



## FOREWORD

In December 2016, I got the opportunity to visit EIFER and to meet KIT's Vice President for Innovation and International Affairs, Prof. Thomas Hirth. New project ideas have risen regarding the topic of local energy systems, which is a key issue for EIFER and EDF. Hydrogen, for example, is a link of energy sectors and it has the potential of becoming a disruptive technology. EIFER has a high-level research infrastructure around hydrogen production via electrolysis. They provide us deeper insights into the technology and into its overall role in a future energy system. Being together with KIT at the heart of the German energy transition, EIFER takes advantage of the impetus of a rich and dynamic local research ecosystem within an international network of partnerships. With KIT as a strategic partner of EDF's R&D, we highly appreciate the recent efforts in increasing joint research as demonstrated in the new EU Horizon 2020 project "SmLLES" around the optimisation of energy storage in local energy systems.

This year, EIFER is celebrating its 15th anniversary and has proven during these years its added value for the EDF Group. The work of EIFER does not only highlight the challenges of the energy transition, it also demonstrates new solutions and business opportunities for future energy systems. We are looking forward to creating this system successfully together.

Bernard Salha

Director of EDF's R&D, EDF Representative  
of EIFER General Assembly of Members

# WHAT'S UP AT EIFER?

APRIL 2017 | # 01/17

NEWSLETTER

## CONTENTS

	<b><u>Energy in Cities and Territories</u></b>	page	<b>2</b>
	• Seminar on Non-Conventional Renewable Energies in Chile		2
	• KIT Workshop on "Environment - Energy - City"		2
	<b><u>Energy Resources and Decentralized Production</u></b>	page	<b>3</b>
	• Colloquium "Sustainable BioEconomy" at KIT		3
	• Kick-off Meeting of the H2020 Project CREATE		3
	<b><u>Economics of Energy Systems and Environment</u></b>	page	<b>4</b>
	• IWAR Colloquium on Environmental Economics		4
	• Assessment of Air Quality and Health in Strasbourg		4

## IN THE SPOTLIGHT

### Hydrogen: The Other Game-Changer for Transport

The ongoing revolution on battery electric mobility may hide another one, which silently started some 20 years ago, but is currently gaining momentum: hydrogen mobility.

Hydrogen is a good complement to batteries for long distance transport: the range of a fuel cell vehicle is typically 500 km for a refuelling time of five minutes only. Until 2010, car manufacturers only developed prototypes at prohibitive costs. However, over the last five years, the production costs have been halved and further reductions are expected by 2020: a hydrogen car may cost less than € 40,000 before 2020, enabling it to compete with diesel cars in the high-class segment. Toyota, Honda and Hyundai have already started the commercialisation of their vehicles, while German and US manufacturers are expected to follow in

the next few years. In France, the start-up Symbio FCell equips battery electric vehicles of Renault and Nissan with a hydrogen kit enabling them to double the range and reduce the charging time.

The sales figures are still more than modest: only 4,000 hydrogen vehicles are currently on the streets worldwide. Perhaps the take-off is already happening: in 2016, 2,500 new vehicles were sold, mainly in California and Japan. This is more than in the previous ten years! Last, but not least: heavy mobility (trucks, ships, airplanes) represents half of the energy consumption in transport. Hydrogen may be the best solution, if not the only one, to electrify and decarbonise this large segment of the transportation sector. Of course, this is only true if the hydrogen is produced with low-carbon energy, for example with an electrolyser.

Contact: David Colomar

## WHAT'S UP AT EIFER ?



### An Energy Model in Transition? Centralism and Decentralisation in the Regulation of the French Electricity System

PhD thesis by **Benoît Boutaud**

This thesis deals with the recent developments in the energy sector, grouped under the term "energy transition". Using a multidisciplinary approach, this thesis attempts to understand the impact of technical and organisational developments on the French centralised model, and determine if the energy transition can be reduced to a general process of decentralisation. The analysis is based on three perspectives - institutional, technological and territorial - highlighting first of all that the state has lost its hegemony, but has nevertheless managed to preserve its centrality. Thus, distributed production is not decentralised by nature. Finally, territorial autonomy is a legal concept which has an impact on many political and administrative, economic and technical interactions. The latest configuration development is a hybrid one: it combines innovations (which lead to important changes) with mechanisms of political and administrative centralisation and techno-economic concentration.

Contact: *Benoît Boutaud*

Link: <https://halshs.archives-ouvertes.fr/tel-01412937>



### Two EIFER Presentations at the KIT Workshop on "Environment - Energy - City" on 29<sup>th</sup> November 2016

These workshops, organised every second year, are a cooperation between the city of Karlsruhe and KIT in order to exchange ideas on current topics, projects and research as well as aiming at initiating new cooperations. EIFER presented two projects, the Reallabor 131 and the Zukunftsstadt.

Within the framework of the research project „Reallabor 131: KIT findet Stadt“, funded by the State Government of Baden-Württemberg, the preliminary results of the "Energy Concept of the district Oststadt" were presented. KIT partner institutes involved in the project are EIFER, ITAS, IIP and fbta.

### Data Science & Cities

Extracting valuable information from geolocalised data, partly generated by citizens themselves, is a challenge for data science. The EIFER work in this field is pioneering. Prominent examples are the tools for energy diagnosis & forecasting of French territories, gathering data and expertise driven approaches, or the activities carried out in the Reallabor project. Recent talks at invited sessions (ENBIS-16 – European Network for Business and Industrial Statistics and SMSA-17 – Workshop on Stochastic Models, Statistics and their Applications) witness the increasing recognition of EIFER among statisticians and data scientists.

Contact: *Andreas Koch, Alberto Pasanisi*

The Zukunftsstadt project "Smart Quarter Vision 2030+", a cooperation between the city of Karlsruhe and CyberForum with EIFER and ITAS as scientific partners, was presented as well.

Contact: *Syed Monjur Murshed, Andreas Koch, Pia Laborgne, Joanna Skok*

### Seminar on Non-Conventional Renewable Energies in Chile

In 2014, Chile announced its "Agenda de la Energía", a national roadmap towards more efficient and clean energy generation. The country has a high dependency on primary energy imports and is facing increasing electricity prices, but has an enormous yet to be exploited renewable's potential especially regarding photovoltaics. In November 2016, Dr. Enrique Kremers gave several lectures and a seminar at Universidad Católica del Norte in Coquimbo, Chile, with representatives from academia, industry and governance to discuss the opportunities that energy system modelling can provide for the energy transition in Chile.

Contact: *Enrique Kremers*

### EIFER in Standardisation: ISO/TC268 Sustainable Cities and Communities

EIFER is a member of the ISO/TC268 technical committee on "Sustainable Cities and Communities" and part of the German mirror committee at DIN. During the international meeting in Boston in October 2016, EIFER represented the German Green Building Council (DGNB e.V.) and also presented the revised certification system on urban districts (DGNB UD 16). Furthermore, EIFER introduced the city platform as a use case on ontology. The next German mirror committee meeting, scheduled for March 2017, in which the chair and the secretary of ISO/TC268 will be present, will be hosted by EIFER.

Contact: *Monika Heyder*

## WHAT'S UP AT EIFER ?



### Recover-EWS: Efficient Recovery of Damaged Borehole Heat Exchangers (BHEs)

Within the public funded project Recover-EWS, EIFER, together with partners, developed a remediation method for inefficient BHEs. A magnetic contrast agent and adapted sensor technology make it possible to detect the orientation of a BHE underground during drilling. The driller can, therefore, constantly realign the drilling tool if needed, and ensure an accurate extraction of the inefficient BHE. Results of the project were successfully presented at the geothermal congress in Essen/Germany, and have been accepted for publication in three national journals including "Geothermische Energie", "bi-Umweltbau" and "bbr Leitungsbau, Brunnenbau und Geothermie".

Contact: *Olaf Ukelis, Roman Zorn*

### Colloquium "Sustainable BioEconomy" at KIT

Last December, the 10<sup>th</sup> colloquium "Sustainable BioEconomy" was held at KIT. This event focused on innovative R&D development technologies for the sustainable conversion of biomass to replace fossil products and energy. In this frame, EIFER presented results on the burning characteristics of biomass pellets, produced at lab-scale from locally available resources. Residual and cultivated biomass were selected and used in order to achieve favourable fuels e.g. using cheap straw with improved burning properties by blending with wood.

Contact: *Rainer Bolduan*

### Kick-Off Meeting of the European Project CREATE in Brussels on 12<sup>th</sup> January 2017

EIFER is a partner of the European research project CREATE, a three and a half year project funded by the Horizon 2020 programme. The project, based on a consortium of ten partners (among them ITM Power - GB, Fumatech and Jülich - DE, CNRS - FR, Israel Institute of Technology - IL, University of Boston - USA), began on 1<sup>st</sup> January 2017. It aims at the development of innovative material solutions that will reduce the capital cost of low-temperature fuel cells and electrolyzers through a drastically reduced amount of expensive metals in electrodes (which prevent future bottlenecks in raw materials supply). The material strategy is based on the functionalisation of a stable backbone and the use of bipolar membranes with a low/high pH electrode.

Contact: *Julian Dailly, Mathieu Marray*



### EIFER Welcomes a Delegation from the Japanese Institute CRIEPI

Hydrogen plays an important role in transforming the energy future in Europe, but also in Japan. CRIEPI (Central Research Institute of Electric Power Industry), the Japanese research institute for electric utilities, started a research programme on hydrogen. The objective of the first meeting with the senior vice president and general secretary of CRIEPI, Mr Shirabe Akita, and the hydrogen researchers, Mr Ichikawa and Mr Yamamoto, was an initial exchange on the topic and to look for potential collaborations.

The two-day visit was finally concluded by a visit to the Power-to-Gas demonstration plant of the Stadtwerke Mainz where 6MW electrolyzers from Siemens convert wind electricity into hydrogen, later delivered by Linde to industrial consumers and hydrogen refuelling stations near the plant.

There are clearly synergies between EIFER / EDF Research topics and CRIEPI ones. The conclusion of the visit is to start regular workshops, to share our views and roadmaps on hydrogen, to better understand the energy transition in Europe and Japan and the role of hydrogen for electric utilities in those contexts. More than that, common research projects may start with public funded projects to speed up innovation on hydrogen.

Contact: *Pascal Terrien, Annabelle Brisse*



## WHAT'S UP AT EIFER ?



### EIFER Took Part in the IWAR Colloquium on Environmental Economics at the Technical University of Darmstadt

An EIFER expert is involved in the development of the new International Standard ISO 14008 of which the current working title is "Monetary valuation of environmental impacts and related environmental aspects – Principles, requirements and guidelines". He was invited to present the scientific and political background of this new standard and its current status of development by the Technical University of Darmstadt in the frame of the IWAR institute's colloquium on 16<sup>th</sup> January.

Contact: *Till M. Bachmann*

### KIT Students visit EIFER/ICT Lab Facilities

On 8<sup>th</sup> March, Dr. Annabelle Brisse welcomed international students listening the hydrogen course of Dr. A. Leon at EIFER's laboratory facilities at the Fraunhofer ICT for the third year in a row. The visit of the fuel cell and electrolysis testing labs gave the students the opportunity to understand technology requirements and competences needed for transferring innovation from concept to product. The visit started with an introductory presentation of the positioning of hydrogen in the energy transition given by Dr. Annabelle Brisse, hydrogen project leader at EIFER. Afterwards, the students had the possibility to ask questions and to discuss about the role of hydrogen in their native countries. This collaboration has already proved to be fruitful, as some students are now writing their master theses at EIFER. We are looking forward to strengthen this collaboration!

Contact: *Annabelle Brisse*



### Assessment of Air Quality and Health in Strasbourg

In partnership with EDF, the city of Strasbourg, ASPA (Alsace's air quality agency), Ecole Centrale de Lyon and Pascal de Giudici (consulting), EIFER developed a methodology to support cities' stakeholders to improve urban planning (energy and mobility) by analysing its influence on air quality and noise. Applied to Strasbourg's "Axe des Deux Rives", the study assessed health impacts of the city's strategy on the local population. The results were presented at the end of 2016 to both the city's involved units and the scientific community (SFSE conference).

Contact: *Camille Payre, Guillaume Bardeau*

### 2016 – The Year of Crew Changes in EIFER's Driver's Cabin

The year 2016 saw numerous changes in the governance of EIFER. The institute did not only welcome Pascal Terrien as its new director, also the EIFER Board of Directors and the General Assembly of Members underwent changes. In January 2016, Prof. Hirth arrived as the new KIT vice-president for innovation and international affairs and he represented our member KIT in the General Assembly. EIFER hosted the meeting of Prof. Hirth and Bernard Salha on 14<sup>th</sup> December 2016 on its premises. Both members expressed their interest in increasing joint international activities.

As a "pioneer" of EIFER, Prof. Reimert of KIT shaped the work of the Board of Directors from the very beginning of the institute. At the Board Meeting on 7<sup>th</sup> December 2016, all Board Members thanked Prof. Reimert for his commitment and acknowledged his valuable contributions to the development of EIFER when he passed the baton to his successor Prof. Hagenmeyer from KIT-IAI. Prof. Fichtner from KIT-IIP is now acting as the president of the Board. Jacques Sacreste and Sylvie Moulet continue their representation of EDF's R&D in this body. Together with the EIFER team we are looking forward to a continuous fruitful cooperation with all crew members.

Contact: *Ute Karl, Nurten Avci*



## SAVE THE DATE



### HANNOVER MESSE 24 - 28 April 2017

All key technologies and core areas of industry – from research and development, industrial automation, IT, industrial supply, production technologies and services to energy and mobility technologies – can be found in Hannover. Take advantage of all the synergies that HANNOVER MESSE has to offer. Welcome to the industry's global hotspot!

HANNOVER MESSE is the global hotspot for the energy sector. "Energy" is the only trade fair worldwide that gets to grips with all the key issues: from power generation, transmission and storage to smart distribution, mobility and digital energy management in business enterprises. In short, a genuine powerhouse!

More information available under: <http://www.hannovermesse.de/files/001-fs5/media/downloads/visitor/visitor-information.pdf>

Contact: Jeannine Eckstein

## PUBLICATIONS

### Book Contributions and Journal Articles:

**Bahu, J.-M., Hoja, C., Petillon, D., Kremers, E., Ge, X., Koch, A., Pahl-Weber, E., Grassl, G., Reiser, S. (2017).** Integrated Urban-Energy Planning for the Redevelopment of the Berlin-Tegel Airport. In: Bisello, Adriano, Vettorato, Daniele, Stephens, Richard, & Elisei, Pietro (Eds.), Smart and Sustainable Planning for Cities and Regions: Results of SSPCR 2015 (pp. 407-419). Cham: Springer International Publishing.

**Cajot, S., Peter, M., Bahu, J. M., Guignet, F., Koch, A., Maréchal, F. (2017).** Obstacles in energy planning at the urban scale. Sustainable Cities and Society, 30, 223-236. doi:<http://dx.doi.org/10.1016/j.scs.2017.02.003>

**Fu, Q., Freundt, P., Bomhard, J., & Hauler, F. (2017).** SOFC Stacks Operating under Direct Internal Steam Reforming of Methane. Fuel Cells. doi:[10.1002/fuce.201600078](https://doi.org/10.1002/fuce.201600078)

**Huber, A. (2017).** Theorising the dynamics of collaborative consumption practices: A comparison of peer-to-peer accommodation and cohousing. Environmental Innovation and Societal Transitions. doi:<http://dx.doi.org/10.1016/j.eist.2016.12.001>

**Koenigsdorff, R., Zorn, R., Riegger, M., Blum, P., Braun, J., Moormann, C., Gratwohl, P. (2017).** Erdwärme nachhaltig nutzen. Einblicke 2016 - Journal zur Umweltforschung in Baden-Württemberg.

**Santana, J. M., Wendel, J., Trujillo, A., Suárez, J. P., Simons, A., Koch, A. (2017).** Multimodal Location Based Services - Semantic 3D City Data as Virtual and Augmented Reality. In: Gartner, Georg & Huang, Haosheng (Eds.), Progress in Location-Based Services 2016 (pp. 329-353). Cham: Springer International Publishing.

**Ukelis, O., Zorn, R., Friderich, J., Steger, H., Linder, P., Meier, S., Burkhardt, F. (2017).** Verlaufsmessung und Richtbohrtechnik, Rückbau und Recovering von Erdwärmesonden. bbr - Fachmagazin für Brunnen- und Leitungsbau, 02/2017.

**Ukelis, O., Zorn, R., Friderich, J., Steger, H., Linder, P., Meier, S., Burkhardt, F. (2017).** Verlaufsmessung und Richtbohrtechnik, Rückbau und Recovering von Erdwärmesonden. Zeitschrift der Geothermischen Vereinigung e.V.(86).

**Zorn, R. (2017).** Mit Messmolch und Kontrastmitte: Ein Konzept zur Sanierung von Erdwärmehohrungen. Einblicke 2016 - Journal zur Umweltforschung in Baden-Württemberg.

### Prize for Best Master Thesis

Hicham Bidah won the best prize for his Master thesis on "Analysis of Dynamic Cooling Energy Needs in Residential and Non-Residential Buildings using CityGML". He was supervised by Dr. Syed Monjur Murshed and Prof. Dr. Martin Breunig of KIT. Out of seven very good theses from German universities, his thesis was selected as the best by the 3D Commission of the German Association of Photogrammetry, Remote Sensing and Geo-Informatics (DGPF) and the German Association of Cartography (DGFK). The prize consists of €2,000 and an invitation to the International Cartography and Geoinformation Society Conference in Washington DC in July 2017.

Contact: Syed Monjur Murshed

### IMPRESSUM

#### EIFER

European Institute for Energy Research  
Emmy-Noether-Straße 11  
76131 Karlsruhe  
Germany  
Phone +49 (0) 721 6105 1330  
Email: [newsletter@eifer.org](mailto:newsletter@eifer.org)  
[www.eifer.org](http://www.eifer.org)

Editorial Director: Pascal Terrien

Chief Editor: Nurten Avci,  
Jeannine Eckstein and the  
EIFER Editorial Committee  
Photos: EIFER and EDF intern