

# Role of hydrogen in future renewable energy system

F. Barbir\*

*Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, R Boskovic 32, 21000 Split, Croatia*

(\*) fbarbir@fesb.hr

It is possible to envision an energy system 100% based on renewable energy sources, namely solar, wind hydro and some biomass. The installed power generating capacity would be significantly larger than it is in the present energy system. This is due to three major differences from the present energy system: 1) there would be much larger need for electricity as electricity would also be used for transportation, thus completely replacing diesel and gasoline; 2) there would be a need for storage of the large quantities of energy which is achieved mainly via power to gas technologies; 3) the solar and wind power plants have much lower capacity factors which is determined by the available annual insolation and wind power.

Although both solar and wind are highly intermittent energy sources their combination, particularly with hydropower plants would result in lower needs for energy storage. Further reduction in needs for energy storage would be accomplished by integrating the transportation sector, as well as with thermal energy storage.

Energy savings and rational use of energy in every sector are essential, particularly in building sector by energy retrofitting the existing and building the new ones to higher energy standards, also by applying efficient heat pumps, both electric and gas. The highest energy savings are possible in transportation, as both electric and fuel cell vehicles are much more efficient than the present, internal combustion engine vehicles.

Hydrogen would have a significant role in such an energy system, serving as a transportation fuel, energy storage and a feedstock for methane generation. Methane is considered as an energy carrier mainly in order to use the existing natural gas infrastructure. Eventually, in more distant future hydrogen could also be used directly in all the applications where natural gas is used today and methane in the envisioned renewable energy system.

The presentation will cover hydrogen as an energy carrier, its history, current status of technologies for hydrogen production, storage and use, and the role of hydrogen in future energy system 100% based on renewable energy sources.