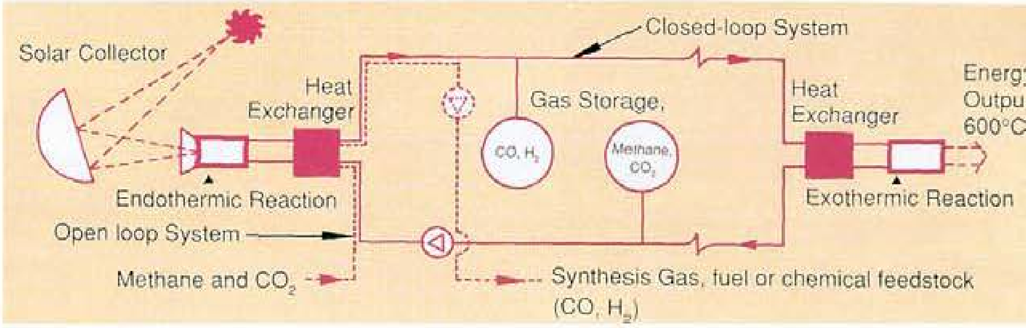
Storing energy while the sun shines

Solar energy should be a valuable resource for countries such as Australia, where there is plenty of sun. But a major problem is storing that energy and transferring it from areas of supply to those of demand.

A new CSIRO project, jointly funded by Pacific Power, the Energy Research and Development Corporation and the New South Wales State Energy Research and Development fund, could help solve this problem. Pacific Power is also collaborating in the research.



The joint project centres on a chemical reaction which uses concentrated solar energy and a chemical catalyst, such as rhodium, to react together with carbon dioxide and methane to form synthesis gas (a mixture of hydrogen and carbon monoxide).

Later, possibly after being transported elsewhere, the synthesis gas can be reformed, releasing energy and leaving the methane and carbon dioxide to be cycled back and re-used. Given a concentrated solar energy input at about 800°C it will be possible for the energy output to be in the order of 600°C.

The technical feasibility of the concept is not in doubt. But to be successful, research is needed to optimise the design of the catalyst and chemical reactor and establish how well it performs under intermittent solar energy.

Project manager, Jim Edwards, from the Division of Coal and Energy Technology, says the technology should not be solely seen as utilising solar power, but as a way to get more out of our natural gas resources.

'By using solar power to produce synthesis gas we are effectively adding 40% to the energy value of methane,' Edwards says.

'It could allow us to make better use of methane from coal seams and landfills, currently considered low value (they contain non-combustible carbon dioxide).

'Also, synthesis gas is a building block in the production of fuel and chemical feedstocks. The research has implications beyond straight energy production.'

The project, which began in February, is to run for two years with CSIRO refining the catalyst and reactor systems and Pacific Power investigating how it can link to high-power solar energy production.

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Ceramic-cell technology world class

A new laboratory at Monash Science and Technology Park in Melbourne will advance Australia's development of ceramic fuel cells, an efficient, low pollution alternative to traditional power-generation technologies.

The laboratory will host research by Ceramic Fuel Cells Ltd (CFCL), a company established by a consortium in July, 1992 to develop world-competitive solid oxide (or ceramic) fuel cell technology. The venture is based on seven years of research into zirconia technology by CSIRO's Division of Materials Science and Technology.

Members of the consortium are CSIRO, BHP, the Energy Research and Development Corporation, Pacific Power, the State Electricity Commission of Victoria, the Strategic Research Foundation and the Electricity Trust of South Australia.

CFCL has underway a five-year, $30 million research and development program employing a team of about 40 scientists, engineers and technologists. The program aims to produce multi-kilowatt fuel cell stacks for testing in a variety of applications by 1997. In the long term, the company plans to establish an international solid oxide fuel cell business centred in Australia.

A ceramic cell is an electrochemical device that converts fuel (such as hydrogen, natural gas or coal gas) and an oxidant (such as air) directly into electricity. This eliminates the usual process of combustion and conversion of heat energy via mechanical means to electricity. The method is efficient and environmentally sustainable.

Extensive use of solid oxide fuel cells is expected to yield significant reductions in pollution and emissions of greenhouse gases. The ceramic fuel cells can convert fossil fuels to electricity with 60% efficiency without heat recovery and possibly 80% with heat recovery, compared with 30-35% efficiency achieved by current coal-fired power stations.

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Dr Karl Foger from the Division of Materials Science and Technology and Lars Christiansen from Ceramic Fuel Cells Ltd at the opening of CFCL's new laboratory.