

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION – UNIDO

Represented by the International Centre for Hydrogen Energy Technologies - ICHET

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INTRODUCTION AND BACKGROUND

The Developing World has the potential to create a viable hydrogen energy market if it is to leap frog to hydrogen energy technologies. UNIDO ICHET is ideally placed to complement existing or potential national activities, providing funds, technical expertise, or support to secure funds from third parties.

UPDATE ON MEMBER'S ENERGY FRAMEWORK

Among its various Energy Efficiency and Renewable Energy activities, UNIDO signed a Trust Fund agreement with the Turkish Ministry of Energy and Natural Resources amounting to \$US 40M to establish and run the International Centre for Hydrogen Energy Technologies (ICHET). ICHET was thus established in Istanbul, Turkey in 2003 and commenced its activities in May 2004.

In its eight years of operation, the centre has managed to realize a number of projects ranging from developing technology demonstrators, establishing laboratories, organizing education and training activities, supporting universities, and industry undertake RD&D, to establishing major pilot infrastructures. In parallel, an appropriate team of scientists was established along with the right team spirit. The centre is now acknowledged as a viable hydrogen energy partner in Turkey and internationally by UNIDO, the IEA HIA, N-ERGHY, and the GEF. ICHET has thus completed the first cycle of developing prototypes and facilities and is thus ready to move to the second cycle, supporting these products enter the market.

HYDROGEN RD&D SPECIFICS

PROGRAMS, PROJECTS, INITIATIVES IN BRIEF

Bozcaada Island wind-solar Hydrogen project

A renewables and hydrogen technologies system was erected on the island of Bozcaada. The total project budget was \$US 1.5 M covered by ICHET. The main features of the system are a 20 kW PV system (already installed) a 30 k wind turbine (installed but eventually removed due to problems and about to be replaced) and a hydrogen production (10 Nm³/hr @ 30bar), compression (220 bar) and storage unit. Hydrogen is used to power 15 kW of PEM fuel cells and a 35kW H₂ genset. The system was inaugurated in October 2012.



Figure 1: Bozcaada Island Wind-solar H₂ Project

VITAL STATISTICS

UNIDO headquarters are in Vienna, Austria. 173 States are Members of UNIDO. ICHET is located in Istanbul, Turkey

Outline

The United Nations Industrial Development Organization (UNIDO) is a specialized agency of the United Nations. Its mandate is to promote and accelerate sustainable industrial development in developing countries and economies in transition, and work towards improving living conditions in the world's poorest countries by drawing on its combined global resources and expertise.

UNIDO is managing the process of forming ICHET and is running the project titled "Establishment and Operation of the International Centre for Hydrogen Energy Technology (ICHET)" according to the Trust Fund Agreement signed in October 2003 between the Government of Turkey and UNIDO.

ICHET aims to promote viable implementations of hydrogen energy technologies in Turkey and in developing countries.

UNIDO is the IEA HIA member (Contracting Party) and has delegated ICHET to represent UNIDO in the IEA HIA.



Development of Hydrogen Fuelled 3-Wheeled Vehicles in New Delhi

This project that was launched in March 2009 finally came to a completion in December 2011. Its aim was to develop and demonstrate a fleet of fifteen 3-wheeler vehicles in Pragati Maydan exhibition ground in New Delhi, complete with a hydrogen refueling infrastructure. Modifications were made to the engines, fuel tanks and fuel lines of the vehicles along with the engine control unit. The project partners are IIT Delhi, Mahindra and Mahindra, Air Products and UNIDO India. UNIDO ICHET provided 50% of the US\$ 1M project budget. Air Products provided the S100 refueler along with expertise. The fleet of vehicles consisting of 5 cargo (picture) and 10 passenger vehicles was developed well in time. However permissions to operate the refueling facility and the vehicles took almost a year to obtain from the respective Indian authority (PESO) due to the fact that hydrogen is a new fuel. Inauguration of the fleet and the refueling facility was planned for January 2012.



Figure 2: Hydrogen Fuelled 3-Wheeled Vehicles in New Delhi

Hydrogen Production and Filling Station on the Golden Horn

This \$US 2M project is funded by ICHET and involves the erection of a facility on the Golden Horn of Istanbul for the production of hydrogen through electrolysis (30 Nm³/hr), its compression and storage at 440 bar and the dispensing of hydrogen to a hydrogen bus (40kg per day) and a hydrogen ship (25kg per day). The electrolyser and compressor modules have been built the respective containers and were shipped to Istanbul for delivery in early 2012. A delay has been announced in terms of delivering the hydrogen storage tanks.

Missions to Developing Countries

Missions were realized to Iran, Thailand and Malaysia. There are more than 500 researchers and more than 50 institutions active in hydrogen and fuel cell research in Iran. Pilot and laboratory facilities focus on hydrogen from renewables and fuel cells. There is potential for hydrogen applications in the transport sector of Thailand in terms of converting the rickshaws to run on hydrogen. Similarly, there is potential to realize a pilot hydrogen community project in Malaysia focusing on the local Proton vehicle manufacturer that is active in H₂ and FC projects through their Lotus subsidiary in the UK.

Technology Demonstrators



Figure 3: H₂ and FC Boat

Three H₂ and FC powered boats have been developed by respective Turkish universities where ICHET provided 8kW PEM FCs and support for their installation and integration. A 5kW FC-based UPS system was installed at OSTIM of the Turkish Ministry of Science Industry and Technology.

Training, Committees. ICHET co-organized with the EC Joint Research Centre the 4th Summer School on PEM Fuel Cells took place in Izmir Institute of Technology campus in Urla, Izmir on July 11-15, 2011. It was attended by a total of 42 MSc, PhD students, and lecturers from 20 countries. A short course on FCs and a workshop on fuel cell modeling were also organised. ICHET launched an initiative with the Turkish Standards Institute (TSE) to develop and implement hydrogen and fuel cell standards in Turkey.



EC Projects

ICHET is a partner in three JU projects, namely FITUP, SHEL and Hy-professionals. FITUP involves the application of PEM FC-based UPS systems in mobile phone relay stations. SHEL deals with the development of a small fleet of H₂ and FC-powered forklifts to be demonstrated in three locations in Europe. Lastly, Hy-professionals involves the development of educational programmes and training initiatives related to hydrogen technologies and fuel cells in Europe.

ICHET Laboratories

Laboratory infrastructure has been improved in order to conduct long-term tests for the FITUP project. Also 2 kW and 12 kW test stations have been commissioned. ICHET Labs were used for the testing of 48kW PEM FCs that are to be installed in a hydrogen ship as primary power for propulsion units.



Figure 4: ICHET Labs

REFERENCES

<http://www.unido-ichet.org/>, <http://www.unido.org/>

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