Technology Fact Sheet

Hybrid Electric Vehicles[i] /http://climatetechwiki.org/technology/hev/

General Description

One approach to lowering the CO_2 emission from traffic is the hybridization of vehicles. A hybrid vehicle uses two or more distinct power sources, i.e. hybrid electric vehicles (HEVs) combine an internal combustion engine and one or more electric motors. Vehicles employed in urban areas like small passenger cars, local delivery trucks and city busses benefit from hybridization and show substantially lower CO_2 emissions, ranging from 23 to 43% depending on the traffic dynamics. For passenger cars there are various levels of hybridization possible all giving rise to various amount of CO_2 emission reductions at different costs. Small passenger cars benefit the most from strong downsizing in combination with micro hybridization. Cars running most of their kilometers on motorways do not benefit from hybridization mostly because on motorways vehicles drive at more or less constant speeds. Hybrid vehicles are still more expensive than traditional vehicles using an internal combustion engine. They have the advantage of higher fuel efficiency and reduced CO2 emissions without additional infrastructure requirements.

Currently there are four different levels of hybridization available in vehicles (Larsen, 2004): (1) Micro hybrids do not use electric motors to propel the vehicle; (2) Mild hybrids have electric motors which are used to propel the vehicle but cannot drive solely electrically; (3) Full hybrid cars are parallel hybrids which can be propelled fully electric at low speeds and use the internal combustion engine at higher speeds or when the electric energy stored in the car battery is low; (4) Series hybrid cars are full electric vehicles which use the internal combustion engine as a generator to produce electricity.

Implementation

Hybrid electric vehicles (cars, buses, local delivery vans) are most feasible for use in urban traffic, where there is a frequent need for breaking. Regenerative braking and electric motors of a hybrid car moving at a speed of 30-40 km / h lower CO2 emissions by 33-40% compared to a car using conventional fossil fuels (liquefied petroleum gas, diesel oil, gasoline). Hybrid vehicles do not show significant improvements in fuel consumption when driven on highways. A large advantage of hybrid vehicles compared to other options for reducing GHG emissions in transport is the fact that no additional infrastructure investments are required.

It is assumed that by 2030 urban passenger transport will switch from diesel buses to hybrid ones. Research has demonstrated that, depending on the traffic dynamics, the hybrid buses have 23 – 43% lower CO_2 emission and 18-39% lower NO_x emissions compared to similar new non hybrid diesel articulated buses.

Implementation barriers

- Compared to a traditional fossil fuel powered vehicle, the purchase cost of a hybrid electric vehicle is higher;

GHG emissions reduction (megatons CO2-eq) – 15 thousand tons CO_2 in 2030.

Impact on development priorities :

a) Social

- Reduce health risks.

b) economic

- enhance energy security by reducing imports of fossil fuels;
- improve balance of payments;

c) environment

- improving quality of local air;

d) other

Investments

Micro hybridization is the cheapest solution, while full hybridization of vehicles is still a relative expensive technique. Estimates of additional costs for the full hybridization of a light passenger car

range from €2800,- (Sharpe) to €4800,- (Erdmann et al., 2006) offering up to 20% reduction in CO2 emissions.

The purchase costs of a hybrid bus can be 30% higher than a comparable non hybrid bus (Chandler and Walkowics, 2006) but the total operating costs of a hybrid bus are approximately 15% lower. Thus, taking into account the cost of purchasing a conventional diesel bus of $ 130,000 the purchase cost of a hybrid bus can be $ 169,000. The cost to change the entire urban buses fleet is cca. 507 million USD.

Operation and maintenance costs are estimated at 8.5% of the annual cost of investment, or $ 4.3 million for the entire bus fleet.

Cost of GHG reduction – 4.324 $/ton CO_2.

Technology lifetime – 10 years.

Other

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[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/**