

1KW DEMONSTRATOR FOR NOVEL FUEL CELL CATHODE SYSTEM

LEAD ORGANISATION

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COST AND DURATION

The Carbon Trust contribution towards this project is £249,288. The project started in July 2008 and is due for completion in July 2009.

PROJECT REFERENCE NUMBER

077-177

OBJECTIVES

The objective is to demonstrate a 1kW proton exchange membrane (PEM) fuel cell system that is based on ACAL Energy Ltd's novel FlowCath[®] technology. This will be a scaled-up version of the current 50W laboratory system.

SUMMARY

ACAL Energy Ltd is a developer of fuel cell systems for a range of uses including stationary, residential and automotive applications. It applies new knowledge, science and innovation to capture the power from electrochemistry to address the modern imperative for environmentally acceptable energy sources.

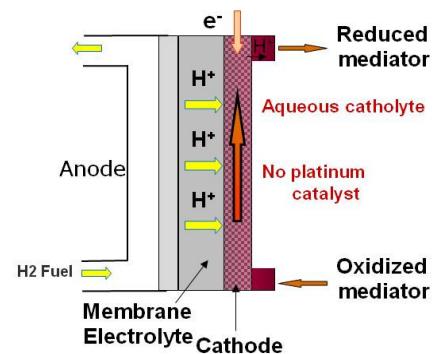
In ACAL's FlowCath[®] system, the cathode used in conventional PEM fuel cells is replaced by a liquid cathode system. A soluble catalyst enables a soluble mediator to be oxidized by oxygen from the air. The oxidized mediator is then transported to the catholyte solution and passes over the electrode where it is reduced to its original state.

FlowCath[®] is an important development in fuel cell technology because it:

- Uses a low-cost, water-based catalyst and mediator solution instead of an expensive, membrane-bound, platinum catalyst cathode that is used in conventional fuel cells
- Has the potential to be mass produced.

The benefits of the FlowCath[®] system will be:

- Substantial cost savings arising from removal of platinum cathode, high power density and system simplification
- No need for membrane humidification as this is now done naturally by the liquid catalyst



The FlowCath[®] fuel cell system

- More efficient heat management is enabled by the liquid cathode system – the liquid is directly in contact with the fuel cell
- Operation at atmospheric pressure with the potential to match and exceed the power density of high-pressure PEM systems.

During this project, ACAL Energy Ltd will:

- Simultaneously develop the catalyst and mediator, the 1kW fuel cell stack design and the catholyte engineering
- Develop the prototype process, and build and commission the prototype
- Assess the performance of the system to demonstrate the potential of the technology.

It is estimated that using this technology will save between 90,000 and 150,000 tonnes of CO₂ per year in 2020 and 1-2 million tonnes in 2050.

