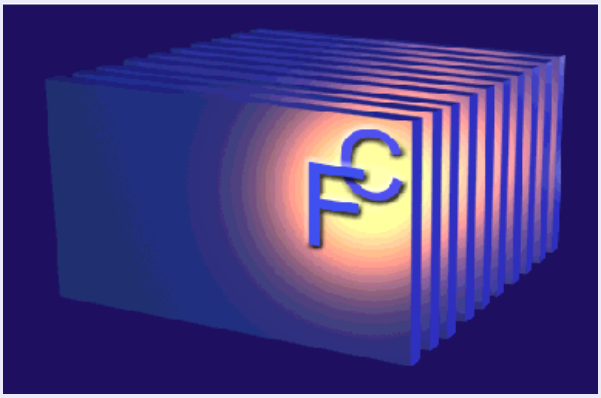
# IEA Advanced Fuel Cells

## Implementing Agreement



AUTUMN NEWSLETTER

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## A word from the Chairman

Welcome to our new newsletter for the Advanced Fuel Cells Implementing Agreement.

This newsletter is aimed at all who are interested in the work of the Advanced Fuel Cells Implementing Agreement. It will be a way to share the work of our group and our outputs, as well as sharing key topics from recent meetings and exciting new developments occurring in our member countries.

Our most recent Executive Committee Meeting was held in Toronto, Canada. We had excellent attendance from countries and welcomed China and Israel to our meeting as new members. All Annexes were represented, ensuring that productive discussions took place. Excellent in-depth technical reports were given by each of the Annexes highlighting the cutting edge technical progress that is being made. The ExCo also took the opportunity to reflect on and update the Implementing Agreement's Strategy and Mission Statement. This now better reflects the value that this group brings to the IEA's work and knowledge, as well as allowing the group to continue to deliver the main benefit sought by member countries; sharing technical progress as well as sharing and learning from national policies and approaches.

Chairman: Prof. Dr. Detlef Stolten

### In this Issue

# Spring ExCo Meeting - Toronto, Canada - June 2012

The recent Executive Committee Meeting took place in Toronto, Canada, held to coincide with WHEC 2012. We had excellent attendance from countries and Operating Agents from the Annexes. This ensured that highly informed and representative discussions took place.

Highlights from the excellent in-depth technical reports given by a few of the Annexes are shared below.

## Annex 22 - Polymer Electrolyte Fuel Cells

Operating Agent: Dr. Xiaoping Wang, Argonne National Laboratory, DoE, USA

The seventh workshop of Annex 22 Working Group was held at KIST in June 2012. Highlights from this meeting include the developments:

- Alkaline fuel cells show promising results as alternatives to the more conventional acidic fuel cells because they are less expensive and because non-noble metals can be used as effective catalysts to reduce the cost of the fuel cell system (to <$30/kW).
- Ethylene glycol has been identified as a better fuel than ethanol or methanol for DF-PEFCs.
- The performance and durability of DMFC systems for forklift applications has been improved through optimizing the MEA and the stack fabrication, structure, and design, and by optimizing system operations.

## Annex 24 - Solid Oxide Fuel Cells

Operating Agent: Dr. Jari Kiviako, VTT, Finland

Annex 24 has held two successful workshops over the past year, one focusing on SOFCs for new generation power plants, and the other on degradation issues affecting fuel cells, in conjunction with PEMFC and MCFC.

Key points from the work of this Annex are:

- Stack development has achieved 5 years run time (30,000 hrs), but this is testing technology that is 5 years old already. The target for more recent technology is 40,000hrs and the evidence to date suggests that this will be met.
- The current target for new SOFC technology is 80,000hrs, 9 years. Newer stacks at 2 years old are on test, and these are showing significantly improved performance already.
- The results of large scale stacks show that large scale power production is viable.
- In Denmark SOFCs running on landfill gas have achieved long run times, which demonstrates that large SOFCs can be run efficiency and smoothly. Methane levels fluctuated, but the system could cope, impurities were handled via a commercially available cleaning system.

# Annex 26 - Fuel Cells for Transportation

Operating Agent: Dr. Rajesh Ahluwalia, Argonne National Laboratory, USA

- 3 kW Auxiliary Power Units for trucks from PowerCell, operating on conventional fuels. Significant improvements in reversible degradation shown in second generation products, with good low levels of noise and vibration, and zero emissions of $NO_x$, CO and $SO_x$.

- Deployment of 10 FC La Poste delivery vehicles, $H_2$ produced locally from solar energy and water electrolysis.

- A number of FC cars are due for release, such as the F-City $H_2$ from a joint French-Swiss project, the HyKangoo from Renault and SymbioFCell, and the Mia FCH vehicle. All have a range of 300km.
- The Scandinavian Hydrogen Highway Partnership has been announced. This currently has 49 vehicles operating and 10 refuelling stations, with 2 more stations under construction, 4 aiming for EU funding and 17+ under consideration.

An area of great focus is FC Buses. Recent results have demonstrated that the reliability of FC buses continues to improve year on year, and hence their practicality for high levels of roll out.

- Operational lifetime is increasing significantly, from 6,700hrs in 2008 to 12,000hrs in 2011 and the aim is >25,000hrs in 2014.
- Fuel efficiency has already achieved the target of 8mpdge.
- Reliability is significantly better, and call outs are generally not due to the FC system.
- Refuelling time has reduced, now at 7-10 mins per bus.

- The cost of FC buses has significantly fallen over time, from $3m in 2003, to approximately $1.5m today.

The full text for Annex 26 Bus Report can be found at the AFC IA website: http://www.ieafuelcell.com/fuelcells.php.

# Annex 23 - Molten Carbonate Fuel Cells

Operating Agent: Dr. Tae Hoon Lim, Korean Institute of Science and Technology (KIST)

New developments in Korea were highlighted during the Executive Committee meeting in Canada, most notable from POSCO Power disseminating 52MW (45.7 MW on operation, 5.6MW under construction) and the intention to achieve 60MW by the end of 2012 at Gyunggi (Korea Hydro & Neuclear Power Co).

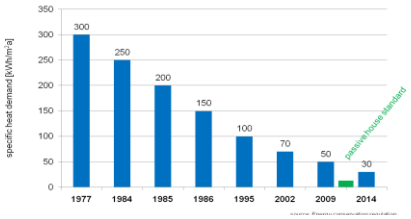
Fuel Cell Energy Solutions based in Germany have taken over the assets and know-how of MTU in a joint venture between FCE and Fraunhofer IKTS.

# Annex 25 - Stationary Fuel Cells

Operating Agent: Bengt Ridell, Grontmij AB, Sweden

This annex has a particular focus on fuel cells for buildings, the different fuels for fuel cells, system optimization and to follow up the real status of stationary fuel cells technology.

The work has identified that the heat demand for new buildings is decreasing, whereas the electricity demand and requirements for UPS are increasing. This has significant implications for the optimisation of domestic fuel cells, and the requirement for high electric efficiency.




In Japan the ENE-Farm Programme, running since 2009, had installed over 28,000 units by the end of 2011, and the total expected target for 2012 is over 42,000 units. Within this programme PEFC dominate, but the SOFC program has increased with more than 800 SOFC AisinSeiki/Toyota units expected to be operational in 2013.

# Annex 27 - Fuel Cells for Portable Applications

Operating Agent: Dr. Martin Müller, Forschungszentrum Jülich, Germany

This annex focuses on portable fuel cells. Key application areas are forklift trucks, wheel chairs, bikes, PDAs and military applications.

New ideas for direct fuel cells (catalyst development) include utilising ethanol, ethylene glycol and glucose feed stocks and the technology requirements this would introduced are progressing.

# FRANCE IN THE 'SPOTLIGHT'

**5 to 10 large deployment projects expected by 2018**

National Representative: Dr. Thierry Priem, CEA

In April 2011, France released their $H_2$ & PAC strategic roadmap. The aim of this roadmap is to enable new and emerging markets to grow capacity, support information and training, increase support from policy makers and boost hydrogen and fuel cells for clean mobility. The existence of such a roadmap marks a new direction for France, providing a greater focus on this area than existed previously.

The intention is to take forward 5 to 10 large deployment projects in France focusing on real world solutions. France's priorities are electro-mobility and utilising renewables in conjunction with a hydrogen and fuel cells based solution.


Smart grid technology is at the forefront of France's future for renewable hydrogen production and lean $CO_2$. The Myrte platform, an experimental project that links a photovoltaic farm and hydrogen fuel cells system to an electrical grid connection, was inaugurated early in 2012. The objective is to control the system power output on the grid during critical hours of operation.

Exciting current partnerships within France include:

- Motor-vehicle giant Renault and chemicals group Solvay developing the 'Kangoo ZE' van prototype, with the to double the current autonomy to an impressive 150km-300km, by using the fuel cell as the range extender. The venture also has the partners SolviCore and SymbioFCell.
- Partners Solvicore, Ballard and Powercell are working in CEA/ARMINE and FC labs to design and produce high power fuel cells systems for cars and trucks.
- Axane and Plug Power, world leaders in fuel cells for forklift trucks, have formed a promising partnership with HyPulsion to complete a European offer to integrate 11 fuel cell power packs in to class I, II and III fork lift trucks.

# PRESS RELEASE!

## Site Preparation Underway for 1-Megawatt CLEARgen™ Fuel Cell System

June 18th 2012

On June 13th Toyota held a ground breaking ceremony at its sales and marketing headquarters in California that will house Ballard's CLEARgen™ fuel cell system. The system will provide peak electrical power and heat to a number of locations on Toyota's multi-building campus, utilizing hydrogen produced by steam-reformation of renewable bio-gas generated at a landfill. The ability to offset peak electricity usage with an emission-free fuel cell system will create significant savings for Toyota, while reducing the facility's environmental footprint.

Delivery of the CLEARgen™ system is planned for July 2012, with commissioning to be complete in August. Project funding is being provided through California's Self-Generation Incentive Program (SGIP).

http://www.ballard.com/files/PDF/Market_Updates/Toyota_Groundbreaking_FINAL.pdf

## Passengers board MTA's Hydrogen Fuel Cell Bus for the first time in Flint, Michigan.

May 29th 2012

The Mass Transportation Authority held the inaugural ride of its first hydrogen fuel cell bus in May, which also incorporates power storage from breaking. The bus will be tested on different routes and share the data with the owning company United Utilities. MTA are planning to buy two further FC buses, with new FCs installed, to use in the area.

The fluctuating diesel price was a factor in this latest trial; MTA's fuel costs have significantly increased in recent years.

http://www.mlive.com/business/mid-michigan/index.ssf/2012/05/mta_introduces_hydrogen_fuel_c.html

Image courtesy of Shutterstock – www.shutterstock.com

# NOT TO BE MISSED

Forthcoming events and workshops

- Annex 22: Expected Spring 2013
- Annex 23: November 2013, Columbus, Ohio
- Annex 24: 6-11 October 2013, Okinawa, Japan - in conjunction with The 13th International Symposium on Solid Oxide Fuel Cells
- Annex 25: 11-12 April 2013, Berlin, Germany
- Annex 26: Expected Autumn 2013
- Annex 27: January 2013

The next Executive Committee meeting will be held in December 2012 in Frankfurt, and the following one in Austria in May 2013.

## Special Thanks

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

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