

## **Pioneering Fuel Cell Technology Underlines Ceres Power's Receipt of *Frost & Sullivan's* Excellence in Technology Award**

London, 19 July 2006: Ceres Power is presented with the 2006 *Frost & Sullivan* Excellence in Technology Award in the European micro combined heat and power (CHP) market for developing a fuel cell technology that operates at lower temperature ranges compared to conventional solid oxide fuel cells. In addition to offering high electrical efficiency, Ceres Power's innovative technology also enables the use of more affordable components for its micro CHP unit, which, in turn, reduces the cost of the product.

Among micro CHP prime mover technologies, fuel cells have relatively higher electrical efficiencies than combustion engine-based technologies. While low levels of emission and noise make them suitable for domestic applications, high upfront costs are deterring fuel cell-based applications of micro CHP.

Consequently, innovations in materials used in fuel cells are critical to lower the cost of fuel cell-based micro CHP units to competitive levels. Here, the UK-based Ceres Power has successfully spearheaded efforts to significantly reduce costs and improve the commercial viability of fuel cells.

"The technology developed by Ceres Power enables the use of low-cost materials and a payback period of less than three years appears to be an achievable target," notes *Frost & Sullivan* Research Analyst Rajat Kumar. "The fuel cell unit can also run on fuels with low levels of hydrogen. Currently, a prototype of the device has been built and Ceres Power is developing it further, working with industry partners, including Centrica."

Solid oxide fuel cells (SOFC) are being developed for micro CHP applications as they have an inherent advantage over proton exchange membrane fuel cells due to the fact that they possess high electrical efficiencies and operate on widely available fuels such as natural gas. However, SOFCs typically have high operating temperatures of nearly 700 to 1,000 degrees and need expensive materials, which can withstand such high temperatures.

"Conventional solid oxide fuel cells use ceramic substances for the anode, cathode, and the electrolyte, with electrolytes such as yttria stabilised zirconia exhibiting conductivity only at operating temperatures greater than 700 degrees," explains Mr. Kumar. "However, Ceres Power has achieved a breakthrough by using cerium gadolinium oxide (CGO), an electrolyte that enables the operating temperature of the fuel cell to be lowered to about 500 degrees."

The lower operating temperature that has been achieved by the innovative use of CGO has enabled the use of stainless steel components, which are robust, readily available and affordable. In addition, standard seals can be used instead of more expensive high temperature seals in the fuel cells. Thus, Ceres Power is realising the development of low-cost fuel cell-based micro CHP devices.

*Frost & Sullivan's* Excellence in Technology Award is bestowed upon the company that has pioneered the development and introduction of an innovative technology with the potential to impact several sectors in the market while making significant contributions to the industry in terms of adoption, change, and competitive posture.

The company is recognised for its overall technical excellence and its commitment towards technology innovation.

*Frost & Sullivan* Best Practices Awards recognise companies in a variety of regional and global markets for demonstrating outstanding achievement and superior performance in areas such as leadership, technological innovation, customer service and strategic product development. Industry analysts compare market participants and measure performance through in-depth interviews, analysis and extensive secondary research in order to identify best practices in the industry.

### **About Ceres Power**

Ceres is a successful AIM-listed fuel cell business developing a range of global market applications including residential combined heat and power, on-site / back-up generators and auxiliary power units for transport. Critically, the technology uses low cost materials and existing mass-production techniques. And unlike many fuel cells, the Ceres cell can run on widely available fuels like natural gas, LPG and biofuels as well as on hydrogen.

Since its formation in 2001, the Company has received major recognition for its technology and business credentials.

Ceres won the prestigious 2003 Carbon Trust Innovation Award for the UK's green technology with the best commercial potential.

More recently, Ceres secured a top industrial accolade by winning the Institute of Materials, Minerals and Mining's Gold Medal for 2005.

In January 2006, Ceres Power was selected as the only fuel cell company in the government's new Energy Research Partnership, contributing directly to national energy policy.

Ceres Power has raised over £25 million of funding through two rounds of private equity and its AIM IPO in November 2004. The company enjoys the support of many blue chip City institutions as financial backers including Fidelity, Morley and JP Morgan.

### **About Ceres Power's Technology**

Ceres fuel cell stacks are comprised of multiple fuel cells layered on top of one another, each made from stainless steel with tiny amounts of ceramic coating. The cells combine fuel and air to create electricity and heat via a quiet, solid state electrochemical process similar to a battery. As this process does not involve combustion, unlike an engine or burner, it is highly efficient and environmentally friendly.

Ceres has developed a unique adaptation of Solid Oxide Fuel Cell (SOFC) technology, able to operate at temperatures substantially lower than conventional designs which run at 800 – 1000 degrees C. By using a new generation of ceramic materials known as CGO (cerium gadolinium oxide) instead of the industry standard YSZ (yttria stabilised zirconia), operation at 500 - 600 degrees becomes possible.

This in turn allows use of conventional stainless steel as the cell substrate, separating the functions of mechanical support from electrochemistry.

The electrochemical layers can then be made extremely thin and optimised for maximum performance, resulting in world-beating power density levels, whilst the stack material costs are radically reduced. The efficiency of converting fuel into electricity and heat is therefore very high and this efficiency is maintained across a wide part-load range. In addition, the heat-to-power ratio is approximately one-to-one making the technology ideal for applications such as CHP, where levels of electrical output need to be maintained even where heat demand is modest.

In contrast to totally ceramic cells, these metal-supported cells are mechanically highly robust and can be easily sealed (e.g. through welding) and have thermal expansion coefficients well matched to their ceramic coatings. This allows great resistance to thermal shock, permitting rapid start-up times and the potential for thousands of ON / OFF cycles for everyday usability. In addition, the technology retains the fuel flexibility of SOFC, and has proven ability to run highly efficiently on commercially available fuels such as natural gas, LPG and biofuels.

In conjunction with the Ceres Stack programme, the Company has been developing the non fuel cell elements within the complete product, known as the balance of plant ("BOP"), as part of its systems integration activities aimed at delivering products for specific customers. Because of the unique attributes of the technology, Ceres Power has been able to dramatically reduce the time and cost of BOP development and systems integration by utilising mature component supply chains and ordinary, low cost materials. Unlike other fuel cell designs which operate at more extreme temperatures, time-consuming and expensive bespoke solutions for BOP components are not required.

### **About Frost & Sullivan**

Frost & Sullivan, a global growth consulting company, has been partnering with clients to support the development of innovative strategies for more than 40 years. The company's industry expertise integrates growth consulting, growth partnership services and corporate management training to identify and develop opportunities. Frost & Sullivan serves an extensive clientele that includes Global 1000 companies, emerging companies, and the investment community, by providing comprehensive industry coverage that reflects a unique global perspective and combines ongoing analysis of markets, technologies, econometrics, and demographics. For more information, visit [www.frost.com](http://www.frost.com).

### **For further information, please contact**

Peter Bance, Chief Executive, Ceres Power  
T +44 (0) 1293 400 404  
Patrick d'Ancona / Charlotte Kirkham, M: Communications  
T +44 (0) 207 153 1531

Kristina Menzefricke, Frost & Sullivan  
T +44 (0)20 7343 8376