

HELMHOLTZ Energy Conference 2023



Tackling the
Global Challenges for the Energy Transition

12 - 13 June 2023 · Rhein-Mosel-Halle · Koblenz

Dear participants of the Helmholtz Energy Conference 2023,

A transformation of global energy production towards a greenhouse gas-neutral energy system is becoming increasingly urgent, but faces us with a multitude of technical, systemic and societal challenges.

What answers do we as Helmholtz Energy researchers have to these pressing questions of our time? Which solutions can we offer in the short term, and which for the more distant future?

One thing is certain: we will not be able to meet the challenges of the energy transition with individual solutions. This makes it all the more important to exchange ideas across disciplines and topics. Only in this way can we arrive at integrated, tailored solutions for the energy system from resources to decommissioning.

With the program of our Helmholtz Energy Conference

Tackling the Global Challenges of the Energy Transition

we address the pressing issues of sustainable energy systems and the global energy transition. We are excited to bring together experts from various disciplines within the Helmholtz Research Field Energy and beyond. Our aim is to create a platform for interdisciplinary discussions, collaboration, and innovation.

The conference organization team set up an exciting program with keynote speakers, a panel discussion, and technical sessions covering a wide range of topics. These include energy scenarios and energy systems design, innovations from technology and materials research, renewables and fusion, energy storage solutions and grid integration, decarbonization strategies and circular economy, nuclear safety, waste management and decommissioning, digitalization and smart energy systems as well as socio-economic aspects and public acceptance of the energy transition.

We would like to express our sincere gratitude to our speakers, panelists, poster presenters, chairs and organizing committee members for their dedication and hard work in putting together this conference.

We wish you an engaging, thought-provoking, and productive conference experience and we hope that the insights shared at this event will inspire new ideas and partnerships that will help drive the global energy transition.

Warm regards,



Prof. Dr.-Ing. Holger Hanselka
Helmholtz Vice President Energy



Helmholtz Energy Conference 2023

Program Summary

Monday, 12 June 2023

from 12:00 Registration at the conference office

Großer Saal

13:00 - 13:15 Welcome and Opening

13:15 - 14:15 Keynotes

14:15 - 15:00 Panel Discussion

15:00 - 15:30 Coffee break

15:30 - 17:00 Technical program in 5 parallel sessions

Atrium

17:00 - 18:00 Postersessions

Information booth exhibition

Großer Saal

20:00 Conference Dinner

Tuesday, 13 June 2023

9:00 - 10:00 Keynotes

10:00 - 10:30 Coffee break

10:30 - 12:00 Technical program in 5 parallel sessions

12:00 - 13:00 Lunch break with snacks

13:00 - 14:30 Technical program in 5 parallel sessions

14:30 - 15:00 Coffee break

15:00 - 16:30 Technical program in 5 parallel sessions

16:30 Summary and Closing

Abstracts

All Abstracts are available online: <https://www.conftool.pro/helmholtz-energy-2023/>

12 June 2023, 13:00 – 15:30 h

Großer Saal

13:00 **Welcome and Opening**
Holger Hanselka, *Karlsruhe Institute of Technology (KIT)*

Plenary Session

Session Chair: Holger Hanselka

13:15 **Solutions for the Climate Crisis - Helmholtz KLIMA as a Cross Research Field Approach** Matthes, Katja, *GEOMAR Helmholtz-Zentrum für Ozeanforschung, Kiel*

13:35 **No Transport without Energy - A Symbiotic Relationship**
Sattler, Christian, *German Aerospace Center (DLR)*

13:55 **The Energy Transition from an Energy Provider's Point of View**
Bechthold, Tilman, *RWE Power AG, Essen*

Großer Saal

14:15 **Panel Discussion**
"Sustainable Energy Supply: Challenges and Opportunities"

Participants:

Holger Hanselka, Helmholtz Vice President Energy, *Karlsruhe Institute of Technology*
Katja Matthes, Helmholtz Vice President Earth and Environment, *GEOMAR Helmholtz-Zentrum für Ozeanforschung*

Christian Sattler, Divisional Board Member for Energy and Transport, *German Aerospace Center (DLR)*

Tilman Bechthold, Vice President Research and Development, *RWE Power AG, Essen*

Moderator:

Marc Oliver Bettzüge, Head of *Institute of Energy Economics at the University of Cologne*

Atrium

15:00 **Coffee Break**

Großer Saal

Design and Implications of Future Energy Systems

Session Chair: Heidi Heinrichs

- 15:30 **Socio-Technical Scenarios in the Helmholtz Program Energy System Design (ESD): Methodological Approach for Storyline Development**
Kopfmüller, Jürgen¹; Kullmann, Felix²; Naegler, Tobias³; Stelzer, Volker¹; Vögele, Stefan²; Poganietz, Witold R.¹; Jochem, Patrick E.P.³, ¹Karlsruhe Institute of Technology (KIT-ITAS); ²Forschungszentrum Jülich (FZJ-IEK3 & -STE); ³German Aerospace Center (DLR-VE)
- 15:45 **Socio-technical Scenarios in the Helmholtz Program Energy System Design (ESD): Results of the Techno-economic Scenarios**
Kullmann, Felix¹; Naegler, Tobias²; Vögele, Stefan¹; Poganietz, Witold-Roger³; Kopfmüller, Jürgen³; Stelzer, Volker³, ¹Forschungszentrum Jülich GmbH, Germany; ²Deutsches Zentrum für Luft- und Raumfahrt, Germany; ³Karlsruher Institut für Technologie, Germany
- 16:00 **Disruptive Events within RESUR (“Robust Energy System and Supply of Scarce Resources”)**
Ardone, Armin¹; Dickler, Sebastian²; Poganietz, Witold-Roger¹; Ross, Andrew²; Weinand, Jann²; Zapp, Petra²; Shamon, Hawal²; Rösch, Chrsitine¹; Haase, Martina¹; Kraft, Emil¹; Kleinebrahm, Max¹; Vögele, Stefan²; Goerge, Marius², ¹KIT, Germany; ²FZJ, Germany
- 16:15 **Global Effects of Natural Gas Exports on the Sustainable Development Goals**
Gähl, Matthias Leonhard¹; Rhoden, Imke^{1,2}; Vögele, Stefan¹; Kuckshinrichs, Wilhelm¹, ¹Institute of Energy and Climate Research – Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich, Wilhelm-Johnen-Straße, 52428 Jülich, Germany; ²Center for Environmental Management, Resources and Energy (CURE), Faculty of Economics, Ruhr-Universität Bochum, 44801 Bochum, Germany.
- 16:30 **Socio-Technical Scenarios in the Helmholtz Program Energy System Design (ESD): Methodological Approach for Storyline Development**
Brauner, Simon Rolf Winfried, Forschungszentrum Jülich, Germany
- 16:45 **Energy Flexibility Potential and Costs of the Materials- and Recycling Industry**
Parvez, Ashak Mahmud; Sajjad, Mohsin; van den Boogaart, Karl Gerald, Helmholtz Institute Freiberg for Resource Technology (HIF),HZDR, Germany

Rheinsaal

Green Energy Solutions for the Transport Sector

Session Chair: Mark Bülow

- 15:30 **The Climate Impact of Global Transportation Emissions: Present-Day Effects and Future Scenarios**
Hendricks, Johannes¹; Righi, Mattia¹; Brinkop, Sabine¹; Dahlmann, Katrin¹; Mertens, Mariano¹; Beer, Christof G.¹; Kaiser, Christopher¹; Grewe, Volker^{1,2}, ¹Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Physik der Atmosphäre, Oberpfaffenhofen, Germany; ²Faculty of Aerospace Engineering, Delft University of Technology, Delft, Netherlands

12 June 2023, 15:30 – 18:00

- 15:45 **A Digital Platform for an Interactive and Interdisciplinary Model- and Data-based Assessment and Optimization of Synthetic Fuels**
Bauder, Uwe; Hall, Clemens; Pütz, Florian; Ruoff, Stephan; Le Clercq, Patrick; Rauch, Bastian, *German Aerospace Center (DLR), Germany*
- 16:00 **Production of Gasoline and Jet-Fuel by Heterogeneously Catalyzed Co-Oligomerization of Methanol-Based Olefins**
Fuchs, Constantin; Arnold, Ulrich; Sauer, Jörg, *Institute of Catalysis Research and Technology (IKFT), Karlsruhe Institute of Technology (KIT), Germany*
- 16:15 **Redox Kinetics of Co-Doped Ceria Ceramics for Solar-Thermochemical Fuel Production**
Knoblauch, Nicole; Lee, Kangjae; Mechnich, Peter; Alkan, Gözde; Roeb, Martin, *Deutsches Zentrum für Luft- und Raumfahrt, Germany*
- 16:30 **Potential of Fuel Cells and DC Grids in Decarbonizing Cruise Ships**
Gosala, Dheeraj B., *DLR Institute of Maritime Energy Systems, Germany*
- 16:45 **Green Kerosene via the Fischer-Tropsch Route – Catalyst Development in the CARE-o-SENE Project**
Wolf, Moritz; Zimina, Anna; Hsu, Cherie; Elbuga-Ilica, Rabia; Sireci, Enrico; Shara, Dmytro; Saraci, Erisa; Studt, Felix; Grunwaldt, Jan-Dierk, *Karlsruhe Institute of Technology (KIT), Germany*

Tagungszentrum Raum 1+2

Energy Materials

Session Chair: Roel van de Krol

- 15:30 **Hybrid 2D Nanomaterial-based Membranes**
Pizzoccaro-Zilamy, Marie-Alix^{1,2}; Meulenberg, Wilhelm^{1,2}; Guillon, Olivier¹, ¹*Institute of Energy and Climate Research IEK-1, Forschungszentrum Jülich GmbH, Jülich 52428, Germany*; ²*Faculty of Science and Technology, Inorganic Membranes, University of Twente, Enschede, AE 7500, The Netherlands*
- 15:45 **Carbon Aerogels for Electrochemical Applications**
Schwan, Marina; Kröner, Jessica; Nojabae, Maryam; Schonvogel, Dana; Milow, Barbara, *German Aerospace Center, Germany*
- 16:00 **Stabilizing Thin Film Ru-Ir Oxygen Evolution Electrocatalysts by Low Ti Additions**
Lahn, Leopold^{1,2}; Mingers, Andrea M.³; Savan, Alan⁴; Ludwig, Alfred⁴; Kasian, Olga^{1,2}, ²*Dynamic Electrocatalytic Interfaces, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH*; ³*Department of Materials Science and Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg*; ⁴*Interface Chemistry and Surface Engineering, Max-Planck-Institut für Eisenforschung GmbH*; ⁴*Materials Discovery and Interfaces, Institut für Werkstoffe, Ruhr-Universität Bochum*
- 16:15 **Limiting Processes in Hierarchically Structured Electrodes: Relationship between Electrode Structure and Cell Performance**
Naumann, Johanna¹; Bohn, Nicole¹; Birkholz, Oleg²; Mueller, Marcus¹; Binder, Joachim R.¹; Kamlah, Marc¹, ¹*Institute for Applied Materials, Karlsruhe Institute of Technology, 76344 Eggenstein-Leopoldshafen, Germany*; ²*APL Automobil-Prüftechnik Landau GmbH, 76829 Landau in der Pfalz, Germany*

- 16:30 **Microstructural Properties of Tape-Cast LATP Ceramic Sheets for Application in Solid State Batteries**
Gross, Jürgen Peter¹; Dashjav, Enkhtsetseg²; Tietz, Frank^{2,3}; Malzbender, Jürgen¹; Ziegner, Mirko¹; Grüner, Daniel¹; Peter, Nicolas¹; Schwaiger, Ruth^{1,4},
¹Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research: Microstructure and Properties of Materials (IEK-2), 52425 Jülich, Germany;
²Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research: Synthesis and Processing (IEK-1), 52425 Jülich, Germany; ³Forschungszentrum Jülich GmbH, Helmholtz-Institute Münster (IEK-12) 52425 Jülich, Germany; ⁴Chair of Energy Engineering Materials, RWTH Aachen University, 52056 Aachen, Germany
- 16:45 **Na-Based Liquid Metal Batteries: Material Compatibility and Cell Performance**
Fetzer, Renate; Zhang, Tianru; Heinzel, Annette; Weisenburger, Alfons; Müller, Georg, Karlsruhe Institute of Technology, Germany

Tagungszentrum Raum 3

Energy Storage Solutions

Session Chair: Klarissa Niedermeier

- 15:30 **Geotechnologies for the Future Climate-Neutral Energy Supply in Germany - GEOZeit**
Schill, Eva¹; Sass, Ingo²; Schmidt-Hattenberger, Cornelia²; Schätzler, Katharina¹,
¹Karlsruhe Institute of Technology, Germany; ²German Research Centre for Geosciences
- 15:45 **Thermochemical Systems for Energy Storage and Conversion**
Linder, Marc, German Aerospace Center (DLR e.V.), Germany
- 16:00 **Molten Salt Storage for Flexibilization of the Future Energy System - Activities at the German Aerospace Center (DLR)**
Bonk, Alexander; Ding, Wenjin; Bauer, Thomas, Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany
- 16:15 **Supercritical CO₂ Cycle for Sensible Thermal Energy Storage and Power Generation Applications**
Unger, Sebastian; Fogel, Stefan; Mohankumar, Malini Bangalore; Guille-Bourdas, Alexandre Florian; Schütz, Peter; Hampel, Uwe, Helmholtz-Zentrum Dresden-Rossendorf, Germany
- 16:30 **Coupling of Power and Heat Sectors by Integrating High-Temperature Thermal Storages in Micro Gas Turbines**
Krummrein, Thomas¹; Henke, Martin¹; Dreißigacker, Volker², ¹DLR - Institute of Combustion Technology, Germany; ²DLR - Institute of Engineering Thermodynamics, Germany
- 16:45 **Energy Storage in Liquid Metals and Fused Salts**
Weier, Tom¹; Ding, Wenjin²; Duczek, Carolina¹; Horstmann, Gerrit M.¹; Landgraf, Steffen¹; Nash, William¹; Monrreal Marquez, Gleidy¹; Sarma, Martins¹; Weber, Norbert¹, ¹Helmholtz-Zentrum Dresden-Rossendorf, Germany; ²Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Technische Thermodynamik, Germany

12 June 2023, 15:30 – 18:00

Moselsaal

Emerging Materials for Photovoltaic Applications

Session Chair: Paul Fassel

- 15:30 **Cation Mutation in Chalcogenide Semiconductors as a Path towards CRM-Free Top Absorber Layer for Tandem Solar Cells**
Gurieva, Galina¹; Schorr, Susan^{1,2}, ¹Helmholtz Zentrum Berlin, Germany; ²Institut für Geologische Wissenschaften, FU Berlin, Germany
- 15:45 **Challenge: Improving on the Structural Disorder in Cu-Based Quaternary Chalcogenides. Solution: Exploring a Different Divalent Cation!**
Matzdorff, David C. N.^{1,2}; Gurieva, Galina¹; Avdeev, Maxim³; Schorr, Susan^{1,2}, ¹Helmholtz-Zentrum Berlin für Materialien und Energie, Germany; ²Institut für Geologische Wissenschaften, Freie Universität Berlin, Germany; ³Australia's Nuclear Science and Technology Organisation, Sydney, Australia
- 16:00 **The Power of Inkjet Printing for Customizable Fabrication of Next-Generation Perovskite Thin-Film Photovoltaics**
Eggers, Helge^{1,2}; Schackmar, Fabian^{1,2}; Ritzer, David B.^{1,2}; Paetzold, Ulrich W.^{1,2}, ¹Lichttechnisches Institut (LTI), Karlsruher Institut für Technologie (KIT), Karlsruhe; ²Institut für Mikrostrukturtechnik (IMT), Karlsruher Institut für Technologie (KIT), Eggenstein-Leopoldshafen
- 16:15 **Does the Solvent Matter? – Influence of the Solvent in Hybrid Halide Perovskites Precursor Solution**
Palacios Saura, Ana^{1,2}; Breternitz, Joachim¹; Hoell, Armin¹; Schorr, Susan^{1,2}, ¹Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany; ²Freie Universität Berlin, Berlin, Germany
- 16:30 **Ternary Nitrides as Disorder-Tunable Materials for Photovoltaic Applications**
Schorr, Susan^{1,2}; Breternitz, Joachim¹; Wang, Zhenyu^{1,2}; Savvin, Stanislav³, ¹Helmholtz-Zentrum Berlin für Materialien und Energie, Germany; ²Freie Universität Berlin, Institute of Geological Sciences, Germany; ³Institute Laue-Langevin Grenoble, France
- 16:45 **Effect of Composition on Structural and Optoelectronic Properties of Combinatorially Synthesized BaCu₂Se₂ Thin Films**
Rusu, Marin¹; Márquez, José A.¹; Hempel, Hannes¹; Choubrac, Leo¹; Schwidessen, Rene¹; Gurieva, Galina¹; Reyes-Figueroa, Pablo²; Wenisch, Robert²; Schleuning, Markus³; Kaufmann, Christian²; Lauermann, Iver²; Schorr, Susan^{1,4}; Unold, Thomas¹, ¹Department Structure and Dynamics of Energy Materials, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH; ²PVcomB, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH; ³Institute Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH; ⁴Institute of Geological Sciences, Freie Universität Berlin

Atrium and Lahnsaal

- 17:00 **Poster Sessions**
Details about the posters can be found at the end of the program booklet

Großer Saal

- 20:00 **Conference Dinner**

13 June 2023, 9:00 – 13:00 h

Großer Saal

Plenary Session 2

Session Chair: Holger Hanselka

- 09:00 **How to Get to Net-Zero? Contributions by "HI-CAM Cluster I: Net-Zero-2050 Phase 2"**
Jacob, Daniela; Köhnke, Fiona; El Zohbi, Juliane, *Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon, Geesthacht*
- 09:20 **Fusion R&D on the Way towards Fusion Energy**
Wolf, Robert¹; Biel, Wolfgang²; Stieglitz, Robert³; Warmer, Felix⁴, ¹Max-Planck-Institut für Plasmaphysik, Germany; ²Forschungszentrum Jülich; ³Karlsruher Institut für Technologie; ⁴Technische Universität Eindhoven
- 09:40 **Technology Assessment to Support a Sustainable Energy Transition – An Attempt to Square the Circle?**
Baumann, Manuel; Weil, Marcel; Milchram, Christine; Poganietz, Witold-Roger; Rösch, Christine; Haase, Martina; Parodi, Oliver; Hilderbrand, Rafaela; Grunwald, Armin, *Karlsruhe Institute of Technology, Germany*

Atrium

- 10:00 **Coffee Break**

Großer Saal

Defossilization of Chemistry

Session Chair: Mariya E. Ivanova

- 10:30 **Power2Molecules: Organic Electrosynthesis for the Energy Transition**
Holtappels, Peter; Krewer, Ulrike; Röse, Philipp, *Karlsruhe Institute of Technology, Germany*
- 10:45 **Alternative Fuels from Renewables: The Role of Methanol**
Arnold, Ulrich; Drexler, Marius; Fuchs, Constantin; Niethammer, Benjamin; Sauer, Jörg, *Karlsruher Institut für Technologie, Germany*
- 11:00 **Integrating Selective Photoelectrochemical Oxidation of Glycerol to Valuable Chemicals into Solar H₂ Production Devices**
Özen, Ciler; Abdi, Fatwa Firdaus, *Helmholtz Zentrum Berlin, Germany*
- 11:15 **Photoelectrochemical CO₂ Reduction with Nanostructured Thin Films**
Aksoy, Dilan; Mayer, Matthew; van de Krol, Roel, *Helmholtz Zentrum Berlin, Germany*
- 11:30 **Plasma-Assisted Conversion of CO₂ into High-Energy Chemical Fuels and Feedstocks**
Reiser, Dirk¹; Kotov, Vladislav¹; Aghdassi, Nabi¹; Fantz, Ursel²; Linsmeier, Christian¹, ¹Forschungszentrum Jülich GmbH, Germany; ²Max-Planck-Institut für Plasmaphysik, Garching, Germany
- 11:45 **High Efficiency Solar Fuel Production via Solar Thermochemical Cycles with Sophisticated Process Management**
Kant, Paul¹; Vega Puga, Estefanía^{1,2}; Brendelberger, Stefan¹; Roeb, Martin¹, ¹German Aerospace Center, Germany; ²RTWH Aachen, Germany

Rheinsaal

Heat Supply for Buildings and Industry

Session Chair: Noah Pflugradt

- 10:30 **Building Energy Performance Diagnostics: How Data Science and AI Can Help Understand the Heat Demand of Our Building Stock**
Estevam Schmiedt, Jacob; Blanco Bohorquez, Luis, *Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany*
- 10:45 **Heat Supply for Office Buildings: A Research Journey Through Different Supply Levels at the Campus of Forschungszentrum Jülich**
Althaus, Philipp¹; Hering, Dominik²; Johnen, Sascha¹; Küpper, Christian¹; Lieberenz, Paul¹; Mork, Maximilian¹; Pick, Jana¹; Riebesel, Lea¹; Redder, Florian¹; Schmülgen, Marek¹; Stock, Jan¹; Ubachukwu, Eziama¹; Westphal, Lidia¹; Xhonneux, André¹; Müller, D, ¹*Forschungszentrum Jülich GmbH, Germany*; ²*RWTH Aachen University, Germany*
- 11:00 **Renewable and Flexible Thermal Energy Supply**
Gutierrez, Andrea, *German Aerospace Center - DLR, Germany*
- 11:15 **Solar-Generated Heat for Industrial Processes**
Hirsch, Tobias; Stengler, Jana; Lackovic, Luka; Buck, Reiner, *DLR, Institute of Solar Research, Solar High Temperature Technologies Department*
- 11:30 **Investigation on Process Architectures for High-Temperature Heat Pumps Based on a Reversed Brayton Cycle**
Kabat, Nancy; Jende, Enrico; Nicke, Eberhard; Stathopoulos, Panagiotis, *Deutsches Zentrum für Luft- und Raumfahrt, Germany*
- 11:45 **Demonstration of a Packed Bed Heat Storage with Liquid Metals – Status and Technical Challenges**
Niedermeier, Klarissa; Müller-Trefzer, Franziska; Weisenburger, Alfons; Wetzels, Thomas, *Karlsruhe Institute of Technology, Germany*

Tagungszentrum Raum 1+2

Challenges for Energy System Modelling by High Shares of Renewable Energy Resources

Session Chair: Maximilian Hoffmann

- 10:30 **Data-Driven Stochastic Modelling of Power-Grid Frequency Applied to Islands**
Oberhofer, Ulrich Jakob¹; Rydin Gorjão, Leonardo²; Yalcin, G. Cigdem³; Kamps, Oliver⁴; Hagenmeyer, Veit¹; Schäfer, Benjamin¹, ¹*Institute for Automation and Applied Informatics, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany*; ²*Faculty of Science and Technology Norwegian University of Life Sciences, Ås, Norway*; ³*Department of Physics, Istanbul University, Is*
- 10:45 **Modelling the Impact of Flexible AC Transmission Systems on the Operation of Electrical Transmission Grids**
Sandmeier, Thorben; Ardone, Armin; Fichtner, Wolf, *Karlsruhe Institute of Technology (KIT), Germany*
- 11:00 **ProPower: Superpriority of Power System Management Utilizing Uncertainty Information in Renewable Energy Source Forecasts**
von Bremen, Lueder; Schyska, Bruno; Bents, Hauke; Buller, Clara, *German Aerospace Center - DLR, Institute of Networked Energy Systems, Germany*

13 June 2023, 9:00 – 13:00 h

- 11:15 **Secure Energy Management Systems with Federated Learning**
Sievers, Jonas, *Karlsruhe Institute of Technology, Germany*
- 11:30 **Simple Creation of Complex Mixed-Integer Linear Energy System Models**
Schönfeldt, Patrik; Schlüters, Sunke, *DLR e.V. Institut für Vernetzte Energiesysteme, Germany*
- 11:45 **tsam – The Time Series Aggregation Module (Abstract)**
Hoffmann, Maximilian¹; Kotzur, Leander²; Stolten, Detlef¹, ¹*Forschungszentrum Jülich, Germany*; ²*(Formerly) Forschungszentrum Jülich, Germany*

Tagungszentrum Raum 3

Decarbonization and Carbon Management

Session Chair: Dieter Stapf

- 10:30 **A Pathway for the German Energy Sector Compatible with a 1.5°C Carbon Budget**
Simon, Sonja¹; Harpprecht, Carina¹; Xiao, Mengzhu³; Sasanpour, Shima¹; Gardian, Hedda¹; Mengis, Nadine²; Pregger, Thomas¹, ¹*Deutsches Zentrum für Luft- und Raumfahrt, Germany*; ²*GEOMAR Helmholtz-Zentrum für Ozeanforschung*; ³*International Renewable Energy Agency*
- 10:45 **DACStorE – A Comprehensive Approach to Harnessing the Innovation Potential of Direct Air Capture and Storage for Reaching CO₂-Neutrality**
Harzendorf, Freia¹; Baumann, Stefan¹; Bowyer, Paul²; Dittmeyer, Roland³; Gergopanos, Prokopios²; Karydis, Vlassis¹; Linszen, Jochen¹; Markus, Till⁴; Meulenber, Wilhelm¹; Peters, Ralf¹; Samsun, Can¹; Schmidt-Hattenberger, Cornelia⁵; Strasser, Peter⁶; Tara, ¹*Forschungszentrum Jülich*; ²*Helmholtz-Zentrum Hereon*; ³*Karlsruhe Institute of Technology*; ⁴*Helmholtz-Zentrum für Umweltforschung*; ⁵*Helmholtz-Zentrum Potsdam*; ⁶*Technische Universität Berlin*
- 11:00 **Superstructure Optimization for a Novel Cement Production Process Utilizing Secondary Raw Materials**
Ojeda Paredes, Ariana Yomira^{1,2}; Sandaka, Gourisankar³; Beuchle, Günter³; Stemmermann, Peter³; Stapf, Dieter³; Mitsos, Alexander^{4,5,6}; Dahmen, Manuel¹, ¹*Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research, Energy Systems Engineering (IEK-10), Jülich 52425, Germany*; ²*RWTH Aachen University, Aachen 52062, Germany*; ³*Karlsruhe Institute of Technology, Institute for Technical Chemistry (ITC), Karlsruhe 76021, Germany*; ⁴*JARA-ENERGY, Jülich 52425, Germany*; ⁵*RWTH Aachen University, Process Systems Engineering (AVT.SVT), Aachen 52074, Germany*
- 11:15 **Circular Zero Emission Concrete: Thermodynamic Modelling of Belite Cement Clinker**
Yarka Reddy, Pallavi Reddy; Beuchle, Günter; Stemmermann, Peter; Stapf, Dieter, *Karlsruhe Institute of Technology (KIT), Germany*
- 11:30 **Reinforced Polymers for Rotor Blades: A Comparison through Life Cycle Assessment with and without Carbon Fiber.**
Benitez, Alicia Maria; Wulf, Christina; Kuckshinrichs, Wilhelm, *Forschungszentrum Jülich, Germany*
- 11:45 **Recovery of Carbon-Fiber-Reinforced Plastics from Wind Turbine Rotor Blades: Current Status and Basic Investigations**
Wexler, Manuela; Mahl, Jonathan; Baumann, Werner; Hauser, Manuela; Stapf, Dieter, *Karlsruhe Institute of Technology, Germany*

Moselsaal

Nuclear safety: Waste Management and Decommissioning

Session Chairs: Emil Fridman, Norbert Jordan

- 10:30 **Cement-Based Materials in the Multi-Barrier System of Nuclear Waste Repositories: Impact on Radionuclide Retention**
Gaona, Xavier¹; Ait Mouheb, Naila²; Altmaier, Marcus¹; Bosbach, Dirk²; Deissmann, Guido²; Geckeis, Horst¹; Kretzschmar, Jérôme³; Schmeide, Katja³; Stumpf, Thorsten³,
¹Karlsruhe Institute of Technology, Institute for Nuclear Waste Disposal, Germany;
²Institute of Energy and Climate Research – Nuclear Waste Management (IEK-6),
Forschungszentrum Jülich GmbH (FZJ), Jülich; ³Institute of Resource Ecology (IRE),
Helmholtz-Z
- 10:45 **Research for the Safe Management of Nuclear Waste: Microscopic Approaches**
Brandt, Felix; Klinkenberg, Martina; Thümmeler, Robert; Barthel, Juri; Bosbach, Dirk,
Forschungszentrum Jülich GmbH, Germany
- 11:00 **Ways for Efficient Decommissioning of Reactor Components and Concrete Shielding**
Poenitz, Erik¹; Roode-Gutzmer, Quirina²; Barkleit, Astrid¹; Konheiser, Joerg¹, ¹HZDR,
Germany; ²now: Fraunhofer IKTS Dresden
- 11:15 **Prolonged Dry Interim Storage and Long-Term Safety of Spent Nuclear Fuel Disposal**
Herm, Michel; König, Tobias; Metz, Volker; Geckeis, Horst, Karlsruhe Institute of
Technology, Institute for Nuclear Waste Disposal, Karlsruhe, Germany
- 11:30 **Fundamental Understanding of Technetium Interactions in the Environment of Nuclear Waste Repositories**
Mayordomo, Natalia¹; Rodriguez, Diana M.¹; Brendler, Vinzenz¹; Rossberg, André^{1,2};
Schild, Dieter³; Müller, Katharina¹, ¹Helmholtz-Zentrum Dresden – Rossendorf,
Institute of Resource Ecology, Bautzner Landstrasse 400, D-01328 Dresden, Germany;
²Rossendorf Beamline (BM20), European Synchrotron Radiation Facility, B.P. 200, F-
38043 Grenoble Cedex, France; ³Karlsruhe Institute of Technology (KIT), Institute for
Nuclear Waste Disposal (INE), Hermann-von-Helmholtz-Platz 1, D-76344, Eggenstein-
Leopoldshafen, Germany
- 11:45 **Innovative Microfluidic Devices in Energy-Related Research: Application to Nuclear Waste Management and Beyond**
Poonosamy, Jenna; Lönartz, Mara I.; Obaied, Abdulmonem; Yang, Yuankai;
Deissmann, Guido; Bosbach, Dirk, Forschungszentrum Juelich GmbH, Germany

Atrium

- 12:00 **Lunch Break**

13 June 2023, 13:00 – 15:00 h

Großer Saal

Hydrogen Technologies

Session Chair: Mariya E. Ivanova

- 13:00 **Electrochemistry for Hydrogen – Electrolysis, Reversible Cells and Fuel Cells**
Müller, Martin¹; Eichel, Rüdiger¹; Eikerling, Michael¹; Friedrich, Andreas²; Gago, Aldo²;
Gazdzicki, Pawel²; Guillon, Olivier¹; Janßen, Holger¹; Kadyk, Thomas³; Korte, Carsten¹;
Kowalski, Piotr¹; Kunz, Felix¹; Lenser, Christian¹; Lohmann-Richters, Felix¹,
¹Forschungszentrum Jülich, Germany; ²Deutsches Zentrum für Luft- und Raumfahrt
- 13:15 **Integrated Pathways for Electrolyzer Manufacturing and Deployment in Germany**
Jesse, Bernhard-Johannes¹; Vögele, Stefan¹; Kramer, Gert Jan²; Koning, Vinzenz^{2/3};
Kuckshinrichs, Wilhelm¹, ¹Institute of Energy and Climate Research – Systems
Analysis and Technology Evaluation, Forschungszentrum Jülich; ²Copernicus Institute
of Sustainable Development, Utrecht University; ³Centre for Complex Systems
Studies, Utrecht University
- 13:30 **Evaluation of Different Hydrogen Carriers in the Context of a Sustainable Hydrogen
Economy**
Peschel, Andreas^{1/2}; Wasserscheid, Peter^{1/3/4}, ¹Forschungszentrum Jülich GmbH,
Institut für nachhaltige Wasserstoffwirtschaft (INW), Jülich, Germany; ²RWTH Aachen
University, Aachener Verfahrenstechnik, Aachen, Germany; ³Forschungszentrum
Jülich GmbH, Helmholtz-Institut Erlangen-Nürnberg für Erneuerbare Energien (IEK 11),
Erlangen, Germany; ⁴Lehrstuhl für Chemische Reaktionstechnik (CRT), Friedrich-
Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany
- 13:45 **Hydrogen as the Key to the Energy Transition**
Dyck, Alexander; Kröner, Michael; Zobel, Marco, Deutsches Zentrum für Luft- und
Raumfahrt e. V. (DLR) German Aerospace Center, Germany
- 14:00 **Sustainable Aviation Fuels from Carbon Dioxide and Renewable Energy**
Dittmeyer, Roland¹; Corre, Gael¹; Monnerie, Nathalie²; Peters, Ralf³; Köhler, Markus²,
¹Karlsruhe Institute of Technology, Germany; ²German Aerospace Center, Germany;
³Forschungszentrum Jülich, Germany
- 14:15 **Ceramic Proton Conductors as Pathfinders in Green Chemistry**
Ivanova, Mariya E.¹; Menzler, Norbert H.^{1/2}; Guillon, Olivier^{1/2/3}, ¹Forschungszentrum
Jülich GmbH, Institute of Energy and Climate Research (IEK-³Materials Synthesis and
Processing), 52425 Jülich, Germany; ²RWTH Aachen University, Institute of Mineral
Engineering (GHI), Department of Ceramics and Refractory Materials, 52064 Aachen,
Germany; ³JARA Jülich-Aachen Research Alliance – Energy

Rheinsaal

Fusion Physics and Technology

Session Chair: Wolfgang Biel

- 13:00 **The Challenge of Designing a Fusion Power Plant**
Warmer, Felix, *Eindhoven University of Technology, Netherlands, The*
- 13:15 **Power Exhaust for a Fusion Reactor**
Wiesen, Sven^{1,6}; Brezinsek, Sebastijan¹; Linsmeier, Christian¹; Bourdelle, Clarisse^{2,6}; Coleman, Matti^{3,6}; Maviglia, Francesco^{4,6}; Siccinio, Mattia^{5,6}; Zohm, Hartmut^{5,6}; Bernert, Matthias⁵; Wischmeier, Marco⁵, ¹*Forschungszentrum Jülich GmbH, Germany*; ²*CEA, IRFM, Saint Paul Lez Durance, France*; ³*Culham Centre for Fusion Energy, Abingdon, Oxon, OX14 3DB, UK*; ⁴*Associazione EURATOM-ENEA Sulla Fusione, C.P. 65-00044 Frascati, Italy*; ⁵*Max-Planck-Institut für Plasmaphysik*
- 13:30 **Turbulence Optimization as a Critical Element for Energy Production through Fusion**
Zholobenko, Wladimir; Jenko, Frank, *Max Planck Institute for Plasma Physics, Germany*
- 13:45 **Leveraging 3D Magnetic Topologies in Support of Long-Pulse High-Performance Plasma Operation for a Fusion Reactor**
Liang, Yunfeng¹; Knieps, Alexander¹; Zhou, Song²; Xu, Shuai¹; Wang, Erhui¹; Huang, Jie¹; Suzuki, Yasuhiro³; Drews, Philipp¹; Liu, Shaocheng⁴; Joachim, Geiger⁵; Feng, Yuhe⁵; Koenig, Ralf⁵; Jakobowski, Marcin⁵; Gao, Yu⁵; Killer, Carsten⁵; Kobayashi, Tatsuya, ¹*Forschungszentrum Jülich GmbH, Germany*; ²*Huazhong University of Science and Technology, China*; ³*Hiroshima University, Higashi-Hiroshima, Japan*; ⁴*Institute of Plasma Physics, Chinese Academy of Sciences, China*; ⁵*Max Planck Institute for Plasma Physics, Germany*; ⁶*National Institute for Fusion Science, Japan*
- 14:00 **Development of a Laser-based Diagnostic for in situ Monitoring of Tritium Retention in ITER fusion device**
Huber, Alexander¹; Andrew, Philip²; Zlobinski, Mirosław¹; Sergienko, Gennady¹; Assmann, Jochen¹; Castañó, David¹; De Schepper, Alexandra¹; Friese, Sebastian¹; Ivashov, Ilia¹; Krasikov, Yury¹; Lambertz, Horst Toni¹; Mertens, Philippe¹; Mlynczak, Krzysztof¹, ¹*Institut für Energie- und Klimaforschung - Plasmaphysik, Forschungszentrum Jülich GmbH*; ²*ITER Organization, Route de Vinon, CS 90 046, 13067 Saint-Paul-lez-Durance, France*
- 14:15 **Development of Megawatt-Class Gyrotrons for Nuclear Fusion at KIT**
Ruess, Tobias; Gantenbein, Gerd; Illy, Stefan; Rzesnicki, Tomasz; Ell, Benjamin; Feuerstein, Lukas; Jin, Jianbo; Krier, Laurent; Marek, Alexander; Stanculovic, Sebastian; Thumm, Manfred; Vöhringer, Max; Wu, Chuanren; Jelonnek, John, *Karlsruhe Institute of Technology, Germany*

13 June 2023, 13:00 – 15:00 h

Tagungszentrum Raum 1+2

Techno-economic and Socially Acceptable Deployment of Renewable Energies

Session Chair: Jann Michael Weinand

- 13:00 **Helmholtz Activities in the Field of Multi-Criteria Decision Analysis (MCDA)- Assisted Sustainability Assessment**
Haase, Martina¹; Mesa Estrada, Laura¹; Wulf, Christina²; Baumann, Manuel¹; Müller, Tim¹; Brand, Urte³; Zeug, Walther⁴, ¹KIT, Germany; ²FZJ, Germany; ³DLR, Germany; ⁴UFZ, Germany
- 13:15 **Is the Expansion of Renewable Energies Taking Place in a Nature-Friendly Way?**
Mittelstädt, Nora; Thrän, Daniela; Manske, David; Schinkel, Björn; Schmiedt, Julius, *Helmholtz-Centre for Environmental Research, Germany*
- 13:30 **Challenges Around the Massive Ramp-Up of Photovoltaics**
Ulbrich, Carolin¹; Mikhnych, Vladyslav²; Utama, Christian^{3,4}; Schlatmann, Rutger¹, ¹PVComB, *Helmholtz Zentrum Berlin, Germany*; ²ScienceForUkraine, *Ukraine*; ³Freie Universität Berlin, *Germany*; ⁴Helmholtz Einstein International Berlin Research School in Data Science, *Berlin, Germany*
- 13:45 **The Opportunity Cost of Environmental Exclusion Zones for Renewable Energy Deployment**
Lehmann, Paul; Tafarte, Philip, *Helmholtz Centre for Environmental Research - UFZ, Germany*
- 14:00 **Automating the Design and Operation of Day-Ahead Photovoltaic Power Generation Forecasts with AutoPV**
Meisenbacher, Stefan; Heidrich, Benedikt; Martin, Tim; Mikut, Ralf; Hagenmeyer, Veit, *KIT IAI, Germany*
- 14:15 **Scenarios for the Optimal Use of Biomass in the Future German Energy System**
Jordan, Matthias¹; Meisel, Kathleen²; Dotzauer, Martin²; Esmaeili, Dania¹; Thrän, Daniela^{1,2}, ¹Helmholtz Centre for Environmental Research - UFZ, *Germany*; ²Deutsches Biomasseforschungszentrum gemeinnützige GmbH—DBFZ, *Torgauer Straße 116, 04347 Leipzig, Germany*

Tagungszentrum Raum 3

Circular Economy

Session Chair: Dieter Stapf

- 13:00 **High Pressure Entrained Flow Gasification: A Key Enabling Technology in the Circular Economy**
Fleck, Sabine¹; Santo, Ulrike¹; Jakobs, Tobias¹; Kolb, Thomas^{1,2}, ¹*Institute for Technical Chemistry, Karlsruhe Institute of Technology, Germany*; ²*Engler-Bunte-Institut, Fuel Technology, Karlsruhe Institute of Technology, Germany*
- 13:15 **Plastic Pyrolysis: An Experimental Study on the Circularity of the Organic-Rich Fraction from Mechanical Recycling of Refrigerators**
Tavakkol, Salar¹; Vogt, Jonas¹; Mütze, Thomas²; Richter, Frank¹; Straczewski, Grazyna²; Stapf, Dieter¹, ¹*Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany*; ²*Helmholtz Institute Freiberg for Resource Technology, Freiberg, Germany*
- 13:30 **Development of a FLOX®-Based Burner Concept Operating with Liquid Fuels**
Schäfer, Dominik¹; Hampp, Fabian²; Kim, Haisol¹; Pareja, Jhon¹; Lammel, Oliver¹, ¹*Institute of Combustion Technology, German Aerospace Center, Germany*; ²*University of Stuttgart, Germany*
- 13:45 **Experimental Investigation of the Fuel Flexibility of a Micro Gas Turbine Combustor at Atmospheric Conditions**
Hohloch, Martina; Kutne, Peter; Zanger, Jan, *German Aerospace Center (DLR), Germany*
- 14:00 **Nitrogen Oxide Reduction in the Oscillating Combustion of Ammonia as a Carbon-Free Energy Carrier**
Wiebe, Janine¹; Aleksandrov, Krasimir¹; Gehrmann, Hans-Joachim¹; Giese, Anne²; Görner, Klaus²; Leicher, Jörg²; Mätzing, Hartmut¹; Nowakowski, Tim²; Stapf, Dieter¹, ¹*Karlsruher Institut für Technologie, Germany*; ²*Gas- und Wärme-Institut Essen e. V. (GWI), Essen, Germany*
- 14:15 **Resource Criticality in Life Cycle Sustainability Assessment: A New Approach for Emerging Technologies**
Zapp, Petra; Schreiber, Andrea; Risse, Eva, *Forschungszentrum Jülich GmbH, Germany*

Moselsaal

Solar Power and Heat | Geothermal Energy

Session Chairs: Kai Wieghardt, Katharina Schätzler

- 13:00 **Liquid Metals in Concentrating Solar Power and Requirements on Structural Materials**
Schroer, Carsten; Yurechko-Hussy, Mariya; Martini, Florian; Bonnekoh, Carsten; Rieth, Michael; Gorr, Bronislava; Weisenburger, Alfons; Heinzl, Annette; Fetzer, Renate; Müller, Georg; Fuchs, Joachim; Ruck, Sebastian; Stieglitz, Robert, *Karlsruher Institut für Technologie (KIT), Germany*
- 13:15 **In-Situ Solar Tower Power Plant Optimization by Differentiable Ray Tracing**
Pargmann, Max¹; Ebert, Jan²; Maldonado Quinto, Daniel¹; Pitz-Paal, Robert¹; Kesselheim, Stefan², ¹*Deutsches Zentrum für Luft und Raumfahrt*; ²*Forschungszentrum Jülich*

13 June 2023, 13:00 – 15:00 h

- 13:30 **Solar-Powered Direct Air Capture: Techno-Economic and Environmental Assessment**
Prats-Salvado, Enric^{1,2}; Jagtap, Nipun^{1,3}; Monnerie, Nathalie¹; Sattler, Christian^{1,2},
¹*Institute of Future Fuels, German Aerospace Center (DLR), Germany*; ²*Chair for Solar Fuel Production, RWTH Aachen University, Germany*; ³*Bremerhaven University of Applied Sciences, Germany*
- 13:45 **High-Temperature Thermal Technologies (HT3) for Heat Storage in Former Hydrocarbon Reservoirs: Contributions from the Helmholtz Research Infrastructure DeepStor at KIT**
Schill, Eva¹; Stricker, Kai¹; Banks, Jonathan²; Bauer, Florian¹; Kohl, Thomas¹,
¹*Karlsruhe Institute of Technology, Germany*; ²*University of Alberta, Canada*
- 14:00 **Permeability Evolution in Open Fractures during Precipitation and Dissolution: A Phase-Field Study**
Späth, Michael¹; Urai, Janos L.²; Nestler, Britta^{1,3,4}, ¹*Institute of Nanotechnology (INT), Karlsruhe Institute of Technology (KIT), Germany*; ²*Institute of Tectonics and Geodynamics, RWTH Aachen University, Germany*; ³*Institute for Applied Materials (IAM-MMS), Karlsruhe Institute of Technology (KIT), Germany*; ⁴*Institute of Digital Materials Science (IDM), Karlsruhe University of Applied Sciences, Germany*
- 14:15 **Development of Thermo-Reporting Nanoparticle Tracer for Geothermal Reservoir Characterization**
Spitzmüller, Laura¹; Nitschke, Fabian¹; Berson, Jonathan^{2,3}; Rudolph, Bastian¹; Schimmel, Thomas^{2,3}; Kohl, Thomas¹, ¹*Geothermal Energy & Reservoir Technology, Institute of Applied Geosciences, Karlsruhe Institute of Technology (KIT), Adenauerring 20b, 76131 Karlsruhe*; ²*Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT), Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany*; ³*Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), Wolfgang-Gaede-Straße 1, 76131 Karlsruhe*

Atrium

- 14:30 **Coffee Break**

Großer Saal

Hydrogen Utilisation

Session Chair: Alexander Dyck

- 15:00 **Hydrogen Production via Thermochemical Cycles Using Solar Particle Reactors**
Neises-von Puttkamer, Martina; Grobbel, Johannes; Giljanivic, Ante; Weber, Anika;
Sattler, Christian, *German Aerospace Center, Germany*
- 15:15 **Solar-Driven Upgrading of Biomass by Direct Coupling of Homogeneous Catalytic Hydrogenation to Photo-Electrochemical Production of Green Hydrogen**
van de Krol, Roel^{1,2}; Abdi, Fatwa F.¹, ¹*Institute for Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH*; ²*Institut für Chemie, Technische Universität Berlin*
- 15:30 **Liquid Organic Hydrogen Carriers: Towards a Mobile Application for Heavy-Duty Vehicles**
Geißelbrecht, Michael¹; Kadar, Julian¹; Wasserscheid, Peter^{1,2}, ¹*Forschungszentrum Jülich, Helmholtz-Institut Erlangen-Nürnberg für Erneuerbare Energien (IEK 11), Cauerstraße 1, 91058 Erlangen, Germany*; ²*Lehrstuhl für Chemische Reaktionstechnik, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Egerlandstraße 3, 91058 Erlangen, Germany*
- 15:45 **The Path towards Reducing and Completely Avoiding Platinum Contents in HT-PEM Fuel Cells**
Schonvogel, Dana; Wagner, Peter; Friedrich, K. Andreas, *DLR-Institute of Engineering Thermodynamics, Germany*
- 16:00 **Research and Development in the Field of Solid Oxide Cells (SOC) at Forschungszentrum Jülich**
Kunz, Felix¹; Peters, Roland¹; Schäfer, Dominik¹; de Haart, L.G.J. {Bert}¹; Menzler, Norbert H.²; Margaritis, Nikolaos³; Naumenko, Dmitry⁴; Kadyk, Thomas⁵, ¹*Institute of Energy and Climate Research - Fundamental Electrochemistry (IEK-9), Forschungszentrum Jülich GmbH*; ²*Institute of Energy and Climate Research - Materials Synthesis and Processing (IEK-1), Forschungszentrum Jülich GmbH*; ³*Central Institute of Engineering, Electronics and Analytics - Engineering and Technology (ZEA-1), Forschungszentrum Jülich GmbH*; ⁴*Institute of Energy and Climate Research - Structure and Function of Materials (IEK-2), Forschungszentrum Jülich GmbH*; ⁵*Institute of Energy and Climate Research - Theory and Computation of Energy Materials (IEK-13), Forschungszentrum Jülich GmbH*
- 16:15 **Influence of Mixedness on Fuel- and Load-Flexibility of a Single-Nozzle, Jet-Stabilized FLOX® Combustor with Hydrogen/Methane-Air Mixtures**
Petry, Niklas; Naduvil Mannazhi, Manu; Yin, Zhiyao; Rein, Dominik; Lammel, Oliver; Geigle, Klaus Peter; Huber, Andreas, *Institute of Combustion Technology, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Stuttgart, Germany*

13 June 2023, 15:00 – 16:30 h

Rheinsaal

Materials Research for a Fusion Power Plant and beyond

Session Chair: Dirk Radloff

- 15:00 **Interlinks between Tritium for Fusion and Hydrogen for Energy R&D**
Größle, Robin; Cristescu, Ion; Niemes, Simon; Priester, Florian; Welte, Stefan, *Karlsruhe Institute of Technology, Germany*
- 15:15 **Probing Hydrogen with High Spatial Resolution: A New Correlative Deformation/Hydrogen Sensing Technique for Hydrogen Embrittlement Study**
Fang, Xufei; Schneider, Hans-Christian; Kirchlechner, Christoph, *Karlsruhe Institute of Technology, Germany*
- 15:30 **Mechanical Length Scale Bridging in Fusion Materials through Deep Learning**
Gopalan, Hariprasad¹; Schneider, Hans-Christian¹; Kirchlechner, Christoph¹; Rajkumar, Arun², ¹*Institute for Applied Materials, Karlsruhe Institute of Technology*; ²*Department of computer science and engineering, Indian Institute of Technology, Madras*
- 15:45 **Advanced Tungsten Composites for Fusion Reactors**
Coenen, Jan Willem^{1,2}, Dorow-Gerspach, Daniel¹; Lau, Alexander¹; Mao, Yiran¹; Riesch, Johann³; Shu, Ru¹; Terra, Alexis¹; Linsmeier, Christian¹, ¹*Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung – 52425 Jülich, Germany*; ²*Department of Engineering Physics, University of Wisconsin Madison, WI 53706 Madison, USA*; ³*Max-Planck-Institut für Plasmaphysik, 85748 Garching b. München, Germany*
- 16:00 **SMART Materials for the Plasma-Facing Wall of a Fusion Reactor**
Litnovsky, Andrey¹; Bram, Martin¹; Gonzalez-Julian, Jesus^{1,2}; Zoz, Henning³; Benz, Hans Ulrich³; Huber, Jens⁴; Pintsuk, Gerald¹; Coenen, Jan Willem^{1,5}; Linsmeier, Christian¹, ¹*Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung, 52425 Jülich, Germany*; ²*Institute of Mineral Engineering, RWTH Aachen University, 52074, Aachen, Germany*; ³*Zoz Group, 57482 Wenden, Germany*; ⁴*Dr. Fritsch Sondermaschinen GmbH, Dieselstr. 8, 70736 Fellbach, Germany*; ⁵*Department of Engineering Physics, University of Wisconsin Madison, WI 53706 Madison, USA*
- 16:15 **Beryllides as Advanced Functional Materials for Nuclear Fusion Reactors**
Gaisin, Ramil, *Karlsruhe Institute of Technology (KIT), Germany*

Tagungszentrum Raum 1+2

Electrochemical Cell Characterization

Session Chair: Roswitha Zeis

- 15:00 **Advanced Characterization Techniques for the Development of Batteries**
Akçay, Tolga; Kramer, Dominik; Mönig, Reiner, *Karlsruhe Institute of Technology (KIT), Germany*
- 15:15 **Development and Characterization of Proton Exchange Membranes for Fuel Cells and Water Electrolyzers**
Böhm, Thomas¹; Thiele, Simon^{1,2}, ¹*Forschungszentrum Jülich, Helmholtz-Institute Erlangen-Nürnberg for Renewable Energy, Erlangen*; ²*Department of Chemical and Biological Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen*

- 15:30 **DRT Characterization of Electrochemical Systems**
Braig, Michael; Zeis, Roswitha, *Karlsruhe Institute of Technology, Helmholtz Institute Ulm, 89081 Ulm, Germany*
- 15:45 **Multimodal Operando Analysis of High-Capacity Electrodes with Photons and Neutrons**
Risse, Sebastian, *Helmholtz-Zentrum Berlin, Germany*
- 16:00 **Towards Standardization and Automation of Solid Electrolyte Ionic Conductivity Measurements for Quality Control of Solid-State Battery Material Components**
Kalyk, Fariza; Vargas-Barbosa, Nella Marie, *Forschungszentrum Jülich, Helmholtz-Institut Münster Germany*
- 16:15 **Multimodal Characterization of Bio-derived Sustainable Electrode Materials for Vanadium Redox Flow Batteries**
Köble, Kerstin; Schilling, Monja; Scherer, Simon; Zeis, Roswitha, *Karlsruhe Institute of Technology, Helmholtz Institute Ulm, Ulm, Germany*

Tagungszentrum Raum 3

Circular Economy: Focus on Minerals and Metals

Session Chair: Jens Gutzmer

- 15:00 **A New Methodological Framework for the Risk Assessment of a Sustainable, Reliable, and Cost-Effective Supply Chain of Raw Materials**
Ciotola, Angela^{1,2}; Elmenshawy, Ahmed¹; Elsayed, Abdallah¹; Colombo, Simone²; Fuss, Maryegli¹; Poganietz, Witold-Roger¹, ¹*Institute for Technology Assessment and Systems Analysis, Germany*; ²*School of Industrial Engineering and Information Engineering, Politecnico di Milano 20133 Milan, Italy*
- 15:15 **From FineFuture to FINEST: Resource Supply for the Energy Transition and Sustainable Value Chains**
Dirlich, Stefan¹; Schlosser, Dietmar²; Stapf, Dieter³; Renno, Axel¹; Gutzmer, Jens¹, ¹*Helmholtz-Institut Freiberg für Ressourcentechnologie am Helmholtz-Zentrum Dresden-Rossendorf, Germany*; ²*Helmholtz-Zentrum für Umweltforschung*; ³*Karlsruhe-Institut für Technologie*
- 15:30 **Lithium from Deep Geothermal Fluids - Chances and Challenges of a Domestic Production**
Nitschke, Fabian¹; Goldberg, Valentin¹; Winter, Daniel²; Kluge, Tobias¹; Koschikowski, Joachim¹; Kohl, Thomas¹, ¹*Karlsruhe Institute of Technology KIT, Germany*; ²*Fraunhofer Institute for Solar Energy Systems ISE, Freiburg*
- 15:45 **Peptide-Based Biomagnetic Separation for the Recycling of Critical Raw Materials from Ultrafine Particles in Complex Waste Streams**
Boelens, Peter; Lederer, Franziska, *Helmholtz Institute Freiberg for Resource Technology*
- 16:00 **Quantitative Assessment of Global Future Lithium Supply: Simulating Mining Projects and Predicting Production Start Times**
Andrade, Laura Buarque¹; Frenzel, Max¹; Bookhagen, Britta²; Kresse, Carolin², ¹*Helmholtz Institute Freiberg for Resource Technology, Germany*; ²*Deutsche Rohstoffagentur in der Bundesanstalt für Geowissenschaften und Rohstoffe*
- 16:15 **Resource Demand and Resource Criticality for the Energy Transition**
Naegler, Tobias¹; Kullmann, Felix², ¹*Deutsches Zentrum für Luft- und Raumfahrt, Germany*; ²*Forschungszentrum Jülich, Germany*

13 June 2023, 15:00 – 16:30 h

Moselsaal

Energy Transition and Society

Session Chair: Hawal Shamon

- 15:00 **Current Issues in the Emerging Field of Normative Energy Ethics**
Düvel, Eike; Frigo, Giovanni; Garcia-Portela, Laura; Hillerbrand, Rafaela; Milchram, Christine; Poznic, Michael; Schmidt, Michael W.; Widyatmanto, Johannes Narasetu, *Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe Institute of Technology (KIT), Germany*
- 15:15 **Normative Emissions Accounting and Responsibility for Contributing to Climate Change**
Düvel, Eike; García Portela, Laura, *Karlsruhe Institut für Technologie, Germany*
- 15:30 **Social Life Cycle Assessment of Fuel Cell Electric Vehicles**
Springer, Sally Kirsten; Wulf, Christina; Zapp, Petra, *Institute of Energy and Climate Research – Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich*
- 15:45 **War, Energy Crisis, and the Impact on Household Heating in Germany: An Empirical Examination of Energy System Relevant Concepts**
Shamon, Hawal; Stöckigt, Gerrit; Meyer, Frauke; Jarke-Neuert, Johannes; Vögele, Stefan; Kuckshinrichs, Wilhelm, *Institute of Energy and Climate Research – Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich*
- 16:00 **Inducing Energy and CO₂ Savings in Private Households by Introducing CO₂ Budgets: Findings from a Living Lab Experiment**
Sandmeier, Thorben; Scharnhorst, Leandra; Ardone, Armin; Fichtner, Wolf, *Karlsruhe Institute of Technology (KIT), Germany*
- 16:15 **MOIDE.behave: Open Source Software for Discrete Choice Modeling**
Reul, Julian Paul^{1,2}; Grube, Thomas¹; Linßen, Jochen¹; Stolten, Detlef^{1,2},
¹Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research – Techno-economic Systems Analysis (IEK-3), 52428 Jülich, Germany; ²RWTH Aachen University, Chair for Fuel Cells, Faculty of Mechanical Engineering, 52062 Aachen, Germany

Großer Saal

- 16:30 **Summary and Closing of the Helmholtz Energy Conference 2023**

Galerie

Poster - Chemical Energy Carriers

From HZDR Multiphase Addon to OpenFOAM RCS towards a Helmholtz Energy Multiphase Platform?

Schlegel, Fabian, *Helmholtz-Zentrum Dresden-Rossendorf, Germany*

A Morphology Adaptive Multifield Two-Fluid Model

Meller, Richard; Schlegel, Fabian; Krull, Benjamin, *Helmholtz-Zentrum Dresden-Rossendorf, Germany*

Methane Pyrolysis and Dry Reforming: Enablers for Efficient and Sustainable Hydrogen and Synthesis Gas Production

Stoppel, Leonid; Dietrich, Benjamin; Duran, Ines; Hofberger, Christoph; Uhlenbruck, Neele; Wetzel, Thomas, *Karlsruhe Institute of Technology, Germany*

Ultrafast Pulsation of Microwave Plasmas for Synthesis of Chemicals in Modular Plants

Navarrete, Alexander¹; Soldatov, Sergey²; Hernandez, Mery Sheryll¹; Link, Guido²; Jelonnek, John²;

Dittmeyer, Roland¹, ¹*Institute for Micro Process Engineering (IMVT), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany*; ²*Institute for Pulsed Power and Microwave Technology (IHM), Karlsruhe Institute of Technology, Karlsruhe, Germany*

Towards Digital Twins of Distillation Columns

Wiedemann, Philipp¹; Hampel, Uwe^{1,2}, ¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*;

²*Technische Universität Dresden, Germany*

Scalable Preparation of Catalysts for Methanol Synthesis

Pitter, Stephan¹; Warmuth, Lucas¹; Guse, David²; Herrera Delgado, Karla¹; Herfet, Moritz¹; Kind,

Matthias²; Zevaco, Thomas A.¹, ¹*KIT, Germany, Institute of Catalysis Research and Technology*;

²*KIT, Germany, Institute for Thermal Process Engineering*

Life Cycle Analysis of a Large-scale Coupled Photoelectrochemical System

Zhang, Xinyi; van de Krol, Roel; Abdi, Fatwa F., *Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany*

Production of Hydrogen, Carbon Monoxide, or Other Chemical Commodities at Demonstrator Scale Using Tailored Concentrated Photon Fluxes

Wullenkord, Michael; Risthaus, Kai, *German Aerospace Center (DLR), Institute of Future Fuels, Germany*

Prediction of Octane Numbers for the Technical Fuel Assessment of Synthetic Fuels

Methling, Torsten; Schlichting, Samuel; Schmidt, Marleen; Oßwald, Patrick; Köhler, Markus, *German Aerospace Center, Institute of Combustion Technology, Germany*

Influence of Support on the Dehydrogenation of Perhydro Benzyltoluene with Platinum-based Catalysts

Herzinger, Elisabeth; Wolf, Moritz, *Karlsruhe Institute of Technology (KIT), Germany*

Galerie

Poster - Circular Economy and Carbon Management

Combining Optical and X-ray Measurements of an Overflowing Foam

Lappan, Tobias¹; Herting, Dominic^{1,2}; Ziauddin, Muhammad²; Stenzel, Julian²; Jiao, Guanghao¹;

Marquardt, Tine^{1,2}; Shevchenko, Natalia¹; Eckert, Sven¹; Eckert, Kerstin^{1,2}; Heitkam, Sascha^{1,2},

¹*Institute of Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), 01328 Dresden, Germany*; ²*Institute of Process Engineering and Environmental Technology, Technische Universität Dresden, 01062 Dresden, Germany*

Test Field for the Integration of Direct Air Capture Technologies into Building Ventilation for the Creation of Negative Carbon Emissions

Omran, Mohamed; Kraut, Manfred; Dittmeyer, Roland, *IMVT, KIT, Germany*

Poster Sessions

Thermoelectric Generators for Autarkic Sensors and Waste Heat Recovery

Stiewe, Christian; Ziolkowski, Pawel; de Boor, Johannes; Müller, Eckhard, *German Aerospace Center, Germany*

Decarbonization Strategy by Optimizing Design and Operation of an Energy Concept

Kansara, Rushit, *German Aerospace Center, Institute of Low-Carbon Industrial Processes*

Comparison of Measured Gas Fraction with Theoretical Approach (Drift Flux Model) within a Reflux Flotation Cell

Tholan, Vaishakh¹; Sommer, Anna-Elisabeth¹; Heitkam, Sascha²; Eckert, Kerstin^{1,2}, ¹*Institute of Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf, Bautzner Landstrasse 400, Dresden 01328, Germany*; ²*Institute of Process Engineering and Environmental Technology, Technische Universität Dresden, Dresden 01069, Germany*

Fundamental Research on Pyrolysis of Plastic Waste via Numerical Simulations

Zhang, Feichi; Tavakkol, Salar; Zirwes, Thorsten; Netsch, Niklas; Zeller, Michael; Vogt, Jonas; Stapf, Dieter, *KIT, Germany*

Industry Flexibility for Future Energy Systems: A Case Study Focused on Secondary Copper Production

Sajjad, Mohsin; Pervez, Ashak Mahmud; van den Boogaart, Karl Gerald, *Helmholtz Institute Freiberg, Germany*

Zero-Emission Circular Concrete

Stemmermann, Peter; Ullrich, Angela; Garbev, Krassimir; Beuchle, Günter; Schweike, Uwe; Precht, Ulrich; Stapf, Dieter, *KIT, Germany*

Concepts for Energy-Efficient Wastewater Treatment in the Future Energy Grid

Reinecke, Sebastian Felix; Parra Ramirez, Alejandro; Huacalco, Ysabel; Kumar, Amit; Ristau, Florian; Hampel, Uwe, *Helmholtz-Zentrum Dresden-Rossendorf, Germany*

Galerie

Poster - Electrochemistry and Energy Materials

Correlative Electron Microscopy as a Supporting Toolbox for the Development of Energy Materials and Devices

Abou-Ras, Daniel; Thomas, Sinju; Wargulski, Dan R., *Helmholtz-Zentrum Berlin, Germany*

In-Situ Nanoscale Hydrogen Mapping

Zimber, Nikolai¹; Lammer, Judith²; Vladimirov, Pavel¹; Dürrschnabel, Michael¹, ¹*Karlsruhe Institute of Technology, Germany*; ²*Institute of Electron Microscopy and Nanoanalysis (FELMI), Austria*

Compaction of Lithium Ion Battery Cathodes: Experiments and Simulation on the Influence of Degree of Densification and Particle Shape

Becker, Verena^{1,2}; Schmidt, Denny^{1,3}; Birkholz, Oleg^{1,4}; Knoblauch, Volker⁵; Kamlah, Marc¹, ¹*Institute for Applied Materials, Karlsruhe Institute of Technology, Germany*; ²*Daimler Truck AG*; ³*Robert Bosch GmbH*; ⁴*APL Automobil-Prüftechnik Landau GmbH*; ⁵*HS Aalen*

Enhancing Electrochemical CO₂ Reduction Efficiency and Selectivity of Copper-Based Electrocatalysts in Aprotic Electrolytes

Witzel, Ruth; Oppel, Niklas; Röse, Philipp; Krewer, Ulrike, *Institute for Applied Materials - Electrochemical Technologies, Karlsruhe Institute of Technology*

A Blueprint for 3D-Printing Lab Scale Aqueous and Organic Redox-Flow Batteries

Kortekaas, Luuk¹; Fricke, Sebastian¹; Winter, Martin^{1,2}; Grünebaum, Mariano¹; Cekic-Laskovic, Isidora¹, ¹*Forschungszentrum Jülich, Helmholtz-Institut Münster, IEK-12, Corrensstraße 46, 48149 Münster, Germany*; ²*MEET Batterie Research Center, University of Münster, Corrensstraße 46, 48149 Münster, Germany*

"Sweet" Electrolytes: Sugar Alcohols as Electrolyte Component for Safer Aqueous Batteries
 Krämer, Susanna¹; Diddens, Diddo^{1,2}; Winter, Martin^{1,3}; Grünebaum, Mariano¹, ¹Forschungszentrum Jülich GmbH, Germany; ²Institut für physikalische Chemie, Westfälische Wilhelms-Universität Münster, Corrensstraße 30, 48149 Münster, Germany; ³MEET Battery Research Center, University of Münster, Corrensstraße 46, 48149 Münster, Germany

Development of Carbon Aerogels as Fe-N-C Catalysts in High-Temperature Polymer Electrolyte Membrane Fuel Cells
 Kröner, Jessica; Reuter, Torben; Schwan, Marina; Zierdt, Tanja; Müller-Hülstede, Julia; Schonvogel, Dana; Wagner, Peter; Milow, Barbara; Friedrich, Andreas, *Deutsches Zentrum für Luft- und Raumfahrt, Germany*

Shear Flow for Bubble Removal from Electrode Surfaces During Electrolysis
 Babich, Alexander¹; Bashkatov, Aleksandr¹; Rox, Hannes¹; Yang, Xuegeng^{1,2}; Mutschke, Gerd¹; Eckert, Kerstin^{1,2}, ¹HZDR, Germany; ²Technische Universität Dresden

High-Temperature Polymer Electrolyte Fuel Cells Based on Protic Ionic Liquids
 Rodenbücher, Christian; Wippermann, Klaus; Korte, Carsten, *Forschungszentrum Jülich GmbH, Germany*

Carbon Nanotubes-Constructed High-Sulfur-Content Cathodes for Lean-Electrolyte Lithium-Sulfur Batteries

Lu, Liqiang¹; Lu, Yan^{1,2}, ¹Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany; ²Institute of Chemistry, University of Potsdam, 14476 Potsdam, Germany

Electrolyte-Induced Changes in the Bulk of Lithium Titanate: Polarons Enable Intercalative Pseudocapacity and Fast Charging

Schleker, Philipp¹; Grosu, Cristina²; Jakes, Peter¹; Eichel, Rüdiger-A.^{1,3}; Granwehr, Josef^{1,3}, ¹Forschungszentrum Jülich GmbH, Germany; ²Massachusetts Institute of Technology, Cambridge, Massachusetts, Vereinigte Staaten von Amerika; ³RWTH Aachen University, Aachen, Germany

Sulphur Depolarized Electrolysis for Hydrogen Production: Approaches and Applications
 Queda, Larissa; Dimitrakis, Dimitrios; Thomey, Dennis; Sattler, Christian, *DLR, Germany*

Membrane Technology

Gerhards, Karl-Ernst; Meulenber, Wilhelm A.; Van Gestel, Tim, *FZ-Jülich, Germany*

Bubble Detachment from the Surface of a (Photo)electrode

Liang, Feng; Abdi, Fatwa Firdaus, *Institute for Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin, Germany*

Effect of Adhesion Layer at the Pt/TiO₂ Interface on the Degradation of TiO₂-Protected III-V Water-Splitting Photocathodes

Suresh Babu, Diwakar^{1,2}; Schneider, Sven^{1,2}; van de Krol, Roel^{1,2}, ¹Institute for Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin, Germany; ²Institut für Chemie, Technische Universität Berlin, 10623 Berlin, Germany

R&D Activities at IEK-1 of Forschungszentrum Jülich GmbH in the Field of Oxygen Ion and Proton Conducting Solid Oxide Cells

Ivanova, Mariya E.¹; Lenser, Christian¹; Guillon, Olivier^{1,2,3}; Menzler, Norbert H.^{1,2}, ¹Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research (IEK-³Materials Synthesis and Processing), 52425 Jülich, Germany; ²RWTH Aachen University, Institute of Mineral Engineering (GHI), Department of Ceramics and Refractory Materials, 52

Electrocatalytic Conversion of CO₂ in a Membrane Electrode Assembly Flow Electrolyzer

Zhong, Siyu; Holtappels, Peter; Dittmeyer, Roland, *IMVT, KIT, Germany*

Development of Proton Conducting Cells: Challenges and Technological Approaches

Ivanova, Mariya E.¹; Zeng, Yuan^{1,2}; Schäfer, Laura-Alena^{1,2}; Guillon, Olivier^{1,2,3}; Menzler, Norbert H.^{1,2}, ¹Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research (IEK-³Materials Synthesis and Processing), 52425 Jülich, Germany; ²RWTH Aachen University, Institute of Mineral Engineering (GHI), Department of Ceramics and Refractory Materials, 52

Transparent Thin Film Structured Catalysts for Electrochemical CO₂ Reduction via Wet-Chemical Deposition Methods

Tsai, Yu-Lin; Bogdanoff, Peter; van de Krol, Roel, *Institute for Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin, Germany*

Poster Sessions

In Operando Electron Paramagnetic Resonance on $\text{LiFe}_{0.4}\text{Mn}_{1.604}$ Spinel

Jakes, Peter; Granwehr, Josef, *Forschungszentrum Jülich GmbH, Germany*

Large Area Template-Free Nanostructured Films for Transparent Conducting Oxide and Photocatalyst Applications

Pattadai Jayaraman, Jayanthan^{1,2}; Harbauer, Karsten¹; van de Krol, Roel^{1,2}, ¹*Institute for Solar Fuels, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin, Germany*; ²*Institut für Chemie, Technische Universität Berlin, 10623 Berlin, Germany*

Atomistic Simulation of Protic Ionic Liquids as a future electrolyte for mid-temperature fuel cells

Parisi, Federico; Rodenbücher, Christian; Korte, Carsten; Kowalski, Piotr, *Forschungszentrum Jülich, Germany*

Galerie

Poster - Energy System and Sector Coupling

Energy Metadata Management to Establish FAIR Data as a New Standard

Süß, Wolfgang Karl¹; Hoyer-Klick, Carsten²; van den Boogaart, K. Gerald³; Stucky, Karl-Uwe¹; Schweikert, Jan¹; Koubaa, Mohamed Anis¹; Steinmeier, Leon³; Ballani, Felix³, ¹*KIT, Germany*; ²*DLR, Germany*; ³*HZDR-HIF, Germany*

Self-Sufficient and Sustainable Low-Energy Cabins for Cruise Ships

Schwager, Patrick; Tippe, Mareike; Brand-Daniels, Urte; Gehrke, Kai; Vehse, Martin; Vogt, Thomas, *DLR Institut für Vernetzte Energiesysteme, Germany*

Future Wind Ships: The Potential of Using Modern Sail and Hydrogen Power Plant Technologies to Decarbonize Shipping

Fitz, Annika Christine; Gosala, Dheeraj Bharadwaj; Gosala, Vaidehi; Lampe, Tobias; Schwedt, Thorben; Stutz, Sophie, *DLR Institut für Maritime Energiesysteme, Germany*

Scenarios for a Greenhouse Gas-Neutral German Transport Sector

Kraus, Stefan^{1,2}; Grube, Thomas¹; Linßen, Jochen¹; Stolten, Detlef^{1,2}, ¹*Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research - Techno-economic Systems Analysis (IEK-3), 52425 Jülich, Germany*; ²*RWTH Aachen University, Chair for Fuel Cells, Faculty of Mechanical Engineering, 52062 Aachen, Germany*

A Gamification Approach to Promote the Energy Transition

Förstner, Ellen¹; Ciotola, Angela^{1,2}; Stumpf, Stephanie¹; Vogler, Monika^{1,3}, ¹*Karlsruhe Institute of Technology, Germany*; ²*Politecnico di Milano, Italy*; ³*Helmholtz Institute Ulm, Germany*

DataLad: Distributed System for Joint Management of Code, Data, and Their Relationship

Hanke, Michael, *Forschungszentrum Jülich, Germany*

Helmholtz Platform for the Design of Robust Energy Systems and Raw Material Supply (RESUR)

Hoffmann, Julian; Hagenmeyer, Veit, *Karlsruhe Institute of Technology (KIT)*

Designing for Care

Frigo, Giovanni; Milchram, Christine; Hillerbrand, Rafaela, *Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe Institute of Technology (KIT), Germany*

Prospective LCA of Energy Technologies - Hydrogen Fuel Cell Ferries, Magnesium Batteries and Offshore Wind Turbines

Gomez Trillos, Juan Camilo¹; Brand-Daniels, Urte¹; Benitez, Alicia²; Wulf, Christina²; Pinto Bautista, Sebastian^{3,4}; Erakca, Merve^{3,4}; Baumann, Manuel³; Ersoy, Hüseyin³; Weil, Marcel^{3,4}, ¹*DLR-Institute of Networked Energy Systems, Oldenburg*; ²*Forschungszentrum Jülich IEK-STE, Jülich*; ³*Karlsruhe Institute of Technology ITAS, Karlsruhe*; ⁴*Helmholtz Institute Ulm, Ulm*

Galerie

Poster - Nuclear Energy

Dosimetry and Activation Calculations for Optimal Decommissioning Planning of NPPs

Rachamin, Reuven¹; Barkleit, Astrid²; Konheiser, Jörg²; Seidl, Marcus², ¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*; ²*PreussenElektra GmbH, Hannover, Germany*

Contribution of Nuclear Power to Climate Change Mitigation

Fridman, Emil¹; Kliem, Sören¹; Tromm, Walter²; Reinecke, Ernst-Arndt³, ¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*; ²*Karlsruhe Institute of Technology*; ³*Forschungszentrum Jülich*

Reactor Safety Research within the NUSAFE Program

Kliem, Sören¹; Tromm, Walter²; Reinecke, Ernst-Arndt³; Fridman, Emil¹; Sanchez, Victor²; Kelm, Stephan³, ¹*Helmholtz-Zentrum Dresden-Rossendorf, Germany*; ²*Karlsruhe Institute of Technology, Germany*; ³*Forschungszentrum Jülich, Germany*

Innovative Radiation-Based Imaging Techniques for Nuclear Safety Research

Wagner, Michael, *Helmholtz-Zentrum Dresden-Rossendorf, Germany*

Reliable Europium Thermodynamic Database: Uses and Needs in the Energy Field

Jordan, Norbert¹; Thoenen, Tres^{2,3}; Starke, Sebastian⁴; Spahiu, Kastriot⁵; Brendler, Vinzenz¹, ¹*Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology*; ²*Paul Scherrer Institut, Waste Management Laboratory, Switzerland*; ³*Present address: Am Rain 14, 4105 Biel-Benken, Switzerland*; ⁴*Helmholtz-Zentrum Dresden-Rossendorf, Computational Science Group*; ⁵*Swedish Nuclear Fuel and Waste Management Co (SKB), Sweden*

Modeling Magnetic Confinement Fusion Power Plants in Future Energy Systems

Breuning, Larissa¹; Kerekeš, Anđelka¹; von Müller, Alexander²; Gawlick, Julia¹; Fietz, Sina²; Zohm, Hartmut²; Hamacher, Thomas¹, ¹*Technical University of Munich (TUM), Lichtenbergstraße 4a, 85748 Garching, Germany*; ²*Max-Planck-Institute of Plasma Physics (IPP), Boltzmannstraße 2, 85748 Garching, Germany*

The Bio-Factor: Implications for Nuclear Waste Repository and Other Key Challenges

Raff, Johannes; Drobot, Björn; Steudtner, Robin; Cherkouk, Andrea; Sachs, Susanne, *Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology, Germany*

Poster Sessions

Lahnsaal

Poster - Renewable Energy

Concentrated Solar Thermal & Photovoltaics: Combining the Best of Both Worlds

Ruhwedel, Moritz¹; Gehrke, Kai²; Lüpfert, Eckhard¹; Sutter, Florian¹; Heller, Peter¹; Pitz-Paal, Robert¹, ¹German Aerospace Center (DLR) Institute of Solar Research, Linder Höhe, 51147 Köln, Germany; ²German Aerospace Center (DLR) Institute of Networked Energy Systems, Carl-von-Ossietzky-Str. 15, 26129 Oldenburg, Germany

Tender Synchrotron Radiation for the Development of Photovoltaic Absorber Materials

Többens, Daniel Maria; Schuck, Götz; Zizak, Ivo; Breternitz, Joachim; Schorr, Susan, *Helmholtz-Zentrum Berlin für Materialien und Energie, Germany*

An Improvement to Analytical Capacitor Voltage Estimation for Modular Multilevel Converters

Ndoh, Eugene Tinjinui¹; Byeon, Seongsu¹; Lotz, Marc², ¹DLR-MS, Germany; ²TU Braunschweig

Fuel and Load Flexibility of a Single-Nozzle Jet-Stabilized Combustor Operated with Hydrogen and Hydrogen-Methane Blends

Planke, Karl; Grimm, Felix; Kutne, Peter; Huber, Andreas, *Institute of Combustion Technology, German Aerospace Center (DLR), Stuttgart, Germany*

Prediction of Pollutant Emissions from a FLOX®-Based Combustor by a Newly Developed Semi-Empirical Approach Using a Simplified Reactor Network

Jacobs, Sascha; Methling, Torsten; Kathrotia, Trupti; Köhler, Markus, *DLR, Germany*

Brayton Battery Configuration with an Extended Induction Air Heater: A Techno-Economic Assessment

Belik, Sergej, *German Aerospace Center, Germany*

Demonstration of Pure Hydrogen Combustion in a Turbec T100 Micro Gas Turbine Equipped with a Jet-Stabilized Syngas Combustor

Lingstädt, Timo; Felix, Grimm, *German Aerospace Center (DLR), Germany*

Development of a Device for Variable Adjustment of Equivalence Ratio in Gas Turbines

Bellaire, Sebastian; Jan, Zanger; Andreas, Huber, *German Aerospace Center, Germany*

Development of Novel Silicone-Oil Based Heat Transfer Fluids for High Temperature Applications

Janotte, Nicole; Jung, Christian; Hilgert, Christoph, *Deutsches Zentrum für Luft- und Raumfahrt, Germany*

Evaluation of a Combined Heat-Storage Micro Gas Turbine System Concept

Farisco, Federica; Grimm, Felix; Seliger-Ost, Hannah; Krummrein, Thomas; Kutne, Peter, *DLR*

Experimental Investigation of Filler Material Compatibility for a Thermal Energy Storage with Liquid Metal as Heat Transfer Fluid

Müller-Trefzer, Franziska¹; Hesse, Robin¹; Heinzel, Annette²; Niedermeier, Klarissa¹; Wetzel, Thomas^{1,3}, ¹Karlsruhe Institute of Technology, Institute for Thermal Energy Technology and Safety, Germany; ²Karlsruhe Institute of Technology, Institute for Pulsed Power and Microwave Technology, Germany; ³Karlsruhe Institute of Technology, Institute of Thermal Process

GeoLab - Geothermal Laboratory in the Crystalline Basement

Kohl, Thomas¹; Sass, Ingo²; Kolditz, Olaf³; Schüth, Christoph⁴; Rühaak, Wolfram⁵; Bremer, Judith¹; Rudolph, Bastian¹; Schätzler, Katharina¹; Schill, Eva^{1,2}, ¹KIT, Germany; ²GFZ; ³UFZ; ⁴TU Darmstadt; ⁵BGE

High-Resolution Short-Term Solar Forecasting for the Integration of Photovoltaics (PV) in Energy Systems

Schmidt, Thomas¹; Stührenberg, Jonas¹; Blum, Niklas²; Lezaca, Jorge¹; Hammer, Annette¹; von Bremen, Lueder¹; Schroedter-Homscheidt, Marion¹; Vogt, Thomas¹, ¹German Aerospace Center - DLR, Institute of Networked Energy Systems, Germany; ²German Aerospace Center - DLR, Institute of Solar Research

Large-Scale Energy Storage Systems Based on Synthetic Natural Gas (SNG) and Subsurface Carbon Dioxide Storage

Fogel, Stefan; Unger, Sebastian; Hampel, Uwe, *Helmholtz-Zentrum Dresden-Rossendorf, Germany*

Materials for High-Temperature Applications in Liquid Metals

Heinzel, Annette; Purwitasari, Anisa; Fetzer, Renate; Lang, Fabian; Weisenburger, Alfons; Müller, Georg, *KIT, Germany*

Mathematical Models and Modelling of Synthetic Tracers Flowing in Complex Formations to Detect Fracture Network Geometry and Reservoir Temperature

Qiao, Yangyang; Yan, Guoqiang; Nitschke, Fabian; Spitzmüller, Laura; Kohl, Thomas, *Karlsruhe Institute of Technology, Germany*

Phase-Field Approach for Modeling the Evolution of Etch-Pits on K-Feldspar Surface

Kumar, Akash¹; Prajapati, Nishant²; Spaeth, Michael¹; Busch, Benjamin³; Schneider, Daniel^{1,4}; Hilgers, Christoph³; Nestler, Britta^{1,2,4}, ¹*Institute of Nanotechnology (INT), Karlsruhe Institute of Technology (KIT), Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany;* ²*Institute for Applied Materials (IAM-MMS), Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germ*

Spatial Correlation Structures of Wind Speed and Irradiance in Europe as Modeled in Regional Climate Models and the ERA5 Reanalysis

Lohmann, Gerald M¹; Monahan, Adam H²; Marzeion, Ben³; von Bremen, Lueder¹; Scholz, Yvonne¹; Schroedter-Homscheidt, Marion¹, ¹*German Aerospace Center (DLR), Institute of Networked Energy Systems, Oldenburg, Germany;* ²*University of Victoria, School of Earth and Ocean Sciences, Victoria, BC, Canada;* ³*University of Bremen, Institute of Geography, Bremen, Germany*

Sustainable Ceramic Particles for CSP Applications

Alkan, Gözde; Knoblauch, Nicole; Mechnich, Peter, *Institute of Materials Research/German Aerospace Center (DLR), Germany*

The Effect of Temperature Lift and Isentropic Efficiencies on the Location of Optimal Coefficient of Performance (COP) of Reverse-Brayton High Temperature Heat Pumps

Hegner, Robert; Klopsch, Roman; Stathopoulos, Panagiotis, *Deutsches Zentrum für Luft- und Raumfahrt e.V. - Institut für CO₂-arme Industrieprozesse, Germany*

Thermo-Mechanical Fatigue Modeling and Lifetime Prediction of a Micro Gas-Turbine Combustion Chamber

Cirigliano, Daniele; Grimm, Felix, *German Aerospace Center (DLR), Germany*

WiValdi (Wind Farm Validation and Diagnostics) – A New Scientific Wind Farm for Research on Wind Energy

Klassen, Jakob; Teßmer, Jan, *German Aerospace Center, Germany*

Exhibitors

Atrium



DataLad: distributed system for joint management of code, data, and their relationship



Joint Program Energy Efficiency in Industrial Processes (EERA JP EEIP)



Helmholtz Climate Initiative



Helmholtz Imaging (HI)



Helmholtz Information & Data Science Academy (HiDA)



Helmholtz Leadership Academy



Helmholtz Office Brussels



Helmholtz Open Science Office



Helmholtz Metadata Collaboration (HMC)

Galerie



A Gamification Approach to Promote the Energy Transition: Graduate School "ENZo"

(Poster in Poster Session "Energy System and Sector Coupling", Graduate School "Enabling Net Zero")

Schedule

Monday, 12th June 2023

13:00	Welcome and Opening					
-	Großer Saal					
13:15	Plenary Session					
-	Großer Saal					
14:15	Panel Discussion - Sustainable energy supply: Challenges and opportunities					
-	Großer Saal					
15:00	Coffee Break					
-						
15:30	Design and Implications of Future Energy Systems Großer Saal	Green Energy Solutions for the Transport Sector Rheinsaal	Energy Materials Tagungszentrum Raum 1+2	Energy Storage Solutions Tagungszentrum Raum 3	Emerging Materials for Photovoltaic Applications Moselsaal	
-						
17:00						
17:00	Poster - Chemical Energy Carriers Galerie	Poster - Circular Economy and Carbon Management Galerie	Poster - Electrochemistry and Energy Materials Galerie	Poster - Energy System and Sector Coupling Galerie	Poster - Nuclear Energy Galerie	Poster - Renewable Energy Lahnsaal
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18:00						
20:00	Conference Dinner					
-	Großer Saal					
22:00						

Tuesday, 13th June 2023

9:00	Plenary Session 2					
-	Großer Saal					
10:00	Coffee Break					
-						
10:30	Defossilization of Chemistry Großer Saal	Heat Supply for Buildings and Industry Rheinsaal	Challenges for Energy System Modelling by High Shares of Renewable Energy Resources Tagungszentrum Raum 1+2	Decarbonization and Carbon Management Tagungszentrum Raum 3	Nuclear safety: Waste Management and Decommissioning Moselsaal	
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12:00	Lunch Break					
-						
13:00	Hydrogen Technologies Großer Saal	Fusion Physics and Technology Rheinsaal	Techno-economic and Socially Acceptable Deployment of Renewable Energies Tagungszentrum Raum 1+2	Circular Economy Tagungszentrum Raum 3	Solar Power and Heat Geothermal Energy Moselsaal	
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14:30	Coffee Break					
-						
15:00	Hydrogen Utilisation Großer Saal	Materials Research for a Fusion Power Plant and beyond Rheinsaal	Electrochemical Cell Characterization Tagungszentrum Raum 1+2	Circular Economy: Focus on Minerals and Metals Tagungszentrum Raum 3	Energy Transition and Society Moselsaal	
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16:30						
16:30	Summary and Closing of the Helmholtz Energy Conference 2023					

Conference Venue	Koblenz Kongress Rhein-Mosel-Halle Julius-Wegeler-Straße 4 56068 Koblenz Phone: +49 261 914810
Information	For information until 9 th June 2023 please contact the Helmholtz Energy Office: Anna Layer / Dr. Dominik Soyk Phone: +49 721 608 410 07 / 06 helmholtzenergy@sts.kit.edu https://energy.helmholtz.de/he-conference-2023/
Conference Office	As of 12 th June 2023, 11:30 h, a conference office will be available at the conference venue. Phone: +49 1525 3098851 / +49 152 0160 1989
Accomodation	The Helmholtz Energy Office does <u>not</u> make reservations for hotel rooms.
Registration	Registration is possible until 22 nd May 2023: https://www.conftool.pro/helmholtz-energy-2023/
Conference Fees	The conference is free of charge for members of the Helmholtz Research Field Energy and invited guests, e.g. from other Helmholtz Research Fields or Federal Ministries.