

Data base Fuel Cells for residential use



Platforms, Initiatives in EUROPE

Initiative Brennstoffzelle_

www.initiative-brennstoffzelle.de

Information platform is an alliance between industry and utilities in Germany. Members are: EWE, European Fuel Cell GmbH, dena, EnBW, Hexis, Vaillant, Verbundnetz Gas, MVV Energie, RWE, Viessmann. Their common goal is to make "compact," natural-gas-fueled stationary fuel cells for residential needs technically and economically competitive. In pursuit of this goal, the Initiative helps coordinate the activities of manufacturers, energy suppliers and research institutions. Its program includes knowledge transfer, field tests and demo projects. Their efforts include the development of devices and components, pilot projects and field tests, the build-up of contracting models as well as the creation of uniform norms and standards. In addition, the deep cooperation with the skilled trades to prepare them for fuel cells has its place among these activities. Not least, the Fuel Cell Initiative aims to inform all relevant actors about the current state as well as future perspectives through a broadly based communication approach.

Contact:

Ulrich Dewald

Redaktion www.wissenschaft.de:

IBZ-Hotline

01802/534794

Email: ibz@konradin.de

Brennstoffzellen Bündnis Deutschland

<http://www.bz-buendnis.de/> (only in German)

20 associations and initiatives are members in the BZ-Buendnis with focus the market penetration in industrial applications, buildings energy supply, transportation and portable systems. BZ-Buendnis prepared the strategy paper for the market penetration of the FC in Germany. BZ Buendnis observes the state of the art in research and development of FC, analyses the market penetration for FC and suggests measures to be taken.

Contact:

Brennstoffzellen Bündnis (BZ Bündnis)

c/o Landesinitiative Brennstoffzelle Niedersachsen

Ansprechpartner: Dr. Guido Weißmann

Götzenbreite 1

37124 Rosdorf / Göttingen

Email: info@brennstoffzelle-nds.de

Deutscher Wasserstoff- und Brennstoffzellen-Verband

www.dwv-info.de

The German Hydrogen and Fuel Cell Association (DWV) is a "lobby" for hydrogen, it promotes and prepares the general introduction of hydrogen as an energy carrier in the economy, primarily in the energy and transportation sector. DWV identifies research and development problems in the field of safety or economy and creates project proposals, makes its influence felt in standardization and regulation and works together with other associations and institutions all over the world who work along similar lines.

Contact:

German Hydrogen and Fuel Cell Association (DWV)

Unter den Eichen 87, 12205 Berlin,

Germany

Tel.: (+49-700) 49376 835 (HYDROTEL);

Fax: (+49-700) 49376 329 (HYDROFAX)

e-mail: h2@dwv-info.de

Initiatives of the German Federal States (Bundesländer), e.g.

- **Research Alliance Fuel Cells in Baden-Wuerttemberg**

<http://www.forum-brennstoffzelle.de/index.php?main=fabz> (only in German)

In November 2000 the Ministry for Science, Research and Art of Baden-Wuerttemberg established the Research Alliance Fuel Cells Baden-Wuerttemberg (FABZ). Goal of the FABZ is the bundling of resources in the R&D by co-ordination of relevant research activities as well as the transfer of the results into the industry for market products. A substantial task of the FABZ is to bring a long-term continuity into the fuel cell of Baden-Wuerttemberg.

- **Kompetenz-Netzwerk Brennstoffzelle und Wasserstoff NRW**

www.brennstoffzelle-nrw.de (only in German)

Goals of this Network are: Positioning of North Rhine-Westphalia as internationally recognized location for Fuel Cells and Hydrogen Technology, early introduction of the fuel cell in market segments as a bridge to the mass-market, development of the fuel cell and fuel cell-suited system components, accompanied by basic research, support of the structure for an hydrogen energy economy

Contact:

Dr. Thomas Kattenstein

Kompetenz-Netzwerk Brennstoffzelle und Wasserstoff NRW

c/o EnergieAgentur.NRW

Haroldstr. 4

40213 Düsseldorf

02 11-8 66 42-0

02 11-8 66 42-22

E-Mail: kattenstein@EnergieAgentur.NRW.de

- **Wasserstoff-Initiative Bayern**

www.wiba.de (only in German)

The Hydrogen Initiative Bavaria (wiba) advises the Bavarian Ministry for economics, transportation and technology in the sense of an efficient use of funds for the hydrogen promotion. Wiba has furthermore following tasks: Initiation of hydrogen projects in Bavaria, support of Bavarian enterprises in planning and submitting project proposals, examination and evaluation of project applications, development of a long-term strategy for the promotion of the hydrogen energy technology in coordination with industry.

Contact:

Dipl.-Ing. S. Richter

wiba - Koordinationsstelle der Wasserstoff-Initiative Bayern

c/o Forschungsstelle für Energiewirtschaft e.V.

Am Blütenanger 71

80995 München

Tel. 089/ 15 81 21-0

Fax 089/ 15 81 21-10

E-Mail: wiba@ffe.de

European Hydrogen and Fuel Cell Technology Platform

www.hfpeurope.org

The European Hydrogen and Fuel Cell Technology Platform (HFP) facilitates and accelerates the development and deployment of cost-competitive, world class European hydrogen and fuel cell based energy systems and component technologies for applications in transport, stationary and portable power. The establishment of the HFP has been facilitated by the European Commission. HFP assists in the efficient co-ordination of European, national, regional and local research, development and deployment programmes and initiatives and ensures a balanced and active participation of the major stakeholders (i.e. industry, scientific community, public authorities, users, civil society. Preparation of the establishment of a Joint Technology Initiative on Hydrogen and Fuel Cells

Contact:

Alfons Westgeest
Kellen Europe, Avenue Marcel Thiry, 204,
1200 Brussels, Belgium
Phone: +32 27 749652
Fax: +32 27 749690

Fuel Cell Europe - An activity of the World Fuel Cell Council e.V.

www.fuelcelleurope.org

Fuel Cell Europe is an activity of the World Fuel Cell Council and has the mission to accelerate the research and deployment of world-class fuel cell technologies for applications in transport, stationary and portable power. Fuel Cell Europe is the central European industry association serving fuel cell and hydrogen industries. The members include industrial, academic and research institutions. Fuel Cell Europe has drawn up an interactive map of fuel cell and hydrogen associations across the continent.

Contact:

Fuel Cell Europe, World Fuel Cell Council e.V.
Frankfurter Strasse 10-14
Eschborn
D-65760, Germany,
Tel: + 49-69-283-851

Fuel Cell Today - Information source for Fuel Cells and Hydrogen

www.fuelcelltoday.com

This information platform is published by Johnson Matthey Public Limited Company and comprises current information on enterprises, scientists, market opportunities, conferences on fuel cell, own articles on the market relevance and activities of industries on fuel cells world wide.

Fuel Cell Markets Ltd

www.fuelcellmarkets.com

The marketplace on the above site is the portal to an interactive communications platform established and operated by Fuel Cell Markets Ltd (FCM) to assist the commercialisation of fuel cell, hydrogen, and sustainable energy technologies. The marketplace is structured in order to achieve following key objectives: accelerate the commercialisation of fuel cell and hydrogen energy industries, bridge the gap between fuel cell and hydrogen energy industries and traditional industries, and provide an educational, outreach and awareness resource for energy users. On this web site one can find a comprehensive directory of industry, products and services.

Contact:
Fuel Cell Markets Ltd.
Thorney Weir House
Iver, Bucks
SL0 9AQ, United Kingdom

FuelCellWorks News and Information Portal

<http://www.fuelcellworks.com>

Fuelcellworks is offering an information platform with daily news on fuel cells and hydrogen issues, information about the fuel cell technology, a company database, and information about conferences and patents

Contact: fuelcellworks@yahoo.com

Direct Industry – Virtual Industrial Exhibition

<http://www.directindustry.com/industrial-manufacturer/fuel-cells-73990.html>

DirectIndustry has established itself as *The Virtual Industrial Exhibition*. This site, accessible in five languages, presents all the industrial equipment and components available on the international market. DirectIndustry is aimed at industry professionals - purchasing, R&D, production, maintenance - offering them an accurate and up-to-date source of information, wherever they are located.

Industry (Manufacturers and Utilities)

Ceres Power

<http://www.cerespower.com/>

CERES is established in May 2001 to acquire fuel cell intellectual property rights developed by Imperial College. The relationship with British Gas in residential CHP (also known as Centrica) is part funded by the UK Department of Trade and Industry to develop CHP fuel cell units specifically for the UK market. Ceres is following the same route as a number of other companies working in the residential space by exploring tie-ups with boiler manufacturers allowing them access to Ceres stacks. Ceres announced this year the commissioning of a pilot scale manufacturing facility, to be up and running by mid2007. The company is developing small scale intermediate temperature, low cost SOFC that will be combined into stacks with 1 kWel to 25 kWel.

Contact

Ceres Power Limited

Unit 18

Denvale Trade Park

Haslett Avenue East

Crawley

RH10 1SS

Phone: +44 1293 400 404

Fax: +44 1293 400 482

E-Mail: info@cerespower.com

Europeanfuelcell GmbH (Member of BAXI INNOTECH GmbH)

<http://www.baxi-innotech.de>

<http://www.europeanfuelcell.de/englisch/brennstoff.htm>

EFC a German subsidiary of the British Baxi Group develops and produces residential PEFC-CHP heat appliances. A functioning test unit with a power rating of 1.5 kWel und 18 kWth was developed for use in a one-family house. Nonetheless, it can also cover the base load in a multi-family house or in a small industrial operation. The system control is already designed to enable the Beta plant to be used in a virtual power plant network.

More details: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/8.html>

Contact:

Frank Jüngerhans

BAXI INNOTECH GmbH

Ausschläger Elbdeich 127

20539 Hamburg

Tel.: +49 (0)40 - 23 66-76 30

Fax: +49 (0)40 - 23 66-76 01

E-Mail: f.juengerhans@baxi-innotech.de

Hexis AG

http://www.hexis.com/index_e.htm

Hexis Ltd. belongs to the worldwide leading companies in the field of the high-temperature fuel cell technology (SOFC) for stationary applications in the small power range. With the model «Galileo 1000 N» the Hexis Team managed to develop a fuel cell heater that, in cooperation with partners of the power supply industry, can probably already be tested soon under real conditions. This system is suitable for single-family houses. «Galileo 1000N» is a compact, with low emissions and virtually silent fuel cell heater with high efficiency that operates with natural gas and generates a maximum of 1 kWel and 2.5 kWth.

More details in:

<http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/13.html>

Contact:

Volker Nerlich

Hexis AG

Hegifeldstrasse 30

CH-8404 Winterthur

Tel.: +41 (0) 52 262 - 82 07

Fax: +41 (0) 52 262 - 63 33

E-Mail: volker.nerlich@hexis.com

Vaillant GmbH

www.vaillant.de

Vaillant has been developing since 1998 a fuel cell heating (FCH) system for multi-family houses and small commercial applications in cooperation with the American fuel cell developer Plug Power. Back in 2001 the heating technology company, which is based in Remscheid, Germany, obtained CE certification according to the EU gas appliance guidelines. As the very first manufacturer of such systems, Vaillant validated the operational safety, environmental soundness and energy efficiency of the FCH. Since then the EURO 1 and EURO 2 field test generations have obtained CE certification. In connection with an EU-sponsored project, 31 of the pilot systems have been networked via a central control room to create a "virtual power plant." After more than 330,000 hours of operation, more than 1 million kWh of electrical energy has been generated.

More details in: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/11.html>

Contact:

Alexander Dauensteiner

Vaillant GmbH

Berghauser Straße 40

42859 Remscheid

Tel.: +49 (0) 21 91 - 18-25 06

Fax: +49 (0) 21 91 - 18-725 06

E-Mail: alexander.dauensteiner@vaillant.de

Ceramic Fuel Cells Limited (CFCL)

<http://www.cfcl.com.au/>

Since the company's formation in 1992, CFCL has had significant experience in the development of SOFC. CFCL's pilot production plant located in Noble Park, Melbourne is capable of producing a range of SOFCs in varying designs. The CFCL experience and know-how spreads across the entire fuel cell production process: from ceramic power production for electrolytes, anodes and cathodes right through to glass sealing technologies for finished fuel stacks. CFCL has already taken the critical step from successfully operating a fuel cell in a laboratory environment to operating a fuel cell system many years ago. Over the last three years, the SOFC system has steadily evolved to form the current Net-Gen pre-commercial demonstration unit today. CFCL is producing limited quantities of Net-Gen units for collaboration with selected utilities and appliance manufacturers in order to integrate the SOFC technology into household appliances for the future.

Contact:

Head Office and Pilot Production Facility

Ceramic Fuel Cells Limited

170 Browns Road

Noble Park, Victoria 3174

Australia

Phone: + 61 (3) 9554 2300

Fax: + 61 (3) 9790 5600
E-Mail: enquiries@cfcl.com.au

European and United Kingdom Office
Ceramic Fuel Cells (Europe) Limited
Regus House, Herons Way
Chester Business Park
Chester, CH4 9QR
United Kingdom
Phone: + 44 (1244) 893 781
Fax: + 44 (1244) 893 101
E-mail: europe@cfcl.com.au

Viessmann Werke GmbH&Co KG

www.viessmann.de

Since 2000 the company is collaborating with partners from science and industry in developing a PEM-based residential fuel-cell system with an electrical power output of 2 kW and a heat output of 5 kW (surplus heat of the gas-treatment process). To maximize constancy in the operation of the fuel cell, the energy system is modulated within wide limits. Surplus heat can be temporarily stored in a storage water heater. An additional condensing boiler is provided for periods of peak heating demand. Viessmann relies on in-house development of the fuel-cell system. This applies both to the gas treatment and the stack. The company's development partners include the University of Dortmund and the Center for Solar Energy and Hydrogen Research (ZSW) in Ulm.

More details in: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/12.html>

Contact:

Rainer Dippel
Viessmann Werke GmbH & Co KG
Viessmannstr. 1
35107 Allendorf
Tel.: +49 6452 703075
Fax: +49 6452 706075
DpR@viessmann.com

E.ON Ruhrgas AG, Essen

<http://www.eon-ruhrgas.com>

In the past few years, EON Ruhrgas has been focusing on the development of fuel-cell heating systems in the power range from 1.5 to 4.5 kW that operate with natural gas. In the course of this work, it has been collaborating with manufacturers and scientific institutions. Currently, the focus lies on the testing of PEM fuel cell heating appliances made by Vaillant within the framework of the EU-sponsored "Virtual Fuel Cell Power Plant" project

The tasks of EON Ruhrgas in fuel-cell field tests in North Rhine-Westphalia were:

- Measurement, analysis and extensive testing during the gas preparation and purification
- investigating the effectiveness of various desulfurization equipment in fuel-cell systems

Additionally E.ON Ruhrgas cooperates with the University Duisburg-Essen on aspects of reformer technology with the aim to improve gas reformation technology based on prior work results provided by the University and to integrate such technology into a PEM fuel cell along with other necessary components, thereby creating a complete and optimized system.

Contact:

Helmut Roloff
E.ON Ruhrgas AG, Essen
Huttropstraße 60
45138 Essen

Tel.: +49 - 2 01 - 1 84-39 52
Fax: +49 - 2 01 - 1 84-43 51
E-Mail: helmut.roloff@eon-ruhrgas.com

Nuvera Fuel Cells Europe

www.nuvera.com

Nuvera has successfully developed its third-generation Avanti system on a PEM basis using natural gas or propane as the primary fuel source. It generates approximately 5 kW_{el} and 7 kW_{th}. The CHP system is appropriately sized for small commercial customers who have a steady, consistent demand for thermal and electrical energy. Target applications Nuvera is currently pursuing include hospitals, hotels, dormitories, restaurants, and swimming pools. Some of the Alpha units are being tested in public demonstrations in the U.S. and Asia. Beta testing and pre-commercialization of the Avanti fuel cell power system is expected to begin by 2008.

Contact:

Nuvera Fuel Cells Europe, SrL
Via XXV Aprile 2 20097
San Donato, Milanese (MI), Italy
Tel.: + 39 (02) 5161.6701
Fax: + 39 (02) 5161.6721

Staxera

<http://www.staxerafuelcells.de/>

The German Staxera GmbH is a joint venture between Webasto AG and H. C. Starck GmbH for the industrialization of SOFC. Staxera develops planar SOFC stacks in the performance class of 0.5 to 5kW.

Typical applications for their technology are auxiliary power units (APU) in transport applications and modules for combined heat and power generation in houses (micro CHP).

Contact:

Dr. Christian Wunderlich
Staxera GmbH
Winterbergstraße 28
01277 Dresden
Germany
Tel.: +49 (0351) 2553 970
Fax: +49 (0351) 2554 403
E-Mail: welcome@staxerafuelcells.de

RWE Fuel Cells

www.rwe.com/fuelcell

RWE Fuel Cells is testing applications of Fuel Cells in stationary electricity and heat generation.

In the household energy sector, RWE Fuel Cells is involved in testing systems built by American manufacturer IdaTech. Demonstration projects with a 4,6 kW_{el} PEM is installed in the NRW-office in Berlin. In 2004 the energy supply concept of the building has been supplemented by 4 fuel cells with a total electrical output of 20 kW. The units are powered by natural gas in cogeneration mode. The cogeneration units ensure the base load supply of the 5,500 square meter office and residential complex, with ten event and meeting rooms, 38 offices and 12 apartments, with electricity, heat, air conditioning and hot water. The local connection to the district heat grid can be used at peak demand times in winter.

More details in: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/9.html>

Contact:

Mrs Anja Ludwig
RWE Fuel Cells
Gutenbergstraße 3
45128 Essen
Tel.: +49 (0) 201 - 12 20-217
E-Mail: anja.ludwig@rwe.com

EnBW AG

www.enbw.com

EnBW is doing pioneering work to test the suitability for every day use of fuel cells under real conditions and to support the development right up to the production stage. Since the summer of 2005, 17 fuel cell heaters have been installed for customers and partners. EnBW tested in the in the filed of CHP for residential use following types of

- 1,5-kW-PEMFC-Brennstoffzellenheizgerät European Fuel Cell;
- 1-kW-SOFC-Brennstoffzellenheizgeräte Sulzer Hexis HXS 1000;
- 4,6-kW-PEMFC-Brennstoffzellenheizgerät Vaillant EURO II

More details: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/7.html>

Contact:

Dirk Ommeln
EnBW Energie Baden-Württemberg AG
Durlacher Allee 93
76131 Karlsruhe
Tel.: +49 (0) 7 21/63-123 20
Fax: +49 (0) 7 21/63-126 72
E-Mail: d.ommeln@enbw.com

EWE AG, Oldenburg

http://www.ewe.de/55_539.php

EWE tests fuel cells together with different manufacturers in the context of field tests at pilot customers. Until today EWE installed 33 plants of the type HXS 1000 premiere (1 kWel and 2.5 kWth for single and two-family houses) of the Swiss company Hexis. As a participant in the European Union project "Virtual Fuel Cell power plants" EWE installed altogether 7 Vaillant fuel cell heaters (4.6 kWel for multi-family houses and small industrial companies). Based on their SOFC fuel cell technology the Australian company Ceramic Fuel Cells Limited (CFCL) developed a fuel cell heater (1 kWel, 1 kWth for single family houses): EWE is testing two CPFL of fuel cell heaters. The Hamburg company european fuel cells (efc) develops a fuel cell heater on basis of the PEM fuel cell (1.5 kWel, 2.9 kWth) which works within the range between 60-80°C and be longs thereby to the low-temperature gas cells. More details in: <http://www.initiative-brennstoffzelle.de/en/live/ibzintern/ibzmitglieder/detail/1.html>

Contact:

Mrs Nina Ziplies
EWE AG Oldenburg
Tirpitzstraße 39
26122 Oldenburg
Tel.: +49-4 41 - 8 03-1811
Fax: +49-4 41 - 8 03-1895
E-Mail: nina.ziplies@ewe.de

Research and Development

Forschungszentrum Juelich – Institut für Werkstoffe und Verfahren der Energietechnik

http://www.fz-juelich.de/iwv/iwv3/fuel_cells

In the FZJ- Institute of Energy Research (IEF), following departments are involved in Research and Development of Fuel Cells:

- A) Material Synthesis and Processing (IEF-1) is concerned with Material Synthesis and Processing
- B) Microstructure and Properties of Materials (IEF-2) is concerned with Microstructure Properties of Materials
- C) Fuel Cells (IEF-3) with focus on DMFCs, SOFCs and Reforming.
- D) Systems Analysis and Technology Evaluation (IEF-STE): This Programme Group performs systems analyses on the long-term orientation of the energy economy with fuel cells as a key technology.

Contact:

Prof. Dr.-Ing. Detlef Stolten
Institut für Energieforschung
IWV3, Forschungszentrum Jülich,
52425 Jülich

Telefon: 02461-61-3076

Fax: 02461-61-6695

E-Mail: d.stolten@fz-juelich.de

Zentrum für Brennstoffzellen-Technik (ZBT)

<http://www.zbt-duisburg.de/en/Technology/>

ZBT's technology portfolio reaches from the material development to the building of stacks, from the gas preparation of hydrocarbons up to characterisation of components and the set up of fuel cell systems for most different applications. ZBT follows the aim to develop the individual elements as part of a total system:

bipolar plates as part of the fuel cell stacks, fuel cell stacks as part of APU systems, catalyst tests for fuel process reactors, individual reactors as a component of decentralized hydrogen producers, hydrogen producers as a component of overall systems, component measurement for modelling and system structure simulation, simulation as preliminary stage to the reactor and system structure

Contact:

Mrs Prof. Dr. rer. nat. Angelika Heinzl
Scientific manager, CEO
Zentrum für BrennstoffzellenTechnik ZBT gGmbH Duisburg (*Center for Fuel Cell Technology*)
Carl-Benz-Straße 201 (Universitätscampus)
D-47057 Duisburg
Germany
Tel: +49-(0)203-7598-0
Fax +49-(0)203-7598-2222
E-Mail: info@zbt-duisburg.de

DLR - Institut für Technische Thermodynamik

www.dlr.de/tt

DLR (The German Aerospace Research Centre) concentrates in particular on SOFC for stationary power stations and for auxiliary aggregates (APU) in vehicles and PEFC and/or DMFC for the decentralized, CHP production. In particular DLR focus on:

Low-temperature fuel cells: Work on low-temperature fuel cells is concentrated on the development of improved membranes, the development of low-cost production processes, the integration of innovative sensor technology in fuel cell stacks with a view to fully automating and optimising the technology, and system aspects

High-temperature fuel cells: Work on high-temperature fuel cells is focused on the production of cells using plasma spray technology. Because this process uses very thin layers, it uses small material quantities and incurs low production costs but is still highly effective.

Contact:

Prof. Dr. Dr.-Ing. (habil) Hans Müller-Steinhagen
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
Institut für Technische Thermodynamik (ITT)
Pfaffenwaldring 38-40
70569 Stuttgart
Tel : +49 711 6862-359
Fax: +49 711 6862-712

ECN Energy Research Centrum of the Netherlands

<http://www.ecn.nl/en/h2sf/products-services/fuel-cell-rd-activities/>

The Dutch ECN is a private research organization covering all aspects of cell, stack and system design and optimization and develops materials, components, stacks and BoP-components for both automotive and stationary applications.

PEMFC: ECN work on the one hand in realisation of substantial reduction in cost and on the other hand in improvement of the performance such as to make the PEMFC suited for a wider range of applications and operating conditions.

SOFC: The ECN research covers the main SOFC components: the electrolyte, the electrodes and the flow plates. High power outputs at reduced operating temperatures are achieved by using thinner electrolyte layers on basis of yttria doped zirconia. The electrode research focuses on developing robust and efficient layers, to have it withstand a variety of fuels with all of its contaminants, fuel interrupts and thermal cycles.

Fuel Cell Systems: ECN is dedicated to the development and demonstration of fuel cell systems on a pilot or demonstration scale with focus on optimal integration of fuel supply, including fuel processors, and fuel cell stacks. Prime applications are residential power systems fed by natural gas and automotive systems fed by hydrogen, fossil fuels or bio-fuels.

Contact:

Dr. F.A. de Bruijn
ECN
Westerduinweg 3
1755 LE Petten
Netherlands
Tel.: +31 (0)224 564949
Fax: +31 (0)224 564480
E-Mail: debruijn@remove-this.ecn.nl

Zentrum für Sonnenenergie- und Wasserstoff-Forschung

<http://www.zsw-bw.de/topics/fuelcells.html>

The focus of the development of the ZSW on Fuel cells is the PEFC type, either with pure hydrogen or reformed hydrogen and DMFC type as well. The experiences available at the ZSW cover the entire chain of fundamental material research oriented work up to the integration of complete systems. ZSW operates its own testing centre with the possibility to test performance, testing life, security aspects of single cells, stacks, components, systems etc.

Contact:

Dr. Ludwig Jörissen
Zentrum für Sonnenenergie- und Wasserstoff-Forschung
Helmholtzstr. 8
89081 Ulm
Tel: +49 731 95 30-609
Fax: +49 731/9531-666
E-Mail: ludwig.joerissen@zsw-bw.de

CEA (French Atomic Energy Commission)

<http://www.cea.fr/GB/publications/Clefs50/pdf/072a073escribano-gb.pdf> <http://www.cea.fr/gb/>

CEA (French Atomic Energy Commission) is a research state agency for nuclear energy, employing a staff of 16000 people. The R&D projects on SOFC are focused on a 5 kW CHP system as a first prototype. Since 1987, the CEA has developed a know-how in the PEFC (Proton Exchange Membrane Fuel Cell) field as well.

Contact:

Dr. Sylvie Escribano
CEA-Grenoble
Commissariat à l'Énergie Atomique
Department of Technologies for Energy and Nanomaterials
17 rue des Martyrs
Cedex 9
F-38054 Grenoble
Tel : +33 4 3878 9406
Fax: +33 4 3878 3556
E-Mail: sylvie.escribano@cea.fr

Standardisation and Regulation bodies, Technical Guidelines

CEN – European Committee for Standardisation

<http://www.cen.eu/cenorm/index.htm>

CEN's National Members are the National Standards Organizations of 30 European countries. There is only one member per country. They have voting rights in the General Assembly and Administrative Board of CEN and provide delegations to the Technical Board which defines the work programme. It is the responsibility of the CEN National Members to implement European Standards as national standards, to distribute and sell them and to withdraw any conflicting national standards.

CENELEC - European Committee for Electrotechnical Standardization

www.cenelec.org

CENELEC is a non-profit technical organization composed of the National Electrotechnical Committees of 30 European countries. A Resolution of 7th May 1985 of the European Council formally endorsed the principle of reference to European standards within the relevant European regulatory work (Directives) In the light of this New Approach, CENELEC is developing and achieving a coherent set of voluntary electrotechnical standards as a basis for the creation of the Single European Market/European Economic Area without internal frontiers for goods and services. In addition to the traditional European standard deliverables, the dynamic Workshop (CWA: CENELEC Workshop Agreement) has been included in its portfolio, offering an open platform to foster the development of pre-standards for short lifetime products where time-to-market is critical.

DIN - Deutsches Institut für Normung e.V.

www.din.de

DVGW – Deutsche Vereinigung des Gas- und Wasserfaches e.V.

www.dvgw.de

VDI – Verein Deutscher Ingenieure

www.vdi.de

IEC - International Electrotechnical Commission

www.iec.ch

Platforms, Initiatives OUTSIDE EUROPE

U.S. Department of Energy DOE – Energy Efficiency and Renewable Energies (EERE)

www.eere.energy.gov

DOE is working closely with its national laboratories, universities, and industry partners to overcome critical technical barriers to fuel cell commercialization. The Hydrogen, Fuel Cells & Infrastructure Technologies fuel cell research and development (R&D) activities are aimed at reducing fuel cell system cost and size and improving the performance and durability of fuel cell systems for transportation, small stationary, and portable applications. Most of this research focuses on advancing polymer electrolyte membrane (PEM) fuel cell systems, with emphasis in areas such as fuel processing (reforming) technologies, improved catalyst and membrane designs, and improved air, thermal, and water management systems.

The program supports fuel cell R&D in three primary areas:

- Transportation Fuel Cell Systems
- Distributed/Stationary Fuel Cell Systems
- Fuel Cell Subsystems and Components

U.S. Department of Defence DOD

<http://dodfuelcell.cecer.army.mil/res/index.php4>

The Department of Defence Residential PEM Demonstration Project began in the Fiscal Year 2001 (FY01). From FY01 to FY04 \$13.7 M were spent for 91 PEM fuel cells at 56 military sites.

Building applications are not required to be residential facilities, but could also include commercial and remote building applications. The demonstration PEM fuel cells has included following options:

- Fuel Type - natural gas, propane, hydrogen, other
- Fuel Options - fuel switching, no fuel switching, fuel blending
- Electrical Interface - grid-connected, grid-independent, both (alternating)
- Thermal Interface - cogeneration, no cogeneration
- Unit Configurations - individual, multiple units

Two ERDC Tech Reports have been published in February 2004 and September 2005 describing the overall PEM Fuel Cell Demonstration Fleet

Fuel Cells – The online Fuel Cell information resource

<http://www.fuelcells.org>

State Fuel Cell and Hydrogen Database: This database catalogues initiatives, policy and partnerships in the fuel cell and hydrogen arena. All stationary fuel cell installations, hydrogen fueling stations and vehicle demonstrations in the United States are also included.

Worldwide Stationary Fuel Cell Installation database: This database catalogues stationary fuel cell installations worldwide - past, present and some planned. There have been more than 2,000 fuel cells around the world since the early 1980s.

Fuel Cell Developers: Additionally a database with industries enables easy contact to Fuel Cell Developers.

US Fuel Cell Council

<http://www.usfcc.com/>

The US Fuel Cell Council is an industry association dedicated to fostering the commercialization of fuel cells in the United States. The US Fuel Cell Council members include the world's leading fuel cell developers, manufacturers, suppliers and support commercialization of fuel cells through market studies, business projections and other projects, and through networking with other organizations to help realize the environmental and societal benefits of fuel cell technology.

Manufacturers

Acumentrics (USA)

<http://www.acumentrics.com/>

Acumentrics is developing a number of products for both UPS and CHP systems, using its tubular SOFC. As well as a 10kW unit specifically targeted for the Japanese market, it is also developing CHP units for the European and US market. Last year the test of one of Acumentrics propane based units at the visitor centre of Exit Glacier National Park in Alaska was completed. The unit being tested was reported to have run for over 1,100 hours without degradation. This unit was previously working at Kenai Fjords National Park.

Residential Power SOFC Series: RP-SOFC-5000 and RP-SOFC-10000 micro-power plants, tubular solid oxide fuel cell (T-SOFC) plants to generate electrical power from multiple fuels and the RP-SOFC-10000 co-generation unit with a total efficiency of more than 75 percent.

Ballard (Canada)

<http://www.ballard.com/>

Ballard in conjunction with its joint venture company Ebara Ballard, released its next generation residential co-generation fuel cell. The liquid cooled Mark 1030 V3 1kW stack has been designed to work towards the 2008 Japanese governments targets of 10 years lifetime in the home (equivalent to 40,000 hours operation). Aims now are to reduce costs, of the stack and fully integrated unit, in line with the 2008 Japanese cost targets. In terms of marketing Ebara Ballard has exclusive rights to the CHP units in Japan, whilst Ballard holds the rights to the rest of the world.

Ebara Ballard

www.ebara.co.jp/en

Ebara Ballard (Japan), as mentioned above, is the offspring of Ballard and Ebara. Since its birth Ebara Ballard has played an increasingly active role within the Japanese stationary fuel cell demonstration programme. As one of only two stack manufacturers to be used in the first round, Ebara Ballard is in a strong position in the market for 1kW residential fuel cells. With the new stacks, outlined in the Ballard overview, it is expected to be able to achieve production costs of 1.2 million Yen (~ US\$10,000) for the Natural Gas unit and 1.5 million Yen (~ US\$12,000) for the Kerosene unit respectively.

Fuji Electric Advanced Technology

<http://www.fujielectric.co.jp/eng/>

Fuji Electric Advanced Technology (Japan) is developing its own 1kW PEM unit, for use in small stationary applications. Since the last survey Fuji have been testing its 4th generation unit, which runs on City Gas (In Japan 85% of City Gas is LNG, a further 5% is natural gas with the remaining 10% being petroleum products such as LPG) and has a demonstrated electrical efficiency of 35% LHV and a heat recovery efficiency of 51% LHV. Fuji has set a commercialisation date of 2008 for its units and is targeting annual sales of 5 – 10,000 units per annum, with a price tag of 1.5 – 2 million yen (US\$12 – 16,000), and a lifetime of 40 thousand hours. By 2015 it is aiming for a further reduction in price to 300,000 – 500,000 Yen (US\$2,500 – 4,000).).

GS Yuasa Corporation

<http://www.gs-yuasa.com/us/>

GS Yuasa Corporation (Japan) is one of a very limited number of companies developing direct methanol technology for small stationary applications. The YFC-1000 unit 1kW unit has been tested at a strawberry farm where the waste CO₂ being used as a help promote the fertilizer. GS Yuasa's unit,

which is aiming for commercialisation date of 2007, is claimed can run for two weeks off 230 litres of methanol.

Japan Energy

<http://www.j-energy.co.jp/english/>

Japan Energy in conjunction with Toshiba Fuel Cell Power Systems, has installed a number of LPG fuelled 700W fuel cells into homes that it serves. For testing of its "ECOCUBE" systems Japan Energy is providing the units free of charge, for installation, but are charging a 90,000 Yen (US\$720) annual maintenance fee. The users are then paid back a gratuity of 90,000 Yen for hosting the units. The unit has a reported electrical efficiency of 33% (HHV) and thermal efficiency of 45% (HHV).

Kyocera

http://global.kyocera.com/ecology/g_prdct.html

Kyocera is developing SOFC fuel cells both for residential use, 1kW, and large units for businesses. The 1kW unit is in collaboration with Osaka Gas, whilst the large unit is with Tokyo Gas and is anticipated to be commercialised in the spring of 2007.

Matsushita Electric Industrial

<http://panasonic.net/index.html>

Matsushita Electric Industrial (Japan) not only is they still installing units, with Panasonic stacks, they are now actively marketing houses with these units pre-installed. During 2006 it system was awarded the Good Design Award for Ecology Design. The PEM units are rated at 33% (HHV) electrical efficiency and 45% (HHV) thermal efficiency. The fuel for the 1kW unit is natural gas. Matsushita Electric Industrial aims to have a production cost of 1.2 million Yen (~ US\$10,000) and a lifetime of 10 years by 2008.

Mitsubishi Heavy Industries

<http://www.mhi.co.jp/mihara/indexe.html>

Mitsubishi Heavy Industries (MHI) (Japan) is working with PEM units and is developing reformers for seven different types of fuel: natural gas, LPG, naphtha, kerosene, methanol, di-methyl-ether (DME) and ethanol. The durability target is over 30,000 hours. Unlike a lot of other Japanese companies MHI is working on a 10kW, aimed specifically at small businesses. MHI is working with Kyushu University and Kansai Electric Power on planar SOFCs. The target size of the unit ranges from low kilowatts to several tens of kilowatts for on-site power generation.

Nippon Oil

<http://www.eneos.co.jp/english/>

Nippon Oil (Japan) is currently working on

- a 1kW kerosene fuelled PEM system, in conjunction with Ebara Ballard, called ENEOS ECOBOY;
- a 10kW kerosene fuelled PEM unit, being co-developed Mitsubishi Heavy Industries and
- a 1kW LPG fuelled PEM unit with Sanyo called ENEOS ECO LP-1.

In terms of commercialisation Nippon Oil is planning on commercialising the 10kW unit at some point during 2007 For the 1kW unit the lease rate is 60,000 Yen per annum (~ US\$500).

Plug Power

<http://www.plugpower.com/>

Plug Power Inc. and Vaillant have been selected by the European Commission to receive a grant for the international development and demonstration of three HT-PEM fuel cell system prototypes. The European Commission will provide €2.5 million in funding for the project, which is estimated to have a

total value of more than €11 million over a two-year period. In October, the U.S. Department of Energy awarded \$3.6 million to support the international collaboration. This is the first cooperative program in fuel cell technology between the two government entities.

Toshiba Fuel Cell Power Systems

<http://www.toshiba.co.jp/csr/en/highlight04/fuelcell.htm>

Toshiba Fuel Cell Power Systems (TFCPS) (Japan) is the new subsidiary formed by Toshiba for the sole purpose of commercialisation of its 1kW residential PEM fuel cells, by 2008. This is termed “Dash to 2008” when it is planning on having a unit priced on the open market at less than 1.2 million Yen (approximately US\$9500). The technical targets for the system are: a cold start time of less than 10 minutes, overall efficiency of > 77% (HHV) and 80 °C waste heat. In the new company TFCPS will produce the stacks, Toshiba Home Techno assembles the systems and the reformers are sourced externally. The current unit, the “TMI-A” is designed to be operated in a daily start-stop mode and provides the residence with all its hot water and most of the base load electricity requirement during the day. The current unit has a total efficiency of 71% (HHV) and can be run of LPG and natural gas. TFCPS are supplying units to Japan Energy, Taiyo Oil, Kyusyu Oil, Osaka Gas and Idemitsu Oil. It is also working in cooperation with Cosmo Oil and Cosmo Gas for testing of its units.