

Renewable Energies for Hybrid and Electric Vehicles (New Annex)

1 Introduction

Surging oil prices, the dependency of transportation on oil products and efforts to reduce greenhouse gas emissions have caused significant interest in developing alternative transport technologies and fuels. Many governments wish to increase the share of renewable energies in both electric power production and the transportation sector. These objectives can support each other in the area of research and technology development. The use of "green" electricity for battery electric vehicles and biofuels for hybrid electric vehicles increases their sustainability. However, a lot of questions still have to be answered to get a clear picture of the most promising combinations of renewable energy sources and clean vehicle technologies.

Existing systems and systems based on renewable energies must be compared on a well-to-wheel basis for a valid assessment of their advantages and disadvantages. For HEVs (hybrid electric vehicles) and EVs (electric vehicles) this means analysing the role of renewable electricity. For HEVs that combine an electric motor and an internal combustion engine, the renewable fuel for the engine must also be included in the comparison.

In many countries there is a strong demand for objective information that makes it possible to get an overview and to compare the different combinations of renewable energy sources and clean vehicle technologies.

Against this background the Executive Committee (ExCo) of the HEV Implementing Agreement (IA-HEV) decided to prepare a new Annex on renewable energies, which in the first phase focuses on hybrid and electric vehicles.

2 Objectives

The goal of the task force in this Annex is to support research, to share new information and to establish working relations among organisations in the world that are working on key topics in this area. This Annex will provide objective information to support decision makers in participating countries to decide on strategies based on locally available renewable energy resources.

In the first phase this Annex will concentrate on the following three areas:

1. Electricity production from renewable sources for battery electric vehicles and 'plug-in' hybrid electric vehicles.
2. Biofuels for hybrid electric vehicles.
3. An updated overview of well-to-wheel analyses of energy efficiencies, greenhouse gas emissions and costs of the different pathways from renewable energy sources to electric and hybrid vehicles.

This Annex is aiming at members of government authorities, local authorities, utilities, energy agencies, environment agencies and end-users.

3 Working Method

Reduction of the oil dependency and greenhouse gas emissions of transportation faces several challenges:

- A shift to renewable/low carbon energy sources may offer significant greenhouse gas (GHG) reduction potential but generally requires more energy.
- A shift to renewable/low carbon energy sources is currently expensive.
- Transport applications may not maximize the GHG reduction potential of renewable energies.
- Optimal use of renewable energy sources such as biomass and wind requires consideration of the overall energy demand including stationary applications.

Battery electric vehicles and hybrid electric vehicles represent new clean vehicle technologies that may contribute to meet these challenges. The following subsections will briefly describe the three main focus areas that are scheduled to be analysed in this Annex.

Electricity production from renewable sources

Several renewable sources of electricity production are available: hydropower, wind power, solar power and combined heat and electricity production from biomass. Some of these sources have already been used for decades, while others are still in a stage of development to improve efficiency and to reduce costs. They have different characteristics as elements in the electricity power and distribution system. The possibilities to increase the electricity production from these renewable sources to meet an increased demand in the transport sector may vary between countries.

Battery electric vehicles and "plug-in" hybrid electric vehicles are options for a very energy efficient use of electricity in road transport. Additionally, the storage capacity of the batteries in these vehicles may represent interesting load levelling capabilities in an electricity system with a large share of wind power.

Biofuels

Biofuels for road transport are currently expensive and the production processes are often energy consuming. In many countries the resources of biomass are limited. Biofuels can be used in neat form, or in blends with conventional fuels in existing infrastructure and vehicles. With surging oil prices there is a growing interest to develop new and more efficient production processes, which may reduce costs and energy consumption. Very promising results have been obtained when the production of biofuels are combined with existing processes in industry and power plants.

"Plug-in" hybrid electric vehicles represent an interesting possibility that combines a very energy efficient use of electricity with a limited consumption of biofuels, and hereby eliminates the current range limitations of the battery electric vehicle.

Well-to-Wheel Analysis of Energy Efficiencies, Greenhouse Gas Emissions, and Costs

A large amount of information on well-to-wheel comparisons is available in the public domain. The intention of this task is to combine that information with new results from electricity production and biofuels, and to apply it to HEVs and EVs to estimate their potential in reducing fossil energy consumption and greenhouse gas emissions from transportation. The focus will be on energy efficiencies, greenhouse gas emissions and costs, and on other important aspects related to the possible interaction between renewable energy production and vehicle technologies (such as load levelling of wind energy).

In the analysis of the well-to-tank path the renewable energy resources could be very different in participating countries. The working method of this Annex will be organised to permit each member country to contribute and also learn especially about those renewable energy sources that are most relevant for that specific country. If possible all relevant renewable energy sources will be covered.

4 Status

On its meeting in Rome on October 6-7, 2005, the IA-HEV Executive Committee discussed the scope of this new Annex on renewable energies and decided to continue into a more detailed planning phase. The focus in the first phase of the Annex should be on renewable energies for battery electric and hybrid electric vehicles. In a second phase hydrogen and fuel cell electric vehicles could be included, in co-operation with other Implementing Agreements that work on those topics.

5 Outlook

A draft work plan will be presented to the IA-HEV Executive Committee during its April 2006 meeting. The ExCo will decide if this new Annex can enter the approval phase, in which formal participation will be solicited.

Interested parties are invited to contact one of the IA-HEV members, the chairman, the secretariat or the interim Operating Agent, to discuss their possible role in the activities of this Annex. Participating organisations can contribute to determine the actual content of the work, so it can be adapted to their needs.

6 How to Join

Further information on the possibilities to join this Annex can be obtained by the interim Operating Agent:

Mr. Jørgen Horstmann
Consultant
Malmlosevej 44
DK-2840 Holte, Denmark
Phone: +45 45 42 24 38
E-mail: horstmann@pc.dk