

Woking Park Fuel Cell CHP

Woking's Pool in the Park is the setting for a commercially operating fuel cell Combined Heat and Power (CHP) system.



The fuel cell is an initiative of Woking Borough Council, which through its joint venture energy services company, Thameswey Energy Ltd, aims to design, build, finance and operate small-scale CHP stations to provide energy services by private wire and distributed heating and cooling networks to institutional, commercial and residential customers.

Thameswey
Energy Ltd



A fuel cell is similar to a battery except that fuel is fed into the cell to generate electricity and heat by an electro-chemical process producing pure water as its output emission.

Like a battery, a fuel cell contains an anode and a cathode insulated by an electrolyte between them. Hydrogen is supplied to the anode while oxygen is supplied to the cathode, creating a chemical reaction which generates the electric current, heat and water.

In the case of the Woking Park scheme, hydrogen gas is chemically reformed from natural gas and oxygen is extracted direct from outside air to fuel the cell.

The technology was first used in the USA Space Programme in the 1960s when fuel cells on board rockets provided the vital heat, electricity and drinking water to keep space missions going.

Fuel cell technology generates 50% more electricity than the conventional equivalent without burning any fuel. As a result CO₂ emissions are significantly reduced and other harmful emissions are virtually eliminated, meeting the Government's sustainability criteria for exemption from the Climate Change Levy.

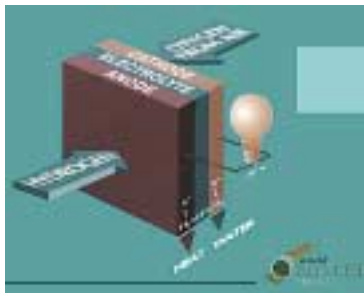
The fuel cell is designed to support the Pool in the Park's heating and power systems and Woking Park's lighting. Excess heat produced is used to power the centre's air conditioning, cooling and dehumidification requirements via heat fired absorption cooling. The CHP station is also designed to provide energy services for the Leisure Centre with surplus electricity exported to the Council's sheltered housing schemes.

The owners acknowledge the valuable contribution of Woking Borough Council, Thameswey Ltd, ESCO International A/S, Hedeselskabet Miljø og Energi A/S, Energy Saving Trust, Advantica, the United States of America Departments of Energy and Defence, International Fuel Cells and the Department of Trade and Industry.

Background technical information

The cost of the fuel cell CHP was diluted by integrating the project into a larger green energy project, as part of the Thameswey Energy Ltd business plan, to demonstrate how such technologies can be implemented in the deregulated energy market in the UK.

How a fuel cell works



A fuel cell contains an anode and a cathode insulated by an electrolyte between them. Hydrogen is supplied to the anode while oxygen is supplied to the cathode. The two gases try to join, but because of the electrolyte, the hydrogen atom splits into a proton and electron allowing the proton to pass through the electrolyte whilst the electron takes a different route, creating an electric current before recombining with the hydrogen and oxygen, creating a molecule of water. This chemical process generates not only electrical energy and water, but also thermal energy.

The project comprises a 200 kWe fuel cell together with four 60kW Frichs units and one 836 kW Jenbacher unit, 9.11 kWp solar energy photovoltaics, heat fired absorption cooling and thermal store. This makes a total CHP capacity of 1.2 MWe and 1.6 MWth interconnected by heat and chilled water mains and private wire.

The fuel cell CHP is visible to the public with a technology information display and viewing area for education purposes and to demonstrate how new and renewable energy can be integrated with other sustainable technologies.

The Woking Park fuel cell CHP unit is an ONSI packaged unit using phosphoric acid as the electrolyte, natural gas reformed into hydrogen gas and oxygen extracted directly from outside air. The 100% pure water is recovered by a water recovery scheme.



The combined system not only meets the energy demands of Woking Park, but is self sufficient in electricity and a net exporter of electricity all year round. The electricity is exported to other Council sites to mitigate the authority's exposure to the Climate Change Levy and, in conjunction with other Thamesway Energy Ltd CHP projects in Woking Town Centre and elsewhere, supply local sheltered housing residents and businesses under the Government's Exempt Licensing regime to maximise income, but still supply affordable, sustainable, alternative power supplies to local communities.

The project was launched with an official opening in June 2003.

Associated DTI monitoring

A DTI-supported project is tracking the initiative from beginning to end, including the original conception, planning, development, procurement, financing and installation, as well as the project's operation and maintenance. The monitoring will provide details on the technical and economic viability of the technology and its ability to be integrated into the commercial environment.

The associated five-year DTI monitoring project is being carried out by Advantica with specific research and reporting carried out by Professor Martin Fry.

