March, 2008

RES-FC Market News

CONTENT

What is RES-FC Market News?

The EU-project behind this acronym is about making a contribution for changing the development of renewable energy sources (RES) fuel cell household systems (FCHS) from solely R&D to include also market development and in this way accelerate the development of the technology and its economic performance.

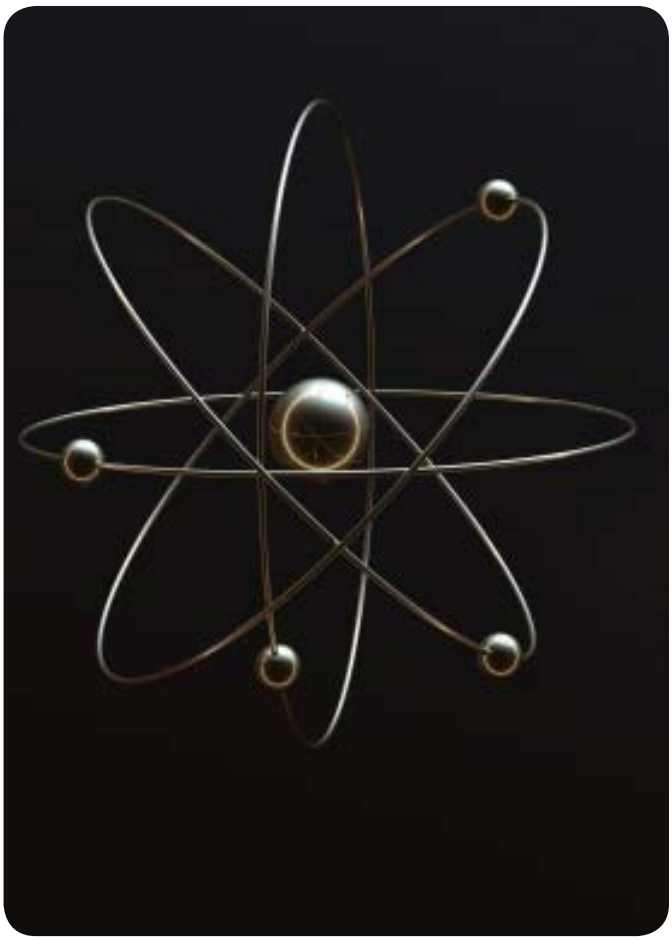
In this newsletter you may read about the findings of this ongoing research and learn more about the challenges that face integration of renewable energy sources in the energy system of today - from a technological perspective as well as from a market perspective. The project participants are the authors of these small articles. In the back you may read more about the participants, what they know, and how to get in contact with them...Enjoy!

The project is supported by the European Commission, Executive Agency for Competitiveness and Innovation, EACI. The sole responsibility for the content of this newsletter lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

Is the take off of residential fuel cell market possible?

by Paula Fonseca, ISR

Nowadays the majority of the fuel cell manufacturers are very reluctant to offer fuel cells for the residential sector with competitive prices. In the low to medium power range they are focused in the automotive/transportation and back-up power applications or they produce high power fuel cells (above 100 kW range). As far as there is not a large demand for fuel cells, the manufacturers cannot decrease the production costs of the technology, and fuel cells will remain very expensive. On the other hand, while the prices of the technology are high, the end-user is not going to switch from secure grid electricity to an immature expensive technology. Therefore, like the example in Japan shows, this technology needs financial incentives from the government to take off, to become more attractive for end-user. The questions however still remain: What will happen once the incentives are canceled? Will the market be established by then? Hopefully the prices will have dropped significantly, allowing their purchase even in the absence of incentives. If the prices of electricity will increase fast in the future, as the actual economic framework and fossil fuel prices sharply increase as projections show, then FC technology may have room for a successful market development.



The taming of the Proton - in Iceland

by Thorsteinn Sigfussion, UoI

In Iceland, where renewable energy is used over most of the country to provide heat and electricity, there are a few areas where geothermal energy is not available.The RESFC project in Iceland is examining the possibility of producing fuels from the CO2 emitted from metals smelters and by coupling it to renewable hydrogen to produce methanol.

The idea is to test such system in the Western Fjords of Iceland where methanol produced from CO2 emissions would be used to replace direct geothermal heating. The project is overseen by the Innovation Center Iceland which has a facility in Isafjordur, Western Iceland.

On April 23rd there will be a big event in Reykjavik where most aspects of the hydrogen economy will be shown to the public. The RESFC project will use the opportunity to reach out to the public with information about the interesting movement created by the Europeana cooperation within the project.

I expects on the occasion to publish an Icelandic translation of this book about the hydrogen economy which will be published in English on March 25th in Oxford. The name of the book is: Planet Hydrogen - the taming of the Proton.

Residential fuel cell units for the Netherlands

by Gerard Kraaij, ECN

The largest Dutch energy company Nuon has ordered 50.000 residential fuel cell units from Ceramic Fuel Cells Limited (CFCL), providing that CFCL meets the performance targets. The deal means boilers containing fuel cell units will start appearing in Dutch homes towards the end of 2009. The first phase production unit will have a capacity of 10.000 unit/year, which will meet the initial demand. The fuel cell units are of the SOFC type, a high temperature fuel cell that operates around 800 °C. These units will use natural gas as the fuel source. In future, also renewable energy sources like biogas can be used in this type of fuel cells after gas clean-up. The size of the fuel cell unit is 2 kW, which means that for the average Dutch household approximately 25% can be used in the house directly and 75% of the electricity will be fed into the grid. The fuel cell unit can supply the hot tap water heat demand. An extra boiler will provide the additional heat demand. This means more efficient use of natural gas resources while CO2 emissions are up to 35% lower than from a gas-fired power station and up to 60% lower than from a conventional coal-fired power station.

Fuels cells for stationary applications - an emerging market?

by Poul Alberg Østergaard, AAU

Fuel cells are often seen as a way to turn transportation towards renewable energy using hydrogen as an intermediary energy carrier. While indeed important in the transportation sector, stationary applications are also emerging; applications where fuel cells are applied to supply individual houses with electricity and as a by-product heating. The RES FC Market has investigated barriers and preconditions for such applications in a number of European countries, and while the efficiency-to-cost ratio is still modest, there are possibilities also for stationary applications. In order to optimise the economy, there needs to be a heat demand where the fuel cell is installed, and electricity markets with widely fluctuating prices are also required. The ability of the fuels cells to supply regulating power is also an element that gives added value to the investment. However, public regulation in most countries do not accommodate such small producers of power and regulating power.

Demonstrate the Future

by Vick Mangru, IRD

There is a need for consumer increased awareness of fuel cell products. More importantly, access to skilled personnel for the installation, operation and maintenance will play a crucial role in the successful launch of micro combined heat and power fuel cells (µCHP FC) in our homes.

Policies aimed at increasing the number of demonstration sites for µCHP FC should be pursued aggressively. Accountability towards realistic targets should be implemented to ensure success, with emphasis on reliability of technology, consumers involvement and education, and development of a skilled workforce.

IRD is committed towards sustainable development of fuel cells by using Intellectual Property Rights (IPR) developed during the last 10 years. The end goal of achieving a mature, reliable and cost effective µCHP FC with advantages such as high electrical efficiencies, fossil fuel independence and balancing of the electricity grid in an environmentally friendly manner while maximising the chance of providing cost and carbon savings is achievable. However, it must be stressed that this challenge addresses not only the µCHP FC developers and manufacturers but the entire supply chain of the technology, including the consumer.

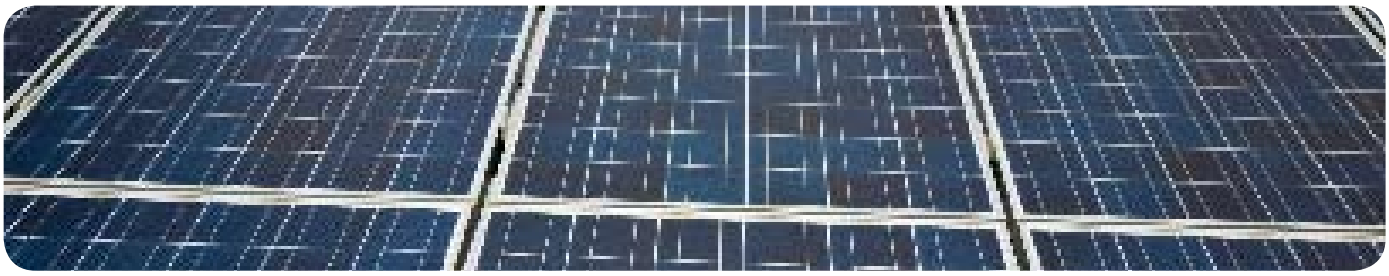
Platforms that promote dialogue and showcase fuel cell technology success is key to the market adoption of IRD µCHP FC. During the next years, IRD is well positioned to address the market in terms of manufacturing capabilities and product availability. Without a doubt, market adoption will follow successful demonstrations.

Hydrogen would be competitive

by Beatriz Alzueta Ibáñez, CENER

One of the most interesting routes to integrate renewable energies with hydrogen is producing this gas from wind energy by means of water electrolysis. Afterwards, this hydrogen could be used in a fuel cell to supply heat and electricity to the household. The main advantage of this process is that it is a zero emissions cycle, since the energy source is renewable and the reconversion process only produces water as by-product. Otherwise, one of the most important barrier we found to install this technology is the high cost both of fuel cell and electrolyser.

Both systems are not full developed from the technological point of view, and actually they don't have a wide market. If an important cost reduction in both systems is obtained (what seems probable), at the same time that its efficiency increases and Government supports these technologies for energy production and encourages demonstration projects and dissemination activities, hydrogen could become competitive within the current technologies. As an example, in Spain we reach the conclusion in this project that if a market for 1,000 fuel cells were developed, cost would decrease and if the Spanish Government promotes hydrogen and fuel cells as the same way as photovoltaic energy, this systems might be competitive for the end user.



Support for renewable energy in Denmark

by Claus Torbensen, HIRC

The Danish parliament has at the 21st of February voted in favour of an energy agreement covering the period 2008-2011. The energy agreement aims to reach 20% renewable energy in Denmark by 2011. In order to reach this goal it is planned to increase the installed wind power capacity by 1300 MW. This is to be achieved by constructing 2 new sea based wind mill parks with a total capacity of 400 MW. To increase the land based capacity a feed in tariff of 0,034 Euro/kWh will be given and an extra feed in tariff of 0,01 Euro/kWh will be due for replacement of old wind turbines.

With this agreement it seems that finally the instalment of new wind power in Denmark will get started again after years of zero net increase in installed capacity. The fact that the agreement was supported by a broad coalition in the parliament gives rise to the hope that the policy of supporting renewable energy in Denmark will continue beyond 2011 – and implies that wind power will be an increasingly central element in the future Danish energy system.

Integrated Bio Conversion

by Martin Møller, DONG

R&D News

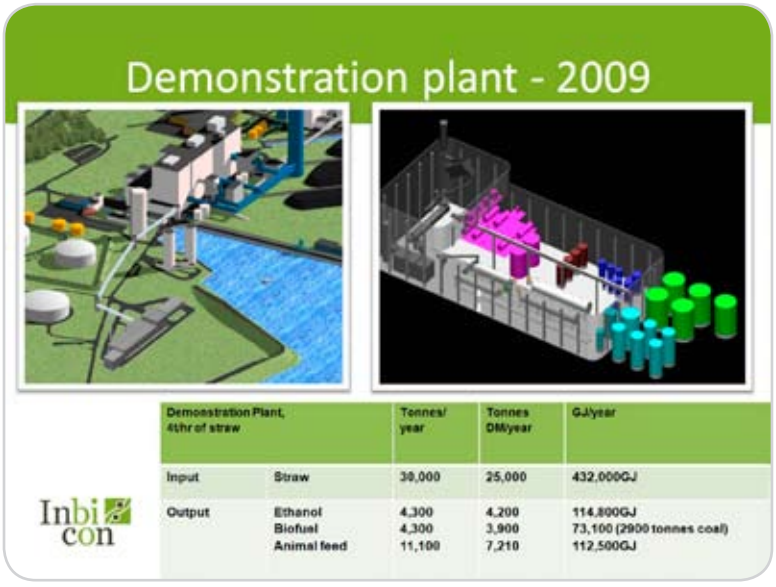
Bioethanol can be reformed to hydrogen and hence be used in fuel cells, and last month Center for Sustainable and Green Chemistry, at the Technical University of Denmark, produced bio-hydrogen based on real 2G ethanol produced from straw.

For hydrogen production based on ethanol, it will be feasible to use the ethanol/water mixture (30-50% ethanol in water) taken directly from the top of the stripper instead of using expensive steam in order to produce 96% ethanol, and then afterwards dilute it with water. The ethanol taken direct from the stripper, however, contains impurities, and the above mentioned experiments revealed the catalyst lifetime is reduced when real stripper ethanol is used compared to diluted chemical grade ethanol, and hence further R&D on catalyst development is needed.

The results of the experiments will be presented in a paper, which presently is under review.

Demonstration News

DONG Energy has concentrated its R&D and knowhow on bioethanol in a new company named Inbicon, which is related to Integrated Bio Conversion. Presently the company is 100% owned by DONG Energy A/S, and it is situated in Skærbæk, Fredericia. Inbicon has the knowhow and IPR needed to produce so-called 2G ethanol based on feedstocks as straw, bagasse and corn-stower. The technology is being developed all over the world, but to our knowledge only 1-2 companies in the world have a pilot plant that can match the size of Inbicon. The Inbicon technology has with success been operated continuously in a scale of up to 1000 kg straw per hour, and is now ready for the next upscale.



Inbicon has just finalized the design for the next scale, which will be able to convert 4 ton of straw per hour. The demonstration plant will be located in Kalundborg, and will be operating during the Climate Summit in Copenhagen Nov/Dec. 2009. The investment is in the range of 300 mio kr, and for the design and engineering Inbicon has received support from the Danish Energy Authority. The bioethanol plant will be integrated with a coal fired power plant, and hence it's possible to increase the overall efficiency. The demonstration plant will have three outputs: ethanol, biofuel and animal feed. The biofuel will replace 2900 tons of coal, and will be converted into green electricity. The demonstration plant shall prove and verify the Inbicon technology, before the technology can be exported all over the world.

RES-FC poster presented at 4. Deutscher Wasserstoff Congress

by Katrin Pietzsch, IBBK

Hydrogen and the current developments in fuel cell technology were the topics discussed at the 4. Deutscher Wasserstoff Congress (4th German Hydrogen Congress) which was held on February 20-21, 2008 in Essen, Germany.

During the first day an overview over the political, economic, technical and research related impacts of hydrogen and fuel cells was given. All speakers generally agreed that a hydrogen economy is an important means to reduce carbon dioxide emissions and thus contributes to stabilising climate change. Issues under discussion were, however, the ways to produce hydrogen. Some speakers argued that only „green hydrogen", i.e. hydrogen prodcued from renewable energy sources, is good hydrogen whereas others advanced the opinion that hydrogen produced from nuclear energy or coal gasification with carbon sequestration and storage (css) is crucial for advancing the hydrogen economy, for protecting the climate and last but not least reduce Germany's dependency from importing energy.

More interesting for the expert audience was the second day when specific topics were discussed in parallel sessions. The main focus was put on mobile fuel cell applications. Stationary applications were discussed in one single session. Altogether three sessions dealt with developing the hydrogen infrastructure and with various technologies for producing hydrogen. Amongst others various approaches for producing hydrogen based on biological processes such as fermentation were presented. Parallel to the Congress a small exhibition and a poster presentation took place where Katrin Pietzsch from IBBK, Germany, presented a poster about the RES-FC project. It was one of the few posters dealing with marketing and mainstreaming fuel cell household systems and thus went further than most technical and scientific posters.

New concept for residential CHP

by Jesper Themsen, DT

Dantherm Power A/S was established in 2007 as a spin of from Dantherm Air Handling A/S. Dantherm Power is a fuel cell system integration company focussing on commercialization of fuel cell technology for residential CHP and building the fuel cell business for telecom power backup.

Dantherm Power has examined both SOFC, PEM FC and HTPEM FC technology for a number of years. Among the latest developments is the HTPEM fuel cell technology for residential CHP which seems to have a very interesting potential of bringing fuel cell technology to commercial use in the residential CHP applications within a few years.

Dantherm Power participates in a number of international market studies aiming at finding the most suitable approach for commercialization of fuel cells for residential CHP. These studies, such as this study RES-FC Market, points at simplicity and flexibility in system architecture in order to reach the cost targets and the proper lifetime and reliability on short term. Simplicity and flexibility in the system architecture is exactly where the HTPEM technology seems to be very strong. For that reason Dantherm Power has developed a modular and sizeable HTPEM fuel cell system concept that enables fuel flexibility and adaption to local geografical system requirements. This system concept is now being tested on lab-scale and will during 2008 be installed in a number of different houses, operating on different fuels under real operating conditions.

Fuel Cell Alliance of the state of Baden-Wuertemberg

by Bernhard Schaible, KIBZ

The former project partner "Fuel Cell Center of Competence and Innovation of the Stuttgart Region" has merged with the "Research Alliance Fuel Cell" to become the new "Fuel Cell Alliance of the state of Baden-Wuerttemberg" (BzA-BW), which is continuing the activities in the RES FC-Market project.

This means e. g. that the members of our enlarged network have been informed and kept up to date about the project. At the same time we use this network for informations, which are essentially for the project and its partners.To do dissemination even on a larger scale we will use our presence at the Hanover fair to inform the visitors of the fair about the RES FC-Market project, using the information ot the recently issued brochure. We also will take the opportunity to inform the leading European and German producers and utility companies, which are actively testing fuel cell systems for residential heating and discuss with them about their future plans.

Our network puts us also in a position to monitor closely the use of larger scale high temperature fuel cells (3 digital kW-range), which are fed with biogas and could be used for big scale residential heating systems. Recent experience stresses once again that

- the biogas has to be cleaned carefully
- and the materials used throughout the fc-system must be adequate under the prevailing conditions.

Details will be published as soon as they are at hand. This experience is also valuable to the much smaller fc-systems and their renewable feed, on which our project focusses.

The participants of RES-FC Market:

Company /organisation:	Tasks and competences:	People:	Contact:
Hydrogen Innovation & Research Centre (HIRC)	Co-ordinator WP4 leader Low cost excess wind electricity/H2	Frans Bjørn-Thygesen Claus Torbensen Line Riisgaard	fbt@hirc.dk ct@hirc.dk lr@hirc.dk
University of Iceland (UoI)	WP5 leader System integration of fuel cell systems Ethanol/methanol from bio-sources	Thorsteinn Sigfusson	this@simnet.is
University of Coimbra (ISR)	WP6 leader Market potential for fuel cells Low cost excess wind electricity/H2	Paula Fonseca Ricardo Lima Aníbal de Almeida	pfonseca@isr.uc.pt rjslima@isr.uc.pt adealmeida@isr.uc.pt
Aalborg University (AAU)	WP3 leader The regional overall energy systems Biogas	Poul Østergaard Jens Bo Holm Nielsen Frede Hvelplund	poul@plan.aau.dk jhn@bio.sdu.dk hvelplund@plan.aau.dk
Fundacion CENER CIEMAT (CENER)	Wind/H2/fuel cells state of the art Low cost excess wind electricity/H2	Beatriz Alzueta Ibanez	balzuelta@cener.com
Energy Research Centre of the Netherlands (ECN)	WP2 leader Wind/H2 Low cost excess wind electricity/H2	Gerard Kraaij	kraaij@ecn.nl
Internationales Biogas und Bioenergie Kompetenzzentrum (IBBK)	Biogas/FCH market potentials	Katrin Pietzsch	K.pietzsch@biogas-zentrum.de
DONG Energy A/S (DONG)	Methanol/ethanol/fuel cell systems state of the art	Martin Møller	martm@dongenergy.com
IRD Fuel Cells A/S (IRD)	Fuel cell state of the art	Laila Grahl-Madsen Vick Mangru	lgm@ird.dk vma@ird.dk
Dantherm Power (DT)	Fuel cell systems, practical implementation	Jesper Themsen	jt@dantherm.com
Kompetenz- und Innovationszentrum Brennstoffzelle der Region Stuttgart e.V. (KIBZ)	Biogas/fuel cells state of the art Wind/H2, methanol	Bernhard Schaible	bernhard.schailble@kibz.dk
Baltic industries and Consulting Sp. z o.o. (BIC)	Electrolyser systems	Lars Yde	ly@hirc.dk

RES-FC Market news is published by HIRC and addresses the network cooperation group of the 10 regional partners in the project.
Text: Participants of RES-FC Market
Lay-out: HIRC