

# Technical Visit to Solar Energy Research Institute, UKM

by **Ir. Mohamad Fadzil bin Adnan**, MIEM, P. Eng.

**THE** trip to the Solar Energy Research Institute (SERI) at Universiti Kebangsaan Malaysia (UKM), Bangi, was organised by the Chemical Engineering Technical Division of IEM on 28 February 2009.

SERI is one of the few research centres in Malaysia to spearhead research in the solar energy field. The institute conducts various research and development (R&D) activities in the solar energy field including solar thermal systems (solar dryers, innovative solar water heaters), photovoltaic (PV) systems (grid connected PV, hybrid standalone systems), day-lighting, radiative cooling, solar hydrogen production system, and photovoltaic thermal solar collectors.

The team was received by two SERI representatives, namely, Dr Sohif bin Mat and Mohamad Arif bin Mokhtar. The visit started with a tour to the Solar-Hydrogen Eco-house, which is the first in the world to be fully self-sustainable and runs entirely on hydrogen.

The house is part of UKM's new fuel cell and automotive research centre and was sponsored by the Science, Technology and Environment Ministry, as it was then known. The eco-house was awarded the ASEAN Energy Award 2005 under the Special Submission Category.

Forty-two multi-crystal PV panels, which have a capacity of 5kW, were mounted on the rooftop of the house. When sunlight hits the PV panels, solar energy is converted into electricity, which is then used to run an electrolyser unit inside the house. The system uses solar power to convert ionised water into hydrogen and oxygen through electrolysis.

The electrolyser has a capacity of 0.54m<sup>3</sup> per hour of hydrogen production, and is used to transform electrical energy from the PV panels into chemical energy in the form of hydrogen. (Oxygen formed is vented into the atmosphere.) A hydrogen gas purifier then purifies the hydrogen before storing it in a 1,500 litre vertical-standing storage tank outside the house.

The hydrogen is then used to run a fuel cell, cooking stove and boiler for the absorption air-conditioning system. When the hydrogen tank is full and household appliances are not in use, the excess electricity will be injected back into the grid. The eco-house functions just like any home except that it utilises hydrogen as a fuel to operate household appliances.

Besides the obvious eco-friendly solar hydrogen system, the eco-house's design also incorporates low energy architectural features such as shading, natural ventilation



Front view of SERI's solar-hydrogen Eco-house which was awarded the ASEAN Energy Award 2005 under the Special Submission Category



Visit to SERI's office cum exhibition room.

and day-lighting. It also has a rainwater recycling system that is powered by solar energy. This combination makes for a sustainable and environmentally-friendly residential dwelling, helping to reduce air pollution, global warming and acid rain, besides aiding in conserving depleting fossil fuel.

After a light refreshment prepared by SERI, the participants visited the SERI office where various models and products were shown. Dr Sohif gave a briefing on their functions and applications. There were also numerous awards on display that SERI had garnered, both locally and internationally, which recognised its efforts in carrying out research in the solar energy field.

The group proceeded to the solar park which is located outside of the UKM campus. There were a number of demonstration units on solar thermal applications. There was also a hybrid solar-wind power generation unit. However, the park has been badly vandalised and most of the metal parts have been scavenged. ■