

## **A Preliminary Study of Integrated Renewable Energy with Fuel Cell Power Generation**

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### **Abstract**

An integrated demonstration system including renewable energy sources of 20 kW solar photovoltaic (PV) and 10 kW wind power, a water electrolyser to produce hydrogen, a metal hydride hydrogen storage device and a 2 kW fuel cells power generator has been designed and set up at the Taipower Research Institute. In view of the ever-diminishing traditional fossil energy, developing renewable energy sources such as solar and wind power becomes important. This is especially true for Taiwan where a lack of conventional energy has already driven up its import dependency to 98%. However, the intermittent nature of these forms of energy is one of the major obstacles keeping renewable energy from being widely adopted as a major source of energy supply. A system making use of the intermittent and/or excess renewable energy coupled with the well-developed water electrolysis technology would produce hydrogen to fuel an efficient fuel cell power generator and supplement the grid capacity when the need arises.

Hydrogen generated by water hydrolysis from the system above can be regarded to serve as an energy carrier, which stores the surplus renewable energy, and the stored energy is released via the fuel cell to meet the demand at a later time. One of the characteristics of the integrated demonstration system is that hydrogen is stored in a metal hydride hydrogen storage device, instead of the common high-pressure tank storage, to save on the parasitic energy consumption and footprint of the system. The demonstration system is scheduled for commissioning at the end of 2006 and, in this preliminary study, factors including on-site load demand profile, availability of renewable energy sources, effectiveness and efficiency of energy storage, the power regeneration and its usage have all been considered and will be presented and discussed in this paper.