ABSTRACTS

SESSION A: TRANSPORTATION AND REFUELLING INFRASTRUCTURE

1.) H2moves Scandinavia - Status of the First European Lighthouse Project to Demonstrate Hydrogen Fuel Cell Cars in Scandinavia

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Alessandro Gariglio, Tommaso Giunti, David Storer – CRF/Fiat (I)
Mikael Sloth – H2 Logic (DK)
Thomas Berg, Peter Bremer – SP (S)
Tom Elliger, Tim Faber – TÜV SÜD Industry Services (D)
Ulrich Bünger[1], Volker Blandow, Volker Schurig, Martin Zerta – LBST (D)
Sven Wolf – Hydrogen Sweden (S)
Flemming Wennike – Hydrogen Link Denmark Association (DK)

Due to the already existing technical and planned infrastructural achievements, the project partnership has agreed to select Oslo as the first hub for the H2moves Scandinavia partnership. This will give the automobile industry partners the unique opportunity to use one of the densest hydrogen fuelling station networks anywhere in Europe with 4 hydrogen stations in or close to Oslo, hydrogen being locally produced via electrolysis, from renewable electricity or from municipal waste. Currently 15 hydrogen cars with internal combustion engines (Toyota Prius hydrogen) are being operated in southern Norway (Stavanger and Grenland).

The new fuelling station for 70 MPa (equipped according to SAE J2601) to be added during the LHP would then raise the fuelling station number to 5 in the medium-term, which will provide good regional coverage for refuelling the FCVs. The existing fuelling stations and those under construction will enable the operation of the hydrogen fuel cell cars on an extended road network of about 500 km in this first LHP phase. In response to recent developments in the road transport sector, the project partners have agreed to demonstrate two fundamentally different vehicle types:

− **Medium-size sedans:** 10 Mercedes-Benz B-class F-CELL with 70 MPa hydrogen storage, representing the state-of-the-art in fuel cell vehicle (FCV) technology, will be provided by Daimler for extensive every day drive experience in and around Oslo. CRF will incorporate the new powertrain in 2 next generation fuel cell cars based on an Alfa Romeo platform.

− **City car:** The car will be a typical short-range city car for 2 passengers and limited luggage and operational characteristics and with up to 250 km extended operation range from the car's batteries and 70 MPa hydrogen tank. In total 5 city cars are expected to be provided by the Norwegian TH!NK company.

Besides the demonstration project core tasks, the project coordination, a safety & certification/approval assessment for Scandinavia, project performance monitoring & assessment and further dissemination and exploitation of results in 5 European Road Tours are major parts of the project.

Work on all tasks is now in full swing. This presentation will also report on some of the recent achievements and learnings from the project planning phase, such as vehicle and workshop development as well as siting considerations for the stationary fuelling station in Oslo.

[1] project coordinator

2.) Auto-Stack – Implementing a European Automotive Fuel Cell Stack Cluster

André Martin, Ludwig Jörissen

The Auto-Stack project combines key European players including automotive OEMs, component suppliers, and research organizations in a structured approach to facilitate the development and commercialization of automotive fuel cells in Europe.
While the supply base for materials and components in Europe is well advanced, automotive stack integration is lagging behind due to massive investment requirements, fragmented markets and the substantial risks associated with commercialization.
The Auto-Stack consortium is striving to reduce the critical barriers for better collaboration between stakeholders during pre-commercial and early commercial phases by generating a competitive and attractive business case for a European automotive stack industry.
The activities include the definition of a common OEM stack platform concept, close interaction between OEMs, supply chain and research organizations, the development of a joint technology roadmap and ultimately the development of a business case by combining volumes and investment while exploring improved economies of scale. In addition, synergies with other vehicle categories such as public transport buses and off-road vehicles as well as vehicular and aircraft APUs and selected stationary applications will be considered.
The presentation will provide an overview of the project, report about the status of activity, address challenges and describe the key milestones towards achieving the project objectives.

3.) Overview and Status Quo of the NextHyLights Project

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1. Introduction

The project is developing consolidated plans for large-scale demonstration projects across three parallel hydrogen fuel cell electric vehicle (FCEV) segments 'passenger cars', 'buses' and 'other vehicles'. In the case of the bus segment a roll-out plan covering the market introduction will also be developed. The vehicle segment specific work plans will cover the time span including the next large-scale demonstration projects.

2. Status Quo of Hydrogen Vehicles

-Fuel Cell Passenger Cars: About seven major demonstration projects involving hydrogen and FCEVs are ongoing or have been launched recently in Europe. A total of about 100 hydrogen fuelled vehicles and FCEVs are in daily use there compared to 350 hydrogen fuelled vehicles and FCEVs worldwide. In the European area a total of 70 refuelling stations are available but only 30 are in principle accessible by the public. Typical FCEVs are small city vehicles, medium sedan cars and SUVs.
-Fuel Cell Buses: The fuel cell bus market has been growing slowly over the last 10 years. The number of competitors for both fuel cell systems and bus manufacture has increased through time from one firm in 2002 up to 12 firms in 2010. The substantial increase in the last two years, for example, has been promoted by a new wave of demonstration projects, which has led to new investments in the sector.
-Other Fuel Cell Vehicles: The material handling sector (i.e. fork lifts, pallet trucks, lift trucks, tow tractors) is the most active group in the "other vehicle" segment with about 700 demonstrators worldwide. Most of the demonstration projects are taking place in the United States. A total number of 683 material handling vehicles are in operation in the U.S. whereas only 10 material handling vehicles are operated in Europe. Further applications are municipal vehicles, scooters, bikes, boats and ships.

3. Regions Approach and Regions Eligibility Assessment

In its endeavour to support the advancement of FCEVs and hydrogen refuelling infrastructure the European Commission is keen to learn which regions across Europe score highest on a "commitment list". For that reason the project comprises an activity to identify and assess the European regions' commitment on hydrogen and fuel cells for transport.

4. Social Environmental Impact Assessment

Even if FCEVs will have a performance similar to conventional vehicles and be available at acceptable cost, they will only be successful if they meet with good social acceptance. In accordance with Ricci et al., we define acceptance as "a lack of (explicit) public opposition to the introduction of hydrogen as fuel in the transport sector". We distinguish three interrelated types of acceptance. Market acceptance is largely beyond the scope of the project, and the remainder of this section focuses on global and local acceptance.
The environmental impacts resulting from the implementation of hydrogen vehicles are assessed principally for demonstration projects and roll-out scenarios for the bus segment.

4.) CHIC – Clean Hydrogen in European cities

Monika Kentzler, Daimler

The Project CHIC - Clean Hydrogen in European Cities will be the essential next step to full commercialization of hydrogen powered fuel cell (H_2FC) buses. The project will facilitate the integration of 26 fuel cell hydrogen busses in daily operations and bus routes in 5 cities across Europe.

The key facts:

- 26 partners from around the world
- 5 cities
- 26 fuel cell buses
- 2 filling stations per city
- Demonstration phase 2010-2016
- 25.9 Mio. EUR funding
- 81.9 Mio. EUR costs
- at least 3 different bus manufacturers

The CHIC project will:

- Intensively test the **technology** to generate learning for the final steps towards commercialisation in 5 European model regions by:
    - **Operating a minimum of 26 H_2FC buses** in medium sized fleets in normal city bus operation and
    - Substantially **enlarging** hydrogen **infrastructure**
- **Embed** the substantial **knowledge and experience** gained from previous H_2FC bus projects (CUTE & HyFLEET:CUTE).
- Accelerate the development of clean public transport systems in 14 **new** European Regions.
- Conduct a life cycle based **sustainability assessment** of the use of H_2FC buses in public transport, based on a triple bottom line approach considering **environmental, economic and social aspects.**
- Build a **critical mass** of public **support** for the benefits of 'green' hydrogen powered transport, leading to increased visibility and political commitment across Europe.

The project is based on a staged introduction and build-up of H_2FC bus fleets and the supporting infrastructure across Europe. A phased approach will link experienced cities with new cities in partnerships, greatly facilitating the smooth introduction of the new systems now and into the future.

5.) Fueling Stations : The way forward with electrolysis

Wido Westbroek, Vice President and General Manager, Hydrogenics

This presentation will give insight on Hydrogenics Europe's way to address the market.

Topics covered :

- Introduction on Hydrogenics
- Water electrolysis technology today: the HySTAT™ based fueling stations
- Update on 2010 fueling projects by Hydrogenics
- Are there real bottlenecks to electrolysis? (complexity, cost, footprint, reliability)
- Electrolysis for energy storage and grid stabilization
- Future R&D needs

6.) HYSYS - system components for hybridized fuel cell vehicles

Jörg Wind, Daimler AG; Vittorio Ravello, CRF; Rolf-Peter Essling, NuCellSYS; Alain Corbet;PSA; Peter Prenninger, AVL;

Fuel Cell Electric Vehicles (FCEV) are considered to contribute largely to a future sustainable mobility. FCEVs as well as other electrified vehicles use electrical drive train components which have still to be improved to be ready for the mass market at low cost. Principal functionality of FC vehicles under all day conditions has already been demonstrated with a relevant number of prototype cars from a large number of car manufacturers, also in projects funded by the EU (like CUTE/ECTOS). Nevertheless FC-vehicles, FC-stacks and -systems do not yet meet all requirements for mass market introduction. Several components for FC-hybrid vehicles have to be improved to meet all necessary requirements for mass production. The overall goal of the project HySYS is the improvement of fuel cell system and electric drive train systems for fuel cell hybrid vehicles and ICE hybrid vehicles with a clear focus on fuel cell vehicles. To achieve this goal several key components for FC vehicles have been developed and tested on the test bench. Work in HySYS is focussed on electrical turbochargers for air supply, low cost humidifiers, hydrogen sensors for automotive use, effective low cost hydrogen supply line, high efficient, high power density drive train and high power Li-Ion batteries. The components have been integrated in two fuel cell vehicles, one from Daimler and one from Fiat. Both vehicles are currently been tested in order to validate the components under real road conditions in the vehicle.