Technology Fact Sheet

Plug in Hybrid Electric Vehicles[i] /http://climatetechwiki.org/technology/phev/

General description

A plug in hybrid electric vehicle (PHEV) is a hybrid electric vehicle with the ability to recharge its energy storage with electricity from an off-board power source such as a grid. (Pesaran et.al, 2009) The PHEV can run either on its Internal Combustion Engine (ICE) or on its battery.

A full electric vehicle uses its energy far more efficiently than a vehicle with an Internal Combustion Engine (ICE) and can drive about 2.5 times further with the same energy. For this reason it is expected that the electric vehicle will replace the ICE vehicle in the long run. However, in the coming 20 years or so vehicles will probably still be equipped with IC engines, possibly in combination with electric engines, because per unit of weight an ICE vehicle can still drive about 40 times further. In this 20 year period the IC engine is expected to improve substantially (Sharpe et al. 2009).

The key advantage of PHEV technology relative to full Battery Electric Vehicles (BEV) is the fuel flexibility. PHEVs have no limitation of the driving range and if the recharging infrastructure is spatially or temporally unavailable, it doesn't restrict the use of the vehicle. A possible drawback of the PHEV is that it contains two systems to propel the vehicle, making it more costly to build than a BEV. However, the car manufacturing industry expects that PHEVs will be introduced to the market first, and that the switch to BEV could be made when the PHEVs are found to be economically and technological viable. (Gilijamse,2009).

Implementation

Plug-in hybrid vehicles (PHEVs) have the potential to displace a significant amount of fuel in the next 10 to 20 years. The main barriers to the commercialization of PHEVs are the cost, weight, safety, volume and lifespan of the batteries. It is expected that more and more car manufactures will bring plug in vehicles to the market in the coming years.

Implementation barriers

- high costs of the vehicles;
- lack of recharging infrastructure;
- lack of standards for vehicles recharging equipment;

GHG emissions reduction (megatons CO_2 equivalent) – 428 thousand tons CO_2 in 2030.

Studies estimate that a PHEV with usable electrical energy storage equivalent to 30 kilometers of electric travel would reduce fuel consumption by 36 - 45% relative to that of a comparable combustion engine vehicle assuming that the PHEV drives in full electric mode in the city and as a hybrid on rural roads and on the highway (Pesaran et al. 2009, CalCars, 2009). The final CO_2 emission reduction depends strongly on the source of the electricity used.

Impact on development priorities:

a) *social*

b) *economic*

- increase energy security of the country;
- improve balance of payments by reducing imports of fossil fuels.

c) *environmental*

- improve local air quality due to low NOx emissions and particulate matter;
- reduce noise.

d) *other*

Investments

The hybridization of the vehicle adds about US$ 4000 to the manufacturer's cost. (Sharpe, 2009) Additionally PHEVs require a bigger battery which adds extra to the costs. The price of the battery system price is about $1700 for a 15 kilometer battery and about $3400 for a 60 kilometer battery. This

brings the additional cost of a PHEV to $ 5700 to $ 7400 compared to a conventional vehicle with an internal combustion engine. However, the costs of the lithium ion battery are expected to decrease in the near future by 1/3 by 2016.

A big advantage of VEHC is that fuel costs compared are lower compared to internal combustion vehicles.

In addition, there is a need for investment into the recharging infrastructure. This infrastructure needs to be standardized in a way that every brand of Plug-in Hybrid Electric Vehicle can recharge at every recharging station. A simple recharging point at a private house or at an office costs about $ 1800. However, a public recharging station, with the necessary electronics to make contact with the bank costs about $ 18.000. (Roeterdink, 2010).

Given the cost of a traditional internal combustion vehicle of $ 20,000 and additional costs of cca. $6, 5000 related to a VEHC vehicle, the total cost of a VEHC vehicle amounts to 26,500 $.

Operation and maintenance costs– estimated at 10% of the annual purchasing cost of a VEHC vehicle, or $2700 / year.

GHG reduction costs– 5.132 $/ton CO_2.

Technology lifetime– 7 years

Other

Source: http://climatetechwiki.org/technology/phev

[i] This fact sheet has been extracted from TNA Report - Technology Needs Assessment for climate change mitigation - Republic of Moldova. You can access the complete report from the TNA project website **http://tech-action.org/**