FUEL CELLS BUS (FCZ H_2-BUS) (FUEL CELLS CZECH HYDROGEN-BUS)

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Project characteristic

At present, hydrogen as an energy source for the transport and power supply industry is one of the most intensively investigated topics. It is expected, world over, that there will be a gradual transition from the fossil-based economy (2000) to more ecological and source-independent hydrogen economy (2050). The related effort is performed on several levels – the topic is addressed at research institutes, industry, important point is that there is also a political support – the President of the USA declared the hydrogen economy support (stressing out the independence from oils supplies from politically instable regions), allocating 1.7 milliard dollars for the corresponding research and development for the next five years. The European Union has decided to become "a leading player" in a hydrogen and fuel cells field and consequently in 2004 founded Technology Platform for Hydrogen and Fuel Cells (the UJV Řež a.s - coordinator of the project under preparation takes part in this Platform) to support the necessary R&D.

Another reason, why energy use of the hydrogen is so much a centre of attention, is protection of the environment. Hydrogen – electricity transformation in a fuel cell is accompanied with only one waste product – water – thus this energy generation method is ecologically friendly. Hydrogen can be produced from a large number of raw materials (water, biomass, natural gas, etc.) using for the process a number of energy sources, including renewable ones, obviously "home available", which minimises the country dependence on the strategic energy import.

The main objective of the project under preparation "Hydrogen technologies for Fuel Cells, Transport and Energy Uses" is to initiate activities connected with hydrogen utilisation in transport and power supply, which should be a significant contribution to the Czech Republic sustainable development. One of the most important social areas connected with the energy utilisation is the transport area – the reason why it was selected for the pilot project, similarly as in many other countries.

The prerequisite of any technology successful development is its acceptance by the general public, so if the Czech concept of motor vehicles driven by hydrogen will fulfil this condition it would have prospects for further development. Implementation of such a project (operation of motor vehicles driven by hydrogen) requires solution of a number of partial issues: hydrogen production, purification, storage, transportation to the end-users and vehicle actual operation. Research of the corresponding technologies and their

implementation in practice is the backbone of this project, which, if realised, will be the first of its kind in the new EU countries.

Objectives and scope of FCZ H2-BUS project

The project objective is the development, implementation and operation of hydrogen driven bus. Hydrogen will be obtained from Spolana Neratovice, where it is generated as a by-product (unused) of several technologies in the amount of approximately several tonnes per day. For technological reasons such hydrogen should be purified, which is a joint task for VŠCHT Praha and Spolana Neratovice.

Purified hydrogen will be available for the bus at pump station, which will be developed and constructed by Linde Gas within the Nerabus site (land of Neratovice town). In the future the same facility may be used also for some other hydrogen-driven vehicles.

Advanced technologies utilised in the bus will allow optimising energy flows (fuel savings – longer range). The main energy source will be electricity generated by fuel cells (manufacturer Proton Motor, output approximately 100 kW), other parts are: NI-Cd accumulator for energy recuperation while braking, and a large capacitor to carry over the current peaks during starting up to speed. Hydrogen will be stored as a gas under pressure of 35 MPa in eight pressure vessels, 205 l (41 kg of H2) each, which will be mounted on the bus roof.

Electric drive will be developed by Škoda Electric that has many-years experience with trolleybuses, including engine control system. The company will be also responsible for final completion of all parts and finally – the bus commissioning.

System MMI (LCD panel), which will be developed, will demonstrate interesting parameters of the new bus (energy flows, amount of CO_2 and other harmful substances “saved” during run) to its passengers.

H_2 FC Bus in Stuttgart (CUTE)

Hydrogen filling station in Island

Due to the scope, exigence and availability of the involved technologies, it was necessary to establish a strong consortium with an international participation (Germany, Netherlands), which will ensure that all the set out objectives will be fulfilled.

Project partners

NRI Řež CZ

- Project coordinator, safety and legislation issues

Škoda Electric CZ

- Electric drive, control system, bus finalisation (assembling)

Proton Motor GmbH Germany

- Fuel cell development and fabrication, fuel tanks, hydrogen infrastructure within the vehicle

Spolana Neratovice CZ

- Hydrogen production and purification

VŠCHT CZ

- Proposal of the hydrogen purification technology

Linde Gas CZ

- Development and construction of the hydrogen filling station

IFE Halden Norway

- Monitoring, information and control technologies, MMI (Man Machine Interface)

JRC Petten Netherlands

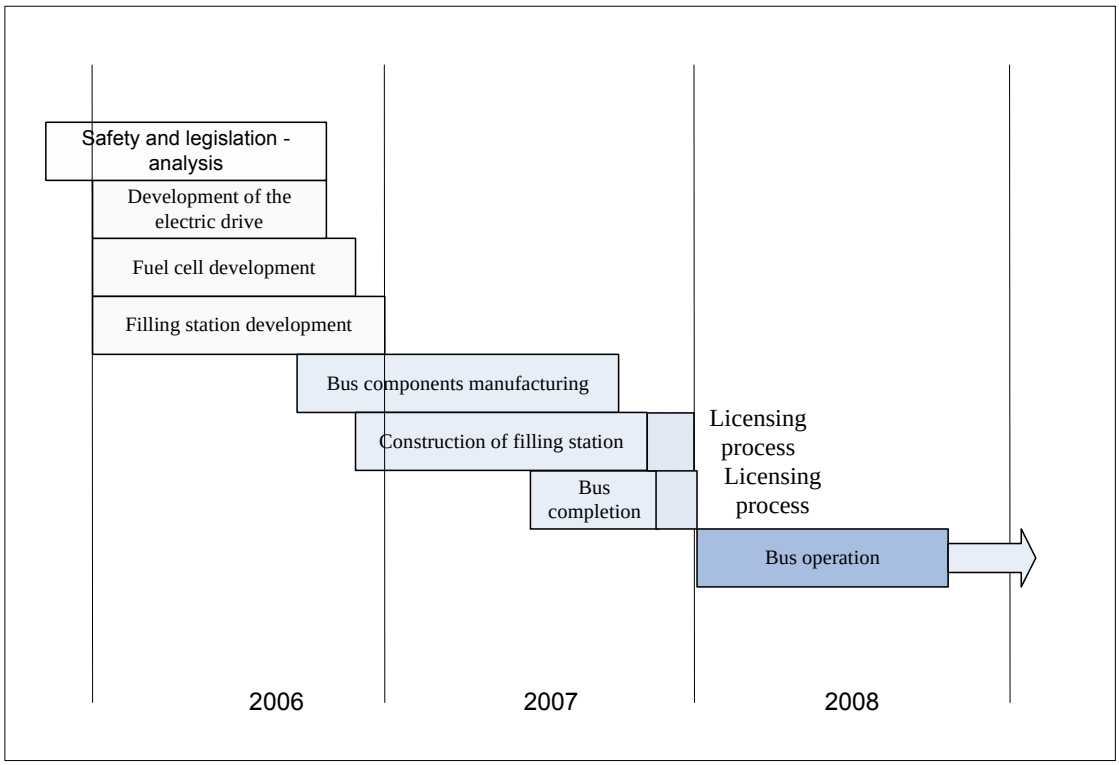
- Consultations on safety and legislative aspects

Nerabus CZ

- Bus operation in Neratovice town

Important project partners were (and are) Central Bohemia region – transport section; town Neratovice and VÚMV TÜV – licensing of the bus operation on highways.

Time schedule



Financing

The hydrogen purification issue is at present addressed within the framework on the ongoing project of the Ministry of Industry and Trade, in which, besides the main contractor – Nuclear Research Institute Řež a.s., participate Spolana and VŠCHT. The project objective is hydrogen in a quality suitable for fuel cells.

Development and manufacturing of the bus and filling station will be financed from the Structural EU funds Infrastructure programme, action 2.3 – support of the alternative fuels implementation. For technical reasons the project was divided into two parts: development and realisation.

Conclusion

The Czech Republic step-by-step joins in the international effort of starting-up the hydrogen economy seen as a way to achieve the sustainable growth and significant improvement of the environment. At present, in our country this effort is very sporadic and divided, therefore the presented project would be a clear momentum, which would in this area set the Czech Republic forward - into the family of the most developed countries. Thus, the project realisation will put the base for the Czech ecological transport. As a result, the harmful emissions and noise pollution of the environment will be significantly reduced and last but not least – reduced will be also dependence on the oil import.