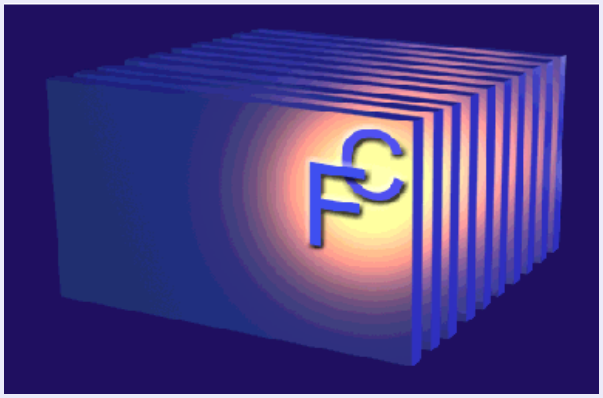
IEA Advanced Fuel Cells

Implementing Agreement



NEWSLETTER

www.ieafuelcell.com Newsletter 2013 – Number 02

A word from the Chairman

This newsletter aims to share the work of our group, key topics from recent meetings and exciting new developments occurring in our member countries. Another way we share our work is through our Annual Report, and through our website: ieafuelcell.com

So far 2013 has shown that fuel cells are providing reliable, efficient power across many locations and to a growing range of customers.

- Stationary fuel cell use has undergone exceptional expansion:
  - Over 42,000 fuel cells installed in Japanese homes since 2009 for electricity generation and hot water, fuelled by the gas grid. Demand is expected to remain very strong with subsidy finding made available for a further 53,000 units in 2013.
  - Fuel cells for telecoms as power and back-up power internationally including 250 installations in Denmark, and a further 652 installed by Danish companies worldwide. In the USA such installations had excellent reliability performance during Storm Sandy.
  - Large companies in the USA utilising fuel cells to help fulfil their energy base load requirements, including eBay, Walmart, BMW and Coca-Cola.
- Fuel cells used in forklift trucks in the US, with purchases continuing throughout 2012 and into 2013. Several companies are pursuing the fuel cell forklift in Europe, with trials in a number of countries.

Such results demonstrate the contribution that fuel cells are beginning to make to meet our energy needs.

Chairman: Prof. Dr. Detlef Stolten

In this Issue

A word from the Chairman……..…..1

December ExCo meeting 'round-up'……..…..2

Highlights from Member Countries ……..……2

In the press……..…….....5

Forthcoming events/ workshops……6

Join our work!.....7

December 2012 ExCo Meeting

The most recent Executive Committee Meeting, the 45th, took place in December 2012, Mainz, Germany, and we had excellent attendance from our member countries. The meeting was originally scheduled to take place in Jerusalem, Israel, to welcome Israel to the group, but sadly this was changed at the last minute due to the security situation at that time. We hope to visit to Israel in the near future.

Our meeting focused on progress at a national level from our member countries, sharing news about fuel cell demonstration projects and deployment levels. It became clear during this meeting that excellent progress has been made in the last few years, particularly in Japan with domestic installations of fuel cells, and in the USA with forklift trucks and stationary power installations, both of which we highlight below.

Highlights from Japan

Presented by Hiroyuki Kanesaka, NEDO

Japan has high expectations for dispersed and high-efficiency power sources, particularly since the terrible Tōhoku Earthquake. Japan already leads the world in the deployment of domestic-scale fuel cells for power and heat through the Ene-Farm products, with over 42,000 units sold and installed in Japan since 2009, establishing a market for installations of fuel cell household energy systems.

Figure 1 Toshiba and Osaka Gas' Ene-Farm Domestic Fuel Cell

Ene-Farm is helping to drive dependency away from the centralised power sources. The benefit to customers is that the installation of an Ene-Farm fuel cell is expected to reduce a household's energy consumption by 39% and CO_2 emissions by 49% annually.

The fuel cell systems are mainly fuelled by the gas grid, with heat as a by-product, which is used to supply hot water to the household. Both PEFC technology and SOFC technology are used in different Ene-Farm products.

The 2012 Ene-Farm model from Toshiba and Osaka Gas costs around JPY 2.6M (picture above), while the latest from Panasonic and Tokyo Gas in 2013 costs JPY 1.99M, breaking through the JPY 2M barrier for the first time. The subsidy in late 2012 was JPY 0.5M*, so approximately 20% of the system price (approx. USD 20,000** / EUR 15,500*** with a subsidy of USD 5,000 / EUR 4,000). The systems described above achieve overall efficiencies of 94% and 95%, run times of 80,000 and 60,000 hours respectively, and the latest stacks come with a 10 year warranty period.

* Where JPY is the Japanese Yen, ** Where USD is the United States Dollar, **** Where EUR is the European Euro

Highlights from USA

Presented by Nancy Garland, DOE

The USA has a strong fuel cells program, the aim of which is to enable widespread commercialisation of this technology. The USA is pursuing ambitious fuel cell targets including fuel cells for transport achieving 60% efficiency and 5000 hour durability by 2017 and for micro (5kW) and medium (100kW – 3MW) CHP fuel cell systems running on natural gas to cost USD1,500 or less per kW by 2020. Many countries look to the USA's targets to influence their own.

In the USA, the state of California has taken a lead on this technology. One particularly exciting example is the world's first tri-generation fuel cell energy station in Orange County, which uses waste water treatment gas as the fuel, a molten carbonate fuel cell and produces electricity and 100 kg of hydrogen per day. California provides a subsidy of USD 4,500/kW for fuel cell systems using renewable fuel, such as bio gas or anaerobic digester gas, and this has helped the state to achieve its market leading position.

Use of fuel cells to drive forklift trucks has dramatically expanded in the US. By the end of 2012 the initial grant aided purchases (from the Recovery Act, 2009) had led to a further three fold increase of the purchase and deployment of forklifts with many repeat orders made without Government funding. Total deployment is given as around 3,500-4,000 fuel cell powered forklift trucks, with 19 sites running a fleet entirely on fuel cells.

Using large installations of fuel cells to provide backup power has also proved very successful, with numerous success stories emerging after hurricanes Sandy and Irene, ranging from ReliOn Inc's PEM fuel cells and Altergy's FCs powering mobile phone call towers, to Bloom Energy and UTC providing back up power at data centres and supermarkets through periods when the main electricity supply was down.

Highlights from Sweden

Presented by Bengt Ridell, Grontmij AB

Sweden's focus for fuel cells is largely for the transport and portable markets. Swedish company PowerCell has developed a 3kW 'PowerPac', the world's first fuel cell system to use road diesel fuel to produce electricity, aimed at both the transport and telecoms sectors. The system is currently undergoing field tests in Africa where telecom operators need to

overcome a lack of stable electricity grid supply to facilitate the mobile phone network. Magnus Henell, CEO of PowerCell describes the Power Pac as “the world’s first functioning fuel cell system that can convert ordinary road diesel to electricity in a silent, clean and cost-efficient manner.” PowerCell is collaborating with Volvo Trucks and Statoil to develop this fuel cell technology for transport systems. The first generation Power Pacs have been test driven for more than 5,000 hours with the second generation now developed providing at least 10,000 hours of lifetime. The benefit is electricity while stationary, so a truck driver can have air conditioning and light while stationary, without running the engine – engine idling is increasingly banned in US cities. PowerCell are now ready for commercialisation and the company is in negotiations with potential operators.

Stockholm based myFC and SiGna Chemistry have jointly launched the pocket sized hydrogen fuel cell charging power solution for mobile devices. The PowerTrekk contains a sodium silicide powder, which when water is added to it at room temperature, produces enough energy to power up portable devices on the go and recharge batteries.

Figure 2 PowerTrekk mobile device recharging

Highlights from Germany

Presented by Can Samsun, Forschungszentrum Jülich

Germany’s green electricity has been steadily growing since 1990, now supplying 20% of the energy demand. Germany has decided to decommission its remaining 9 nuclear power stations by 2022 and increase renewable sources to 80% by 2050.

Innovative approaches at Forschungszentrum Jülich for using direct methanol FC systems and integrated HT-PEFC systems with GTL-Kerosene reforming are undergoing continuous testing and improvements to increase performance, conversion and reduce power loss.

Interest in fuel cells for domestic heating has made steady progress with the largest nationwide field trials for microCHP systems in the Callux Programme underway. Heating specialists such as Baxi Innotech, Hexis and Vaillant are using PEFC and SOFC technologies, fuelled by natural gas or biogas. Already 300 systems are operational, with a further 250 anticipated. Electrical efficiencies of 33% and overall efficiencies of 96% have been achieved to date, stack operation times of 10,000 hours have been proven, and the degradation rates have been reduced to 0.2%/1000 hours.

PRESS RELEASE!

H2USA launched by the DOE

May 2013

The US DOE has launched a public-private partnership to deploy hydrogen infrastructure, H2USA. This focuses on advancing hydrogen infrastructure to benefit transport energy options, including fuel cell electric vehicles.

Figure 3 Hyundai's ix35 powered by fuel cells and hydrogen.

Current members include American Gas Association, Association of Global Automakers, the California Fuel Cell Partnership, the Electric Drive Transportation Association, the Fuel Cell and Hydrogen Energy Association, Hyundai Motor America, ITM Power, Massachusetts Hydrogen Coalition, Mercedes-Benz USA, Nissan North America Research and Development, Proton OnSite, and Toyota Motor North America. The plan is for industry and government to identify actions to encourage early adopters of FCEV, conduct market research and evaluate the fuelling infrastructure that is needed to achieve cost reductions and economies of scale.

Fuel Cell powered submarine

May 2013

Germany launched a fuel cell propelled submarine, the U36. A previously launched fuel cell propelled submarine, U32, a sister ship to U36, produced a new non-nuclear record for submerged time, achieving 18 days in April 2013. U36 uses a Siemens PEFC, developed by HDW into the required air independent propulsion system, storing the fuels hydrogen and oxygen on board. There is also a diesel generator on board.

Green hydrogen at airport

February 2013

A project to generate green hydrogen has begun at Berlin-Schönefeld, at the new international Berlin Airport currently under construction. The wind energy company Enertrag, gas group Linde, and energy company Total are building a multi-energy fuelling station, using solar panels and a specially planned wind farm to generate the energy required to produce hydrogen. A 500kW pressurised electrolyser from Enertrag will produce over 200kg of hydrogen each day, sufficient for about 50 cars. Germany aims to have 50 publically accessible hydrogen fuelling stations by 2015.

World's largest fuel cell power plant under construction

April 2013

Figure 4 Artists Impression of the finished 58MW power plant at Hwasung, South Korea.

Construction of a 58MW MCFC power plant is underway with operation scheduled to begin by the end of 2013. This is the world's largest fuel cell power plant, and is being built by POSCO Energy in Hwasung, South Korea. The plant will cost about USD 280 million to construct and commission and will provide electricity and heat for 20,000 family homes, with 47% electricity efficiency.

OUR ACTIVITIES

Forthcoming Annex Meetings

- Annex 22: 10-12th December, 2013, Tokyo, Japan
- Annex 23: November 2013, Columbus, Ohio, USA
- Annex 24: 5 October 2013, Okinawa, Japan - in conjunction with the 13th International Symposium on Solid Oxide Fuel Cells
- Annex 25: Spring meeting April 2014 ENEA, Italy. Fall meeting, Dantherm Power, Denmark
- Annex 26: 14th May 2013, Arlington, USA
- Annex 27: 12-13 September 2013, Intertek, Stockholm, Sweden

The next Executive Committee meeting will be held on the 18 – 20th November 2013 in Jerusalem, Israel.

NOT TO BE MISSED

- The **Third International Workshop** on **MCFC** is to be held on the 26-27th September 2013 in Gyeongju, Korea.
- "**Community Energy Storage**" Conference in Eilat, Israel, 21st November, with a focus session on "**Will fuel cells become the leading technology for grid storage**".

Join our Work!

We welcome new participants to our work, at the expert level, company level and at the country level. Participants from member countries (ieafuelcell.com/contact) may join the work of our Annexes, please contact the following Operating Agents, leaders of the Annex work:

Annex 22: Polymer Electrolyte Fuel Cells, Dr Xiaoping Wang: xiaoping.wang@anl.gov

Annex 23: Molten Carbonate Fuel Cells, Dr Tae Hoon Lim: Thlim@kist.re.kr

Annex 24: Solid Oxide Fuel Cells, Dr Jari Kiviaho: jari.kiviaho@vtt.fi

Annex 25: Stationary Fuel Cells, Mr Bengt Ridell: bengt.ridell@grontmij.se

Annex 26: Fuel Cells for Transportation, Dr Rajesh Ahluwalia walia@anl.gov

Annex 27: Fuel Cells for Portable Applications, Dr Martin Müller: mar.mueller@fz-juelich.de

Annex 28: Systems Analysis, Dr Can Samsun: r.c.samsun@fz-juelich.de

If you are from a non-member country, please contact Dr Louise Evans at Secretariat-AFCIA@ricardo-aea.com who would be delighted to discuss membership with you, either on a country basis or on a company basis. To see the benefits of joining our work, see ieafuelcell.com/joining.

Special thanks to the following companies and organisations for their permission to use the pictures in this Newsletter.

- Toshiba for use of their Ene-Farm product picture.
- myFC for use of their PowerTrekk pictures.
- Hyundai for pictures of the ix35 fuel cell car.
- KIST and POSCO for the artist's impression of the Hwasung site.