



## Hydrogen - A Competitive Energy Storage Medium To Enable the Large Scale Integration of Renewable Energies

Seville, 15-16 November 2012

### Island and remote communities An early H2 market also for the Developing World

#### Overall Objectives and Budget

To implement a Renewables and Hydrogen energy technologies system on a remote island of Turkey. To assess the performance of the various components and of the overall system. To provide a demonstration, training and education facility for researchers and technicians of the developed and developing world.

Total budget was 1.5 MUS\$ covered 100% by UNIDO International Centre for Hydrogen Energy Technologies (ICHET). Local authorities of Bozcaada island hosted the system providing suitable roof space for installing PV panels and land for the wind turbine and hydrogen components.

**Islands / remote communities are suitable but challenging early markets for hydrogen energy technologies**

#### Technical Barriers and Targets

To realise, operate and maintain a technically advanced hydrogen energy system in a remote location – limited local technical skills, 12 hours drive from Istanbul. To install a RES-H2 system capable of providing back-up power to Governor's building (30kW peak). To check technical maturity and market readiness of hydrogen energy sector in terms of providing turn-key containerised system. To test performance of electrolyser under highly variable input power, as produced by wind turbine and PV.

#### Technical Accomplishments / Progress / Results

RES-H2 system installed consisting of 20kW PV, 30kW wind turbine, 50kW 30bar electrolyser, 35kW H2 gen-set, 20kW FC, 40kW H2 storage at 20 and 220 bar. Local skills adequate for operation of plant following training. Unsatisfactory operation of wind turbine in terms of safety and noise – small wind turbines are crude for installation in vicinity of buildings. PEM FCs synchronisation with grid problematic, change in inverters necessary. Considerable parasitic losses of H2 gen



UNIDO ICHET Hydrogen energy facility on Bozcaada



Port of Bozcaada island, Turkey

set due to heating requirements in winter. Damaged sustained at electrolyser stack due to very low temperatures.

#### Future Work

Commissioning of the plant is to be completed by end of 2012. Monthly test campaigns foreseen on dynamic performance of plant, component and system overall efficiency. Stand alone operation to be simulated. Facility to be used for summer school for H2 and FCs for engineers from developing world. Facility to be expanded through addition of hydrogen vehicle and hydrogen boat. Similar systems to be promoted in the context of South-South cooperation on islands of the South Pacific Ocean.

#### Conclusions and Major Findings

The industry has matured enough to be in a position to offer complete H2 production, storage & use systems rather than just components. Adequate level of technical expertise on compressed gases is required at national level and knowledge of electrical – mechanical devices on site. Still challenging to implement and employ such facilities outside industrial estates. Synchronisation of FCs with grid still not a straightforward issue.

#### Project Overview

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- Local Governorship of Bozcaada island
- 04/09 to present (on-going)
- [www.unido-ichet.org](http://www.unido-ichet.org)