

16th WHEC DAILY REPORT

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French Minister welcomes the 16th WHEC participants

Yesterday in his opening address, **François Loos**, the French Minister of Industry outlined the importance of energy R&D in order to substantially reduce the emission of greenhouse gases and limit the dependency on fossil fuels. New energy technologies (NET) such as the new generation of nuclear power plants, CO₂ sequestration, clean hydrogen production and fuel cell applications will be the building blocks to greater energy efficiency and sustainability. The progress of NET specifically in France will highly influence the competition in economy and industry both nationally and internationally.

In July 2005 the French Parliament adopted an ambitious Energy Act with the objectives to secure energy supply and independence, to guarantee a competitive price for energy, to protect the environment and to dramatically decrease greenhouse emissions. Taking these challenging issues into account, the new Energy Act sets these goals for the future:

- reduce fossil fuel consumption by 50% over the next 10 years
- maintain or even decrease energy consumption
- diminish the emissions of green house gases by a factor of four by 2050

Loos believes that hydrogen could be the key to environmentally-friendly energy solutions, yet only when hydrogen can be produced with non-pollutive technologies.

European Commissioner Potocnik shows his support of the 16th WHEC

Europe is characterized by a GDP of 10 trillion Euro and a population of 450 million people. Europe consumes 1800 million tons of oil each year, which is about 50% of the world consumption. The next Framework Program (7th FP) has included energy as a main topic, paying special attention to hydrogen, fuel cells and CO₂ sequestration. Maximizing this Hydrogen and Fuel Cell Technology Platform, the Framework Program will work to mobilize the necessary means and support hydrogen and fuel cell readiness within 5-10 years. Among the various tools which will be implemented, the JTI (Joint Technology Initiative) will create opportunities to unite public - private partnerships.

Hydrogen Association Chairmen open up the Conference

President of the EHA **Lars Sjunnesson** opened the Conference early Tuesday morning. He said that over 1000 participants from 45 countries joined the WHEC this year. During the week more than 300 oral presentations and 300 posters are anticipated. He welcomed all participants to take an active part in the discussions throughout the week. Furthermore he pointed out the political interest for hydrogen in order to strengthen the security of energy supply.

Leaning on 20 years of expertise in hydrogen and fuel cells, **Thierry Alleau**, Chairman of the French Hydrogen Association, states his deep-seated conviction that hydrogen will become a major energy vector - at least in the transportation sector - before 2050. That conviction does not rely on the interesting properties of hydrogen, but mainly on the obvious fact that, besides the biofuels which will fill a part of the resources in the transportation fuels, hydrogen is the only storable carbon-free fuel. Whatever the primary energy which is solicited (fossil, renewable or nuclear), hydrogen can be produced without CO₂ emissions, provided that CO₂ is sequestered when issued from fossils. The price is still the main concern; however the cost of hydrogen including CO₂ sequestration is still lower than the European gasoline price with its taxes. Consequently, incentive decisions could – if the political will is there – rapidly open the hydrogen economy through ICE in a first phase, waiting for future cheap fuel cell technology.

Dr. T. Nejat Veziroglu, President of the International Association for Hydrogen Energy, also gave a short

presentation at Tuesday's Opening Session. The IAHE strives to advance the day when Hydrogen Energy will become the principal means by which the world will achieve its long-sought goal of abundant clean energy for mankind. Toward this end, the IAHE stimulates the exchange of information in the Hydrogen Energy field through its publications and sponsorship of international workshops, short courses and conferences. In addition, the association endeavors to inform the general public of the important role of Hydrogen Energy in the planning of an inexhaustible and clean energy system.

Prof. Gang Wan: More than 1000 FC vehicles expected in Shanghai in 2010

In his presentation Tuesday morning, **Prof. Gang Wan**, President of the Chinese Tongji University which is responsible for the coordination of all "Clean Car" projects in China, explained that the exponential growth in the number of vehicles in China necessitates major changes in the transportation policy. From 2000 to 2004, the number of automobiles in China increased from 2.0 million to 5.1 million, leading the government to adopt a "Safe and Clean Energy Vehicle Program" for the next four years. Prof. Wan elaborated on these plans which include the implementation of fuel cell vehicles at the 2008 Olympic Games in Beijing and at the 2010 World Fair in Shanghai. By 2008 China anticipates more than 1000 clean automobiles and buses in circulation, 100 of which will be powered by H₂/FC. In Shanghai they are working on a demonstration program which will employ 1000 public vehicles (taxis and buses) and require 15-20 H₂ filling stations.

Poster Session: Solutions for Hydrogen Production

Decentralized H₂ filling stations could be enhanced through the value added use of oxygen as seen in the **Barth Project**, located in a small, North German town. This filling station has been installed at the community sewage plant. The electricity for the electrolyser comes from a photovoltaic power station and from wind mills via grid transmission. The produced oxygen create 30% better efficiency in the aeration basin. A middle-sized hybrid bus has been designed to be the first customer of this hydrogen filling station. It is powered by a 60 kW fuel cell and an electric motor. Announced at the 2002 Montreal WHEC Conference, this installation has been erected and is now in operation.

More than 1000 MW are generated through the wind mills in Northern Germany, overloading the local electricity grid. The situation will become more critical due to the rising number of wind mills and off-shore installations. Furthermore the problem is stressed by the small electrical demand in this region. The solution could be the **uncoupling of wind energy from the power requirement**. Thus wind parks would be connected with a loop of electrolysis, gas storage and reconversion of hydrogen into electricity. The Barth Filling Station and the Northern German Wind Coupling with the H₂ production are coordinated by Stralsund University of Applied Sciences. (Posters 8-611 and 8-724).

A glance in the exhibition hall

We visited the **PaxiTec/BioLogic** booth to find out more about their work and their ambitions for the future.

PaxiTec, a 3-year old start-up, specializes in the production of Membrane Electrode Assemblies (MEAs) and the development of portable power sources. PaxiTec together with BioLogic Science Instruments developed a new test bench for fuel cells. This joint venture combined PaxiTec's experience in the fuel cell field and BioLogics's expertise in characterization techniques and appliances. Educational test kits have recently been added to PaxiTec's products. These kits include one small, light-weight air-breathing test cell, 3 MEAs, hydrogen source (metal hydride) and the necessary connections. PaxiTec's future plans include increasing the number of partnerships with fuel cell industries, universitites and research institutions as well as developing and producing MEAs that fit to the individual partner's specifications. For 2006 PaxiTec's has set the priority of developing and commercializing portable fuel cell power sources up to 10W, and for 2007 a 50W system is also scheduled for production. You can stop by the PaxiTec/BioLogic booth and see the 3W caving helmets and 20W DVD Player powered with PaxiTec fuel cells. We made another stop at the **Air Liquide** booth. The Air Liquide is recognized for their 40 years of expertise in the hydrogen business: a deep knowledge of the hydrogen "chain", from research to production, distribution and applications. Air Liquide operates more than 200 hydrogen production plants and controls the entire logistic chain safety system. Air Liquide is working on the following points in particular:

- Hydrogen storage in vehicles, technologies of storing gaseous hydrogen at high pressure (350 to 700 bar) and liquid hydrogen at very low temperature
- Hydrogen distribution, Air Liquide is

developing service stations for hydrogen distribution. Air Liquide has already designed, built and commissioned 7 hydrogen stations in the last 4 years. Hydrogen service stations have a fast track system for delivering high pressure hydrogen (700 and 350 bar) to the tank, ensuring complete safety for the driver and the vehicle.

- Axane (a wholly owned subsidiary of the Air Liquide Group, designs, develops and manufactures hydrogen powered fuel cells on international level.

Air Liquide is involved in more than 10 European and French projects using hydrogen as a new energy vector (strategy, storage, fuel-cells, safety). The Hychain Project, coordinated by Air Liquide, is 5-year project (2006-2010) with 158 vehicles (tricycles, scooters, wheelchairs, light utility vehicles and minibuses) and 2000 Clip'on cyclinders (350 and 700 bar cylinders, a major innovation which puts the entire mechanical hydrogen delivery mechanism into motion. Regulators, safety devices and connectors make it possible for any user to remove and replace the cylinder simply and safely. All and all the Hychain Project is made up of 4 partner regions and 24 partners who work with a total budget 36.7 million Euro - 17.2 M€ of which is provided by the European Commission.

A look into the Parallel Sessions

Throughout the course of the 16th annual WHEC - the plenary presentations, the parallel sessions and the poster presentations - hydrogen energy production has remained in the spotlight with over 80 oral presentations and 100 posters devoted to this theme.

The biological hydrogen production seems to be a very promising R&D theme. In the session S07-220 **Nicolas Loubette** from **ALPHEA** gave an overview of hydrogen production processes with bacteria or algae. Four main processes were described: water bio-photolysis, photo-fermentation, biological CO conversion and dark fermentation. Performances, limits and outlooks were given for each process. In the session S07-109 **Bent Sørensen** from the **Roskilde University** presented their work on several schemes of biological hydrogen production. At one end is the genetic modification of biological systems (such as algae or cyanobacteria) to produce hydrogen from photosynthesis, instead of the energy-rich compounds (such as NADPH₂) normally constituting the endpoint of the transformations through the photosystems. A second route is to collect and use the biomass produced by normal plant growth processes in a separate step that produces hydrogen. This may be done similar to biogas production by fermentation, where the endpoint is methane (plus CO₂ and minor constituents).

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