

What Lies Ahead For Australia's Energy Future?

The emergence of the 'hydrogen economy' is seen by many to be a cure-all for problems facing the industrialised world.

Scientists worldwide are embracing the use of hydrogen as a clean, safe and efficient fuel, saying it is the saviour of transport industries, a boost for the renewable energy movement, and a way for oil-deficient nations to become energy-independent.

A Commonwealth Government initiative, the recently launched National Research Flagship Energy Transformed (the 'Flagship'), aims to take the first steps towards developing Australia as one of the world's first hydrogen economies.

The large research project, undertaken by leading Australian scientists, will work towards: doubling the efficiency of fuel use (natural gas and eventually hydrogen) by the generation of power/heat/cooling at point-of-use; developing and implementing technologies leading to near zero emissions power from fossil fuels and eventually, large-scale hydrogen generation; developing cost-effective electricity and hydrogen from renewable sources; and increasing the fuel and traffic management efficiency of urban transport leading to an eventual transition to hydrogen-powered vehicles.

According to CSIRO acting chief of energy technology, Dr Jim Smitham, gasification technology will move towards achieving zero emissions from fossil fuels.

"Gasification is the generic technology for producing, firstly, a syngas and then reacting it further to produce a hydrogen gas mixture with carbon dioxide before separation", Dr Smitham said.

"The primary interest for Australia is coal, as it is in the US, although the principles and reactions are equally applicable to natural gas. In the case of natural gas, the cost of the fuel is higher and a major consideration as to whether it will be the long term source of hydrogen."

Dr Smitham said natural gas was a prime source of hydrocarbons already. "... it can be exported and used, or used domestically. The decision on whether natural gas is more valuable in use or in storage ultimately comes down to the total cost of exploration, development and use, including environmental costs.

"... the hydrogen economy could be provided by a route starting with natural gas. The largest current production of hydrogen is from natural gas.

"The development of Australia's natural gas reserves will be required for current needs



CSIRO Energy Centre in Newcastle.

and future needs. Even at present, removing carbon dioxide at the wellhead from the natural gas is practised and increasingly it is stored underground in depleted gas reservoirs.

"As I said earlier, natural gas can be a great source of hydrogen via the chemical gasification process if the economics compared with substitute fuels are favourable."

Dr John Wright of CSIRO, Director of the Flagship initiative, said use of hydrogen would help to eliminate greenhouse gases and air pollution, create greater efficiencies and build a new export industry in energy technology.

The recent launch of the Flagship initiative coincided with opening of the \$36 million CSIRO Energy Centre in Newcastle, which represents the largest base of energy research and development in the Southern Hemisphere.

Dr Smitham said the new centre was a "... distributed energy system in action", a living example of the smart use of energy.

"Photovoltaic cells, gas microturbines and wind generators will initially provide most of our power, with any surplus being fed back into the main grid", Dr Smitham said.

"Building and energy management systems are also in place and we are monitoring the performance of the various technologies in relation to our needs.

"Effective distributed energy systems make good use of waste heat. In our case, the waste heat from two 60kW microturbines will provide space and water heating in winter and will be linked to novel turbo-chiller technology in the future for cooling in summer."

CSIRO CEO, Dr Geoff Garrett, said researchers in the energy sector worldwide were keenly aware of the importance of

moving quickly towards cleaner energy generation, and ultimately a hydrogen economy.

"We believe that demonstrating new and emerging technologies in a working building is an excellent way to show our industry and government partners what can be achieved", Dr Garrett said.

Dr Wright said that distributed generation would become increasingly important as demands on national centralised generation and transmission infrastructures increased.

"Recent power blackouts in the United States, Italy and Denmark demonstrate that total reliance on central power generation is not a wise future option", Dr Wright said.

"Unfortunately, we use so much power that distributed generation can be only part of the solution. We must strenuously research and promote cleaner options in large scale centralised generation systems."

Dr Smitham said he envisaged petroleum exploration would continue in parallel with alternative energy technology developments in the short to medium term because the petroleum reserve situation was declining globally.

"Global petroleum production has peaked or will peak in the relatively near future", he said. "Petroleum exploration is occurring in many accessible areas of the world, that is, not prevented by governments, but also in areas of increasing inhospitality such as deep oceans in the Gulf of Mexico."

Dr Smitham said that while the petroleum industry had not yet offered to work with the centre to achieve near zero emissions, it appeared that the industry viewed the goal as realistic.

"A number of petroleum companies are supporting 'hydrogen economy' projects of their own in conjunction with automotive companies", he said. ■