

# Press Release

Freiburg  
April 14, 2009  
No. 07/09

## **Electricity from Bioethanol – renewable, mobile, available worldwide**

### **Fraunhofer ISE presents portable reformer fuel cell system at the Hannover Trade Fair**

Researchers at the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, Germany have developed an ethanol reformer fuel cell system. The system is suitable for outdoor use and has an electric power output of 250W. Along with other innovations from Fraunhofer ISE, this system will be presented to the public for the first time from 20<sup>th</sup> – 24<sup>th</sup> April in Hall 13/ Stand F 74 at the Hannover Trade Fair.

The system is fueled with denatured bioethanol, which is inexpensive, non-toxic and commercially available worldwide. One potential application is as a power supply for medical equipment in developing and threshold countries.

The core piece of the system to be presented at the trade fair is a commercial PEM fuel cell with an electric power output of 300W. "If fuel cells are to achieve long periods of operation, then it is best if they are combined directly with a reformer. In this case, the use of hydrogen storage, be it either metal hydride storage or pressurized gas cylinders, is neither economical nor practical," says Dr. Thomas Aicher, head of the group Hydrogen Production at Fraunhofer ISE.

Using precisely this point, reformer fuel cell systems can demonstrate their great advantage. These systems combine the high energy storage density of the fuel with the high power density of the fuel cell. A further advantage is that with the integration of a reformer, commercially available fuels like bioethanol, propane or gasoline (U.S.) can be used.

**Fraunhofer Institute for  
Solar Energy Systems ISE**  
Heidenhofstraße 2  
79110 Freiburg  
Germany  
Press and Public Relations  
Karin Schneider  
Tel. +49 (0) 7 61/45 88-51 50  
Fax +49 (0) 7 61/45 88-93 42  
e-mail: [info@ise.fraunhofer.de](mailto:info@ise.fraunhofer.de)

<http://www.ise.fraunhofer.de>

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The ethanol reformer fuel cell system developed at Fraunhofer ISE can be used outdoors and operates at ambient temperatures ranging from -10 to +40 °C. At the push of a button, the electric power becomes available. A buffer battery is used during the start-up phase, when hydrogen is not yet flowing to the fuel cell. The system including the tank has a total volume of 200l and a weight of 30kg, respectively. It consists of four modules (fuel cell, reformer with gas purification, electronics and tank). The main system functions are carried out by:

1. a low-temperature PEM fuel cell from the company Schunk. This was optimized for operation with a reformat gas (product gas of the reformer).
2. a reformer with gas purification. The latter reduces the amount of carbon monoxide in the reformat gas to a level that is suitable for the following PEM fuel cell.
3. a tail gas combustor in which the offgas from the anode is oxidized and provides the heat needed for evaporation and overheating the feed streams (ethanol, water and air).

No further heat integration is used in the reformer system in order to maintain a simple system architecture and achieve controllability of the entire system. The four modules are stacked on top of each other within a housing mounted on wheels for easy transport.

The development of the reformer fuel cell system is supported by the Federal German Ministry for Economics and Technology BMWi. The partners in this cooperative project are the companies DMT GmbH, EGO Elektro-Gerätebau GmbH, Elbau GmbH, Intratec GmbH, LIFEBRIDGE Medizintechnik AG, Magnum Automatisierungstechnik GmbH und Umicore AG & Co. KG. The Hahn-Schickard-Gesellschaft e.V. (HSG-IMIT), the second research institute involved in the project, contributes its expertise in the area of liquid dosage.

**Fraunhofer Institute for  
Solar Energy Systems ISE**  
Heidenhofstr. 2  
79110 Freiburg  
Germany  
Press and Public Relations  
Karin Schneider  
Phone: +49 (0) 7 61/45 88-51 50  
Fax: +49 (0) 7 61/45 88-93 42  
E-mail: [info@ise.fraunhofer.de](mailto:info@ise.fraunhofer.de)

[www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

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“The goal at the end of the development work was to present a fully functional technology for demonstration purposes. Today, the consortium is able to offer interested manufacturers the technology for series production,” reports Johannes Full, the project leader responsible at Fraunhofer ISE.

**Hannover Trade Fair, 20<sup>th</sup>-24<sup>th</sup> April 2009**  
**Fraunhofer ISE Stand located at:**  
**Hall 13 Stand F 74**

## **Information Material**

Fraunhofer ISE, Press and Public Relations  
Tel. +49 (0) 7 61/45 88-51 50  
Fax +49 (0) 7 61/45 88-93 42  
E-Mail: [info@ise.fraunhofer.de](mailto:info@ise.fraunhofer.de)

**Text of the PI and photos can be downloaded from our web page: [www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)**

## **Contact person for further information**

Dr.-Ing. Thomas Aicher, Fraunhofer ISE  
Tel. +49 (0) 7 61/45 88-51 94  
Fax +49 (0) 7 61/45 88-93 20  
E-Mail: [Thomas.Aicher@ise.fraunhofer.de](mailto:Thomas.Aicher@ise.fraunhofer.de)

## **Fraunhofer Institute for Solar Energy Systems ISE**

Heidenhofstr. 2  
79110 Freiburg  
Germany  
Press and Public Relations  
Karin Schneider  
Phone: +49 (0) 7 61/45 88-51 50  
Fax: +49 (0) 7 61/45 88-93 42  
E-mail: [info@ise.fraunhofer.de](mailto:info@ise.fraunhofer.de)

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Source: Fraunhofer ISE

Three of four modules in the reformer fuel cell system developed at Fraunhofer ISE. Left background: fuel cell module, middle: reformer module, right background: tank module.