Renewable hydrogen energy - an answer to the energy crisis

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Harvesting solar energy to produce renewable, carbon free and cost effective hydrogen as an alternative energy source is the focus of a new £4.2 million research programme at Imperial College London, it is announced.

The College's Energy Futures Lab receives the funding from the Engineering and Physical Sciences Research Council (EPSRC).

The programme will develop both biological and chemical solar driven processes to develop renewable and cost effective methods of producing hydrogen which can be used to operate fuel cells. Fuel cells are electrochemical devices that can convert hydrogen to electricity and heat at a very high efficiency, with the only emissions being clean water.

Scientists believe that hydrogen could be an effective solution to reducing the world's dependence on non-renewable carbon-producing fossil fuels because it is clean, portable and versatile. Professor Nigel Brandon, Principal Investigator on the project and Director of the Energy Futures Lab, says:

"The successful production of solar energy-driven renewable hydrogen could transform the supply of carbon free fuel and make an enormous impact on the viability of hydrogen as an energy carrier. In addition, it will be an essential step on the route to fully exploiting fuel cell technology. It will position the UK as a world leader in one of the very few solutions to a truly sustainable energy future."

Spanning five years, the project aims to significantly increase the efficiency of solar driven hydrogen production processes, integrating science and engineering to deliver a prototype reactor for domestic and industrial use. This will create a unique facility, which the team hopes will place Imperial College and the UK at the forefront of renewable hydrogen production, both for the UK's own future clean energy supply and also for the sustainable exploitation of hydrogen energy worldwide.

The project aims to develop materials and technologies for the enhanced production of hydrogen from water using solar energy to drive the process. The biological process will mimic how plants work, using green algae. The oxygen and hydrogen produced will then be separated and the hydrogen stored, ready for use in a fuel cell. The chemical process will use photo-electrodes to directly split water into molecular oxygen and hydrogen using both inorganic electrodes and molecular catalysts whose function will mimic the water oxidation enzyme of plant photosynthesis.

The project will culminate in the design, build and operation of a working prototype system, with the aim of demonstrating that solar energy can be directly harvested to produce hydrogen, and in turn cost effective electricity and heat.

EPSRC Interim Chief Executive, Dr Randal Richards says:

"This is excellent, exciting, multidisciplinary research. It is also the first time that we have funded a project of this size in the area of solar hydrogen production. This work has enormous potential to speed up the development of competitive alternatives to fossil fuels. It will significantly strengthen the UK's contribution to the international effort to deliver new sustainable energy technologies."

The programme draws together a new interdisciplinary team from across Imperial College, under the umbrella of the Energy Futures Lab, with

Professor Nigel Brandon as the Principal Investigator. The team comprises Jim Barber (Molecular Biosciences), James Durrant (photochemistry), Klaus Hellgardt (catalytic reactor engineering), Geoff Kelsall (electrochemical reactor engineering), David Klug (molecular energy transduction), Geoff Maitland (energy engineering), and Peter Nixon (Biology).

Source: Imperial College London