IEA *INTERNATIONAL ENERGY AGENCY*

HYBRID & ELECTRIC VEHICLE IMPLEMENTING AGREEMENT

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A word from the Chair

Recently, Australian and European politicians announced a future ban on sale of the old-style incandescent light bulb for reasons of its poor energy efficiency. The light bulb is more an electric heater than a light emitter. Leading bulb producers including Philips, OSRAM and General Electric have asked consumers to replace their incandescent bulbs with more efficient, energy-saving lights, such as compact fluorescents.

I asked myself if this could happen with another energy application, one that produces much more heat than needed power: namely, cars with internal combustion engines. A small car with a rating of 50 kW dissipates several hundred kW of heat energy, enough heat for 20-30 family houses. It seems persuasive that the internal combustion car should be next on the list!

Now, can you imagine leading car companies asking us to replace our 100% combustion-engine cars, “big ticket” items, with electric, hybrid-electric, and fuel cell vehicles?

Of course there is a big difference between light bulb producers and the car industry. The lighting industry has developed the incandescent bulb over many decades, selling millions of units, but has recently perfected alternatives such as compact fluorescents; thus a ban on old light bulbs would offer a huge business opportunity for that industry. For the consumer the change will offer advantages too: savings of energy and money. A consumer should thus be willing to pay more for a longer-lived, energy saving light.

Only the energy producer will loose. He will sell less electricity. But this allows him to avoid investments in new power generating capacity, expenditure that would lower his profit. Some of them may themselves start to sell the new alternatives to incandescent bulbs, making the changeover a profit opportunity for them as well and thus a win-win situation for all in the business chain.

The car industry is not ready yet for this change. Most manufacturers have failed to bring electric- and hybrid-vehicles into the marketplace, even as consumers and politicians seek pro-actively to lower CO_2 emissions. But change will come, and as the movement to reduce greenhouse gases matures, the auto industry will be asking us to replace our exclusively combustion-engine propulsion because it sees for itself a win-win market situation applying.

This transition will increase energy efficiency across society, but until it occurs we will need much concerted action among industry, politicians, and the public to move forward. The Implementing Agreement for Hybrid and Electric Vehicles is a place and a forum in which such concerted action can occur. We hope that we will see additional countries recognizing and taking action to help bring their home industries into this win-win position.

In this issue

Successful ExCo, Annex I Meetings in Yokohama

On 30 and 31 October and 1 November of 2006, the IA-HEV conducted its 24th Country Experts' Meeting and 25th Implementing Agreement Executive Committee (ExCo) meeting, in conjunction with the 22nd annual International Electric Vehicle Symposium in Yokohama, Japan,. Representatives of eight member countries presented reports on activities relating to indigenous developments in EV and HEV technologies, policies, and marketing, whilst the ExCo took up matters related to new technical annexes (working groups) and outreach activities for the Implementing Agreement. Brief synopses of key aspects of the country presentations and of the ExCo meeting are provided below.

Country experts convene in Yokohama

The Austrian government's R&D-Programme "A3" (Austrian Advanced Automotive Technology) issued in 2006 its fourth solicitation of proposals, emphasising alternative propulsion systems and fuels, material research, and vehicle electronics. The programme selected 23 projects from 35 proposals, with a total budget of €5 million. Also, the second call for "A3-lighthouse" (pilot and demonstration) projects in 2006 yielded nine proposals, from which four were selected for € 2 million total budget. Synergies among funded projects is a very high priority goal in Austrian governmental research programmes, and more such synergies should be achieved as the central bank (OeNB) has allocated €100 million to stationary and mobile clean energy projects over the next several years.

The Belgian government and industry position on pure EVs remains negative, but sales of HEVs, especially the Prius (but with both the Civic and Lexus hybrids also now available), have been robust. Also, interest in e-bikes has been increasing over the past year. A vehicle acquisition tax reduction of 15 percent remains in effect for units achieving certified CO2 emissions below 105 g/km (Prius scores 103). The Flemish government will be supporting research on super-capacitors, and interested research organisations in the country are already submitted proposals.

Interest in hybrids and EVs is again on the rise in Denmark thanks to high oil prices, which have re-focused priorities to include a new long term energy strategy with a major role for renewable energy, energy-efficient vehicles including HEV and EV, research in biofuels and fuel cells, an annual vehicle-tax strongly related to fuel consumption, and registration and annual tax exemptions for EV's. For these reasons and others, the Danish government is interested to re-apply for membership in IA-HEV. However, the lack of a registration tax exemption for hybrids forces their acquisition price up to, for example, about € 80.000 for the Toyota Prius—not much of an inducement to purchase, and beyond the power of EU regulations to affect!

Despite a new government in Italy with a Minister of Environment from the Green Party, perception of EVs and HEVs has not changed in a favourable direction; in fact, the new Government has not taken a clear position on them because they are not a priority item. The perception of electrically-powered vehicles by the general public is still limited and hampered by misinformation in the media, especially for EVs. Public curiosity is most concentrated in hydrogen and fuel cell vehicles, although initiatives from local authorities and the Italian Ministries of Environment and Production (€ 90 million in combined support) favour the introduction of cleaner vehicles (LPGV, NGV, EV, HEV) without discriminating by type (as it stands, EV and HEV research receives about 6 percent of the Ministry funding). It remains true

that the major focus of significant national R&D funding is on hydrogen and fuel cells, although local authorities support local enterprise R&D, which includes a few activities on EVs and HEVs, and the new Minister of Environment strongly supports EVs under the rubric of "eco-mobility."

Availability of hybrid cars in the Netherlands during 2006 was limited to the Toyota Prius II and, from January 2006, the Honda Civic (sales price € 24.000), but demand for both is growing. DAF Trucks introduced a prototype hybridised distribution truck after claiming not to be working on hybrids. The Netherlands remains a strongly biking-oriented country, so both use and supply of e-bikes of different models and various makes is vigorous. The government now focuses generally on transition paths for sustainability, with which alternative fuels for transportation and hybridization of vehicles appear consistent strategies. An explicit goal is to achieve a threefold reduction in well-to-wheels carbon emissions in transport by 2035.

Whilst there remain no national grants available in Sweden for the purchase of "green" vehicles, the newly-installed Swedish government has begun discussing such grants for both company and private cars. The following research themes have emerged nationally: lightweight construction, vehicle simulation, hybrid technology, fuel cells for APUs, combustion engine efficiency improvements (especially high-technology Otto and diesel engines), second generation biofuels (especially enzymatic ethanol production from biomass and biomass gasification), HCCI, and emission reduction technology. New for 2006 is a Swedish Hybrid Vehicle Center funded at € 3 million/year. Nevertheless, the persistent high cost of hybrids (despite the annual use tax reduction benefit of € 2.000) is sending "green"-minded motorists to other alternatives: ethanol (E85) cars now have about 13 % of the new car market.

The e-bike market remains strong in Switzerland: over 2'000 have been sold in the first half of 2006 (compared to 2'300 for all of 2005), which would bring sales to around 4'000 by year's end. Whilst the market for 4-wheeler EVs remains at a standstill, HEV purchases are picking up, especially for the luxury Lexus GS450 model, and a trial programme to create favourable terms for long-term business rental of clean fleets (HEVs, CNGs and biofuels included) is underway. Also, 112 projects funded by collection of the "climate rappen" were underway as of September, 2006 with 47 submitted from EU countries; total estimated savings would be 3,6 million tonnes of CO2. The number of cantons granting tax relief for "clean vehicles" continues to grow: for EVs in 16 cantons, solar vehicles in 4 cantons, hybrid vehicles in 8 cantons, CNG vehicles in 4 cantons, and fuel cell vehicles in 1 canton. Four additional cantons (Geneva, Ticino, Vaud, Lucerne) are planning to revise their taxation policies to exempt vehicles with low CO2 emissions.

HEV sales in the USA are exceeded 250'000 in 2006 (reaching about 1.5% of total LDV sales), bringing the HEV car park size to nearly 650 thousand. Prius II and Civic are still far out in front of the pack, but the various hybrid SUVs have begun to catch on, especially as the U.S. (2005) Energy Policy Act's variable tax credits available for Toyota models are used up. Tax incentives for fuel-efficient vehicles should continue to play a key role in demand. Public sector entities that actively promote hybrids as part of a clean/fuel efficient vehicle mix include New York, California, Michigan, Minnesota, South Carolina, Pennsylvania, New Mexico, and local governments in California. New York is converting part of its state fleet to plug-in hybrids, and has exempted some lower governmental entities (counties) from paying state tax on the purchase of hybrids. California permits single-driver HEVs meeting the state's most stringent emission certification levels to use HOV lanes. Minnesota has adopted a policy of preferential purchasing of plug-in hybrids for state vehicles, once they become available, and South Carolina has included sales tax rebates for PHEVs in its budget legislation.

The 25th ExCo meeting on October 31 and November 1, 2006 was attended by members from eight of the ten member countries that participate in the Implementing Agreement for Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV). A major component of this meeting was the official recognition of two new Annexes and establishment of preparatory arrangements for two others.

The IA-HEV ExCo unanimously decided to start a new Annex on 'Heavy-duty hybrid vehicles', with VITO (Belgium) as the Operating Agent. This is Annex number XII. It also unanimously decided to grant 3000 Euros from the common fund to VITO for preparing the new Annex. On behalf of the new interim Operating Agent

(iOA) for Annex XII, Mr. S. Smets, Mr. L. Pelkmans of VITO presented the updated proposal for the Annex. A kick-off meeting was proposed for 9 February 2007 (see following article), in conjunction with other meetings on hybrid and electric vehicles. The Annex should complete its mission during the third phase of the Agreement, which ends in November 2009. Austria intends to join this Annex if also the new Annex on fuel cells for vehicles is inaugurated. Belgium and the USA will also join this Annex. Mr. Conte is optimistic about participation of Italy, but he cannot confirm that yet. The Netherlands will join if the Ministry of Transport makes the participation fee available. Sweden and Switzerland might be interested to join, but still need to discuss it in their country. In summary, two countries confirmed their participation in this Annex, the participation of two others is very likely and at least two more countries are likely to participate

The IA-HEV ExCo unanimously decided to start a new Annex on 'Fuel cells for vehicles', with BMVIT (Austria) as the Operating Agent. This is Annex number XIII. Austria, Switzerland, and the USA will participate in this Annex, Italy is very interested and will participate if the required budget can be made available, and Belgium, France, the Netherlands, and Sweden all expressed interest. The ExCo unanimously decided to grant 3000 Euros from the common fund to BMVIT (Austria) for preparing the new Annex. On Wednesday, 25 October 2006, in conjunction with EVS-22 in Yokohama, the interim Annex XIII Operating Agent Mr. A. Dorda had organised a workshop to provide a broader exposure to this new Annex and to get feedback on the working programme from potential participants. Auxiliary power units (APUs) were identified by this workshop as a topic of interest. Since the April 2006 IA-HEV ExCo meeting Mr. Dorda had also explored a possible collaboration with Annex XX of the IEA Implementing Agreement on Advanced Fuel Cells (IA-AFC). His impression is that the OA of that Annex has very limited time available, which makes progress toward collaboration rather slow. The IA-HEV Annex on Fuel cells for vehicles will have duration of approximately 2.5 years and will terminate by November 2009, the end of Phase 3 of the HEV Implementing Agreement. In the wake of its Yokohama workshop, the Annex workplan is well defined, and Mr. Dorda was to contact IA-AFC and IA-AMF (motor fuels) to investigate possible collaboration and to avoid duplication of work.

Ms. Kleindienst (iOA) presented an updated proposal for a new Annex on lessons learned in market deployment of hybrid and electric vehicles and distributed a printed version of the updated workplan. In connection with EVS-22, a workshop was held on 28 October 2006 to provide a broader exposure to this new Annex and possibly attract participants. Thirty-one persons representing governmental bodies, universities, and (automotive) industry and research institutes worldwide participated in the workshop. These participants heard five presentations on lessons learned and on the plans for this new Annex. While preparing the proposal for the new Annex. Ms. Kleindienst had spoken with many people willing to answer the type of questions that will be addressed. Austria, Switzerland and the USA have confirmed that they are interested in participating in this Annex; Italy and Sweden might be interested. However, an Operating Agent with experience in this field needs to be appointed for this Annex (early in 2007, Dr. Thomas Turrentine of the University of California at Davis agreed to assume the role of OA, opening the way for a kick-off of the new Annex by late spring of 2007).

The Danish Energy Agency has invited Mr. J. Horstmann to write a proposal for Danish participation in IA-HEV over the three years remaining years in phase III of the Implementing Agreement. This participation would be contingent on creation of a new Annex on 'Renewable energies for hybrid and electric vehicles' in the (updated) form currently proposed. Biofuels receive a lot of attention in other organisations and publications, so the work on biofuels in this Annex will be limited. Collaboration with other Implementing Agreements will be sought to avoid any duplication of work by this Annex. Denmark, Switzerland and the USA are interested to participate in this Annex. Austria and Sweden might be interested. All ExCo members were to seek out experts in their respective countries that might be able to contribute to, or participate in, this Annex, and were to inform Mr. Horstmann by the end of January 2007. Mr. Horstmann was also to seek experts from outside IA-HEV member countries whilst finalising negotiations with the Danish Energy Agency.

New IA-HEV Annexes Launched

As described above, IA-HEV Annexes XII and XIII have been officially inaugurated. Annex XII on heavy-duty hybrid vehicles held its kick-off meeting on 9 February 2007 in conjunction the Society of Automotive Engineers Hybrid Vehicle Technologies Symposium in San Diego, California, USA. The Annex work plan is summarised below.

The following items are focal to this Annex:

1. Technical requirements of heavy-duty hybrids (HDH), highlighting especially as they differ from those for light-duty
2. Available HDH technologies and their characteristics
3. HDH system integration requirements.
4. HDH powertrain configurations (topologies);
5. HDH powertrain strategies for high efficiency and low emissions.

This annex will undertake to study hybrid technology applications for HDH by first investigating the current mix and availability of hybrid prototypes and standard vehicles, focusing on applied technology as well as costs and the merits in a broader sense. This is intended to increase the insights into these applications and provide essential information for future hybrid vehicle deployment projects, especially with respect to the technical barriers to overcome and the framework (training, support, etc.) required for successfully implementing projects. A related goal is to identify niche applications that may benefit to a great extent from hybridization—for example, to supplant today's relatively inefficient use of the gearbox PTO of the powertrain to provide power for auxiliary systems with hybrid vehicle technology for a potentially more energy efficient solution. It is essential to involve centres of experience and technology providers in participating countries in this process.

To increase the attractiveness of participating in the annex, the operating agent will also prepare papers and presentations dealing with the contents and the results from this annex, to be presented at relevant conferences, and he will encourage participants to take similar initiatives.

The operating agent will gather general information about heavy-duty hybrid vehicles and distribute it to participants. The collected information will also be structured into a report.

Example Diesel Hybrid Bus (HDH)

Annex XIII (Fuel cells for vehicles) will rely on natural synergies with other IEA Implementing Agreements, specifically those on Advanced Motor Fuels and Advanced Fuel Cells, in defining the future configurations of hybridized fuel cell vehicles. Coordinating activity is now underway, and the plan of procedure for this annex may be summarised as follows.

This Annex will concentrate on the development of fuel cells insofar as their properties my be tuned for successful application in vehicles. The main focus will be on road vehicles, but other means of transport (e.g., boats, airplanes and mining vehicles) will also be considered if meeting their specific (niche) needs could help accelerate market introduction of fuel cell road vehicles. Given the broad range of technical requirements for both light- and heavy-duty vehicle propulsion, auxiliary power units, and even no-road transport, the new Annex will not only focus on PEM fuel cells as the (presumptive) dominating research technology of today, but will analyze the potential of other fuel cell types. Because many scientists believe that auxiliary power units (APUs) might be the first economically viable niche for the market introduction of fuel cells in vehicles, the Annex will study the potential of fuel cells in this market segment, especially if the relatively stable power demand of APUs in a vehicle enables advanced technologies such as solid oxide fuel cells (SOFCs) to enter the market. The SOFC might be an APU option not only for passenger cars, but also for boats or even trucks.

Another vehicular attribute with importance to the transport sector is quick cold start capability. This may require high initial temperatures, and because overheating can threaten the performance of fuel cells and batteries, thermal

management of fuel cells and batteries will play an important role in the new Annex.

Finally, how to choose the most suitable fuel and how to store it on board is probably the most important question for fuel cell vehicles. Therefore all fuel options including hydrogen, methanol, even liquid fossil fuels for SOFCs will be investigated, taking the specific limitations of mobile (rough service) application into account. The special requirements for on-board (1) low-temperature liquid or (2) high-pressure gaseous storage of hydrogen demands the participation of specialists in vehicle technologies such as those who contribute to the HEV Implementing Agreements

An added value of this Annex will be to analyze technological solutions outside the mainstream of fuel cell development. Exotic fuels like ammonia or other liquid or gaseous fuels will be examined for their practical relevance as fuel for fuel cells. Because the Annex is not financing research directly but providing advice for the orientation of national R&D activities and industrial research investments, the costs for these technology foresight and assessment activities are moderate and allow with limited financial resources the consideration of technical solutions beyond mainstream R&D. To minimize development risks, the Annex will also address components that offer multiple benefits for other areas of technology (such as efficient electric motors), irrespective of the success of fuel cells.

Clean Vehicle Awards 2006

At a ceremony in Yokohama (Japan) on 25 October 2006, the International Energy Agency Hybrid and Electric Vehicle Implementing Agreement (IA-HEV) presented its 2006 Clean Vehicle Awards recognizing three categories of achievement: (1) to manufacturers, for outstanding worldwide sales figures for hybrid models; (2) to a nation or institutional entity in recognition of outstanding promotion of electric vehicles; and (3) to an individual, the "Personal Award," that honors his or her long-standing commitment to promoting clean vehicles. This year's winners are:

1. HONDA (Japan) achieving sales of more than 135,000 hybrid models worldwide

   LEXUS Division (Japan) for achieving sales of more than 50,000 hybrid models worldwide

   FORD (USA) achieving sales of more than 30,000 hybrid models worldwide.

2. THE PEOPLE'S REPUBLIC OF CHINA for outstanding promotion of electric vehicles.

3. HANS THOLSTRUP (Australia) for decades of commitment to enable progress in electric vehicles by establishing the World Solar Challenge solarmobile race.

Representatives were present to accept all awards.

Martijn van Walwijk, Secretary

Production of 2006-07 IA-HEV annual report underway

The IA-HEV Secretary and the Annex I Operating Agent share responsibility for compiling and editing the annual report of the HEV Implementing Agreement from experts' contributions, summaries of the activities of the various Annexes as provided by the respective Operating Agents, and from their own efforts to assemble useful information on developments in non-member countries. General HEV markets and fleet growth trends are also included. The 2006-07 edition of the report is now in preparation (all raw copy having been received) and is scheduled for release by mid April 2007.

Chris Saricks, Operating Agent Annex I

IA-HEV developments featured in IEA newsletter

Issue Number 39 (12 December 2006) of the *IEA OPEN Energy Technology Bulletin* recognized the emergence of the two new Annexes (XII and XIII) for the HEV Implementing Agreement as well as the new features to be found on the IA-HEV web site (www.ieahev.org). As reported in the *Bulletin*, new participants are welcome in the new projects.

Operating Agents and Country Experts for 2007

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Annex Activities Agenda—1st and 2nd quarters of 2007

May 30-June 2	26th ExCo and 25th Annex I Experts' Meetings held in conjunction with the *European Ele-Drive Transportation Conference 2007*, Brussels, Belgium
March 24	Annex XI Third Progress Meeting, Taipei, Taiwan
February 20-23	IEA NEET (Networks of Expertise in Energy Technology) Workshop G8 + 5, Johannesburg, S. Africa
February 9	New Annex XII on Heavy-Duty Hybrid Vehicles, Kick Off Meeting, San Diego, California, USA
February 5 & 6	Annex VII Expert Meeting, San Diego, California, USA

Colophon
This electronic Newsletter is produced by IEA's Implementing Agreement on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV). For information about the agreement and for contributions to this Newsletter, please contact the IA-HEV secretary Mr. Martijn van Walwijk at:
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