scenarios would be met by existing power plants. The exact kind of electricity produced to meet this demand would depend on the availability, flexibility and marginal cost of the power production sources at any given moment in time.

When vehicle batteries are charged in base load hours, i.e., at night, coal/lignite and nuclear will be in a strong position to meet this additional demand. For extra demand in peak hours, an increase in gas-fired power production is most likely in the countries that were analysed. CO_2 emissions from this additional electricity production in the EU fall under the EU ETS cap, which will ensure, in principle, that any increase in emissions is balanced out by reductions elsewhere[1].

In the coming decades, an increasing share of renewable 'must-run' electricity production from wind or solar energy will require more flexibility in demand and in power production from the other sources. Gas-fired production, pump-storage hydro and interconnection could be used for this, as could EV and PHEV batteries if used for energy storage in times of excess renewable energy supply. This requires smart metering/smart storage technology, combined with demand side management, which is currently under development.

Policy instruments: how can the green opportunities be harvested?

Policies could be implemented to ensure that the additional electricity production for these vehicles is 100% green. If that is the aim, the best policy option is national regulation to

[1] Increasing electricity demand from transport will have an upward effect on the CO_2 price in the ETS. This effect has not been studied further in this report, but is expected to remain small in the coming decade as the additional electricity demand will be limited.

ensure that renewable electricity targets are increased by the additional amount of electricity consumption from EVs and PHEVs.

Policies aimed at promoting the voluntary purchase of green electricity by electric car owners will also be useful and will help clear the way for more ambitious policies. For example, governments or car dealers can promote the voluntary purchase of green electricity by electric car owners while electricity suppliers, local governments and companies that own and operate charging points can ensure that renewable electricity is used for the charging points for these cars. National governments could support these developments, for example through fiscal policies.

Under the current EU regulation on CO_2 from cars, an increase in electric vehicle sales will effectively result in less stringent standards for conventional cars. This cancels out the potentially positive impact of electric cars on CO_2 emissions and oil consumption in transport. The regulation should be improved by eliminating super credits and the practice of zero counting for electric vehicles.

In addition, the Renewable Energy Directive (RED) could be further improved so that actual data is reported on renewable electricity used for vehicle charging. In the FQD and regulation on CO_2 and cars, more realistic methodologies should be implemented to take into account the actual energy use and the CO_2 emissions of electricity used in these vehicles. This requires accurate metering, which is also an important aspect to ensure any future regulation of electricity and to provide an opportunity for demand side management.

An important issue for further research and development at both the EU and national level is the potential, feasibility and cost of using EV and PHEV batteries renewable energy storage in the longer term. The appropriate technology, infrastructure and standards need to be developed in the coming years to ensure that they are implemented and fully operational as the share of variable renewable energy supply increases. This would, among other things, allow active management on the demand side, which is set to become an important ingredient in a future electricity system.

You can download the full report ‘Green Power for Electric Cars, Development of policy recommendations to harvest the potential of electric vehicles’ atwww.ce.nl. More information: Bettina Kampman +31`15 – 2150150.