



## FOREWORD

The first international event for EDF's research and innovation was organized at EDF lab Clamart on 29th January. It gave the opportunity to present initiatives, solutions and projects developed by international R&D teams and to listen to the feedback and expectations from EDF business lines, EDF affiliates as well as EDF major academic and industrial partners. Around 300 people attended this first worldwide R&D Forum. In this framework, EIFER could illustrate its value proposition. Promotion of innovation and local value creation is a key mission that we must continue within the EDF Group. Let me use the occasion to thank our strategic Partner KIT, in particular Dr.-Ing. Karl Friedrich Ziegahn and Prof. Dr. Veit Hagenmeyer for their active contribution to the success of our event.

Jacques Sacreste  
Vice President EDF's R&D International & Partnerships, Member of EIFER Board of Directors



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# WHAT'S UP?

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NEWSLETTER FROM EIFER

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## IN THE SPOTLIGHT

### EDF's R&D is fully open to the world



The first international event for EDF's research and innovation hosted by Bernard Salha, senior executive R&D Vice President, was organized at EDF lab Clamart on 29th January. Around 300 people coming from R&D, EDF business lines, affiliates and partners attended this first worldwide R&D Forum. In the introduction both

Bernard Salha and Philippe Torrión, Executive Group Director in charge of Innovation, Strategy and Programmation, insisted that R&D should be responsible for the EDF key challenges and more especially for the transfer of services and technology innovation to business.

The first session "Working together for the development of the EDF Group through R&D and Innovation" covered four overlapping themes: Digital, Micro Grids, Sustainable Cities and Advanced Thermal Generation, mixing representatives from business lines, R&D programmes and international centres. In the sustainable cities panel, Ludmila Gautier, EIFER Director, gave a solid overview of the R&D activities' added value in terms of energy systems, environment, economics and society impacts as well as scenario development.

*...read more on page 2*

## SPECIAL: INNOVATION



### CONTINUED SPOTLIGHT

... The second session, "Which added-value does R&D offer its customers?" was mainly focused on EDF key challenges. The round table assembled directors from EDF Energy, EDISON, EDF EN the Nuclear Division and Bernard Salha. Each of them expressed their expectations on R&D activities for the next years. In the short movie that started this session, Bernard Gsell, CEO of EDF Deutschland, explained the key role of EIFER in the Tegel project selection.

It was a great pleasure for me to chair the last session "Which mutual benefits do EDF and its major academic and industrial partners get from their cooperation?" with our key major international partners. That means partners with whom we are presently working very closely: the Karlsruhe Institute of Technology (KIT), the Politecnico di Torino, Manchester University, the MIT, EPRI in the USA as well as CGN, the CEPRI in China and Mitsubishi in Japan.



Prof. Dr. Ute Karl (EIFER) and Dr.-Ing. Karl Friedrich Ziegahn (KIT)

Simone Rossi, International senior executive Vice President concluded on the R&D Group's contribution to the EDF International Development.

Let me conclude with special thanks to both Dr.-Ing. Karl Friedrich Ziegahn and Prof. Dr. Veit Hagenmeyer from KIT who have actively contributed to the success of our event.

## EIFER Winner of the "Trophée de la R&D d'EDF" in the Category "Collaboration with a Start-up"

Two EIFER teams participated at the R&D Innovation Challenge with the innovative projects "HTEL - High Temperature Electrolysers to integrate renewables" and "Simul City: decision aid for urban planning". The effort was rewarded as EIFER received the "Trophée" for its successful collaboration with the German start-up sunfire GmbH, developing a reversible system for electrolysis and fuel cell. Since more than 5 years, the EIFER team works with sunfire GmbH to optimize the performance and life of their technology of high temperature electrolyser for converting electricity into hydrogen and other fuels. Initially developed for the reverse operation, producing electricity and heat from hydrogen, this collaboration has turned an innovative solution into a customer centric product, speeded-up with the financial support of Electranova Capital, EDF venture capital, which has been a partner of this collaborative dynamics for nearly two years now.



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Contact: Annabelle Brisse

## EIFER Participates Actively in the EDF Pulse Awards 2016



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The 2016 Internal EDF Pulse Awards aims to showcase the best innovations from the different directions and subsidiaries of the EDF Group which are a source of performance and progress. EIFER submitted the project "EDF City Platform" in the category "Innovation supporting solutions for local communities" together with the department SINETICS and the EDF Lab Singapore. The EDF City Platform is a simulation platform for urban planning to help cities in their decision making process relating to numerous topics such as energy, construction, transport, air quality etc. The selection of the 18 finalists will be done before the 18<sup>th</sup> March. Besides the internal EDF Pulse Awards, EIFER also contributed to the external edition as an official campaign partner. Firstly, EIFER played a sourcing role, informing innovative start-ups in Germany, France and the rest of Europe about the launch of the Awards through our partnership with competitiveness hubs and clusters. Then, as part of the jury, EIFER - represented by the director Ludmila Gautier - provided its expertise on issues relating to the low-carbon city.

Contact: Jeannine Eckstein

Read the entire interview with Dr. Ludmila Gautier by clicking on below:

<http://pulse.edf.com/en/ludmila-gautier-citizen-participation-is-a-critical-success-factor-for-urban-projects>

Dr.-Ing. K.F. Ziegahn explained how the strong collaboration with EDF R&D is part of the KIT strategy. For instance, the joint project "Karlsruhe Living Lab Quartier Zukunft" presented together with Prof. Dr. Ute Karl from EIFER and also the presentation given by Prof. Dr. Veit Hagenmeyer on Information and Communication Technology in Energy Lab 2.0. Promotion of the innovation and added value offered by the R&D Centres is a key mission that we, together, must continue within the EDF Group.

Christine Patte

Coordinator for EDF's R&D International Activities and Partnerships



## WHAT'S UP AT EIFER ?



### Cooperation with ITAS (KIT) in the Transdisciplinary Project 'District Future – Urban Lab'



In Karlsruhe, the urban living lab 'District Future – Urban Lab', led by ITAS (KIT), tests and develops sustainable urban life. One action tested is the implementation of green infrastructure. In 2015, a socio-geographic study led by EIFER, analysed the actor network. Interviews have been conducted with actors from citizen's initiatives, municipality, the business sector and citizens. The results were presented at conferences in Vienna and Bonn. EIFER and ITAS will continue their cooperation in 2016.

Contact: Pia Laborgne, Monika Heyder

Links: <http://quartierzukunft.de/>

[https://greenurbancommons.files.wordpress.com/2015/10/abstract\\_beer\\_heyder\\_laborgne.pdf](https://greenurbancommons.files.wordpress.com/2015/10/abstract_beer_heyder_laborgne.pdf)

### News on BMBF Project „Zukunftsstadt“: SmartQuarterVision KA 2030+



Citizen Vision Workshop in Mühlburg, 12.12.2015

The project aims at developing visions for two city quarters in Karlsruhe (Mühlburg and Knielingen). In 2015, two workshops with children and seven group discussions with citizen associations, senior citizens, migrants, local trade and industry took place, followed by two citizen visions workshops. Creative ideas towards the future of the districts were discussed and visualized. They will be the basis for the "future concept" for city quarters in Karlsruhe and beyond. It will be publicly presented to the mayor of Karlsruhe in April 2016.

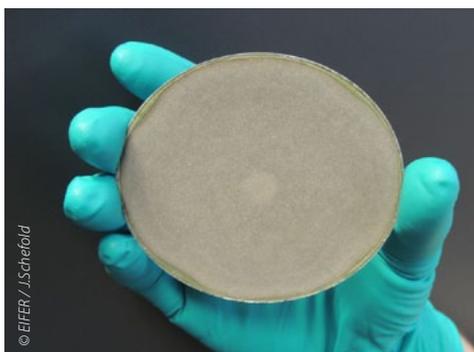
Contact: Pia Laborgne, Joanna Skok



## WHAT'S UP AT EIFER ?



### World Record at EIFER: 23,000 Hours of Operation of a High Temperature Steam Electrolysis Cell



View of the electrolyser cell after dismantling. The cell of 45 cm<sup>2</sup> area and 0.2 mm thickness has finally consumed 300 kg water for the production of 370 cubic metres of hydrogen.

A test with a ceramic solid oxide cell for steam electrolysis was recently completed at EIFER after 23,000 hours of duration – which is more than two and a half years. At present, this is by far the longest test for such a cell world-wide. The cell represents the heart of a steam electrolyser producing hydrogen with electrical energy. The experiment was performed in the frame of the sunfire research project of the German Federal Ministry of Education and Research (BMBF) using an electrolyte supported cell from the German cell producer KERAFOL®. The project milestone of 1,000 hours was finally exceeded by a factor of 23! The cell remained fully operational until the end of the test, without indications for accelerated degradation. Therefore, there is little doubt that operation times of above 40,000 hours, required for industrial applications, are reachable.

Contact: Josef Schefold

Link: <https://www.eifer.kit.edu/World-Record-at-EIFER-23-000-Hours-of-Operation-of-a-High-Temperature-Steam>

### HyVolution 2016: European Hydrogen Days in Paris

The Hyvolution days took place in the "Parc floral" of Paris on 4<sup>th</sup> and 5<sup>th</sup> February 2016. This event on hydrogen energy was attended by more than 500 representatives of the French and European hydrogen and fuel cell industry, as well as institutional players, and was open to the public. A programme of conferences and round tables enabled the participants to exchange their visions of the energy transition, concrete action plans and first deployments of hydrogen technologies as well as further need for research



© HyVolution

and innovation. In parallel, 25 companies and institutions were represented in an exhibition area, where workshops and B-to-B meetings were taking place. During the event, several important announcements were made. ADEME presented its position paper on hydrogen in the energy transition. Toyota announced the commercialization of its hydrogen passenger vehicle (the "Mirai") in France in 2016. The French Taxi company "Hype" has bought 7 hydrogen Taxis from Hyundai in December 2015. They announced that they would have deployed 70 by the end of 2016 in Paris.

EDF was represented at the round tables by Thierry Le Boucher, Head of Sales & Marketing, Renewable Energies, Energy Management and Networks R&D Programmes, who emphasized the need for using hydrogen to reduce greenhouse gas emissions, and to increase industrial competitiveness and energy access in remote areas. He also highlighted that the hydrogen has to be produced by carbon free electricity rather than by steam reforming. EIFER was represented by Ludmila Gautier and David Colomar who participated at round tables and discussed the technological roadmaps, the role of hydrogen for energy storage and mobility and the need for further innovation, especially in electrolysis and hydrogen service-stations. Over the last few years, the development of hydrogen mobility across Europe has accelerated, with several large demonstration projects being launched, such as H<sub>2</sub>ME ([www.h2me.eu](http://www.h2me.eu)), aiming at deploying 29 service-stations and 300 vehicles in Europe. In Germany, in October 2015, the federal government committed its support to a deployment of 400 refueling stations by 2023. In parallel, several car manufacturers such as Toyota, Hyundai and Honda have started the commercialization of their hydrogen cars, while the French company SymbioFCell has started to sell electric vehicles with hydrogen range extenders based on the Renault Kangoo ZE.

Contact: David Colomar, Ludmila Gautier

### EIFER is Member of the Cluster Brennstoffzelle BW / e-mobil



competence in hydrogen and fuel cell solutions



In November 2015, EIFER was appointed as a new member of the Cluster Fuel Cell BW which is led by the State Agency for Electric Mobility and Fuel Cell Technology Baden-Wuerttemberg GmbH. The aim of the cluster is to connect the activities in the field of hydrogen and fuel cell technologies in Baden-Wuerttemberg bringing together partners from industry, science and politics. Together, the members of the cluster want to tackle the industrialisation of fuel cells both for mobile and stationary applications. The membership will provide EIFER a deeper insight into the research landscape in Baden-Wuerttemberg and will offer a good opportunity to build new partnerships for the future.

Contact: Volker Schlabach, Joelle Franceschi

## WHAT'S UP AT EIFER ?



### The Biogas Project "Optigär" Has Started

At the beginning of November 2015, the kick-off meeting for the three-year biogas project "Optigär" funded by the Fachagentur Nachwachsende Rohstoffe e.V. (central coordinating agency in the area of renewable resources in Germany) was held. The aim of the project is to enhance the efficiency of biogas plants by coupling energetic use of the biogas and raw material recovery. In addition to this, excess acids will be separated from the hydrolysate and upgraded to preproducts for use as raw material while the hydrolysate is digested. The partners of the project are:

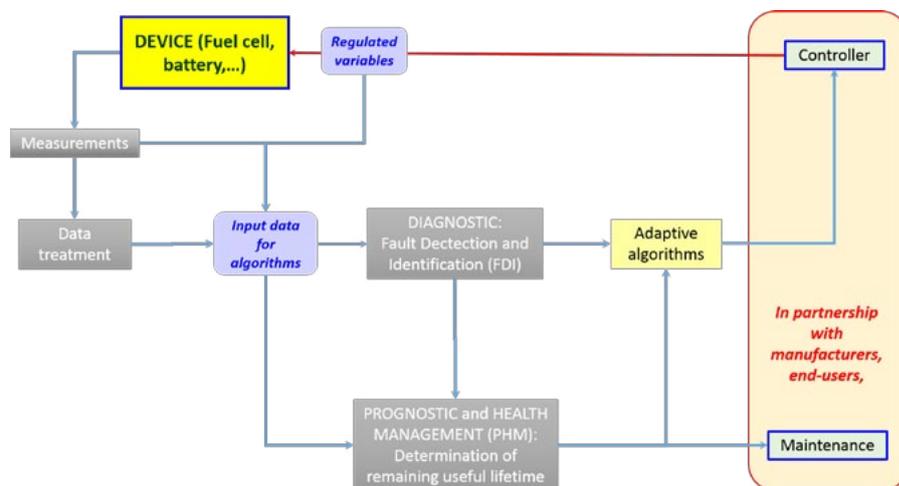
- Fraunhofer ICT (separation of acids and upgrading)
- University of Hohenheim (anaerobic digestion tests of substrates)
- Lipp (practical support, upscaling)
- EIFER (environmental assessment, economy)

Contact: Rainer Bolduan

### EIFER Reached a Milestone in Improving the Reliability and the Robustness of Fuel Cell Technologies

With the end of two public funded projects dealing with the estimation of remaining useful lifetime of Proton Exchange Membrane Fuel Cells (PEMFC), EIFER has reached a milestone in the improvement of the reliability and the robustness of fuel cell technologies for both stationary and automotive applications.

The activities of EIFER in the fields of diagnostics and prognostics of fuel cells were initiated after the feedback of on-field testing of fuel cell based micro combined heat and power (mCHP) systems. Step by step, through successive public funded projects, EIFER integrated a strong network of high level academic and industrial partners at European level. With these partners, EIFER contributed to the development of innovative monitoring tools and data treatment methodologies. EIFER also developed new types of algorithms for diagnosing the State of Health of fuel cell devices and for estimating their Remaining Useful Lifetime. These developments already resulted in two patents with EDF as a co-inventor. Now, EIFER participates with industrial partners to the development of an integrated hardware-software control tool for fault diagnostic and lifetime prediction. With the partners of the European funded SAPPHERE project, the concept of this tool has recently been submitted to the European Patent Office and will be presented at the Hannover Fair at the end of April. EIFER will then contribute to the achievement of the highly ambitious and applicative targets set by the European Commission for the market deployment of fuel cell technologies on the horizon 2023. For this, through its partnerships, EIFER will contribute to the integration on real systems of all these developments and to their final on-field validation. Another ambition is also to extend the field of application of these developments to other electrochemical devices. Using long term testing data from EDF, first promising results have already been obtained for the prediction of batteries' lifetime.



Contact: Philippe Moçotéguy, Davide Beretta, Christoph Kaendler

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### Women4Energy – the European Network of Women for Innovative Energy Solutions

On 2<sup>nd</sup> December 2015, EIFER had the opportunity to be present at the Women4Energy conference in Stuttgart. This year's main topic was "Smart Cities". The speakers from research and business talked about their experiences on sustainability concepts, energy efficiency, resources and efficient buildings. EIFER participated in the session on "resources" presenting climate resilience challenges of energy infrastructures and cities. Therein, their vulnerabilities as well as their dependencies were highlighted.



Contact: Jeannette Sieber

### Sustainability@EIFER

In September 2015, a Sustainability Group (SG) was launched at EIFER, replacing the institute's former Environmental Group. Adding the social and economic dimensions to the initial environmental concern was an evolution in the scope. The relaunch of the group and the additional dimensions was largely welcomed by staff members who deal daily with transdisciplinary research projects and who know the necessity to consider behavioural parameters and budgetary constraints when trying to implement long-term changes. To identify priority topics which could be supported by the SG, a survey was carried out. The results have shown that reducing the energy consumption, and sustainable mobility and transportation are key issues for the staff members and the group will start to work on these topics.

Contact: Lorraine Roy

## SAVE THE DATE

### Au fil du Rhin/ Am Rhein entlang

Preservation of the environment along the Rhine region and sustainable development are the key topics of the association "Au fil du Rhin".

In this context, three different conferences have been organized for this spring to inform and raise awareness for the sustainable development of this region.

- 21<sup>st</sup> March 2016: 19:15 - 20:30 on "The Rhine economy" in Mulhouse
- 18<sup>th</sup> April 2016: 18:00 - 20:00 on "Biodiversity along the Rhine" in Colmar
- 9<sup>th</sup> May 2016: 18:00 - 20:00 on "Cross-border cooperation with regard to economics and employment" in Mulhouse.

Contact: Manon Pons

Link: <http://www.aufildurhin.com/fr/actualites/cycle-de-conference-au-fil-du-rhin-avec-l-uha>



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## PUBLICATIONS

### Book Contributions and Journal Articles:

**Auer, C., Lang, M., Couturier, K., Nielsen, E. R., McPhail, S. J., Tsotridis, G., Fu, Q., Chan, S. H. (2015).** Solid Oxide Cell and Stack Testing, Safety and Quality Assurance (SOCTESQA). In: ECS Transactions, 68(1), 1897-1905. <http://dx.doi.org/10.1149/06801.1897ecst>

**Cajot, S., Peter, M., Bahu, J. M., Koch, A., Maréchal, F. (2015).** Energy Planning in the Urban Context. In: Challenges and Perspectives. Energy Procedia, 78, 3366-3371. <http://dx.doi.org/10.1016/j.egypro.2015.11.752>

**Laurin, L., Amor, B., Bachmann, T. M., Bare, J., Koffler, C., Genest, S., Preiss, P., Pierce, J., Satterfield, B., Vigon, B. (2016).** Life cycle assessment capacity roadmap (section 1): decision-making support using LCA. In: The International Journal of Life Cycle Assessment, 21(4), 443-447. <http://link.springer.com/article/10.1007%2F11367-016-1031-y>

**Scheffold, J., Brisse, A., Poepke, H. (2015).** Long-term Steam Electrolysis with Electrolyte-Supported Solid Oxide Cells. In: Electrochimica Acta, 179, 161-168. <http://dx.doi.org/10.1016/j.jelectacta.2015.04.141>

**Moçotéguy, P., Ludwig, B., Yousfi Steiner, N. (2016).** Application of current steps and design of experiments methodology to the detection of water management faults in a proton exchange membrane fuel cell stack. In: Journal of Power Sources, 303, 126-136. <http://dx.doi.org/10.1016/j.jpowsour.2015.10.078>

**Zorn, R., Neuner, F., Friderich, J., Meier, S., Kauffeld, M. (2016).** Miniaturisierte in-situ Druck- und Temperaturmessung in Erdwärmesonden. In: Zeitschrift der Geothermischen Vereinigung e. V., Nr.83. <http://www.geothermie.de/wissenswelt/literaturdatenbank/zeitschrift-geothermische-energie.html>

### Green Electricity at EIFER

Future energy systems and its impacts on the environment are among the research topics dealt with by EIFER. That's why EIFER also tries to meet its responsibility for the environment and has used green electricity from hydroelectric power plants since December 2015 and will do so for a period of three years. As a result, CO<sub>2</sub> emissions will be reduced by 65,520 kg.

Contact: Jeannine Eckstein



**MEINE ENERGIE.**  
Für Karlsruhe. NATÜRLICH.

Wir engagieren uns für nachhaltigen Klimaschutz. Mit umweltfreundlicher Energie der Stadtwerke Karlsruhe.

Die Stadtwerke Karlsruhe bestätigen den Kauf von Ökostrom aus Wasserkraftanlagen, welcher den strengen Zertifizierungsanforderungen des „GrüP“ entspricht. Verbrauchestelle: Emmy-Noether-Str. 11, Benzenbergstr. 01-12, 76133 Karlsruhe

**Europäisches Institut für Energieforschung**  
156.000 kWh Ökostrom, 65.520 kg CO<sub>2</sub>-Einsparung

*Jeannine Eckstein*  
Roland Schwarz  
Produkt  
Vertrieb und Marketing

**STADTWERKE KARLSRUHE**  
ENERGIE MIT VERANTWORTUNG

## IMPRESSUM

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