

# ENERGIELANDSCHAFTEN SCHLESWIG-HOLSTEIN 2042

SZENARIEN ZUR ZUKUNFT DER ENERGIEWIRTSCHAFT  
IN SCHLESWIG-HOLSTEIN



3rd edition 2018

Energy research in Schleswig-Holstein

EKSH

Gesellschaft für Energie und  
Klimaschutz Schleswig-Holstein GmbH

## Energy research in Schleswig-Holstein

Research projects and courses on energy  
and climate protection at  
universities and research institutes

3rd edition 2018

REPORT

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## Stefan Sievers

Managing Director

Gesellschaft für Energie und Klimaschutz

Schleswig-Holstein GmbH

The transformation of the energy system is one of the most groundbreaking and forward-looking projects of our time and has gained significant momentum within the last years. Implementation is also and in particular progressing by leaps and bounds in Schleswig-Holstein. For example, there are a number of new topics and projects that are dealing with exciting energy issues at the universities and research institutes. An update of the brochure “Energy research in Schleswig-Holstein”, published for the first time five years ago, was therefore overdue. Here is the full work with over 90 leaders in energy research, as well as 15 major projects and centres of excellence. It shows that the complexity has increased. There is barely a topic that is still studied in isolation, the recognisable objective generally remains climate protection by CO<sub>2</sub> reduction and enhancing the essential, associated overall system – the interaction of renewables, energy conversion and storage, energy efficiency, sustainable mobility and related cross-cutting issues. The necessary sectoral coupling gives rise to new research questions and new approaches requiring ecological, business and wider economic, technological or technical evaluation or implementation.

### The necessary sectoral coupling gives rise to new research questions and new approaches.

It was our goal to design a brochure that, on the one hand, you would enjoy browsing through, and at the same time would offer added value at events and trade fairs. On the other hand, it should also be capable of serving as a convenient reference work. Therefore we created a detailed register of persons and accommodated additional information, e.g. by using cross-references or QR codes. For young people interested in studying energy issues, there are still detailed descriptions of the relevant courses of study at the universities. The brochure is intended to communicate in many ways – first and foremost, it should arouse interest and make energy research in Schleswig-Holstein accessible.

The EKSH does not conduct its own research. We rather promote applied research projects and their transfer, support pilot projects and networks, including events with and for energy experts from universities, companies, associations, politics and administration. Examples include our large, HWT university programs and PhD doctoral scholarships (see page 128 et seq.) or the Kiel Energy Discourse.

As soon as you look at the back of this brochure, you will see four pictures of scenarios regarding the future of the energy industry in Schleswig-Holstein, which we presented to the public at the beginning of 2017 as Energy Landscapes 2042. The fast pace and increasing dynamisation of our everyday lives, globalisation, changes in the Internet culture, changing mobility patterns, as well as the intensification of the energy and resource situation, are increasingly affecting our economic development. The Schleswig-Holstein energy industry is particularly affected by these changes. A key to successfully adapting to and shaping the

“The non-profit EKSH has a broad base when it comes to supporting groundbreaking projects addressing energy and climate protection issues in Schleswig-Holstein.

future lies in the ability to anticipate, discuss, and incorporate emerging developments in strategic considerations. Looking ahead, we designed a distant future and four scenarios that demonstrate a fictitious 2042 with potential futures of the Schleswig-Holstein energy landscape. Since then, a number of discussion forums moderated by the EKSH involving various stakeholders have been held, articulating the need for further specification and the derivation of recommendations for action. The EKSH will now continue the wide-ranging future dialogue to be initiated in a follow-up project accordingly. The objective is to develop new focus topics and publish them in regular succession.

### A triad of energy transition, transport transformation and transition to sustainable mobility offers great potential.

Exciting questions are posed and offer many points of contact; one is, for example, the future of sustainable mobility in our federal state. A triad of energy transition, transport transformation and transition to sustainable mobility offers great potential. The EKSH is therefore currently working on a pioneering Delphi study on mobility in Schleswig-Holstein. The aim of the study is to initiate a dialogue on the perspectives for sustainable transport and mobility transition in Schleswig-Holstein involving all relevant stakeholders. The results of the study will be available in May 2018, waiting for discussion and further shaping.

Let yourself be surprised!

The non-profit EKSH has a broad base when it comes to supporting forward-looking projects addressing energy and climate protection issues in Schleswig-Holstein. You have a project idea or you are looking for a partner to implement a pilot project with a lasting impact? Talk to us!

For now, enjoy reading and discovering!

Stefan Sievers



**Dr. Oliver Grundei**  
State Secretary for Science and Cultural Affairs  
Ministry of Education, Science and Cultural  
Affairs of the State of Schleswig-Holstein

Energy research in Schleswig-Holstein has many faces – this brochure demonstrates this literally. I very much welcome this approach of providing an overview of current courses and research fields in a new edition. This is how the Gesellschaft für Energie und Klimaschutz Schleswig-Holstein supports our goal of showing the state's considerable energy research and of promoting cooperation across institutions.

There is hardly any research field so closely linked to a major social project like energy research. The transformation of our energy system – energy transition – is in full swing and there is much to be done. This is no longer a question of technical issues; it also concerns environmental, sociological and economic challenges that need to be taken into consideration in research right from the outset. Energy transition can only succeed when it enjoys broad public acceptance.

The numerous innovations in the field of energy research must prove effective as components of a comprehensive transformation. At the same time, a high level of specialisation in this field requires a high degree of open-mindedness and compatibility with further scientific and economic partners. Schleswig-Holstein's universities and research establishments are well prepared for this by combining their scientific expertise with a willingness to collaborate interdisciplinarily. The Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein, in short EEK.SH, has also been a common point of contact for all questions of the universities relating to renewable energy since 2015.

Currently, additional opportunities for energy research open up. As an innovator in the sector of renewable energies, our state offers excellent conditions for pioneering the next steps in energy system transformation. For example, it addresses the question of how the power, heat and mobility energy sectors can be meaningfully combined using regenerative solutions. The state government therefore aims at promoting energy research even more in the coming years – in close cooperation between the ministries of energy transition, the economy and science. In addition, it considers to work together with the other northern German states to nationally promote energy research as a common strength of the North.

Dr. Oliver Grundei  
State Secretary for Science and Cultural Affairs  
Ministry of Education, Science and Cultural Affairs of the State of Schleswig-Holstein

# Energy-related courses



© iStock by Getty Images / Ivanmandic

Europa-Universität Flensburg  
Flensburg University of Applied Sciences  
Kiel University  
Kiel University of Applied Sciences  
Universität zu Lübeck  
Technische Hochschule Lübeck  
West Coast University of Applied Sciences

# Europa-Universität Flensburg

## Course guidance

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www.uni-flensburg.de



Europa-Universität  
Flensburg



Canteen

Photos: Christoph Schellhaus



Library

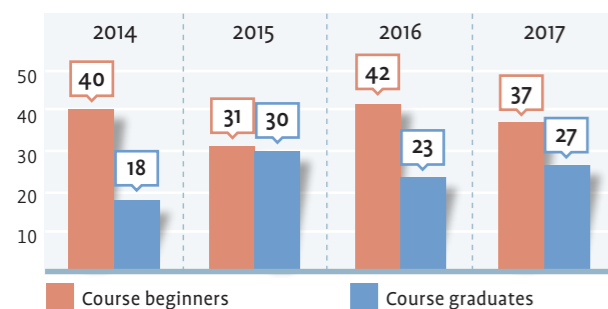
## Energy and Environmental Management in Industrial Countries (M.Eng.)

The course focusses on energy management, environmental economics, economics and legal sciences, engineering computer science and selected business engineering subjects. This form of specialisation in energy and environmental management is the only one of its kind in the Federal Republic. Graduates are in a position to work in the following professional fields at national and international level:

- › Energy supply companies
- › Manufacturers of energy technology
- › Service companies and engineering offices in the energy and environmental sector
- › Major companies in manufacturing industry
- › Energy and environmental research institutions
- › Associations in the energy and environmental sector
- › Authorities, Ministries and parliaments

The admission requirement for this Master's course is an above-average degree from the Bachelor's course in Energy and Environmental Management at Flensburg UAS, including one semester spent abroad or a comparable qualification.

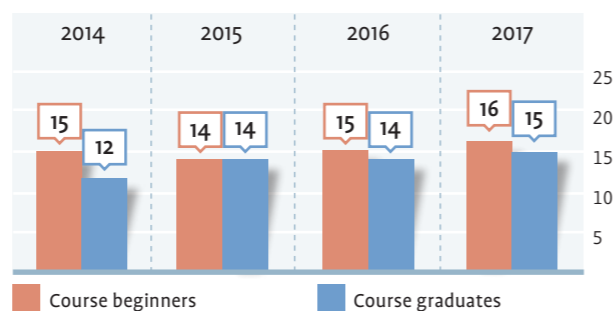
Duration: 3 semesters



## Energy and Environmental Management in Developing Countries (M.Eng.)

This course with 15 places is based on the content of the "Energy and Environmental Management in Industrial Countries" course. The admission requirements also apply accordingly here. Specific knowledge is imparted for worldwide use in the field of energy and management. The language of instruction is English.

Duration: 3 Semesters



Information for Summer Semester (SS) and the subsequent Winter Semester (WS)

# Flensburg University of Applied Sciences



Hochschule  
Flensburg  
University of  
Applied Sciences

## Course guidance

Tel +49 461 805-1215 /-1747  
studienberatung@hs-flensburg.de  
www.hs-flensburg.de

## Energy Sciences (B.Eng.)

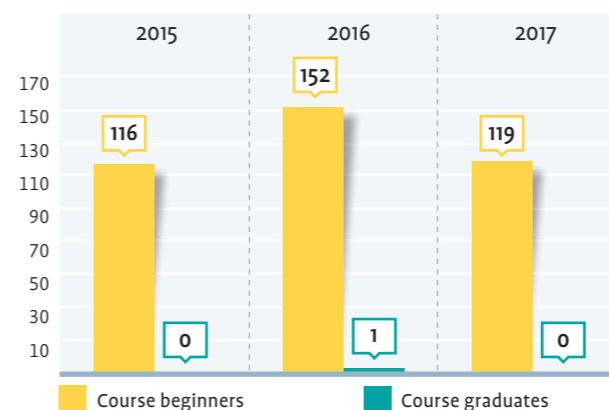
Energy supply, energy transition, new, sustainable, Renewable energies - the degree program introduced in 2015 brings together professionals and executives of the future energy supply. At the beginning the students will be taught in common events the most important energy science

basics. Then the study continues,

according to individual interests, in one of the three fields:

- › The study program **Electrical Energy System Technology** trains engineers - qualified in electrical engineering energy systems. They learn about project planning, planning, development, production and operation.
- › The field of study **Regenerative Energy Technology** trains engineers - familiar with the full spectrum of applied energy technology. Their broad expertise apply them on modern facilities for the use of renewable energies in technical projects of any size.
- › The field of study **Energy and Environmental Management** trains industrial engineers - heavily influenced by interdisciplinary thinking. These industrial engineers develop solutions for a wide variety of energy and environmental problems in the sense of "sustainable development".

Duration: 7 Semester



© Fotolia.de/Igor Mojzes

## Electrical Energy Systems Engineering (B.Eng.)

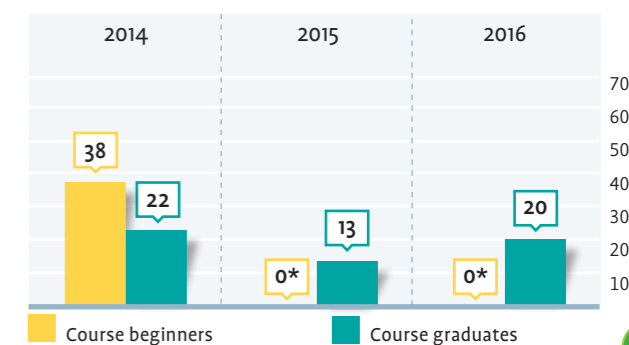
Electrical energy systems engineering is omnipresent in both in our private lives and industry in the form of supply facilities, drives, sensors, control devices and equipment. There is a corresponding range of content on the course and the later professional activity of graduates. A major part of the course features cooperation with industry. The basic skills from electrical engineering, mathematics and physics are components of the first course semester. The course therefore prepares students for technologies of the future. In the 6th semester a choice can be made between two main subjects:

- › **Electrical energy systems engineering** with problems from control technology, control and management as well as model creation and simulation in complex power plants
- › **Renewable energy engineering:** Technology and operation of wind energy plants, photovoltaic and solar power plants, small power plants and the use of biomass

Duration: 7 semesters

The three-semester Master's course in systems techniques builds on this Bachelor's course. It incorporates skills from mechanical engineering into electrical energy systems engineering.

Duration: 7 Semesters

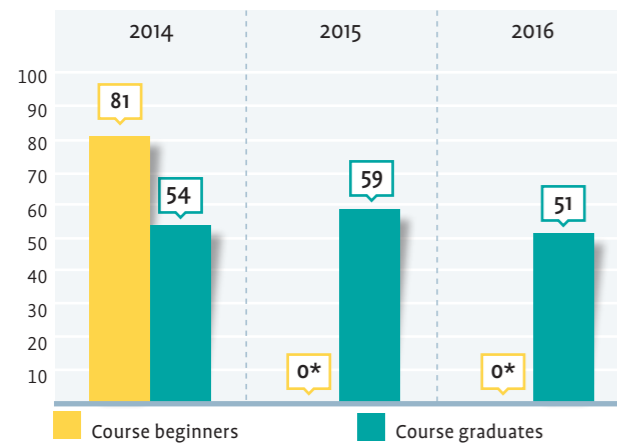


## Flensburg University of Applied Sciences

### Energy and Environmental Management (B.Eng.)

The course run in collaboration with the Europa-Universität Flensburg combines business engineering with technical aspects of the energy and environmental sector. The integral features are in particular interdisciplinarity, internationality and practical aspects. After the scientific fundamentals have been taught in natural sciences, technology as well as business and economics, specialisation starts as of the 4th semester. This includes the specialist fields of electrical energy engineering, structure and design of energy and environmental engineering plants, environmental engineering as well as energy and environmental project management. A compulsory stay abroad and a three-month placement in a company or an authority round off the three and a half year course.

Duration: 7 Semesters



Information for WS and the subsequent Summer Semester SS

\*The three courses have been integrated in the new course "Energy sciences". To the numbers of course beginners, see page 9.

### Wind Engineering (M.Sc.)

This course run in English at Flensburg UAS is offered in cooperation with the universities and universities of applied Sciences in Kiel and Flensburg, the West Coast UAS and the Nordakademie. It paves the way for engineers that have specialised in mechanical engineering, civil engineering or electrical engineering to become multi-disciplinary generalists with individual specialisations. Graduates will have the ability to understand wind energy plants and systems in their entirety. Their later fields of activity will include in particular the planning, construction and operation of wind turbines and their components. Admission requirements are an above-average Diplom or Bachelor qualification in engineering sciences, mechanical engineering/electrical energy systems engineering/renewable energy engineering or associated subjects as well as an excellent

### Renewable Energy Engineering (B.Eng.)

The increasing importance of renewable energy engineering is also reflected in the main subjects on the course. With regard to the latest developments in industry, the following topics are covered in depth:

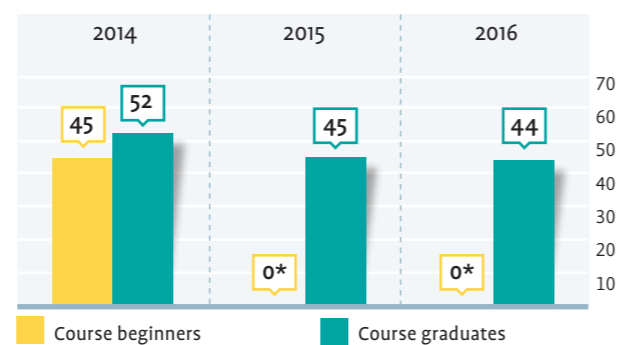
- › The use of wind energy
- › Solar and geothermal energy
- › The use of biomass to produce energy
- › Conventional energy engineering
- › Energy efficiency and application

In the first part of the three and a half year course the basics of mechanical engineering, electrical engineering and other subjects are covered. The second part will deal with the application of energy technology. Students can choose to specialise in:

- › Mechanical and industrial engineering or
- › Systems and grid integration for the generation of renewable energy

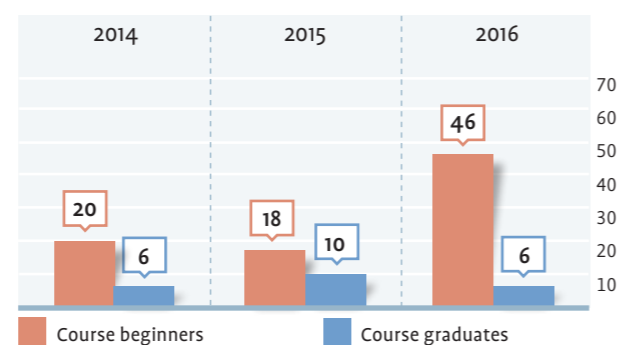
A placement in the energy industry is intended to prepare students in applying their scientific knowledge.

Duration: 7 Semesters



knowledge of English.

Duration: 4 Semesters for Bachelors with 180 CPs. Bachelors with 210 CPs can graduate in 3 Semesters.



## Kiel University

C | A | U

Christian-Albrechts-Universität zu Kiel

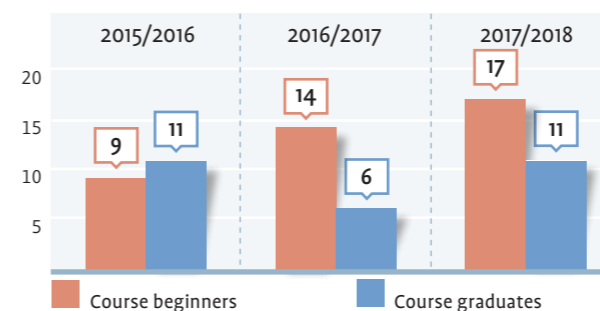
Course guidance

Tel +49 431 880-7440  
zsb@uv.uni-kiel.de  
www.uni-kiel.de

### Climate Physics (M.Sc.)

The Climate Physics course (meteorology and physical oceanography) that is taught in English is intended to provide students with advanced knowledge of the terms and laws of atmospheric physics, the ocean and the climate system, familiarise them with experimental and theoretical methods and introduce them to current research. Students will be prepared to present physical facts, critically assess scientific questions and make optimal use of modern experimental or theoretical working methods. This course builds on the Bachelor's course in "Physics of the Earth System: Meteorology – Oceanography – Geophysics" and is offered in cooperation with the Helmholtz Centre for Ocean Research in Kiel (GEOMAR).

Duration: 4 Semesters



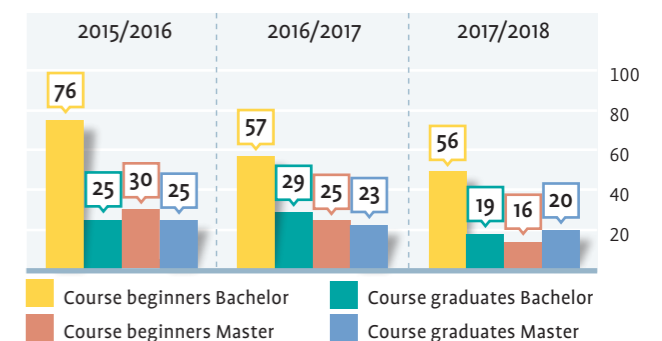
Information for Winter Semester (WS) and the subsequent Summer Semester (SS)

### Electrical Engineering and Information Technology (B.Sc. and M.Sc.)

In addition to traditional electrical engineering, the subject has above all developed further in the field of computer technology into general systems engineering. This concerns applications in almost all technical fields, therefore also in the energy sector. The course is supplemented by mathematical and theoretical system-based concepts as a basis for interdisciplinary collaboration with the subjects of computer science, biotechnology, medical engineering and nanotechnology. One main subject is electrical energy engineering, dealing with the generation, transmission and distribution of electrical energy as well as its application. The field of power electronics concerns its use in wind turbines and vehicles with electric or hybrid drives amongst other things.

Bachelor's: 7 semesters

Master's: 3 semesters

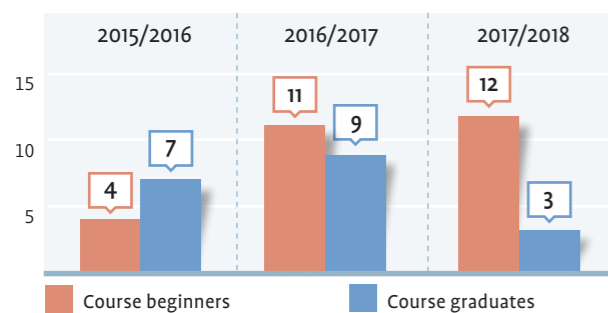


## Kiel University

### Marine Geosciences (M.Sc.)

The interdisciplinary course run in English teaches all the main subject areas that deal with geological, biological, geochemical and physical processes in the oceans. As well as basic research, marine geosciences also pursue application-related objectives, including the investigation of resources such as hydrocarbons or hydrothermal stores in the ocean. The changes in the climate system can also be reconstructed using geoscientific methods. Model calculations can be developed from these findings to forecast the world's climate. Students benefit from the close collaboration between the Faculty of Mathematics and Natural Sciences at Kiel University and the Helmholtz Centre for Ocean Research in Kiel (GEOMAR), in particular in the subjects of meteorology and oceanography.

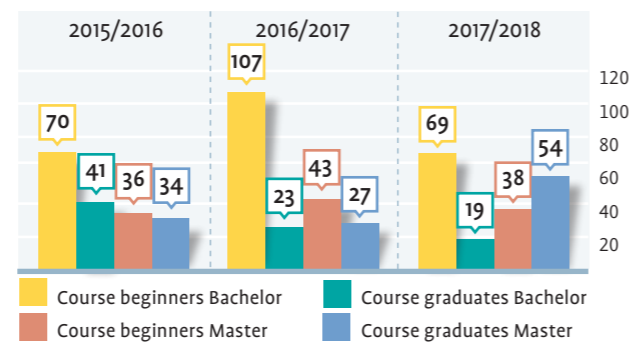
Duration: 4 Semesters



### Materials Science (B.Sc. and M.Sc.)

The main subject concerns functional materials made of metal, semi-conductors, ceramics and polymers. Composite materials, in which various materials are combined, are also covered. Modern materials are used extensively in almost all technologies of the future. Solar cells, computer processors and the latest generation of medical engineering would be unthinkable without the latest materials. They make it possible to lower the energy consumption of vehicles or aircraft through lighter construction techniques with improved functionality. Alternative energy generation as part of the energy transition in Germany is also inconceivable without the latest functional materials. The course combines natural and engineering sciences.

Duration: 6 Semesters

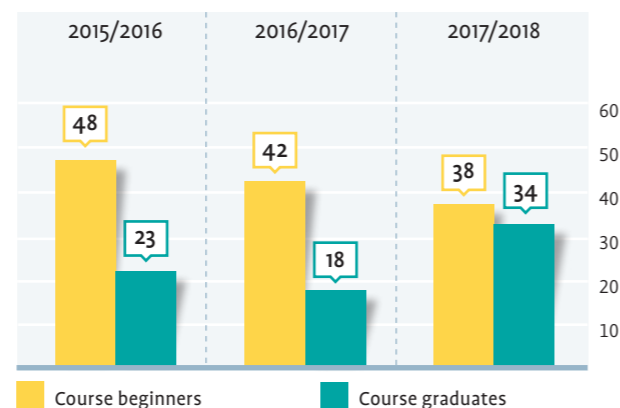


Information for WS and the subsequent Summer Semester SS

### Physics of the Earth System: Meteorology – Oceanography – Geophysics (B.Sc.)

The "Earth System" is the research subject of physical earth sciences with its physical-chemical processes that occur in the atmosphere, in the ocean, in the lithosphere and on the earth's surface as well as deep in the earth's core, its natural resources, dynamism and living environment. In addition to pure basic research, the geosciences also follow applied objectives. The course teaches all the most important fundamentals to forecast the world's climate and weather, investigate and extract raw materials, use natural resources, determine the condition of the ocean, forecast storm surges and sea conditions as well as safeguard the environment. The course is offered in collaboration between Kiel University and the Helmholtz Centre for Ocean Research in Kiel (GEOMAR).

Duration: 6 Semesters

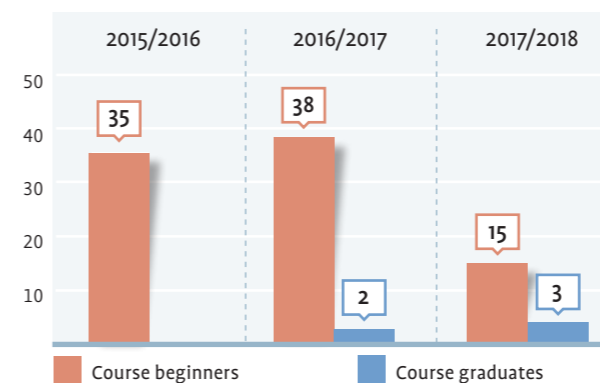


Information for WS and the subsequent Summer Semester SS

### Environmental and Resource Economics (M.Sc.)

In an initial phase, the English-language, single-subject master's program provides students with a sound basic knowledge of microeconomic and statistical econometric methods. In a second phase of the course, students specialise in environmental and resource-economic topics, such as the impact of environmental policy instruments or the monetary valuation of environmental damage. In addition, interdisciplinary approaches may be followed. In contrast to the courses offered by other universities, this course places a clear emphasis on a sound, methodological, economics education.

Duration: 4 semesters



Information for WS and the subsequent Summer Semester SS



The main auditorium of Kiel University.

Photo: Kiel University



### Sustainability, Society and the Environment (M.Sc.)

The Master "Sustainability, Society and the Environment" is cornerstone of the Kiel School of Sustainability. The program analyses society's sustainable development issues and empowers students to develop strategies for a sustainable future. It offers students learning opportunities to expand their competences as a change maker and change leader either in the field of research - to analyse and understand sustainable development challenges - or in the field of social entrepreneurship - to design and implement local change projects in the fields of sustainable development and social innovation. The social-entrepreneurial yooweedoo learning program is fully integrated into the course program. Many students transfer their projects to charitable organisations and social startups during the course of their studies. Students can choose from an interdisciplinary spectrum of more than 70 teaching modules, thus developing their individual emphases. The course is international and attracts students from around the world. Around 30 students are admitted per year.

[www.sustainability.uni-kiel.de](http://www.sustainability.uni-kiel.de)

[www.yooweedoo.org](http://www.yooweedoo.org)



Prof. Christoph Corves, PhD  
Head of the School of Sustainability  
Head of the yooweedoo – changemaker project  
Brief bio, page 80

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## Climate Adaptation in Urban Areas

Kiel University,  
Institute of Geography  
Didactics of Geography Working  
Group

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# KUR



**PTJ**  
Projektträger Jülich  
Forschungszentrum Jülich

Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages

Climate change is coming. Even if we save energy and reduce our emissions today, climate change is regarded as unavoidable. International research reveals that, depending on global emissions reductions and population growth, the climate is considered to change in a number of ways.

Climate change involves two things. Change; this may appear to imply something gradual. For example, it will involve long-term and global phenomena such as global sea-level rise and global temperature increase. However, climate change also involves weather events on a local level: climate change means that extreme weather events may be more frequent and more powerful.

Climate change has local impacts. Climate change will appear around the globe. How affected a human system, such as a country, a city, or a group of people will be, essentially depends on its properties. To what extent can a country react to a one-hundred-year flood? How well is a city prepared for extreme rainfall? How can people be supported when infrastructure fails?



In the future, extreme rainfall and storm surges may occur more frequently. Photo: Pixabay/Hermann

The KUR research project is developing an education module dealing with climate adaptation in urban areas, using the city of Kiel as an example. The project will produce educational materials, tools and media to help make climate adaptation more accessible to the general public. KUR organises events for both school pupils and citizens.

Here, ideas on how Kiel can adapt to the consequences of climate change are generated jointly. Established as a practice/research interface project, KUR deals with climate adaptation as an important way of addressing climate change, in addition to climate protection. The project is based at the Institute of Geography at Kiel University and offers students a range of possible thesis topics. The project is funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety over a two year period.



The management and protection of coastal areas is an important component of climate adaptation in coastal towns and cities – here: Falckensteiner Strand in Kiel. Photo: KUR

## Kiel University of Applied Sciences



Course guidance

Tel +49 431 210-1760  
studienberatung@fh-kiel.de  
www.fh-kiel.de

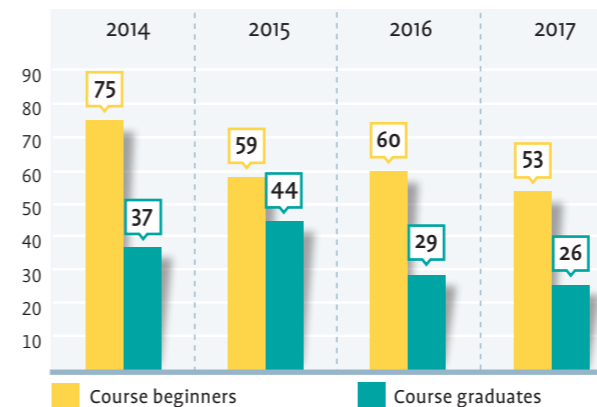
### Electrical Engineering/Electrical Energy Engineering (B.Eng.)

“Electrical Energy Engineering” is one of the three main subjects on the Electrical Engineering course. The course offers in-depth teaching on the engineering and natural sciences basic subjects of electrical engineering and is structured in modules in line with international engineering education. The main subject of Electrical Energy Engineering includes:

- › High voltage technology
- › Energy generation and application
- › Renewable energy
- › Networks and plants
- › Drive technology
- › Electromagnetic compatibility

In the Competence Center for Power Electronics Schleswig-Holstein (KLSH) at Kiel UAS (see page 33) students have the opportunity to carry out research in teams with professors and engineers on new technologies.

Duration: 7 Semesters



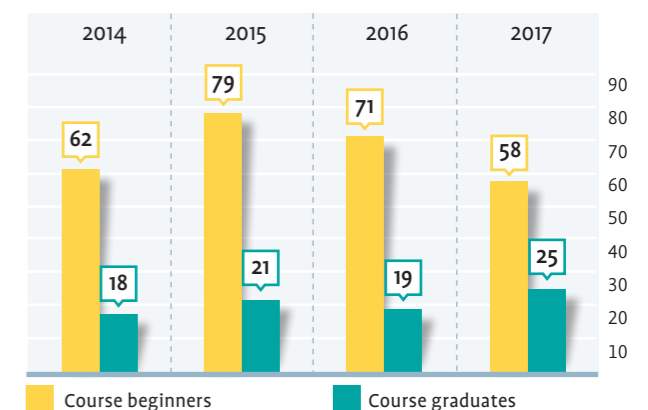
### Mechatronics/Electromobility (B.Eng.)

Mechatronics is an interdisciplinary field combining mechanics, electronics, optics and computer science. Mechatronic systems include for example CD players or mobile transport vehicles with automated navigation. The course first teaches the basics of mechatronics, including mathematics, physics, electrical engineering, programming, design, technical mechanics and computer-aided design (CAD). The subject of Electromobility involves these areas:

- › Development of electric vehicles
- › Power electronics in engine controls
- › Circuit simulation and manufacture of electronic components
- › Basics of power electronics
- › Micro controller technology
- › Modelling and simulation
- › Bus systems in vehicle technology
- › Sensor technology

In the Schleswig-Holstein Electromobility Center of Excellence at Kiel University of Applied Sciences (see page 29) students work with professors and engineers on forward-looking solutions for electric vehicles.

Duration: 7 Semesters



Information for SS and the subsequent WS





## Kiel University of Applied Sciences

### Technology Management and Marketing/ Renewable Energy (B.Eng.)

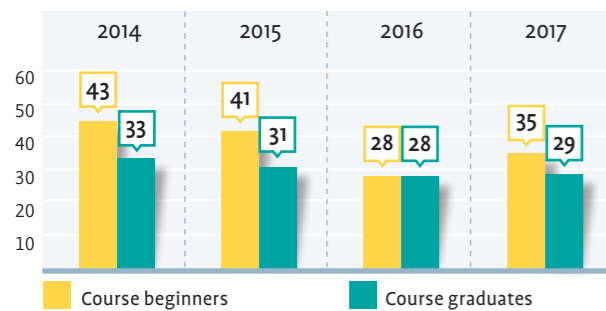
The interdisciplinary course offers a balanced combination of technology and business. It includes all the technical and business aspects that are close to the market in the various fields of work and in this way prepares students for work in management and marketing interfaces. These include:

- › Product and system development
- › Manufacturing and sales
- › Purchase of products and systems
- › Consultancy and training

The course is structured in modules and offers two main subjects. The main subject of "Renewable Energy" primarily includes these areas:

- › Solar energy systems
- › Wind energy
- › Energy from biomass
- › Sustainability/climate protection

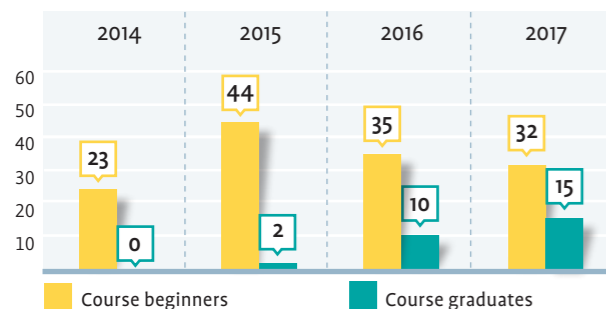
Duration: 7 Semesters



### Offshore Systems Engineering (B.Eng.)

The broad-ranging course is based on basic engineering and naval architecture teaching supplemented by comprehensive offshore-specific specialist knowledge. In addition to the general engineering applications, graduates can above all be deployed in design, development or planning and the operation of dynamic, extremely demanding systems in the offshore field.

Duration: 6 Semesters

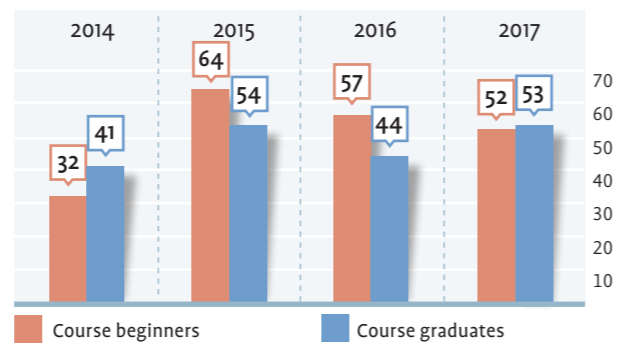


### Electrical Technologies (M.Eng.)

The modules on this course deepen knowledge from the courses in electrical engineering and mechatronics with specific content in energy engineering, communication technology or mechatronics. This will enable students to acquire various skills:

- › managing sustainable energy systems
- › expanding worldwide communication networks
- › controlling projects
- › developing mechatronic systems
- › linking technical areas through interdisciplinarity

Duration: 3 Semesters



Information for SS and the subsequent WS

### Wind Engineering (M.Sc.)

This course run in English is offered in collaboration with Flensburg UAS (see P. 10).

### Online course in Business Management (M.A.)

This course that started in 2014 with 21 students is provided mostly online. Students learn with supervised course modules and together with other students on an online learning platform. Face-to-face events are voluntary and are held on Fridays and Saturdays. Through this model it is easy for students to combine the course with work or with other commitments. The content areas covered in depth include the energy industry module with the sub-disciplines of energy engineering, energy policy, energy trade and energy law.

Duration: 4 semesters full-time, correspondingly longer part-time

Info: [www.oncampus.de](http://www.oncampus.de)

## Technische Hochschule Lübeck



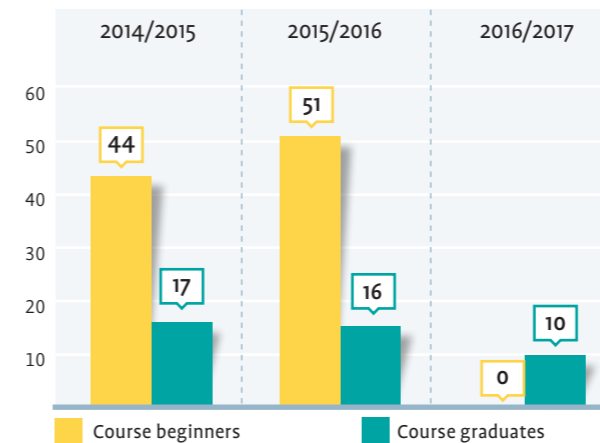
### Course guidance

Tel +49 451 300-5644 or -5629  
studieren@th-luebeck.de  
[www.th-luebeck.de](http://www.th-luebeck.de)

### Chemical and environmental engineering (B.Sc.)

The main subjects of this broad-ranging interdisciplinary course lie in the fields of environmental protection engineering, chemistry, biotechnology and process engineering. Its curriculum is based on the continuous further development and interlocking of the courses in chemical engineering and environmental engineering. The sectors of environmental protection, chemistry, pharmacy, biomedical engineering and food will be open to graduates.

Duration: 7 Semesters



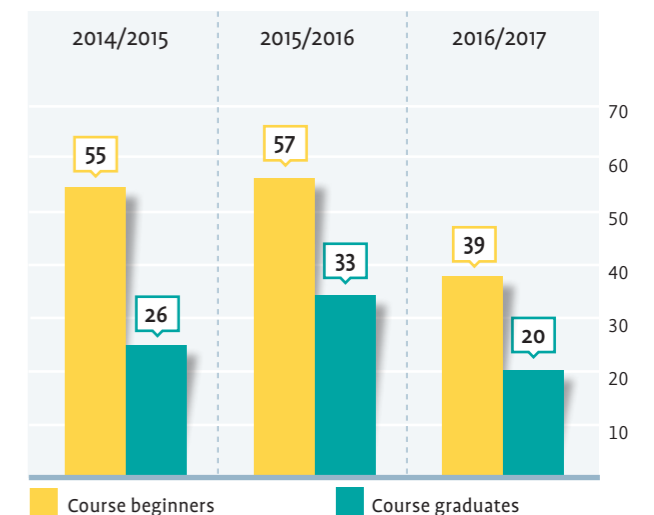
### Energy systems and automation engineering (B.Sc.)

The traditional main subjects of energy engineering are supplemented by the requirements of automation engineering owing to the change in demand from the market. Therefore the merger of energy engineering and automation engineering in the Energy systems and automation engineering course represents a tailor-made course for the requirements of the energy and product market. Graduates are in demand at energy supply companies and in the new fully automated energy billing sector as well as at companies, which operate in the renewable energy sector. The course content in the main subject of energy engineering includes:

- › Technical mechanics
- › Drive technology
- › Positioning drives
- › High voltage technology and EMC
- › Energy supply
- › Renewable energy

After the 3rd semester students can move to the "the international electrical engineering course of studies". Here they will study for two semesters in Lübeck with American students in English and then complete a double Bachelor's degree at the partner university in Milwaukee (USA).

Duration: 7 Semesters



Information for WS and the subsequent Summer Semester SS



Fully equipped laboratories ensure knowledge is imparted at the highest level in the universities in Lübeck.

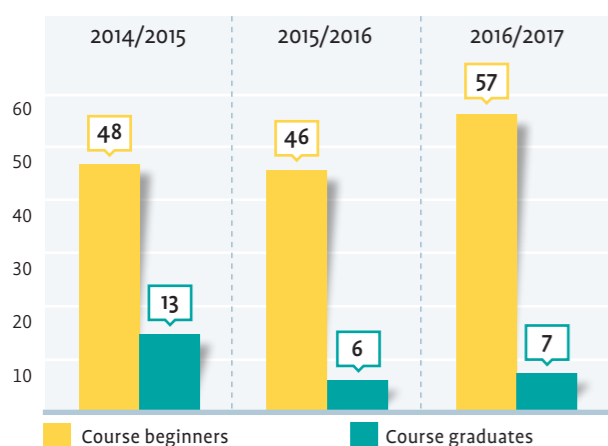
Photo: Universität zu Lübeck

### Online course in industrial engineering (B.Eng.)

The majority of the course that has been offered since 2003 is provided online. Students learn with dedicated course modules and together with other students on an online learning platform. Face-to-face events account for approximately 20 per cent of the study time, including examinations, laboratory events and exercises, which mainly take place at the weekends. Through this model students can combine the course with work or other commitments. In addition to imparting economic and engineering skills in the field of mechanical engineering/manufacturing, the course also focusses on technical information media as well as social-communicative content. Students can choose the specialisation module of the energy industry.

Duration: 7 semesters full-time, correspondingly longer part-time

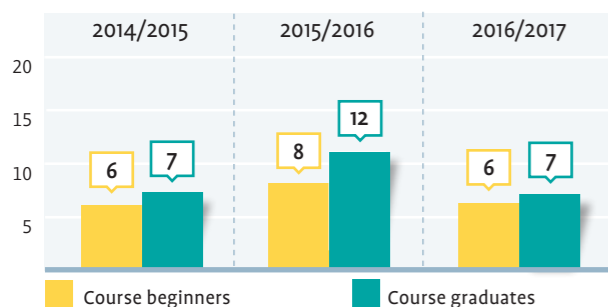
Info: [www.oncampus.de](http://www.oncampus.de)



### Applied information technology (M.Sc.)

The course started in the 12/13 winter semester and is in line with Bachelor's courses in energy systems and automation engineering, electronics and communication systems as well as the international electrical engineering course of studies. Graduates of these courses benefit from a broader, in-depth scientific content without excessive specialisation. The aim of the course is to acquire knowledge and skills for the design, development and operation of information technology systems in companies, public administration or other establishments.

Duration: 3 Semesters

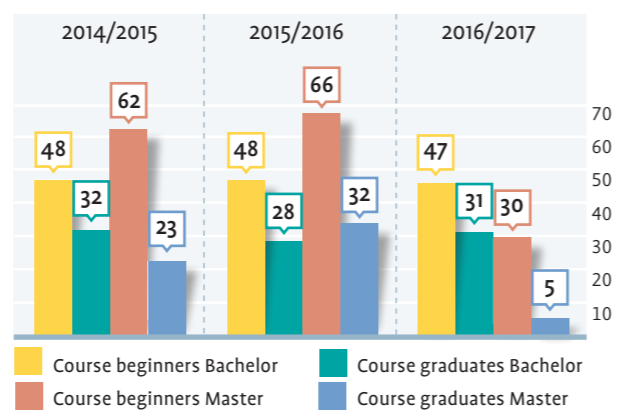


### Architecture (B.A. and M.A.)

Skills and basic knowledge are taught in design, presentation and configuration, building design and technical building equipment, urban planning, history of architecture, as well as organisational and business support for building projects. Students are expected to acquire the ability to think on the basis of scientific and artistic fundamentals and work as well as learning the corresponding methods and specialist knowledge in the field of architecture from the course and prepare for a career in the field of engineering. Specialisations in the energy sector are possible in these elective subjects:

- > Climate-conscious construction
- > Energy performance certificates
- > Sustainable building

Duration: 6 Semesters



Information for WS and the subsequent Summer Semester SS

### Energy and Building Engineering (B.Eng.)

The study program started in the winter semester 16/17 is based on to the classical study to the engineer for technical building equipment. Since modern, energy-efficient, environmentally sound and ecological building technology can be integrated meaningful only in close coordination with the building planning the course also provides in-depth knowledge of the building sector. It contains elements of the study courses Mechanical Engineering,

Electrical engineering and computer science, but goes even more clearly, to regard aspects of planning in construction. There will be integrated elements of civil engineering and the architecture as well as energy efficiency and sustainability. Course graduates are capable of technical tasks to work on when planning a building, to coordinate and monitor. In addition they develop the basics of climate-friendly buildings.

Duration: 7 Semesters

Students in the SS 2018: 34

## West Coast University of Applied Sciences



### Course guidance

Tel +49 481 8555-141  
[beratung@fh-westkueste.de](mailto:beratung@fh-westkueste.de)  
[www.fh-westkueste.de](http://www.fh-westkueste.de)

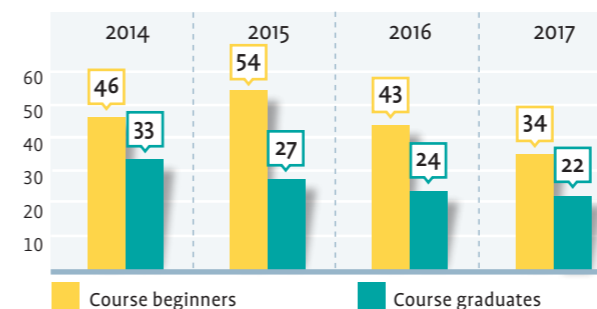
### Electronics and Information Technology (B.Sc.)

The course is geared to the requirements of the growth markets of microelectronic systems and industrial automation. The course therefore takes into account the ever-increasing share of information technology within the field of technology.

After teaching the scientific, electrical and information technology fundamentals, wind energy technology is one of the elective subjects. The specialisation courses offered are:

- > **Automation and applied informatics:** use of innovative sensor and actuators, open- and closed-loop control of systems using modern computer hardware and software, programming and networking.
- > **Microtechnologies and electronic systems:** from resistor to microchip, from PCB design to microwave circuit, from digital signal processing to Bluetooth and satellite communications.

Duration: 7 Semesters



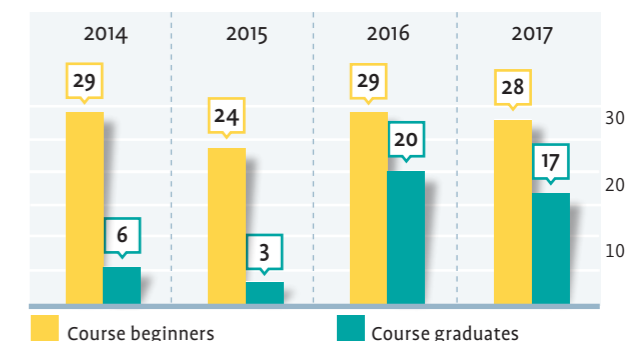
### Environmentally Friendly Building System Technology (B.Sc.)

Students of this course are trained as experts who can holistically analyse and optimise a building in terms of energy, material and information flows. The focus is on building optimisation in terms of energy efficiency and sustainability. The central topics are:

- > Building services engineering (heating, ventilation, air-conditioning, refrigeration, sanitary engineering)
- > Renewable energy supplies
- > Building services automation and security technology
- > Thermal insulation

Graduates are able to manage projects, develop building concepts in terms of energy and technologies, and provide advisory services throughout all phases of construction.

Duration: 7 Semesters

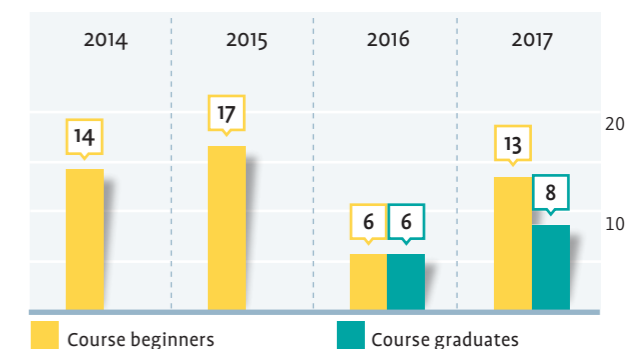


Information for SS and the subsequent WS

### Green Energy (M.Sc.)

This course, which began in the 14/15 winter semester, provides a link between the economic, technical and legal aspects in the field of renewable energy resources. Students acquire interdisciplinary knowledge with a focus on management, project planning and certification in the field of renewable energy resources. The students develop holistic concepts and strategies to market them. They can work in energy utilities, as energy commissioners in associations and companies, in government agencies, research institutes or as experts.

Duration: 4 Semesters





Collaborative project Norddeutsche Energiewende 4.0 (NEW 4.0)  
Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH)  
R&D Centre Kiel University of Applied Sciences GmbH  
Centers of Excellence Power Electronics Schleswig-Holstein (ECPE)  
Smart Energy Center of Excellence  
Schleswig-Holstein Electromobility Center of Excellence (KESH)  
E-Mobility Coordination Schleswig-Holstein  
Schleswig-Holstein eHighway Field Trial (FESH)  
Autonomous Driving Collaborative Project  
ANGUS II Research Network  
Center for Sustainable Energy Systems (ZNES)  
Wind Energy Technology Institute (WETI)  
Green Energy Center of Excellence and QUARREE 100  
Wissenschaftszentrum für intelligente Energienutzung (WiE)  
Green Entrepreneurship Center (GEC) Flensburg

## Centers of Excellence and major projects in energy research

## Energy Transition in the Reality Lab

NEW 4.0 coordinating agency  
Schleswig-Holstein  
c/o Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH  
Lars Kaiser  
Tel +49 431 9805-850  
kaiser@eksh.org

NEW 4.0 project manager  
Prof. Dr. Werner Beba  
Alexanderstraße 1  
20099 Hamburg  
Tel +49 40 42875-6937  
new4-0@haw-hamburg.de  
www.new4-0.de



Barely any other region is as well suited as a model for energy transition than that of Germany's Hamburg/Schleswig Holstein region. Hamburg generates practically no electricity from renewables, but needs a lot. Schleswig Holstein, on the other hand, increasingly produces more green power than it needs. Late in 2016, a unique innovation alliance incorporating a total of 60 protagonists from business, science and politics established under the title of NEW 4.0 (Norddeutsche EnergieWende - North German Energy Transition), with the aim of uniting the two threads.

The acronym NEW stands for Norddeutsche EnergieWende (North German Energy Transition) and forms part of the Schauenster intelligente Energie - Digitale Agenda für die Energiewende (SINTEG) program (Smart Energy Showcase - Digital Agenda for the Energy Transition) launched and funded by the German Federal Ministry for Economic Affairs and Energy. A funding volume of €46 million aimed at triggering additional investments of up to €80 million by the end of 2020 forms the basis for NEW 4.0.

Furthermore, it is no coincidence that this considerable sum is being spent in the North of Germany. As early as 2015, Schleswig Holstein was able to cover 100% of its electricity demand from renewable energy sources in absolute terms, predominantly wind power. Hamburg, on the other hand, generates merely three percent from renewables, still accounting for 40 percent across the region as a whole. This model region, of which there are another four in Germany, is therefore up to ten years ahead of schedule in Germany's energy transition. The more so, Schleswig-Holstein aims at generating three times more green electricity by 2025 than is needed and generation is simultaneously unlikely to increase much more in Hamburg because of the extremely limited area of the city-state, this model character will become even more significant in the future. On the



*"The central topic of NEW 4.0 is that of networking, bringing together producers and consumers. The correlation of protagonists is automated to the greatest possible extent and allows us to increase the utilisation of renewable electricity in the region. At the same time practical relevance*

*is very important in this respect, which is why NEW 4.0 demonstrates the technology in a real system."*

Lars Kaiser, head of the NEW 4.0 coordinating agency Schleswig-Holstein

other hand, managing the growing imbalance between energy production and consumption in the model region would be a blueprint for energy transition as a whole.

Economic heavyweights such as Aurubis AG, Trimet Aluminium SE and ArcelorMittal GmbH account for approximately 30 percent of the electricity demand of the entire Hanseatic city of Hamburg, bringing about quite a paradigm shift in these times of energy transition. While electricity has previously been available practically anywhere and anytime, consumption now needs to follow generation as closely as possible. Let the machines run at full steam when the wind blows is the somewhat exaggerated motto, brought to life not least due to innovations in turbine engineering.

Part of the solution also lies in sector coupling. Excess green electricity is converted into different forms of energy, for example heat or hydrogen. In the context of NEW 4.0, this can be achieved by means of a multi-megawatt hybrid storage project in the Brunsbüttel Industrial Park. Excess wind power, which would otherwise only be a bur-

Zeit, dass sich was dreht.

100% erneuerbare Energien für Hamburg und Schleswig-Holstein bis 2035

www.new4-0.de

NEW 4.0  
Norddeutsche EnergieWende

SINTEG

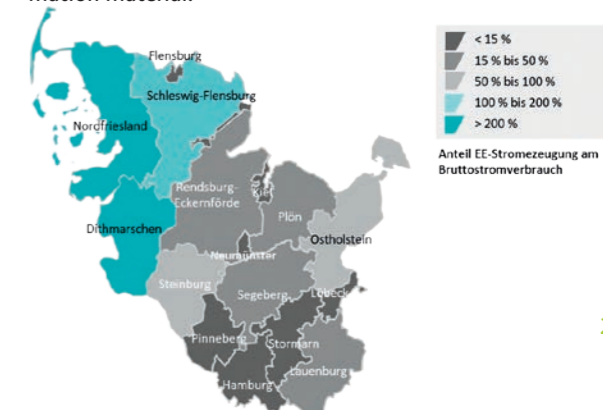
den on the grids, is used to generate hydrogen, which ends up in the gas network of the municipal utility or in gas fuelling stations. Construction of the electrolysis plant necessary to produce the hydrogen will begin in spring 2018. In addition, battery storage, which will compensate for fluctuations in the grid, has been in operation since autumn 2017. The demonstration plant thus exemplifies the goals of NEW 4.0: energy should be generated safely, cost-effectively and environmentally friendly, regardless of whether it being electricity, heat, traffic or industry.

NEW 4.0 addresses numerous other energy transition issues. Among other things, the aim is to develop procedures to make electricity trading even faster, because electricity generation is also subject to very short-term effects. A topic known as grid traffic lights, a system that distinguishes between three phases similar to ordinary traffic lights is also on the agenda. A green light means everything is just fine; a red light means that the stability of the grid is endangered, meaning that the grid operator must take action. Thus the grid operator takes the wind turbine off the grid. The establishment of a yellow phase aims at allowing flexible consumers to be switched in to avoid this particular imminent collapse.

Intelligent control systems play a key role – not only in this

field. The 4.5 million inhabitants in the Hamburg/Schleswig Holstein region are facing 46,000 power generation facilities, and consumption and production can only be appropriately coordinated using highly efficient control technology.

Further crucial factors for a functioning energy transition are comprised within entirely different aspects. Thus, NEW 4.0 addresses various legal regulations that are still tailored to the era of large-scale power stations and have an inhibiting effect on the flexibility available today. Another field is the education and training of skilled workers at universities and in the craft trade sector, while another subsection deals with public relations and acceptance research. Here, the focus is on the NEW 4.0 Roadshow, which will be launched in 2018 and will carry the project and its goals deeply into the region holding a wide range of information material.



## COMPETENCE CENTRE RENEWABLE ENERGIES AND CLIMATE PROTECTION SCHLESWIG-HOLSTEIN (EEK.SH)

### For all things regenerative

Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH)  
c/o FuE-Zentrum FH Kiel GmbH  
Tel +49 431 218-4433  
info@eek-sh.de  
www.eek-sh.de



Competence Centre  
Renewable Energies and  
Climate Protection Schleswig-Holstein

Project management,  
Competence Centre, coordination:  
Dr. Wolfgang J. Bonn

Great climate? Diverse research initiatives in Germany's northern federal state should ensure that the question mark above will be replaced by an exclamation mark as soon as possible. The Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH) bundles these research initiatives with the aim of finding pioneering solutions for topical questions relating to renewable energy to promote energy transition.

The EEK.SH has been operating since October 2015, but that does not mean it started from scratch. Rather, the EEK.SH follows in the footsteps of the Schleswig-Holstein Centre of Biomass (CE Bio) and the Center of Excellence for Wind-energy Schleswig-Holstein (CE Windenergy). Their work, which has been successful for more than a decade, will continue under the new organisational umbrella, but the range of topics will be expanded to include more renewable energy sources such as solar energy and hydropower.

Five Schleswig-Holstein universities are united in this network, and thus have a central point of contact when it comes to energy research. At the same time, the EEK.SH is also aimed at municipal protagonists, plant operators and, last but not least, companies that are, or wish to become, active in the field of green energy.

"We promote knowledge transfer to businesses and society, but we also aim to contribute to integrating practical findings in teaching," coordinator Dr. Ing. Wolfgang Bonn describes the double thrust. Here, technologies previously in the background are increasingly moving to the centre of focus. Wind, biomass and photovoltaics may continue to be the strongest pillars of renewable energy generation in the North, but promising new approaches are also emerging in these areas. For example, turning algae into mini-power stations by means of molecular biology no longer works simply in the lab and could give the utilisation of biomass a completely new impetus.

What's more, the economic potential is far from being exhausted. The energy generated onshore as well as the

energy generated offshore more and more can now be produced much more cheaply than initially assumed by many experts. There are considerable amounts of dormant reserves to be found in grids and power electronics, the development of which could contribute to making Schleswig-Holstein an attractive location for energy-intensive businesses. Meanwhile, the use of shore power for ships in ports of cities for reasons of climate protection has become an issue.

In addition, there are cross-cutting issues that affect all renewable energy sources. This primarily encompasses storage, but also the development of smart grids or sector coupling, which deals with heat and traffic with their enormous consumption of fossil fuels, in addition to electricity. In Schleswig-Holstein, hydropower or the deep geothermal energy potential has barely been researched and certainly not used.

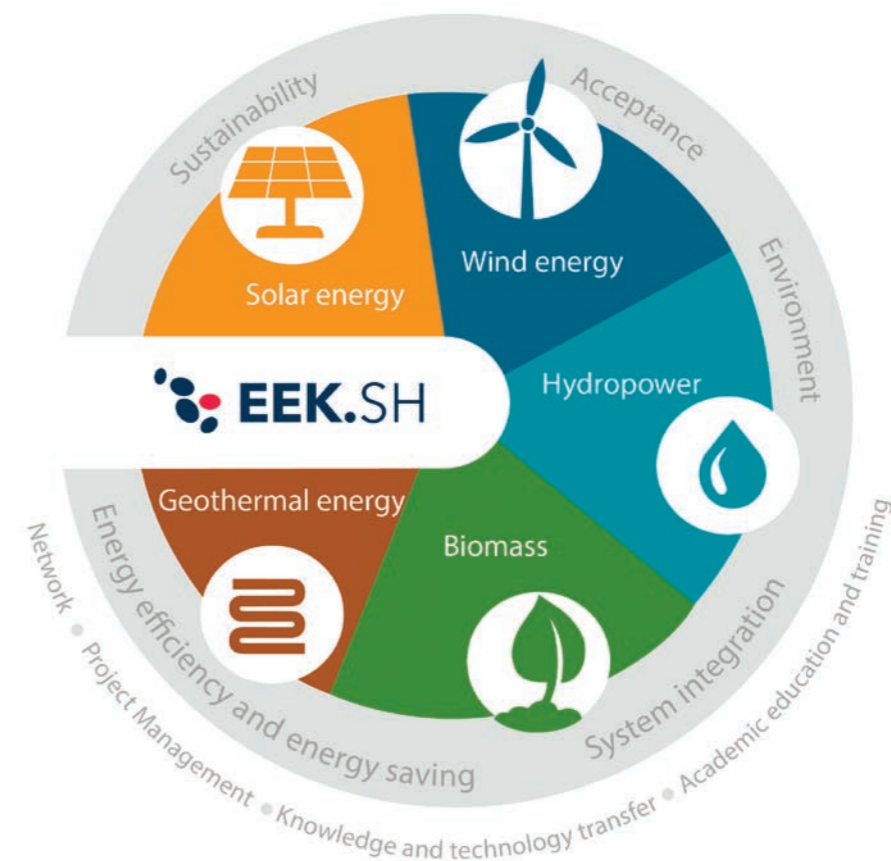
In principle, these are all issues that the EEK.SH deals with in many ways. It initiates and implements research projects, but also assists researchers and scientists in attracting third-party funding or supervises projects that are funded by the EKSH.

Interdisciplinarity is an important factor in innovation. For a start, it assumes that experts in the respective disciplines know what is going on in other disciplines. In series of events such as the "Kiel Algae Round Table" or "Workshop – Science – Business", the EEK.SH supports precise-



*"We promote knowledge transfer to businesses and society, but we also aim to contribute to integrating practical findings in teaching."*

Dr. Wolfgang J. Bonn,  
Dr. Wolfgang Bonn, project  
manager and Competence  
Centre coordinator



ly such forms of dialogue. In addition, network partners from universities, companies and business development agencies collaborate continuously with one another on new event formats to initiate cooperation or projects. Brokering expert partners from industry and science is an important task to be completed by the EEK.SH as well as supporting companies in applied research.

The Competence Centre is closely interlinked with the Schleswig-Holstein Renewable Energy Network Agency (EE.SH), the successor project to the Wind Energy Network Agency windcomm, which continues in the form of an association and supports the work of the EE.SH. In principle, the EE.SH is the counterpart to the EEK.SH on the entrepreneur side and represents companies from all marketable renewable energy sectors in the state.

The EEK.SH Competence Centre is funded by the state and through the European Regional Development Fund. The project executing organisation is R&D centre Kiel University of Applied Sciences GmbH (FuE-Zentrum FH Kiel GmbH). The EEK.SH has a second site in Flensburg, which is mainly responsible for continuing education.



## Head start due to knowledge pool

FuE Zentrum FH Kiel GmbH  
Björn Lehmann-Matthaei

Tel +49 431 218-4440  
fue-zentrum@fh-kiel-gmbh.de  
www.fh-kiel-gmbh.de



They test ways of producing energy from renewable natural resources and develop the offshore technologies of the future on the FINO3 research platform in the North Sea. The collective knowledge pool of around 150 professors from Kiel UAS and other universities in the state are bundled in the Forschungs- und Entwicklungszentrum der Fachhochschule Kiel GmbH (R&D centre Kiel University of Applied Sciences GmbH) – for the

benefit of innovative businesses in the North.

Since its founding in 1995 the R&D centre Kiel University of Applied Sciences GmbH has processed more than 1,000 private and public projects. Around 150, often well-known, businesses from Airbus and BMW Oracle Racing through Dräger and Jungheinrich to Repower and Thyssen Krupp Marine Systems, are among the project partners. “We bring scientific expertise and corporate research and development requirements together. The comprehensive technical facilities of Kiel UAS and other universities in Schleswig-Holstein are available to this end, in addition to the recognised expertise of the professors,” explains Björn

Lehmann-Matthaei, CEO of the R&D centre. The facility accepts scientific challenges from all fields – from consultation to project completion. Companies can fall back on an enormous knowledge pool, providing practical results for a rapid ROI.

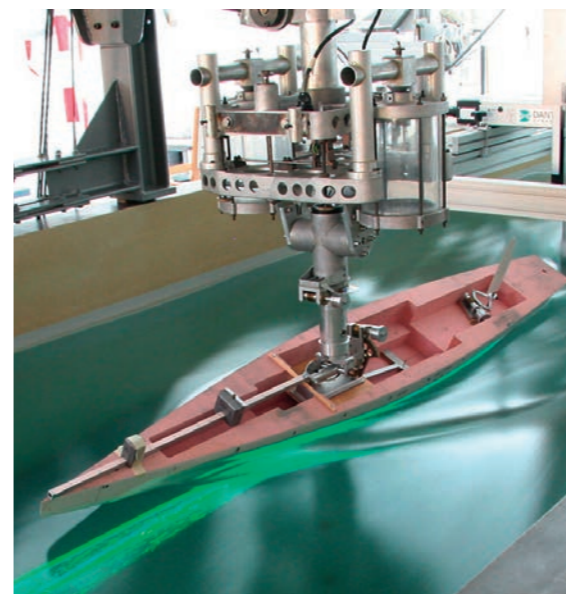
### FINO<sup>3</sup> North Sea research platform

The “Competence Centre Offshore Wind Energy Use – North Sea Development Platform for Technology and Nature Conservation (FINO3-NEPTUN)” which was sponsored by the Ministry of Economic Affairs of the Federal State of Schleswig-Holstein with federal state funding and funds from the European Regional Development Fund (ERDF), together with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety was established at the end of 2005. After three and a half years of planning, design, construction and erection of the platform 80 kilometers west of the German island of Sylt, operations began in August 2009. Ever since, far out in the sea scientists have developed and tested procedures and products for offshore technology – practically adjacent to the offshore wind farms which are already in operation. The aim is to gain knowledge on wave behaviour, meteorology, hydrology, bird migration, noise control and wind farm foundations. The results help wind farm operators and wind turbine manufacturers in planning, building and operations of offshore wind farms.

In 2012 the R&D centre at Kiel UAS was commissioned by the German Federal Ministry for the Environment to also operate the FINO1 research platform in the North Sea north of the island of Borkum. On the platform, which has been operated by Germanischer Lloyd since 2003, the scientists perform research with a variety of project partners on physical, hydrological, chemical and biological projects. They

Research in the middle of the North Sea: The FINO3 platform provides information on the construction and operation of offshore wind farms.

Photos: FuE Zentrum FH Kiel GmbH



Fast racing boats: Flow tests in experimental set-ups form part of the research services in the Yacht Research Unit Kiel.

investigate environmental conditions and the effects of offshore wind turbines on the environment. The data acquired and results achieved provide crucial information for both the licensing agencies and the potential operators of offshore wind turbines.

Since autumn 2015, the R&D centre Kiel University of Applied Sciences GmbH has been the project promoter of the Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH), a scientific Network of six universities in Schleswig-Holstein. Pillars of the EEK.SH are formed by the networks of the former competence centers wind energy and biomass utilization (see report page 24).

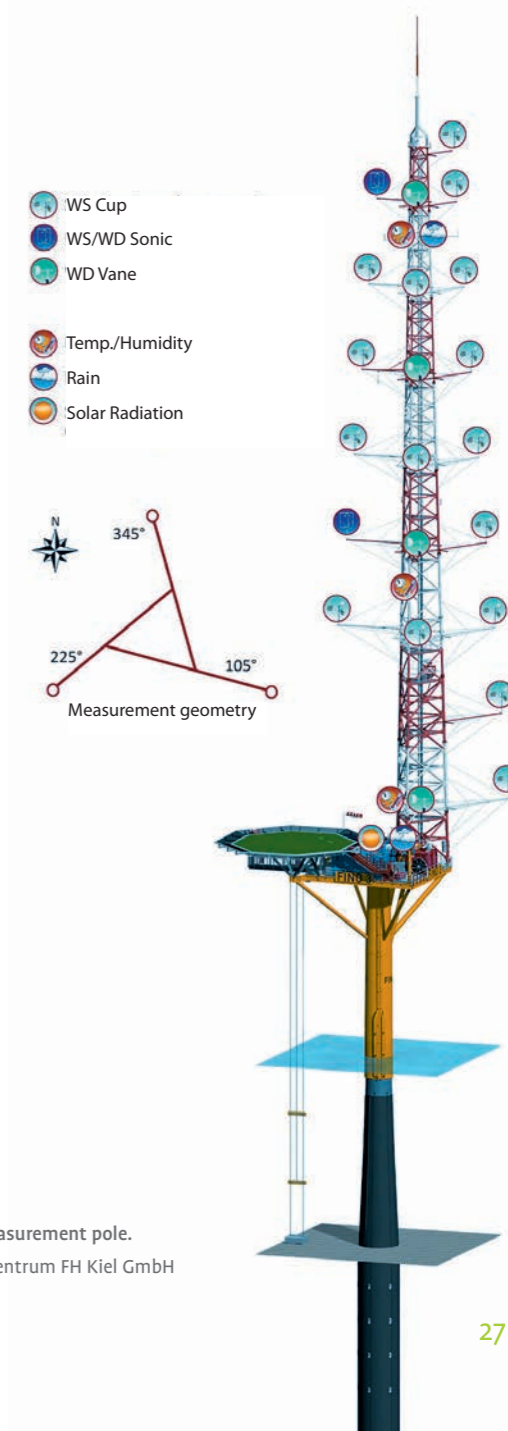
“It is primarily regional companies that profit from the expertise of our researchers,” explains Lehmann-Matthaei. Two-thirds of customers are from within Schleswig-Holstein, the remaining partners are distributed throughout the federal republic or outside its borders. The young scientists also profit: In the projects the UAS graduates get the chance to test the waters and recommend themselves to companies looking for qualified new staff, says the head of the R&D centre. “Since our foundation far more than 250 graduates have taken the leap into industry from the research centre and found a permanent job.”

Determination of physical-meteorological parameters on a 100 meter high wind measurement pole.

Figure: FuE Zentrum FH Kiel GmbH

The R&D centre brings its expertise into the following fields:

- › **Testing and measuring services:** Testing and measuring products, developments and failure cases with precise results.
- › **Transfer projects:** From expert opinions through project planning and development to acceptance and quality assurance as a partner in technical projects in a wide variety of fields
- › **Externally funded project services:** The R&D centre can help in the acquisition of external public funds, from project initiation through application to successful project execution
- › **CPD:** The R&D centre has managed the Kiel UAS CPD program since 2009



## Power from a chocolate box

ECPE European Center for Power Electronics e. V.  
www.ecpe.org

ECPE-Facilities in Schleswig-Holstein:  
Kiel UAS, Institute of Mechatronics and  
Institute of Electrical Engineering  
Prof. Dr. Ronald Eisele  
Brief bio page 97

Prof. Dr. Ulf Schümann  
Brief bio page 107

Kiel University,  
Faculty of Engineering,  
Chair of Power Electronics  
Prof. Dr. Marco Liserre  
Brief bio page 86

Fraunhofer Institute (ISIT)  
Prof. Dr. Holger Kapels  
holger.kapels@isit.fraunhofer.de

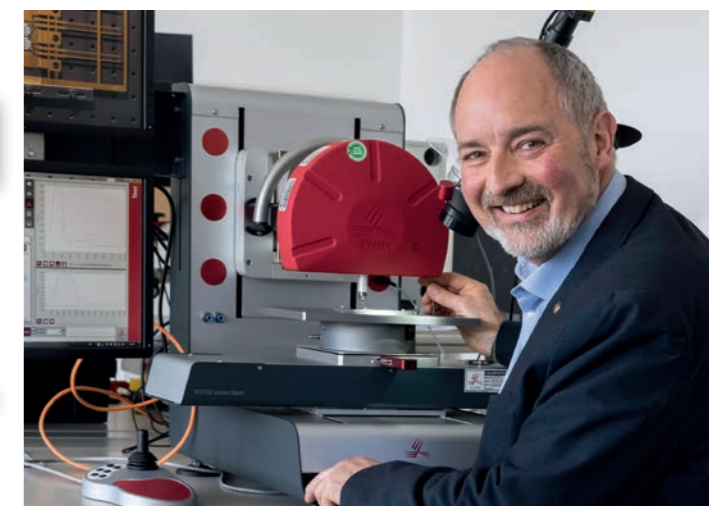
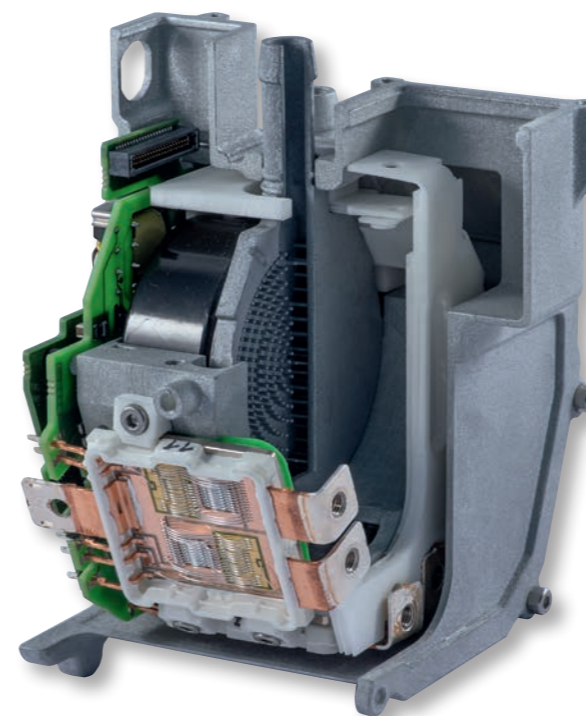
In recent years, three institutes in Schleswig-Holstein have been appointed Centers of Competence by the European Center for Power Electronics (ECPE): in addition to the Fraunhofer Institute of Silicon Technology ISIT (Itzehoe) and the Chair of Power Electronics, Kiel University, Kiel UAS was included as the first university of applied sciences in these important European research facilities in the field of power electronics. This equates to an academic knighthood for the Institute of Mechatronics' excellent research work.

Power electronics represents something like the central

theme of energy transition. This special field of electrical engineering is important whenever power needs to be converted, such as from high to low voltage, or from DC to AC or vice versa. Depending on the field of application, the necessary power electronics components are as big as a matchbox or a box of chocolates. Even the smallest elements can handle remarkable amounts of energy. The chocolate box effortlessly manages a throughput of 200 kilowatts, which is about two to three times the power of a motor in today's affordable electric cars.

This is precisely what the InMove research project, funded by the German Federal Ministry of Education and Research (BMBF), under the direction of Professors Ronald Eisele and Ulf Schümann, deals with at the Center of Competence. All e-cars include a converter in addition to the charger, which converts three-phase current – actually three-phase alternating current – into direct current. Within InMove, the aim is to develop such a converter with a very high power density – more than 100 kilowatts in one litre volume – by the end of 2018. Dominik Hilper takes care of the radiator design, which is a crucial aspect, because higher performance always means greater heat. Meanwhile, Jasper Schnack is responsible for mechatronic integration and has the task of assembling many small individual parts requiring the closest space possible. InMove is particularly important for e-mobility because it helps to make electric motors scalable. From the supporting auxiliary drive on the axle to the complete electric motor under the bonnet, one and the same module can be used and easily supplemented with additional units at higher power demands.

Stefan Behrendt, also from the Eisele team, recently visited his dentist. Not because he was in pain, but because he is currently carrying out research on how to fix electronic components using commercial cements such as those



Prof. Dr. Ronald Eisele examining the mechanical strength of the sintered joint on the XYZTec shear test bench.

Cross-section of the InMove inverter with cooler, power modules, capacitor and driver in the size of a soup can.

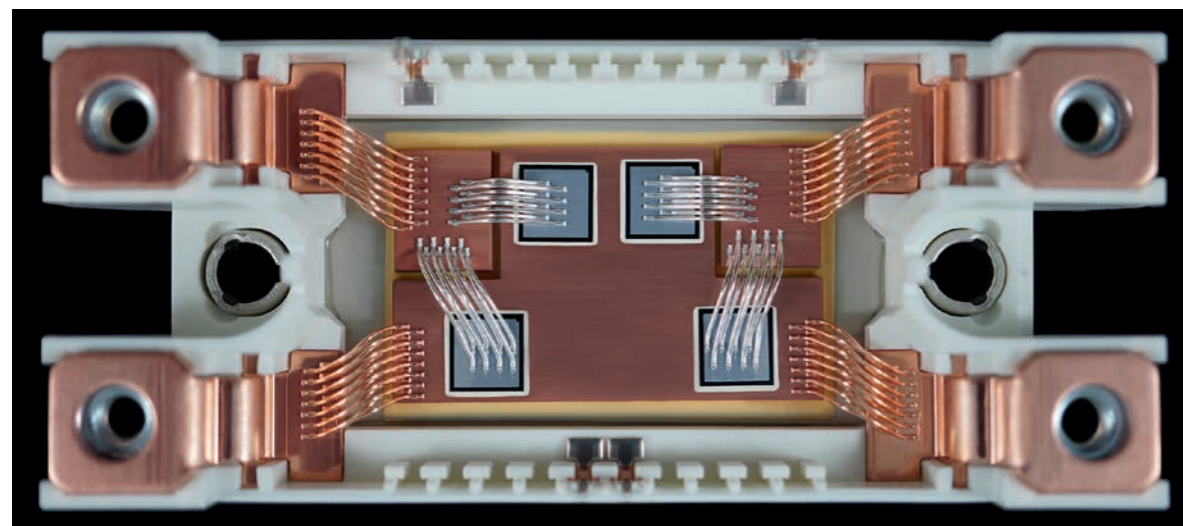
used in dental technology. The aim is to use an alternative to the previously common, but only partially stable and less thermally conductive material, silicone gel. "I am the first mechatronics technician with a trowel in the hand," jokes Behrendt, whose doctoral thesis is part of the BMBF-funded ReLEEB project thus currently meeting great interest from the project partners Bosch, Siemens, Heraeus and Danfoss.

Conceptually, all ECPE projects focus on the question how to make electronics more powerful and, at the same time, more durable. Which, according to Professor Eisele, in principle represents an eternal conflict, because higher power density results in greater heat with the corresponding mechanical stress and wear. The experts continuously come up with new tricks in order to outsmart physics. For example, in her BMBF ThermoFreq project, Lea Lehmann-Matthaei attempts to double the conductivity of so-called bond connections, which couple individual components, up to 300 to 400 amperes. To achieve this, she works with tiny metal bands, which are nevertheless comparatively thick and are not welded by ultrasound, as usual, but are directly applied onto the sensitive chip by laser. Here, the rather large surface of the metal bands counteracts the greater heat development by means of ever smaller and more powerful chips.

Heat is also a problem for the base plates on which the individual module components are mounted. High temperatures result in greater strain and material fatigue, leading to increased performance but with lower durability. To mitigate this effect, team member Stefan Söhl is focusing on the development of a hybrid metal that combines

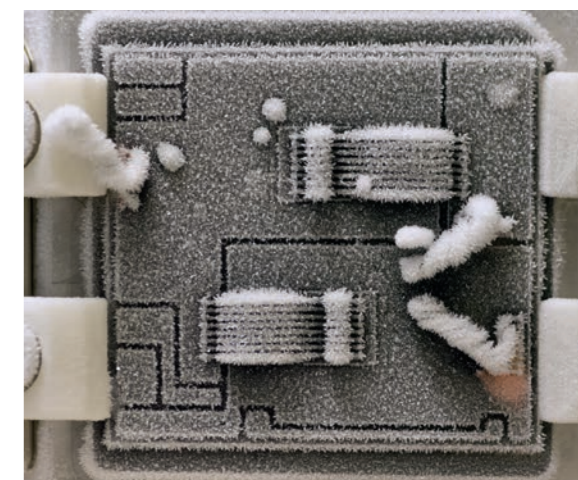
the benefits of different worlds and low strain with high thermal conductivity.

The fact that the necessary tools are largely self-built at the University of Applied Sciences Kiel, or at least modified according to their own needs, is exemplary for this project. Moreover, not only established experts are involved, but also students. "We have a total of 24 employees in the project teams – from students to engineers," reports Ronald Eisele. "Anyone working as a research assistant in a team today will often become tomorrow's research project engineer following graduation." In his experience, young professionals in particular benefit from dissertations based on pioneering innovations: "This opens up very interesting prospects on the job market for our graduates, especially with respect to our partner companies."



Rectifier module with IsoPower substrate and organic insulation layer (own development Kiel UAS).

Photo: Aylin Bicakci



Power electronics at low temperatures. Ice crystals on diodes and bond wires.

Photos: Dominik Hilper

## Tinkering at the e-charging station of the future

The Chair of Power Electronics at the Kiel University is part of the European Center for Power Electronics (ECPE). However, while the neighbouring University of Applied Sciences and the Fraunhofer Institute for Silicon Technology ISIT in Itzehoe do their part, as additional elements of this cloverleaf, to make small electronic components more durable and efficient, the Chair of Power Electronics focuses on system level.

The current version of the intelligent HEART transformer has approximately the dimensions of a wardrobe. The acronym HEART stands for Highly Efficient And Reliable smart Transformer. It incorporates a technology that in the end is much smaller than a wardrobe and is optimally adapted to the needs of renewable energy generation.

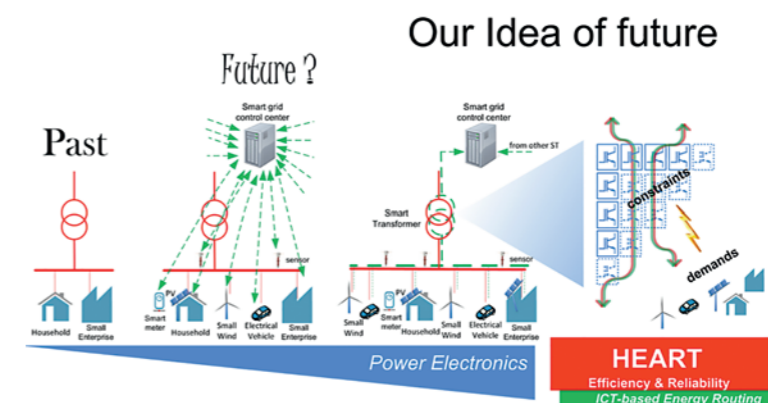
To date, transformers, usually analogue and mechanically controlled, were performing their tasks between the power stations and the point of consumption the same way they did 100 years ago. This still works, but doesn't quite match up to the dynamics of the energy production transition. Sometimes the wind blows hard, then maybe not at all, meaning that this inflexible system is exposed to strong fluctuations and corresponding stresses. In Prof. Marco Liserre's power electronics department, a Smart Transformer is therefore being developed that can handle such fluctuations much better. Here, intelligent softwares have been developed to reduce power losses and the age-

related stress on components. The aim is to provide shorter maintenance delays, longer lifetime, and higher control efficiency.

HEART's goal is to have a commercial product ready by 2020, hopes Prof. Liserre, whose team set out in late 2017 to take at least half a step into the market. In the United Kingdom, there have already been taken initiatives asking for the integration of a transformer very similar to the Kiel model into the real power grid. Liserre and his team are involved in this process hoping to receive positive impulses for their own work. 'We rely on testing these components in operation', he emphasises.

Other projects in the power electronics department are taking great steps. The implementation phase for a medium-voltage laboratory began in 2017, which allows prototypes in medium voltage range to be tested and real-time simulations of electrical networks to be simultaneously performed, began in 2017. This allows to better understand realistic scenarios with the lab testing facility. For example, it is possible to investigate the effects of further expansion of renewable energy systems on grid nodes and what type of interventions are possible for an intelligent HEART Smart Transformer, without burdening the real grid.

A pilot project involving rapid charging stations for electric cars is expected to run until 2022. Here, the Smart trans-



HEART Concept: The Smart Transformer as central energy and data concentrator in the distribution grid.

former plays a crucial role. It aims to reduce, without any drawback, the stress to which the power grid is inevitably exposed when the high power e-charging stations request high power demand. In this direction, first analytical results have been carried out together with the Stadtwerke Kiel, a collaboration partner of the Kiel University in the strategic national Kopernikus ENSURE project.

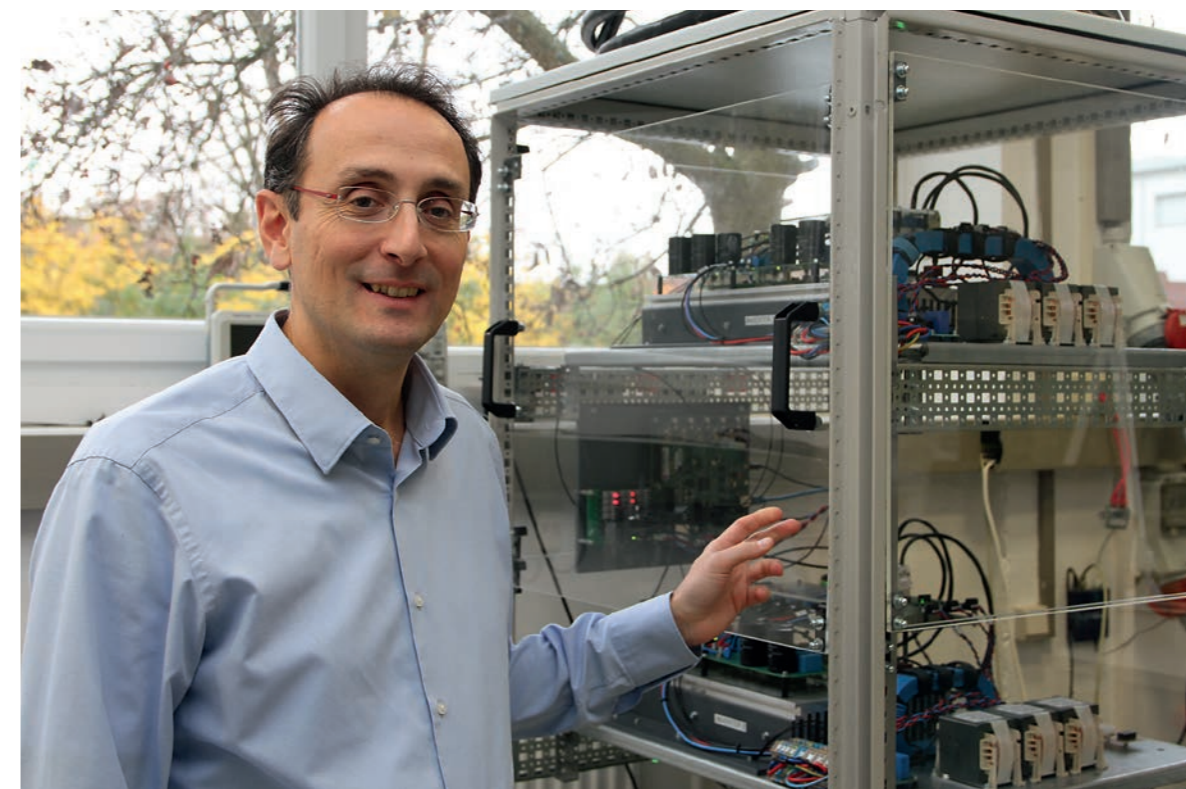
They also collaborate regarding the German Research Foundation's Hybrid and Multimodal Energy Systems priority program considering the power grid of the future. However, a prerequisite is to have sufficient stable opera-

tions in the grid supported by power electronics.

Increasing the reliability and lifetime of electronic components is a major concern at Kiel University, as well as at the University of Applied Sciences. Wherever possible, this is done by means of software solutions that can help to extend battery lifetime in e-cars, for example thanks to optimised energy management. For Liserre, an optimal use of resources is also a social issue. The more carefully this aspect is taken into consideration, the greater is the acceptance of energy transition at large.



Power-Hardware-In-Loop Setup for Smart Transformer grid test integration.



Prof. Liserre with the first Smart Transformer Prototype.

Photos/Figure: Kiel University



## Clever technologies

Smart Energy Center of Excellence  
Prof. Dr. Harald Wehrend  
Brief bio page 109

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In view of the energy challenges we now face in energy transition, the Kiel UAS Smart Energy Center of Excellence sees its role in the bundling of resources and expertise. The focus is on application-oriented research projects in cooperation with both regional and interregional commercial enterprises. In addition to the purpose of the research, the implemented projects enable students to be educated specifically in order to optimally prepare the young engineering talents for their career paths using real projects, and to offer suitable candidates to companies.

Expertise at the centre of excellence covers the following topics:

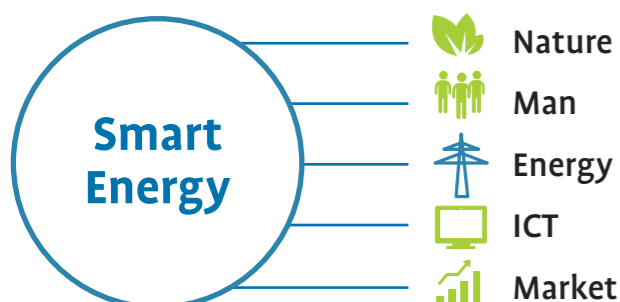
- › Energy generation
- › Energy transmission
- › Energy distribution
- › Energy storage

and the consumer topics:

- › Smart meters
- › Building services automation and building energy automation.

The word smart – here meaning clever, resourceful and enterprising – is used to describe modern and future electrical energy systems. In the context of future electrical energy supply systems, this means upgrading energy supply networks from innumerable generators, through the transmission and distribution systems and their components, to the consumers, to upgrade from today's level of technology to intelligent systems and processes.

In addition to trend-setting developments in primary engineering components and equipment, ever more com-



prehensive communications networking and the use of system-spanning automation processes and intelligent software controls facilitated by this, play an essential role in the reorganisation of our energy supply.

Topics and projects being worked on in this field are:

- › Energy concept of a self-sufficient district
- › Self-sufficient mobile housing container
- › Development of an autarkic energy concept for small residential buildings – Contribution to market research in Schleswig-Holstein with standard buildings for municipal accommodation and apartments
- › Investigation of Integrating Renewable Power Plants in Island Grids

Self-sufficient buildings, from housing containers to large housing estates, self-sufficient thanks to the integration of regenerative energy generators in conjunction with energy storage systems, were examined and evaluated by means of examples.

- › Studies on the temporal response of GOOSE messages from IEC 61850 compliant IEDs
- › Design and construction of a control centre simulation with a communications structure compliant with IEC-61850

Both projects examined the possibilities of modern ICT solutions using example applications.

- › Technical study of the potential of electric vehicle storage capacity for use with network-related measures in Germany
- › Frequency and voltage control of an isolated microgrid with renewables, energy storage and smart loads
- › Simulation of HVDC lines in ATP-EMTP

These projects are examples of studies addressing network operation challenges.

The various institutes in the informatics and electrical engineering faculty at Kiel UAS, with their emphases in traditional power engineering, renewable energy sources, and information and communications technologies, are available. They are supplemented by the expertise of additional Kiel UAS faculties.

## Smart technology for e-vehicles



Schleswig-Holstein Electromobility  
Center of Excellence (KESH)  
Prof. Dr. Klaus Lebert  
Brief bio page 100

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Developments are irreversible: cars with electric or hybrid drives will guarantee long-term mobility in industrialised nations. And even though no cars are mass-produced in the far north: the Schleswig-Holstein Electromobility Center of Excellence (KESH) at Kiel University of Applied Sciences has gained a good reputation in research cooperation with industry partners.

In order to achieve the Federal Government's climate goals for the year 2050, transport in Germany must become greenhouse-gas neutral. However, transport is the one sector that has not been able to significantly reduce its greenhouse gas emissions since 1990. "To achieve this, it will be necessary to develop a whole series of innovations in terms of vehicles, drives and components, as well as in integrating vehicles in the electricity and transport networks", explains Prof. Klaus Lebert, Vice President of Kiel UAS. Together with colleagues Prof. Ronald Eisele (power modules), Prof. Christoph Weber (battery management) and Prof. Ulf Schümann (mechatronic implementation), the systems simulation and control engineering expert

is part of a four-man center of excellence team primarily occupied with optimising electrotechnical components in vehicles.

"In research and transfer projects we concentrate on the problem of how to design individual components and their interactions more efficiently. It is first necessary to acquire detailed data on the operational behaviour of electric vehicles.", reports Prof. Lebert. This purpose is served, for example, by the Kiel University of Applied Sciences electric company cars, including a white Peugeot iOn, which operates as a rolling laboratory in and around Kiel – for research as well as for student education.

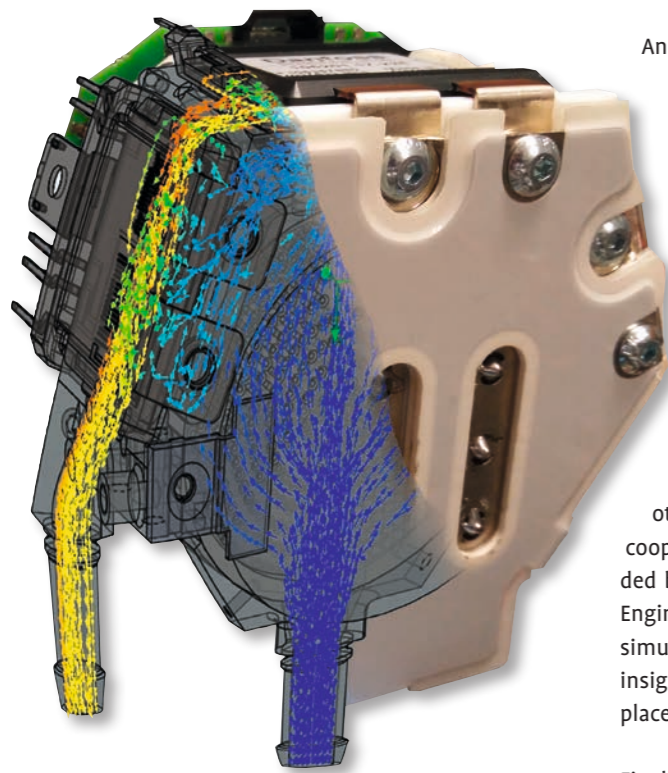
Germany's largest car manufacturer, Volkswagen, is on board as partner of the InMOVE cooperative project (funded by the Federal Ministry of Economics and Energy). In this project, the research partners are investigating how the power of an electric vehicle drive can be divided among several small drive modules. The Institute of Electrical Power Engineering at Kiel University of Applied



New developments in battery management for electric vehicles are being tested in the KESH laboratories at Kiel University of Applied Sciences.

Photo: KESH

## SCHLESWIG-HOLSTEIN ELECTROMOBILITY CENTER OF EXCELLENCE (KESH)



Final motor stage highly integrated by Kiel UAS for e-vehicles with innovative and compact liquid cooling of all components (BMW funded project (ATEM3): InMOVE, joint research by Volkswagen, Danfoss, Vishay, FTCAP REESE + Thies, FHG-ISiT) – 80 kW in less than one litre volume. Photo: Kiel UAS, D. Hilper

Sciences is responsible for mechatronic integration, which is an essential support for achieving the most compact system possible', reports Prof. Schümann. As a result, all project partners – including Danfoss Silicon Power, Vishay Siliconix, Reese + Thies Industrieelektronik and the Fraunhofer Institute for Silicon Technology in Itzehoe – as well as VW – will be optimally networked. The converter's thermal management system is also being developed by specialists from Kiel University of Applied Sciences, in this case by the Institute of Mechatronics in Prof. Eisele's working group.

Other projects are dealing with crucial battery management systems innovations – for example, to precisely record the current charge and cell health status, thus enabling reliable electricity feed-in. This project, run in cooperation with Liacon GmbH from Itzehoe, is supported by the EKSH with €148,000 as part of the HWT Energie und Klimaschutz program. 'Determining the charge and cell health status is either not possible at all or only to an insufficient level when using traditional battery management systems, because they are usually based on a simple current and voltage measurement', explains Prof. Weber, who heads the research group. Using the new Kiel UAS metrology procedures, it is possible to monitor every single cell in the battery storage system.

An important factor for the KESH team in all projects is that regional industry, in particular, can profit from the head start in electronic component expertise and the centre of excellence thus supports the competitiveness of these enterprises. This also applies to Schleswig-Holstein's major eHighway project (see report page 36), in which a pilot route with overhead lines for electric trucks is to be established on the A1 Autobahn near Lübeck. 'Among other things, the KESH takes care of the power distribution to the so-called rectifier substations along the route', explains Lebert.

In addition, the KESH maintains a network with other universities in Schleswig-Holstein, including the cooperation with the Universität zu Lübeck, which is headed by Prof. Martin Leucker at the Institute for Software Engineering and Programming Languages. This involves simulation studies on electric bus routes in order to gain insights into the necessary infrastructure, such as the placement of the charging stations and further aspects.

Finally, Kiel University of Applied Sciences involves its students in research in order to expertly train them specifically for the future-oriented electromobility sector, adds Prof. Weber, who heads the electromobility research laboratory. Here, young professionals can work intensively on electric vehicles and their components under professional conditions. This led to numerous new designs – such as the MegaWattRad for the SHeff-Z energy information center in Neumünster. Here, visitors and participants in the Energy Checker program can discover how long they need to pedal in order to power a fan or a light fixture.

### Service portfolio:

- › Expertise and technological services in the broad field of electromobility
- › Investigation of the behaviour of battery systems
- › Development of battery management systems
- › Investigation of the behaviour of electric drive systems and on-board supply systems in vehicles
- › Robust electronics and cooling fabrication laboratory with testing and verification options
- › Thermal systems simulation
- › Mechatronic system integration using model-in-the-loop, software-in-the-loop, rapid prototyping and hardware-in-the-loop methods
- › Research on reliable and durable connections for semiconductor elements using special production methods

## E-MOBILITY COORDINATION SCHLESWIG-HOLSTEIN

### Promoting moving technologies



E-Mobility Coordination  
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The topic of E-Mobility is omnipresent – and not just since the Diesel scandal! Schleswig-Holstein is increasingly mentioned in this context, because the state has much to offer in this promising field. On the one hand there are various technological competences of companies, universities and institutes. On the other hand, innovative and committed protagonists from sectors such as the energy or transport sector, tourism and climate protection are located here. Thus, advanced projects, solutions and services are implemented.

Established in 2012, the E-Mobility Coordination at Business Development and Technology Transfer Corporation of Schleswig-Holstein GmbH (WTSH) has become central

point of contact for E-Mobility. It strengthens knowledge, idea and technology transfers – for example, at the Schleswig-Holstein E-Mobility Forum, which is one of the largest b2b events for E-Mobility in northern Germany and takes place annually in Kiel. Participants predominantly comprise company representatives, as well as representatives from science, administration and politics.

The specific services of the coordinating agency cover the following aspects:

- › Networking of experts in business, science and politics
- › Information on E-Mobility in Schleswig-Holstein as well as E-Mobility funding programs
- › Support for innovative activities/concrete E-Mobility projects
- › Performing information events and workshops on various subject-related topics



Is convinced about e-cars: Jens Sandmeier, E-Mobility Coordination Schleswig-Holstein.

Photo: WTSH

## Diesel Off, Overhead Lines On!

Jan Bachmann  
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An electrified highway could be the solution for climate-neutral truck operations. This is a possibility to achieve a reduction in CO<sub>2</sub> emissions and a simultaneous improvement in the health of the residential population near heavily used highway sections in metropolitan areas. In the Schleswig-Holstein eHighway Field Trial (FESH), the project partners will be testing electric trucks on the A1 federal highway between Reinfeld and Lübeck as of 2019. They are supplied with power via an overhead line.

Although electric cars that have long been produced in series are already rolling on Germany's roads, switching trucks from diesel to electric drives is more complicated. Batteries, such as those used in cars and small trucks, would need to be so large that the economic operation of trucks on long-haul routes would not be considered

practicable. Among professionals, therefore, overhead line operation on highways is regarded as a possible solution offering several advantages: this existing system is similar to that for trams and requires a relatively low capital expenditure compared to busbars or induction loops in the road. Running costs should also be relatively low. "Prior to any possible German or European introduction, however, we want to put the technology to the acid test. We do this as realistically as possible at FESH", explains project manager Jan Bachmann from R&D Centre Kiel University of Applied Sciences GmbH (FuE-Zentrum FH Kiel GmbH).

The Federal Government's Climate Action Plan 2050 aims to reduce exhaust emissions by 55 percent by 2030. In addition, the dependence of transport on fossil fuels such as diesel and petrol will be reduced. To achieve this, it is also

important to establish electromobility in freight transport. The aim of the FESH project now is to demonstrate how trucks running on overhead lines fare in practice. "The project partners expect the field trial to provide insights into achieved system efficiency, economic efficiency, traffic engineering and CO<sub>2</sub> savings", explains Bachmann. FESH is funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) with around €14 million within the program "Erneuerbar mobil".

Implementation is split into two parts: initially, project partners in the FESH1 subproject design and build the overhead line system for e-trucks on an approximately six kilometer long section of the A1 highway between the Reinfeld junction and the Lübeck interchange. The construction costs for an overhead line system for e-trucks are around €2 million per kilometer. In the next step, FESH2, regionally based logistics companies such as Spedition Bode use the overhead line system with specially equipped trucks. The company is one of the larger hauliers in the state and supports the FESH pilot test. Spedition Bode trucks regularly take the route between the port of Lübeck and the company's own logistics center in Reinfeld, as usual in day-to-day business. The idea is that the e-trucks on the highway section to travel up to 50 times a day and test the technology and processes in everyday traffic. This practice phase will be monitored as part of scientific research projects. Here is how it works: the electric trucks are equipped with innovative pantographs above the cab

and have a diesel-electric hybrid drive. The pantographs can be almost fully automatically connected to the overhead line while driving, so that the truck's electric motor is supplied with power from the overhead line and at the same time power is fed into the batteries. Thus, the truck can also drive for some time on a non-electrified section. The pantographs are designed in a way that they can automatically connect to, and disconnect from, the overhead line while travelling. The electric trucks can thus travel on the highway without functional restrictions. All other vehicles can use the right lane beneath the overhead line as usual. Motorist safety should be ensured in the event of the overhead line snapping: sensors can detect this and ensure that the system is deactivated.

The FESH project partners in the state government are the transport ministry (MWVATT) and the energy transition ministry (MELUND) of Schleswig-Holstein. A FuE-Zentrum FH Kiel GmbH project team is responsible for design and construction. Landesbetrieb Straßenbau und Verkehr Schleswig-Holstein (LBV SH) is the project developer and, with the Lübeck branch, in particular, the agency responsible for the construction and maintenance of the relevant highway section, responsible for design, licensing and construction.



Left: electrified trucks will soon be travelling the test route between Reinfeld and Lübeck. The image shows a Scania and Siemens test deployment.

Top: the driver can comfortably control the e-lobby, whereby the switchover from diesel to electric operation takes place automatically.

Right: the installation of overhead lines for e-trucks is regarded as being relatively inexpensive. They cost around two million euros per kilometer.

Photos: [www.siemens.com/presse](http://www.siemens.com/presse)

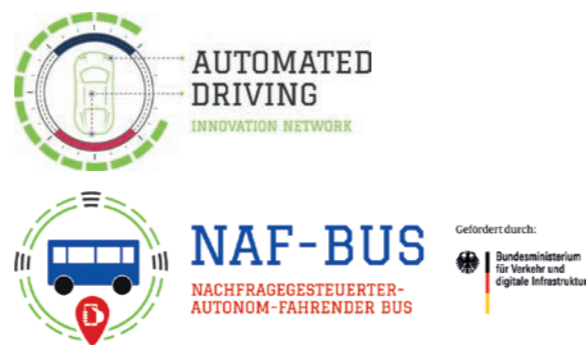


## AUTONOMOUS DRIVING COLLABORATIVE PROJECT

## The Driverless e-bus is on its Way!

Autonomous driving in rural areas innovation network  
NAF-bus project  
Project management: EurA AG, Ralph E. Hirschberg

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Call the bus on the smartphone using the app – and it even turns up without a driver sitting behind the wheel. This vision could supplement public transport in rural areas, which is often not worthwhile for economic reasons. The NAF-bus project, funded by the Federal Ministry of Transport (BMVI) aims to test its feasibility in Schleswig-Holstein. Researchers from Kiel University (CAU), also belong to the innovation network.

The aim of this innovative mobility concept is to organise public transport without fixed routes and timetables. The passenger only controls the route via an online-based request. Can this actually work in rural areas using a so-called NAF-bus (demand-driven autonomous-travelling bus)? A corresponding model project for autonomous driving is to be developed in the North Frisia region of Schleswig-Holstein, in which small electric buses are tested and researched in practice.

The Federal Ministry of Transport funds the project in Schleswig-Holstein with €2.38 million. The research project, which was started in the late summer of 2017, runs until June 2020 and includes various scientific studies in the fields of technology, computer science, natural sci-

ences, law, economics and social science, as well as the purchase of three autonomous electric buses, which will be undergoing test operations from mid-2018.

The project is managed by the EurA AG through its branch office on the GreenTEC Campus in North Frisian Engesande, where the THE FIRST NAF-bus test rack is located. In addition to three research teams from various CAU departments, the innovation network includes GreenTEC Campus GmbH, the transport companies Autokraft and Sylter Verkehrsgesellschaft. FLS, a company from Heikendorf near Kiel, will program software for public transport route planning and optimisation, and the engineering service provider moteg from Flensburg is developing an energy management system for autonomous and electric buses. The Berlin company Interlink supports the network in traffic planning and integration into the public transport system.

The three CAU working groups investigate on completely different problems: computer science professor Dirk Nowotka and his Reliable Systems research group are researching formal methods for error detection and avoidance in hardware and software systems. “Among other things, we test and analyse the characteristics of the appropriate NAF-bus software with regard to traffic safety”, explains Prof. Nowotka. The aim here is to avoid certain possible causes of errors in order to gain acceptance for the new technology. Passengers should be able to trust autonomous buses, and they can only do so when they feel safe.

Prof. Florian Dünckmann of the Geographical Institute's working group deals precisely with the latter, socially very important question: how will the innovative public transport service be accepted by the population? For this purpose, the CAU Working Group on Cultural Geography is carrying out an acceptance study as well as public participation procedures. In addition, it is entrusted with networking

This is how autonomous e-buses will look like in future. This model has been presented at the CEBIT IT-fair in spring 2017.

Photo: Ralph Hirschberg

the protagonists to establish the NAF-buses. Legal issues regarding driverless buses in practice are investigated by Prof. Michael Stöber of the CAU Institute for Economic and Tax Law.

For public transport in rural areas and tourist regions, the system with driverless e-buses, which are individually requested, could be a financially viable vision, because the routes that a bus needs to cover in the countryside are often not profitable over long distances and with few passengers. Fixed timetables do not take passengers' needs into consideration and remote districts are often not even connected to the bus network. This is especially problematic for older and younger people, who are not as mobile with cars.

The project is therefore intended primarily to provide insights into the behaviour and experience with users regarding autonomous vehicles. In various test scenarios on the GreenTEC Campus test site in Engesande near



Order the bus with the smartphone: a future vision, which will be tested and explored in the pilot project „autonomous driving in rural areas“ in Schleswig-Holstein.

Figure: Andrey Suslov

Niebüll, the network partners intend to closely study the practical application of the NAF-buses. The use in commuter traffic on public roads in the region of North Frisia and on the North Sea island of Sylt aims to demonstrate that the technology is convenient.

## “Revolutionary Effect for Mobility”

### Three questions to Ralph Hirschberg, head of the NAF-bus project

#### “What will the NAF-bus project's timetable be under your direction?”

**Ralph Hirschberg:** Thanks to the planned deployment in three different usage scenarios, the project conveys extensive insights into controllability, driving experience and acceptance of autonomous driving either by the vehicle users or further road users. The three usage scenarios are:

- › Transport of training delegates on the grounds of the GreenTEC Campus in Engesande
- › Use in tourism on the North Sea island of Sylt by our partner SVG
- › Transport by commuter traffic on public roads in rural areas in the region of North Frisia by Autokraft

Currently, we are in the selection phase for the vehicles to be procured, the first of which is scheduled to travel in June 2018.

#### How is the collaboration with the project partners getting on, including the researchers from Kiel University?

The arrival of autonomous minibuses raises new and exciting issues in the fields of the environment, safety, traffic, law and social acceptance, the answers to which can redefine future passenger transport. The collaboration of seven participating companies and the Kiel University's three scientific partners is good and very fruitful. The le-

gal aspects, in particular, will be extremely challenging for the project. To date, hardly any research has been carried out on the legal basis of autonomous driving, especially in public transport. The unresolved legal issues initially concern the road traffic regulations for these autonomous minibuses. In addition, there are questions on passenger transport law, insurance law and civil liability law, in particular road traffic and product liability.

#### A glance into the future: What could be the effects of NAF-bus in terms of autonomous driving?

From our point of view, autonomous and electric minibuses may represent a new and innovative extension for public transport in rural and urban areas. In our view, the progressive development and use of driverless minibuses will have a revolutionary effect on future mobility services. Autonomous minibuses are highly flexible and thus facilitate an innovative, personal service: digitisation makes it possible to optimally adjust the mobility offer to the needs of the users. Large buses following fixed routes for a small number of passengers in rural areas would be replaceable; new, until now unserved (or no longer serviced) regions and villages in rural areas could be re-connected to the public transport network.

## Subsurface Power and Heat Storage

ANGUS II Research Network  
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Research is underway on storage solutions to compensate for the fluctuating power supply from renewable energy sources. It seems that large underground storage facilities allow for an optimal management of the temporary electricity surplus. In addition, such facilities could store heat in summer and deliver it to households as heating energy in winter. However, which of these geotechnical storage types are suitable for Schleswig-Holstein and how can they be coupled to the energy and heating market? These topics are the subject of the ANGUS II research project (Effects of using the geological subsurface as thermal, electrical or material storage system).

The geological subsurface offers an enormous potential of storage capacity that can be utilised for energy transition. Thus, Schleswig-Holstein's weekly power requirement could theoretically be covered by one large hydrogen storage system in a porous geological formation in order to compensate for fluctuating production.

"If we aim to permanently exploit underground geological strata by inserting and extracting gases or warm water, storage operations will have to be reliable", emphasises Prof. Bauer. "On the other hand, we will have to be able to predict and monitor the hydraulic, chemical, thermal

or mechanical effects in the subsurface. No harmful side effects, for example caused by undesirable water displacement or fracturing of the subsurface, may be accepted."

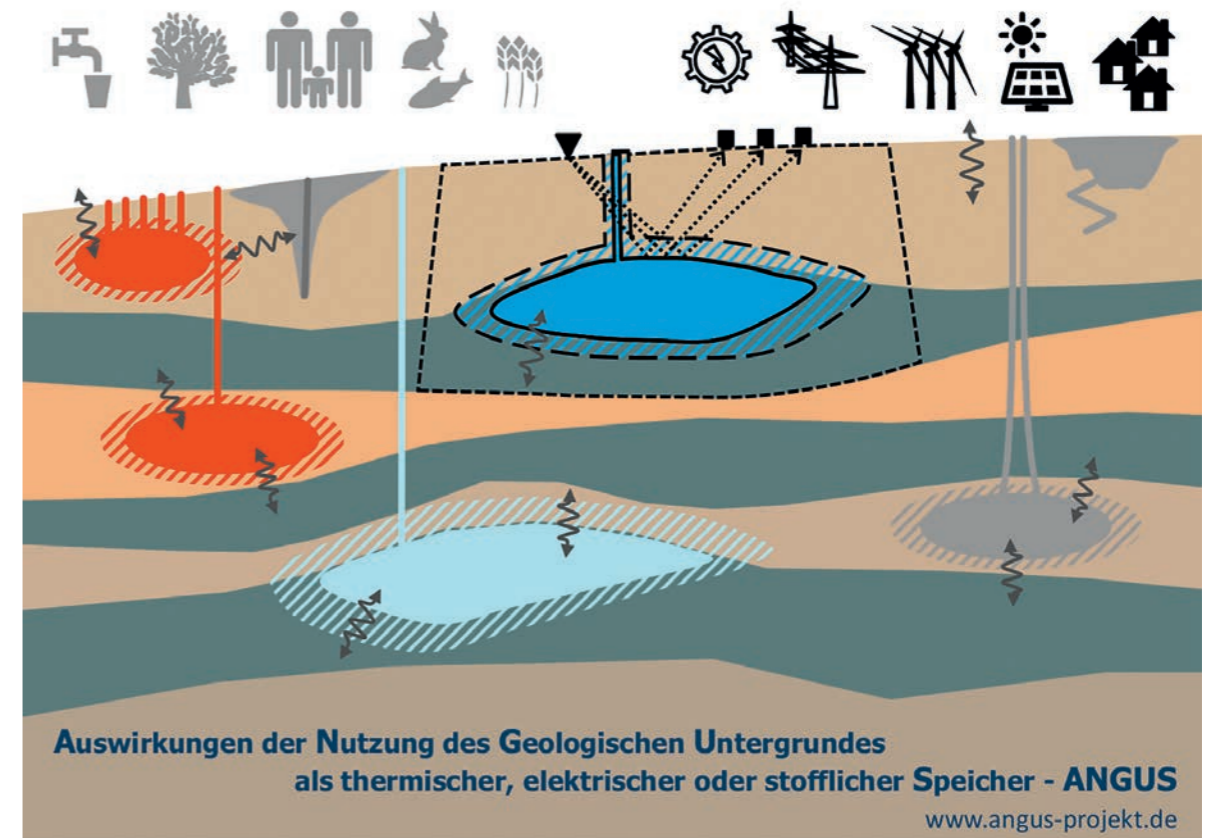
In addition to the storage of electricity (for example by chemical conversion into hydrogen), the focus of ANGUS II is on heat storage: around one quarter of energy consumption in Germany is used as electrical energy, while half of it is used to provide heat. In the course of energy transition, as much as 60 percent of energy supplies in Germany are to be delivered by renewable energy sources by 2050. "It is easy to see from these figures how important the large scale storage of heat (stored in the medium of water) will be in the future." New sources of energy such as solar thermal are needed to achieve the objectives: heat produced by solar thermal systems on roofs in summer, for example, can be stored in storage systems near the city, so that they can be used to meet heating demand in winter, explains Prof. Dahmke: "There can be no energy transition without heat transition."

In practice, heat storage may look like this: the storage systems, which are located up to 200 meters below ground level, have a closed water system and work similarly to heat exchangers. The water temperature is between 50 °C and 90 °C. "We have hypothetically investigated this scenario



Project start in Kiel 2017: scientists from Kiel, Flensburg, Mainz and Leipzig outlined the procedure for the four-year ANGUS II project.

Photo: Alina Kabuth



The figure shows underground variants of energy storage systems in natural geological formations. Various environmental assets and energy market sectors are listed at the top.

Figure: ANGUS

for Kiel. In order to store the solar thermal energy recoverable within the city underground, which corresponds to approx. 20% of the heating requirement, less than 10% of a 100 m thick layer in the subsurface is needed", Prof. Bauer adds. "This is how sufficient capacity remains for drinking water abstraction, for example."

The Kiel researchers know from the results of the ANGUS+ predecessor study that there are numerous good storage options in the ground beneath Schleswig-Holstein. "Hydrogen, synthetic methane from wind power and compressed air could be stored in salt caverns and in deep, porous rock formations. Warm water can be stored in the shallow subsurface", Dahmke reports.

The scientists then aim to review the findings of the process studies in large-scale thermal storage system laboratory tests. "Using around five tons of sediment, we intend to imitate nature and study which processes are closely linked to different types of heat storage under controlled conditions. The focus is on the immediate effects there are on the storage system itself, as well as on the surrounding stratum and shallow underground environmental assets

such as groundwater", explains project manager Dr. Alina Kabuth, who also supervises the networking of the working groups and organises symposia.

ANGUS II is funded by the Federal Ministry for Economic Affairs and Energy (BMWi) with a total of €6.7 million for four years until the end of 2020. The project partners are:

- › Kiel University: coordination and subproject Geological Modelling and Parametrisation
- › Helmholtz Centre for Environmental Research – UFZ, Leipzig: subproject Geochemical and thermal processes
- › Flensburg University of Applied Sciences: subproject Simulation of individual energy systems
- › Europa Universität, Flensburg: subproject Energy network modelling and future energy pathways
- › Johannes Gutenberg University, Mainz: subproject Evaluation of fault zones

## Technology under the Banner of Technology Transition



Center for Sustainable Energy Systems (ZNES)  
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From biogas upgrading to solar thermal, from island technologies to energy transition as a system transformation – the Europa-Universität Flensburg and Flensburg University of Applied Sciences have been researching jointly in the field of sustainable energy systems since 2012. The Center for Sustainable Energy Systems (ZNES), with its approximately 40 scientists, bundles the know-how of both universities in the relevant research fields. Together, both partners acquire a broad range of research projects and third-party funds. The network, with its five focal areas, strengthens the interdisciplinary research approach of the energy and sustainability science fields in Flensburg.

The **biomass** research field deals with the development of technologies for converting energy crops, residual biological substances, and waste and wastewater to recyclable materials and fuels. The focus is on the development of efficient and adapted biogas technology, and its integration in process chains for facilitating nutrient loops. Examples include the development of small, modular fermentation units, biogas upgrading using suitable fermentation unit design and process management, innovative pretreatment processes and fermentation residue treatment, as well as the integration into sustainable food production process chains.

ZNES develops long-term **climate protection concepts** for communities, corporations and businesses. When developing local climate protection concepts, in particular, greater acceptance of the results and higher chances of implementation are achieved by including all key players. In addition to individual technical-economical solutions, climate protection concepts for businesses comprise strategic corporate planning, based on a long-term company climate protection vision.

Questions related to the design of sustainable energy systems based on renewable energy sources and high energy efficiency are addressed in the **system integration and simulation** cluster. Both the development of consistent target systems with one hundred percent renewable energy

supplies, and the analysis and design of changeover paths from today's energy systems to the target systems, in the context of the energy transition, are addressed. Here, questions focusing on the interactions between different renewable energy sources and the integration of energy storage technologies are dealt with.

The **thermal energy systems** research emphasis focuses on the role of individual installations and thermal energy technology concepts in current and future energy supply systems. Examples of such systems are solar thermal power stations, compressed air energy storage plants, systems for combined heat and power or other advanced heating systems. Here, the focus is on the evaluation, development and optimisation of such energy installations.

The **wind** research field is represented by Flensburg UAS Wind Energy Technology Institute (WETI). The WETI conducts research on various fields of wind power technology. The topics covered range from grid integration, controls, mechanical loads to structures of wind turbines. Research projects are primarily conducted in cooperation with companies from the wind power business. The results of these projects are relayed to the scientific community as well as the broader public. As part of the Flensburg UAS the WETI performs scientific education for both undergraduate and post graduate students.

Currently, these professors work at ZNES:

- Prof. Dr. Jens Born  brief bio page 66
- Prof. Dr. Torsten Faber  brief bio page 67
- Prof. Dr. Olav Hohmeyer  brief bio page 64
- Prof. Dr. Clemens Jauch  brief bio page 69
- Prof. Dr. Bernd Möller  brief bio page 65
- Prof. Dr. Ilja Tuschy  brief bio page 74
- Prof. Dr. Jochen Wendiggensen  brief bio page 77

## Technology and tomorrow's young professionals

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The Wind Energy Technology Institute (WETI) is all about wind energy - whether it is about applied research projects, students education or transfer of technology. The WETI is part of Flensburg University of Applied Sciences and founded in 2010. Its activities are conducted in close collaboration with companies from the region. Additionally, future specialists are trained in six study programs.

The main objective is to develop new wind turbines or single components to be more efficient, cost-effective and intelligent. In order to achieve this, it is important to break new grounds and develop new concepts like rotor blades made from wood or guyed tower design, explained by



WETI's director Prof. Dr.-Ing. Torsten Faber. Another point of interest is the development of the strategies to support power system stability with wind turbines.

Tasks covered by the WETI include various research topics, student education, transfer of technology and public relation work. The WETI is an endowment institute which is supported by the Flensburg University of Applied Sciences, the Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH (EKSH) as well as from wind energy related businesses. Outside parties are informed via presentations, advanced training programs, research projects as well as by scientific publications, popular science publication and consulting services. (The WETI plays an important role as a link between universities and industry partner concerning student research projects in wind energy related companies). Further, the WETI organises national and international cooperations with other research institutes, universities and companies working in the wind industry.

How wind turbines can support power system stability is part of the research project "Bereitstellung von Regelleistung und Systemträgheit mit Windenergieanlagen". In collaboration with the wind turbine manufacturer Suzlon Energy a synthetic inertia controller is being developed which enables the wind turbine to stabilise the electrical grid. Prof. Dr. Clemens Jauch explains, that an inertial support from wind turbines is essential for power system stability, especially in power systems with a high share of renewable energy sources.

A new way to supply power systems with synthetic inertia via wind turbines was also developed by Clemens Jauch, for which he received the special award "Green Economy" in 2016 at the "Ideenwettbewerb Schleswig-Holstein". The basic concept of the system resembles a pirouette performed by a figure skater. Prof. Dr. Clemens Jauch explains: "If a figure skater rotates with arms stretched out, she has a higher moment of inertia and rotates at slower speed. Pulling the arm in increases the rotational speed. This principle was transferred to a wind turbine's rotor." Each rotor blade is equipped with two piston accumulators, one installed at the blade root and one close to the blades tip. One accumulator is filled with a movable liquid. For example: If the liquid is stored at the accumulator at the blade tip, the moment of inertia is high and kinetic energy is stored. In the event the power system has to be stabilised with additional energy, the liquid is pumped into the accumulator at the blade root. Hence, the rotor speed increases and the wind turbine feeds-in additional power to the electrical

Victory with small wind turbine: WETI students on the Wind Engineering master's course won an international competition in Delft, the Netherlands.

Photo: WETI

grid. By this means the grid frequency can be restored to its nominal value.

Other research projects, which are supported by the EKSH, are as well consider the development of a monitoring concept to early detect damages at wind turbines or to develop new concepts for continuous feed-in management. Due to continuous feed-in management wind turbines are able to feed-in more power in the event of grid bottlenecks. This is especially important for Schleswig Holstein, as wind turbine capacity exceeds grid capacity and the grid operator has to intervene in order to secure grid stability. A PhD project researches new tower concepts: "Windenergieanlagenturm-Konzept mit Azimutlager am Turmfuß". The tower comes in different shapes and is geared according to wind direction. As a result, the durability as well as the energy efficiency are increased.

Education of future specialists is an important part of the WETI. The master programs "Wind Engineering" and "Systemtechnik" as well as the bachelor programs "Elektrische Energiesystemtechnik", "Energie- und Umweltmanagement", "Maschinenbau" and "Regenerative Energietechnik" at Flensburg University of Applied Sciences, as well as the master programs "Energie- und Umweltmanagement" and "Energy and Environmental Management" at the Europa Universität Flensburg offer a wide selection to teach future specialists associated with energy system transition. Prof. Dr. Torsten Faber explains: "it's important that the students comprehend how the wind turbine components operate that are not part of their specialist field. The master program "Wind Engineering" qualifies students for a holistic view on wind turbines. The demand for well-trained specialists is huge and is most likely to increase in the future."



The achievements of the rather young master program speaks for itself: Designed for locations with low average wind speeds a team of 24 students from five different countries developed a wind turbine called "Optimus150". The new concept could set a new standard for onshore wind turbines.

The Optimus150 team leader Markus Starr explained, that the efficiency of the wind turbine is interesting for investors in terms of the cost-benefit-factor. Markus Starr is in his third semester in the master program "Wind Engineering" just like his team colleagues in the Optimus150 team. For three months, they kept working intensively on the project. Prof. Dr. Faber is satisfied with the project results, too. He explains: "We start with students from different backgrounds like electrical or mechanical engineering and teach them to become generalists in terms of wind turbine technology. The third semester of the master program is designed to train specialists in different disciplines



around the wind turbine. Those specialists have a good understanding of the entire wind turbine but are experts in their particular field of work."

The team

**Endowed professors:**

- › Prof. Dr.-Ing. Torsten Faber  Brief bio, page 67
- › Prof. Dr. Clemens Jauch  Brief bio, page 69


**Associate professors and lecturers (for teaching in the master course Wind Engineering):**

- › Prof. Dr.-Ing. Christian Keindorf (Kiel UAS)  Brief bio, page 99
- › Prof. Peter Quell (Kiel UAS)  Brief bio, page 103
- › Dr. Hermann van Radecke  Brief bio, page 71
- › Prof. Dr. Klaus Rave  Brief bio, page 106
- › Prof. Dr. Alois Schaffarczyk (Kiel UAS)  Brief bio, page 106
- › Prof. Dr.-Ing. Reiner Schütt (West Coast UAS)  Brief bio, page 124

**Research assistants:**

- › Laurence Alhrshy, Arne Gloe, Elisabeth Kose, Jan Leichhauer, Marcel Schedat, Henning Thiesen

**Doctoral students:**


- › Sebastian Hippel und Achim Struve  page 130

**Assistants:**

- › Ulrike Reiche und Barbara Simonsen

**Institute founders**

- › Allgemeiner Verband der Wirtschaft Norddeutschlands e.V. (AGV Nord)
- › Denker & Wulf AG
- › GL Garrad Hassan Deutschland GmbH (DNV GL)
- › EasyWind GmbH
- › Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH (EKSH)
- › HanseWerk AG
- › OffTEC Base GmbH & Co. KG
- › Senvion GmbH
- › Siemens Wind Power
- › WKN AG

 EKSH-information brochure no. 6/2018 (German)

## How the Future Becomes Practical

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Prof. Dr. Gunther Gehlert (Project manager QUARREE 100)  
Brief bio page 122



Because the wind at the North Sea drives energy transition as industriously like nowhere else, the West Coast University of Applied Sciences in Heide has a particularly strong bond with this topic. It pursues activities in research and academia, some of which are unique across the country.

„With us, your studies are as interdisciplinary as your later work in the energy industry.“ The Green Energy Center of excellence at West Coast UAS works according to this motto. Green Energy can even be learned in the aptly named master's program. The special feature of this course, unique in the German higher education landscape: with its technology, business administration and law aspects, it combines the struts of energy transition. No wonder, then, that the course is in high demand. „We have students from all parts of Germany“, said Vice President Prof. Reiner Schütt happily about the success of this program, which offers graduates excellent career prospects, not only in northern Germany.

The West Coast UAS also bundled its green expertise in research. A total of six professors joined forces in the Green Energy Center of excellence in order to promote interdisciplinary energy transition research. With its center of excellence, the UAS is in a position to investigate, comprehensively and practically, energy transition questions in technical, economic and energy law terms.

Meanwhile, the activities of the university in Heide, meanwhile, are also incorporated in very tangible initiatives which radiate far beyond the west coast. The QUARREE 100 project, which is expected to run until 2023, began in November 2017 with the aim to demonstrate how a residential area that is past its best years in terms of energy standards can, as it was, be catapulted to the forefront of the movement. The Rüsddorfer Kamp district, in Heide, is around 20 hectares in size. The majority of buildings are blocks of flats built in the 1950s to 1960s, occasionally also single-family homes and commercial operations. The idea is to develop efficient power, heating and fuel supplies there following comprehensive energy refurbishment, which – as the number 100 in the project name suggests – is delivered entirely by renewable energy sources.

Because of the heavy use of wind power, the power supply itself is a smaller challenge. What is more exciting, is developing what Prof. Schütt calls, resilient systems. That is, systems that can handle natural variations in the generation of green energy and can also make the energy available in the form required respectively. Transforming surplus wind energy into heat using the heat pumps and storing it efficiently before it is needed is one way to do so. What would otherwise be wasted power can also be collected electrochemically in centralised battery storage systems and in gas storage systems. Finally, one of the goals of QUARREE 100 is that the people living in Rüsddorfer Kamp can move around on a one hundred percent renewable basis. The aim is to test hybrid solutions for individual and public transport. For example, a filling station of the future may deliver renewably produced hydrogen, methane and electricity as alternative sources of power for vehicles.

More than €25 million will be invested in QUARREE 100, thanks to funding from the Federal Ministry of Education and Research, among others. This sum alone indicates that the West Coast UAS, which is of manageable dimensions with 2,000 students and 160 employees, needs partners for this project. Among others on board are the University of Bremen with its Institute for Resilient Energy Systems and Baden-Württemberg's Center for Solar Energy and Hydrogen Research.

The topic of hydrogen, in particular, plays a prominent role. Heide refinery, which almost solely supplies Hamburg airport with kerosene and represents a real economic heavyweight on the west coast, is a local facility. The refinery aims to tackle issues of the future in collaboration with West Coast UAS and makes sustainable use of the previously governed down wind power in front of the company door. Even beyond the usual power supply, it should also serve the production of CO<sub>2</sub>-neutral synthetic kerosene, so-called Synfuel. One of the main arguments against this process, the high energy expenditure, would thus be nullified; however, there is still a considerable way to market maturity. Since legal as well as business aspects have a role to play here, cooperation with the West Coast UAS is almost inevitable. Meanwhile, the SmartRegion Pellworm model has been successfully implemented, while being

continuously refined. Beginning on its own campus, West Coast UAS aims to deepen its work on the topic of heat energy, not only theoretically but also practically, with regard to existing elements such as energy storage and management. Here, development can be based on many existing aspects. West Coast UAS already generates energy from wind and the sun, including a certain amount of electrical storage capacity. The self-produced renewable energy will be utilised in heat supply for a new building which is currently being constructed. As the produced energy is volatile over time, a special focus lies on additional heat storage and the automation and control system.

In the meantime, the concept of the intelligent weeding robot, known beyond the state's borders, is unexpectedly related to renewable energy. No pesticides, but instead a machine that recognises weeds using intelligent cameras,

in order to then mechanically destroy them, is the principle. With the Westhof Bio company group from Friedrichsgabekoog, a Major League partner was acquired. Image recognition is currently satisfactory. The next step will be to make weed killing more extensive and profitable by using larger weeding equipment.

Another project is based on West Coast UAS tourism expertise. A number of companies and institutions have come together under the umbrella of a Northern Energy & Sustainability Trail (NESTrail) within the Integrated Territorial Investment - West Coast Tourism and Energy Excellence program. The aim is to open up tourist facilities and energy transition projects to a broader public and thus turn energy transition into a perceptible attraction for holidaymakers.



Energy park on the grounds of the West Coast UAS and participants in the West Coast UAS Green Energy Center (from left to right: Prof. Thomas Haack (governance), Prof. Reiner Schütt (grid integration/automation), Prof. Michael Berger (spokesperson), Prof. Gunther Gehlert (Power-to-X), Prof. Oliver Opel (environmentally compatible building systems engineering), Prof. Christian Buchmüller (energy transition law)).



## Research dialogue for regional energy issues

Wissenschaftszentrum für intelligente Energienutzung

Prof. Dr. Cecil Bruce-Boye

 Brief bio page 116

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The Lübeck UAS Wissenschaftszentrum für intelligente Energienutzung (WiE – Scientific centre for intelligent energy use) enjoys intensive dialogue and knowledge transfer with small and medium-sized energy supply companies, energy-intensive businesses, the trades and interested citizens. The work focuses on research and development, as well as qualification in the modern energy supply and the energy industry.

The research emphases at WiE are energy information technologies for decentralised, regional upgrading of energy infrastructure for intelligent energy conversion and use. In addition, the scientists research the effects and interactions of the legislative framework on technological change within the energy industry.

Today's energy grid is characterised by its good availability and constant good grid quality. Technologies and procedures have been developed over many years for this purpose. The energy industry has successfully established itself using this energy infrastructure in an environment moulded by a regulatory, political and economic framework.

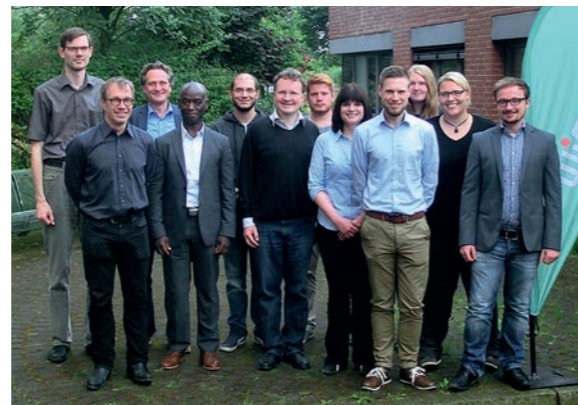
Whereas in the past it was exclusively the role of centralised large power plants to guarantee the reliable distribution of electrical energy to the consumer, the task now is to also integrate fluctuating quantities of electricity, for example from wind or solar energy, in the grid.

The increasing proportion of volatile, renewable energy in the electricity supply and its decentralised feed-in to the energy supply networks, in particular in the low voltage ranges, initially appear to contradict the guarantee of good availability and constant good grid quality. "A new generation of electricity grids must control the behaviour of all users integrated in the electricity grid so intelligently that a cost, resource, and low-pollutant as well as a sustainable energy industry will be achieved, based on regenerative and low-risk energy forms," emphasises the head of the scientific centre, Prof. Cecil Bruce-Boye.

WiE is part of the project NEW 4.0 (see page 22). In the ICT working group there will be developed multi-agent systems projects and energy efficiency of ICT systems. In the training and further education working group, WiE designs online modules in the field of intelligent energy.

As part of an international research project carpeDIEM, the WiE is developing intelligent control mechanisms for the efficient management of subautark microgrids.

Since summer 2016, WiE has been designing a project with state funding: the master course of studies "Intelligent Energy". This should offer continuing industry-specific and scientific education opportunities for the staff of companies in the energy industry. The Master's degree program is characterized by a deepening and interdisciplinary education with shares of computer science, business administration, power engineering, energy industry, environmental technology and automation technology. Furthermore, the study should empower for scientific work and provide formal and personal conditions for a doctorate. The course is a part-time continuing education program and should also be based on a knowledge transfer using e-learning support. It is aimed at course graduates of the disciplines energy technology and automation technology with a bachelor's degree or diploma that are already employed in the energy industry. The project lasts till summer 2018.



The WiE-Team: Prof. Dr. Carsten Lüders, Prof. Dr. Dirk Jacob, Prof. Dr. Hans Schäfers (Cooperating partner), Prof. Dr. Cecil Bruce-Boye, Jendrik Menz, Dr. Joachim Staats, Joscha Höck, Dr. Sabrina Ernst, Henning Meyer, Fenja Früchtenicht, Mareike Redder, Malte Myrau.

## Goodbye Campus: Green Start-up Made Easy

Green Entrepreneurship Center (GEC) Flensburg

Prof. Dr. Dirk Ludewig

 Brief bio, page 70

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The Green Economy is both a global and a German growth market, which will probably more than double between 2013 and 2025. For Schleswig-Holstein, too, the Green Economy is extremely important to employment and added value. This especially applies to renewable energy forms. Almost every fifth start-up in the northernmost state is green today. The Green Entrepreneurship Center in Flensburg supports universities in encouraging new, green start-up potential.

Renewable energies have been identified as one of five relevant fields of specialisation of the Schleswig-Holstein Regional Innovation Strategy. In 2013, 15,740 people were employed in renewable energies in Schleswig-Holstein alone, an increase of 440 compared to 2012. The number of companies in the renewable energy sector has increased from 2,376 in 2012 to 2,629 in 2014. Green start-ups and innovations are more influential in shaping the transformation towards environmental sustainability of the economy than established companies and at the same time drive economic growth. Start-ups in the Green Economy in Schleswig-Holstein reveal lively dynamics. Today, 17 percent of all start-ups are green start-ups (compared to 14 percent nationally).

The Jackstädt-Entrepreneurship-Center (JEC), and Flensburg University of Applied Sciences in particular, have successfully established themselves in the field of entrepreneurship. Flensburg University of Applied Sciences builds on a wealth of experience, structures and networks in the field of Green Entrepreneurship, in Schleswig-Holstein, Germany and Denmark. The Jackstädt-Entrepreneurship-Center (JEC), together with the Green Entrepreneurship Center (GEC), therefore specialises in raising green economic potential at universities in Schleswig-Holstein.

An online presence with a comprehensive database is being developed as a central information platform, with the relevant start-ups, universities, business promoters, projects and partners in local and state politics, and is accessible for the public via a networking tool. A Green Entrepreneurship Newsletter for parties interested in start-ups, as well as special newsletters for start-up supporters (each with university focus), are sent out regularly. In addition, Green Entrepreneurship ideas, competitions or subprizes

are supported. Moreover, GEC conducts scouting and informational visits to national partners.

In the field of qualifications, GEC offers a portfolio of different formats. These include, for example, Green IdeaLabs or Train the Trainer Workshops. A so-called incubator represents a special means of mentoring and networking partner for questions related to business concepts, subsidies and financing, and supports parties interested in start-ups.

GEC actively focuses on networking and is the point of contact and consultant for partners and politics. Again, there are special event formats, e.g. green financing events (matching green business ideas with investors) or the annual IGEF (International Green Entrepreneurship Forum).

Research in the field of Green Entrepreneurship is also promoted and published by GEC in the core fields of start-up support, green financing and investment. Doctoral theses as well as bachelor's and master's theses are supervised in the field of Green Entrepreneurship.

GEC is funded by the European Union – European Regional Development Fund (ERDF), the German federal government and the state of Schleswig-Holstein as a sub-project in the overriding StartUp-SH project.



GEC chief Prof. Ludewig talks with staff about preparing a Green IdeaLab on the campus in Flensburg.



# Research Institutes Covering Energy Research

Fraunhofer Institute for Silicon Technology  
Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research  
GEOMAR Helmholtz Centre for Ocean Research Kiel  
Kiel Institute for the World Economy (IfW)  
Kiel Cluster of Excellence "The Future Ocean"

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## Innovative Power for Batteries and Power Electronics



Institute Management  
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The Fraunhofer Institute for Silicon Technology (ISIT) in Itzehoe is one of the most advanced European research establishments for microelectronics and microsystems technology. Around 160 employees with engineering and scientific profiles collaborate closely with partners in industry to develop components for power electronics and microsystems with fine, movable structures for sensors and actuators, including the necessary housing technology. These miniaturised components are used in medical applications, environmental and transport technology, communications technology, the automotive industry and in mechanical engineering.

Fraunhofer ISIT operates two clean room facilities large enough not only for research, but also to produce, on an industrial scale, the microchips developed in collaboration with partner companies.

Power electronics, one of the central research topics at Fraunhofer ISIT, turned into a key 21st century technology, guaranteeing energy efficiency. Using state-of-the-art semiconductor devices, as developed by ISIT in a variety of projects, made it possible to significantly increase the efficiency, power density and reliability of individual components as well as systems such as converters for wind turbines.

Here, ISIT constantly drives steady miniaturisation progress while simultaneously increasing the power density at the system and component level. For example, gallium nitride (GaN) was introduced as a new material base for innovative power semiconductor components. Compared to silicon, it offers a number of advantages in the production of power devices and enables significantly smaller devices with excellent electrical properties. GaN transistors are central elements in power modules, e.g. as converters in electric vehicles or in photovoltaic systems and wind turbines, and they help to make these systems considerably more powerful and durable.

ISIT is a co-initiator of the major NEW

4.0 project funded by the German Federal Ministry for Economic Affairs and Energy (see page 22/23). Here, research is carried out into how flexibility can be used to aid system stability and how important system-stabilising services can be provided by novel control methods, among other things. In addition, overall system simulation is supported.

Energy storage based on lithium-ion batteries is also an important research topic at Fraunhofer ISIT. Each application places its own demands on the storage system, e.g. a particularly high energy density for a long range in electric vehicles or a high power density for rapidly charging and discharging batteries. The latter topic is of particular interest for storing wind energy for grid stabilisation. One aspect of research currently focuses on developing high-performance batteries that can be charged in less than four minutes and deliver all their energy in a minute when needed. In addition to this, next generation energy storage systems are researched, such as the lithium-sulphur battery.

In all these activities, Fraunhofer ISIT pays special attention to production-oriented development. As a result, ISIT laboratory processes have repeatedly been successfully transferred to the production environment of several battery manufacturers, including local companies.



Fraunhofer Institute for Silicon Technology in Itzehoe.

Photo: ISIT

## Know-how for Lightweight Materials and Climate Protection



Centre for Materials and Coastal Research

Scientific Director  
Prof. Dr. Wolfgang Kaysser

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More than 1,000 employees currently work at the Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research (HZG) at its headquarters in Geesthacht and at the branches in Teltow near Berlin. Their work focuses on current, key scientific, economic and social issues: for example, new lightweight materials, functionalised materials in medical and materials research, environmentally friendly technologies, the climate of the future and management of the coastal and marine environment.

### Materials – Lightweight and Flexible

In the field of materials research, scientists are developing and testing particularly lightweight and functional materials based on magnesium and titanium. The tasks range from alloy development through innovative production and processing technologies to the characterisation and testing of developed materials. The overarching goal is to make cars and aircraft lighter and thus conserve raw material and energy resources.

In addition to metallic materials, HZG looks at polymer materials for membranes and environmentally friendly and resource-saving applications in chemical process technology. These serve water purification or the reduction of ship flue gases, for example.

Another field of research is dedicated to polymeric and metallic biomaterials. They are being developed for medical applications, such as implant materials or for use in the regeneration of cells and tissues.

### From Fundamentals to Innovation

Under this guiding principle, coastal research addresses the problem of increasing settlement and industrialisation pressures in coastal regions worldwide, as well as natural hazards such as storm surges, because almost half of the world's population now lives less than 100 kilometers from the coast.

Climatic changes, material flows and coastal habitats require professional management; scientific monitoring is one of the tasks of the coastal researchers in Geesthacht. Their objective is to contribute to a better understanding of natural processes and anthropogenic coastal impacts by means of observations, analyses and models.

In addition, HZG operates two service facilities for knowledge transfer in the field of climate research:

1. **The Climate Service Center Germany (GERICS)** develops scientifically based prototype products and services to support decision-makers in politics, business and society in adapting to climate change. The focus is on the topics of water, energy, ecosystems and cities.

2. **The North German Coastal and Climate Office:** North German partner in questions of climate. Climate change is often perceived as a global problem. Because the impact of climate change varies from region to region, scientifically based information on possible climate change impacts in the different regions is needed. The Climate Office makes climate research information available, in particular for Northern Germany.

### In brief: At HZG ...

- › More than 1,000 people from 57 nations work
- › in 4 institutes: biomaterials research, coastal research, polymer research and materials research, as well as
- › In GERICS, the Climate Service Center Germany – the climate change information and consulting platform
- › At the two branches in Geesthacht (headquarters) and Teltow near Berlin, and
- › At the external offices in Hamburg and Munich in the German Engineering Materials Science Centre-GEMS.

## Tracking Down the Secrets of the Ocean



CEO  
Prof. Dr. Peter M. Herzig

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www.geomar.de



The GEOMAR Helmholtz Centre for Ocean Research Kiel, with around 1,000 employees, is one of Europe's leading ocean research institutes. The scientists study chemical, physical, biological and geological processes in the ocean and their interactions with the seabed and the atmosphere. These include major basic research projects such as the Future Ocean Cluster of Excellence and Collaborative Research Centre 754 Climate Biogeochemical Interactions in the Tropical Ocean. In addition to basic research, GEOMAR also addresses practical topics. Of the latter, the following are of interest to commercial enterprises:

- › Active mineral and marine agents
- › Gas hydrates

GEOMAR holds a powerful research infrastructure at its disposal. This includes four of their own research vessels: the only manned German research submersible JAGO, the underwater robots KIEL 6000, PHOCA, HyBis and ABYSS, as well as various long-term observatories. On land, too, the institute offers excellent working conditions with leading European isotope analysis equipment, access to powerful mainframes and one of the largest marine science libraries in Germany.

Amongst others the research priorities on marine resources and climate research include:

### Marine resources

The extent and potential uses of the living and non-living resources in the world's oceans are still largely unknown. However, the use of the oceans' biological, mineral and energy resources will become increasingly important by the end of this century in view of the rapidly increasing global population. The usable resources available in the world's oceans can be divided into:

- › **Living resources:** important in terms of nutrition, pharmaceutical applications (active agent research) and regenerative energy sources
- › **Non-living resources:** metallic and energy resources or potential submarine CO<sub>2</sub> storage systems (important in questions of climate protection)

Manned underwater submersible JAGO.

Future research fields include:

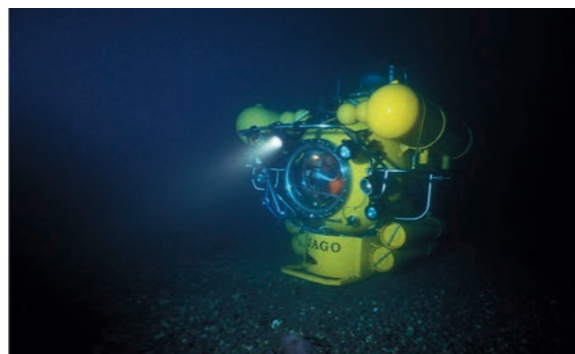
- › The exploration of new mineral and energy resources
- › The investigation of genetic resources in the oceans
- › The development of environmentally friendly and sustainable utilisation strategies

Resource exploitation of manganese nodules, massive sulphides, gas hydrates and heavy minerals, for example, will affect both the non-living environment and the essential functions of marine ecosystems. Thus, it is extremely important to harmonise the use of resources and the protection of the underwater world.

### The Ocean and Climate Change

The oceans play a central role in global climate change on our planet. A prominent example of this is the Gulf Stream, emerging in the Caribbean, and possible reactions to the melting of Greenland's inland ice. In addition, the uptake and transportation of gases and solid particles in the ocean, and their exchange with the atmosphere, both affect the climate, because some of these substances are chemically active and can influence the atmosphere's radiation budget. The central research topics are:

- › Understanding past, present and future changes in ocean circulation
- › Changes in tropical and temperate latitudes
- › Past and present oceanographic and climatic conditions in the Arctic
- › Changes in the composition and function of marine biocoenoses
- › Future climate warming: investigation and modelling
- › Past geochemical changes in the oceans



## Prof. Dr. Mojib Latif



Active in ocean circulation and climate dynamics  
At the institute since 2003

Tel +49 431 600-4050  
mlatif@geomar.de

### Core Expertise in Energy Research

- Natural climatic fluctuations
- Human influence on the climate
- Development of climate models

### Leadership Duties Relevant to Energy Research

- \_ Future Ocean Cluster of Excellence board member
- \_ Head of GEOMAR's maritime meteorology research unit
- \_ Chairman of Deutsche Klima-Konsortium e. V. (DKK)
- \_ President of the German CLUB OF ROME society

### Miscellaneous

#### Books

- \_ Latif, M. (2017): Die Meere, der Mensch und das Leben. Bilanz einer existenziellen Beziehung. Herder Verlag.
- \_ Latif, M. (2014): Das Ende der Ozeane – Warum wir nicht ohne die Meere überleben werden. Herder Verlag.

#### Peer Reviewed Publications

- \_ Wengel, C., Dommenges, D., Latif, M., Bayr, T., Vijayeta, A.

(2018): What controls ENSO-amplitude diversity in climate models? Geophys. Res. Lett.

\_ Khon, S., Schneider, B., Latif, M., Park, W., Wengel, C. (2018): Evolution of Eastern Equatorial Pacific Seasonal and Interannual Variability during the Holocene and Eemian from Model Simulations. Geophys. Res. Lett.

All publications since 1984 can be found on the GEOMAR Institute website (see QR code)

### Global Land and Ocean Temperature Anomalies

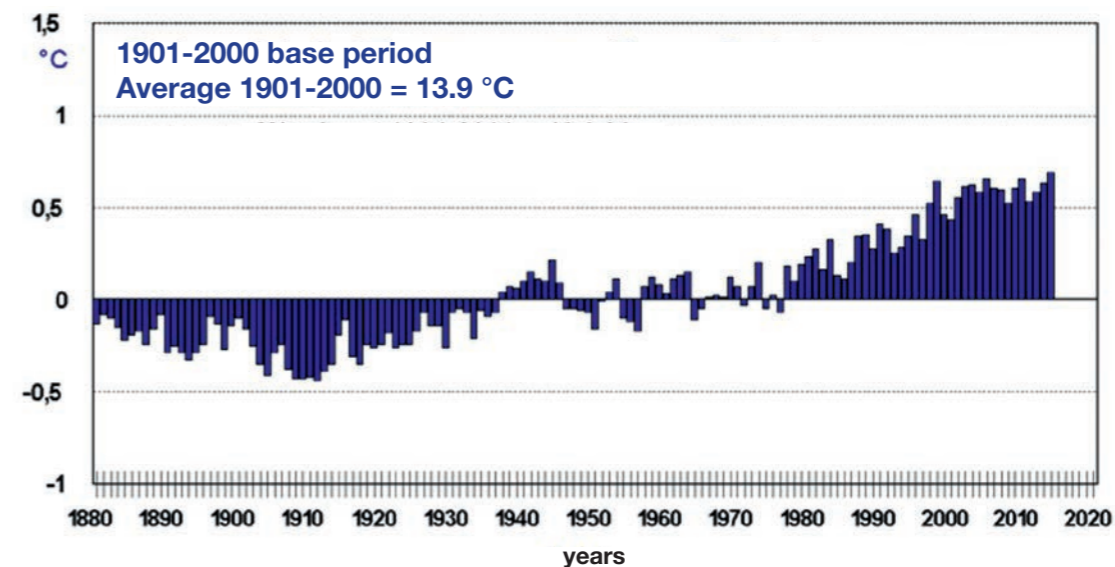


Figure: NOAA

### Further information

www.geomar.de

### Detailed researcher profile



## Economic Problem Solver



President  
Prof. Dennis J. Snower

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www.ifw-kiel.de



Founded in 1914, the Kiel Institute for the World Economy (IfW) at Kiel University is regarded as one of the world's most important centres for global economic research, economic policy advice and economic education. The institute is a member of the Leibniz Association. It employs around 170 personnel, more than 90 of them scientists. Around €13.7 million/per annum (2016) are available for research and project work.

The institute sees its main task in researching innovative solutions for urgent global economic problems. Based on the results of this research, it advises politics, business and society and informs the interested public about important economic policy relationships.

As a gateway to global economic research, it maintains a wide-ranging network of national and international experts, whose research work directly or indirectly flows into Kiel Institute research and consulting activities.

Kiel Institute places a particular emphasis on economic education and training, and cooperates closely with the largest business and social science library in the world.

Kiel Institute activities are organized in seven research fields and two economic policy advice centres. The **environmental and natural resources** field focuses in particular on energy research, which has developed models and practical instruments, building on the 2030 Sustainable Development Agenda with its 17 Sustainable Development Goals (SDGs) and the Paris Agreement on Global Climate Change, which can be adopted to:

- › evaluate various conflicting policy objectives,
- › provide options for political decision-makers, and
- › identify synergies and solutions.

Humanity works at the expense of future generations. We consume natural resources faster than they can regenerate, thus harming the climate, ecosystems, habitats and biodiversity. However, the influence of the environment and natural resources on the development and prosperity of societies has received little attention in political decisions to date. The two United Nations decisions could mark

a turning point towards shaping sustainable national and international politics.

The projects in this research field can be assigned to the three main emphases of **climate, land and ocean**.

Anthropogenic **climate change** represents one of the greatest challenges to future sustainable development. The reduction of greenhouse gas emissions is a particular focus. This includes, among other things, the potentials and risks of technologies for achieving negative CO<sub>2</sub> emissions and their public acceptance.

The sustainable **use of biomass** represents an enormous challenge in feeding a growing global population, substituting fossil fuels by renewables and storable energy, and preserving ecosystems. An exemplary research field studies the use of the scarce resources water and land, and pays special attention to international feedback.

The **ocean** regulates the global climate, provides numerous natural resources and ecosystem services, provides the transportation routes for international trade and is essential for recreation and leisure, as well as for the cultural identity of humans. One of the problems addressed here is all about how we measure this welfare contribution and agree on international regulations? Research on this topic is closely interlinked with Kiel's interdisciplinary Future Ocean Cluster of Excellence. (See page 61)

## Prof. Dr. Sonja Peterson



Scientific Managing Director at Kiel Institute  
Environment and Natural Resources research department

Honorary professor in the economics and social sciences faculty at Kiel University  
At the institute since 2002

Tel +49 431 8814-406  
sonja.peterson@ifw-kiel.de

### Core Expertise in Energy Research

- International, European and domestic climate and energy policy
- Environmental policy instruments
- Climate-economy modelling

### Leadership Duties Relevant to Energy Research

\_ Member of Leibnizforschungsverbund Energiewende (LVE) (Leibniz Energy Transition Research Alliance) steering group

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Alexander Roltsch, Die EEG Reform 2017: Eine ökonomische Analyse der Vor- und Nachteile, 2017
- \_ Birte Ewers, Fossil Fuel Divestment, Carbon Risk, and Climate Change Mitigation. Dynamics in an Agent-Based simulation, 2016
- \_ Jana Herr, Electricity Price Reduction by Renewable Energy Generation. The Merit-Order-Effect for Germany 2010-2015, 2016
- \_ Peter Kolbe, How the oil price affects regional welfare under different climate policies, 2015

### Energy and Climate Protection R&D Projects

#### ETSPLUS – Consistent promotion of renewable energy resources through an expansion of European emissions trading

Funding volume: €635,000 (Fachagentur nachwachsende Rohstoffe)  
Cooperating partners: Meo Carbon Solutions, University of Göttingen

#### CORE – A cooperative approach to future climate policy

Funding volume: €135,000 Federal Ministry of Education and Research)  
Cooperating partners: Fraunhofer Institute for Systems and Innovation Research (ISI), Karlsruhe; Karlsruhe Institute of Technology (KIT)

### An experimental study of climate policy negotiations: implications for policy design and impact assessment (EXPECT)

Funding volume: €110,000 Federal Ministry of Education and Research)  
Cooperating partners: Kiel University, Chair for Innovation, Competition Policy and New Institutional Economics

### Miscellaneous

- \_ Co-organiser: Kieler Energiediskurs – Gespräche zur Energiepolitik (Kiel Energy Discourse - Energy Policy Talks)
- \_ Member of T20 Task Force Climate Policy and Finance

### Publications

- \_ Peterson, S. & Weitzel, M. (2016): Reaching a climate agreement - compensating for energy market effects of climate policy. *Climate Policy* 16:8, 993-1010.
- \_ Hintermann, B., Peterson, S. & Rickels, W. (2016): Price and market behavior in phase II of the EU ETS. *Review of Environmental Economics and Policy* 10(1): 108-128.
- \_ Weitzel, M., Ghosh, J., Peterson, S. & Pradhan, B.K. (2015.): Effects of international climate policy for India: Evidence from a national and global CGE model. *Environment and Development Economics* 20(4): 516-538.
- \_ Rickels, W., Görlich, D. & Peterson, S. (2015): Explaining European Emission Allowance Price Dynamics: Evidence from Phase II. *German Economic Review* 16(2): 181-202.
- \_ Heitmann, N. & Peterson, S. (2014): The Potential Contribution of the Shipping Sector to an Efficient Reduction of Global Carbon Dioxide Emissions. *Environmental Science & Policy* 42:56-66.

### Further information

www.ifw-kiel.de

### Detailed researcher profile



## Prof. Gernot Klepper, PhD



Senior Researcher Environment and Natural Resources research department

Appointment as honorary professor by the state of Schleswig-Holstein: 1989  
At the institute since 1995

Tel +49 431 8814-485  
gernot.klepper@ifw-kiel.de

### Core Expertise in Energy Research

- Economic modelling
- Bioenergy promotion
- Biomass certification

### Leadership Duties Relevant to Energy Research

- \_ Chairman ISCC e. V. (International Sustainability and Carbon Certification)
- \_ Vice-chairman Deutsche Klima Konsortium (DKK e. V.)
- \_ Chairman of the scientific advisory board at Helmholtz Centre for Environmental Research – UFZ, Leipzig
- \_ Head of the Bioenergy working group within the framework of the acatech Energy Systems of the Future (ESYS) initiative – German Academy of Science, the National Academy of Sciences Leopoldina and the Union of German Academies

### Energy and Climate Protection R&D Projects

#### ETSPLUS – Consistent promotion of renewable energy resources through an expansion of European emissions trading

Cooperating partners: Meo Carbon Solutions, University of Göttingen

#### GLUES – Global Assessment of Land Use dynamics on Greenhouse Gas Emissions and Ecosystem Services

Cooperating partners: Helmholtz Centre for Environmental Research – UFZ, Leipzig, Technical University of Dresden, Kiel University, Potsdam Institute for Climate Impact Research, Institute for Biodiversity, M&Z Consulting Science for Sustainable Development, Rheinische Friedrich-Wilhelms-Universität, Bonn, Ludwig-Maximilian-Universität, Munich, con terra GmbH, Metronom – Agentur für Kommunikation und Design GmbH

#### ViWA – VirtualWaterBioNex – The Future of the Biomass Nexus

Cooperating partners: Ludwig-Maximilian Universität, Munich, Hannover University, Helmholtz Centre for Environmental Research – UFZ, Leipzig, GERICS, VISTA – Geoscience Remote Sensing GmbH, Leibniz Supercomputing Centre (LRZ), Bavarian Academy of Sciences, Munich.

#### Climate Economics Dialogue – Coordination of Accompanying Activities to the BMBF funding priority Economics of Climate Change

Funding: Eight German institutes for economic research

### Miscellaneous

#### Publications

- \_ Klepper, G., Rickels, W., Schenker, O., Schwarze, R. (2017). “Kosten des Klimawandels und Auswirkungen auf die Wirtschaft”, in: Guy P. Brasseur | Daniela Jacob | Susanne Schuck-Zöller (Hrsg.) Klimawandel in Deutschland
- \_ Mauser, W., Klepper, G., Zabel, F., Delzeit, R., Hank, T., Putzenlechner, B., Calzadilla, A. (2015). Global biomass production potentials exceed expected future demand without the need for cropland expansion. *Nature Communications*, 6, 8946.
- \_ Klepper, G., Rickels, W. (2014). Climate Engineering—Economic Considerations and Research Challenges. *Review of Environmental Economics and Policy*, 8, 270-289.
- \_ Narita, D., Klepper, G. (2016). Economic Incentives for Carbon Dioxide Storage under Uncertainty: A Real Options Analysis. *International Journal of Greenhouse Gas Control*.

#### Further information

www.ifw-kiel.de

#### Detailed researcher profile



## Dr. Ruth Delzeit



Environment and Natural Resources research department

At the institute since 2010

Tel +49 431 8814-405  
ruth.delzeit@ifw-kiel.de

### Core Expertise in Energy Research

- Biofuel policy
- Land use competition
- Bioenergy

### Leadership Duties Relevant to Energy Research

- \_ Head of environmental and natural resources research field (together with Dr. Wilfried Rickels)

### Energy and Climate Protection R&D Projects

#### ViWA: Multiscale Monitoring of Global Water Resources and Options for their Efficient and Sustainable Use

Project duration: 2017 to 2020

Funding: Federal Ministry of Education and Research

Cooperating partners: Project manager: Kiel Institute for the World Economy, Ludwig-Maximilian Universität Munich

#### BioNex – The Future of the Biomass Nexus

Project duration: 2017 bis 2020

Funding: Federal Ministry of Education and Research

Cooperating partners: Project manager: Kiel Institute for the World Economy, Ludwig-Maximilian Universität Munich

#### MOD\_GW – Modelling and Shaping Sociopolitical Decision-making Processes to Facilitate the Establishment of Sustainable Economic Systems in Industrialised and Developing Countries

Project duration: 2017 to 2019

Funding: Federal Ministry of Education and Research

Cooperating partners: Institute for Agricultural Economics at Kiel University

#### Options for Consistent Promotion of Renewable Energy Sources

Project duration: 2013 to 2014

Funding: Federal Ministry of Education and Research

#### Assessing the Land Use Change Consequences of European Biofuel policies and its uncertainties

Project duration: 2011

Funding: European Biodiesel Board

### Miscellaneous

#### Publications

- \_ Calzadilla, A., Delzeit, R., Klepper, G. (2016): Assessing the Effects of Biofuel Quotas on Agricultural Markets. In: Dinar, A. (Eds.): *The WSPC Reference Set on Natural Resources and Environmental Policy in the era of Global Change, Computable General Equilibrium Models (Vol. 3)*, p.399-442.
- \_ Delzeit, R., Klepper, G., Söder, M. (2015): Sachstandsbericht über vorhandene Grundlagen und Beiträge für ein Monitoring der Bioökonomie: Wirtschaftliche Kennzahlen, Bericht für das Bundesministeriums für Bildung und Forschung, unterstützt durch das Forschungszentrum Jülich GmbH, Projektträger Jülich, 49p.
- \_ Britz, W., Delzeit, R. (2013): The Impact of German Biogas Production on European and Global Agricultural Markets, Land Use and the Environment. In: *Energy Policy*, 64, p.1268-1275.
- \_ Delzeit, R., Kellner, U. (2013): The impact of plant size and location on profitability of biogas plants in Germany under consideration of processing digestates. In: *Biomass and Bioenergy*, 52, p.43-53.
- \_ Delzeit, R., Britz, W., Holm-Müller, K. (2012): Modelling regional input markets with numerous processing plants: The case of green maize for biogas production in Germany. In: *Environmental Modelling and Software* 32, pp.74-84.
- \_ Delzeit, R., Holm-Müller, K., W. Britz (2012): Ökonomische Bewertung des Erneuerbare Energien Gesetzes zur Förderung von Biogas. In: *German Economic Review*, Wiley, 13(3), p.251-265.
- \_ Delzeit, R., Lange, M. (2012): Zusätzliche landwirtschaftliche Flächen reduzieren den Klimaschutzeffekt von Biokraftstoffen. In: *IfW Highlights 2012*, p.16-17.

#### Further information

www.ifw-kiel.de

#### Detailed researcher profile



## Dr. Wilfried Rickels



Environment and Natural Resources research department

At the institute since 2006

Tel +49 431 8814-408  
wilfried.rickels@ifw-kiel.de

#### Core Expertise in Energy Research

- Negative Emissionstechnologien
- Europäisches Emissionshandelssystem
- Nachhaltigkeitsziele der Vereinten Nationen

#### Leadership Duties Relevant to Energy Research

\_ Head of environmental and natural resources research field (together with Dr. Ruth Delzeit)

#### Supervised Bachelor's/Master's these

\_ *Jana Herr*, The Merit-Order Effect for Germany 2010–2015, 2016

#### Energy and Climate Protection R&D Projects

##### LEACC-II – Learning About Cloud Seeding in the Face of Uncertainty: Investigation on Feasibility and Traceability, on Incentives and Decentralised Control of Spatially Limited Climate Manipulation

Project duration: 2016 to 2019

Funding: Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Priority Program 1689 Climate Engineering

Cooperating partners: Kiel University, University of Leipzig

##### Benefits and Implications of an Optimal and Non-optimal Application for the Reduction of Atmospheric Carbon Dioxide (CDR) in Globally Coordinated and Non-coordinated Climate Policies

Project duration: 2018 to 2021

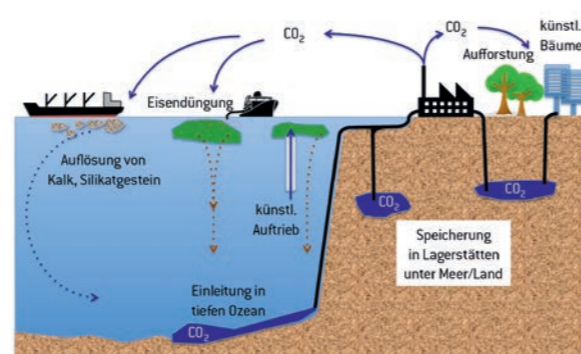
Funding: German Research Foundation, DFG

Cooperating partners: Kiel University, GEOMAR Helmholtz Centre for Ocean Research Kiel, Leibniz Institute of Ecological Urban and Regional Development, Dresden, Wageningen University

#### Miscellaneous

##### Publications

- \_ Quaaas, M., Quaaas, J., Boucher, O., Rickels, W. (2016): Regional climate engineering by radiation management. *AGU Earth's Future* 4(12): 618-625.
- \_ Hintermann, B., Peterson, S., Rickels, W. (2016): Price and market behavior in Phase II of the EU ETS, *Review of Environmental Economics and Policy* 10 (1): 108-128.
- \_ Rickels, W., Görlich, D., Peterson, S. (2015): Carbon Price Dynamics – Evidence from Phase II of the European Emission Trading Scheme, *German Economic Review* 16(2): 181-202.
- \_ Klepper, G., Rickels, W. (2014): Climate Engineering—Economic Considerations and Research Challenges, *Review of Environmental Economics and Policy* 8(2): 270-289.
- \_ Bahr, G., Narita, D., Rickels, W. (2012): Recent Developments in European Support Systems for Renewable Power, *Kiel Policy Brief* 53, Kiel Institute for the World Economy, Kiel.



Large-Scale Intentional Interventions into the Climate System? Assessing the Climate Engineering Debate. Scoping report for the German Ministry of Education and Research (BMBF), Kiel Earth Institute, Kiel.

Source: Rickels, W., G. Klepper, J. Dovern et al. 2011

#### Further information

[www.ifw-kiel.de](http://www.ifw-kiel.de)

#### Detailed researcher profile



## Kiel Cluster of Excellence “The Future Ocean”



Prof. Dr. Martin Visbeck (GEOMAR)  
Prof. Dr. Nele Matz-Lück (CAU)  
Prof. Dr. Ralph Schneider (CAU)

sprecher@ozean-der-zukunft.de  
[www.futureocean.org](http://www.futureocean.org)

#### Understanding the Ocean – Sustaining our Future

More than 250 scientists participate in the Kiel Cluster of Excellence “The Future Ocean” to investigate past, present and future changes in the ocean using a multidisciplinary approach: marine, geo-, life, social, economic and computer scientists, mathematicians and lawyers pool their expertise in interdisciplinary research groups in order to gain deeper insights in to the ocean system and the human – ocean interface. An improved basic understanding of the ocean facilitates more accurate predictions and scenarios. This new knowledge generated often in close cooperation with decision makers will inform sustainable development option.

Cluster research topics with a view to energy and climate protection:

- › **Ocean resources:** discover and evaluate energy related ocean resources and the establishment of appropriate best practices towards more sustainable exploitation.
- › **The ocean as a CO<sub>2</sub> storage system:** assessing the potentials and limitations of marine CO<sub>2</sub> sequestration and storage technologies
- › **Ocean interfaces:** accumulation, modification and transportation of climate-relevant substances on and above ocean surfaces

- › **Oceanic regulating systems:** the role of the ocean in climate and environmental changes and associated environmental impacts
- › **Predictions:** improving modern ocean and climate system models to shed light on changes in regional ocean dynamics and bio-geochemistry over the next 50 to 100 years

The fields of knowledge transfer, public relations and international activities, the ISOS (Integrated School of Ocean Sciences) graduate school and the IMAP (Integrated Marine Postdoc Network) postdoctoral network, as well as the school programs in the Kiel ocean:labor of the Kieler Forschungswerkstatt will help promote a close dialogue with both decision makers and society. The Future Ocean Cluster of Excellence is supported by the Kiel University, the GEOMAR Helmholtz Centre for Ocean Research Kiel, the Kiel Institute for the World Economy (IfW) and the Muthe-sius University of Fine Arts and Design), and is part of the Excellence Initiative funded by the Germany.



Research vessels are specially equipped to meet the demands of oceanographers and represent ideal platforms for exploring the oceans.

Photo: Maria S. Merian; Felix Gross, Kiel University

# Heads of Energy Research: Brief bios

## Europa-Universität Flensburg

Prof. Dr. Olav Hohmeyer  
Prof. Dr. Bernd Möller

## Flensburg University of Applied Sciences

Prof. Dr. Jens Born  
Prof. Dr. Torsten Faber  
Prof. Dr. Frank Hinrichsen  
Prof. Dr. Clemens Jauch  
Prof. Dr. Dirk Ludewig  
Dr. Hermann van Radecke  
Prof. Dr. Rajesh Saiju  
Prof. Dr. Michael Thiemke  
Prof. Dr. Ilja Tuschy  
Prof. Dr. Dirk Volta  
Prof. Dr. Holger Watter  
Prof. Dr. Jochen Wendiggensen

## Kiel University

Prof. Dr. Rainer Adelung  
Prof. Dr. Sebastian Bauer  
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Prof. Dr. Andreas Dahmke  
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Prof. Dr. Eberhard Hartung  
Prof. Dr. Dr. Christian H. C. A. Henning  
Prof. Dr. Joachim Krieter  
Prof. Dr. Marco Liserre  
Prof. Dr. Katrin Rehdanz  
Prof. Dr. Till Requate  
Prof. Dr. Carsten Schultz  
Prof. Dr. Friedhelm Taube  
Prof. Dr. Georg Thaller  
Prof. Dr. Frank Wuttke

## Kiel University of Applied Sciences

Prof. Dr. Sabah Badri-Höher  
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Prof. Dr. Ronald Eisele  
Prof. Dr. Hans-Jürgen Hinrichs  
Prof. Dr. Christian Keindorf  
Prof. Dr. Klaus Lebert  
Prof. Dr. Andreas Luczak  
Prof. Dr. Jens Lüssem  
Prof. Peter Quell  
Prof. Dr. Yves Reckleben  
Prof. Dr. Kay Rethmeier  
Prof. Dr. Alois Schaffarczyk  
Prof. Dr. Ulf Schümann  
Prof. Dr. Christoph Weber  
Prof. Dr. Harald Wehrend  
Prof. Dr. Jan Henrik Weychardt  
Prof. Dr. Christoph Wree

## Universität zu Lübeck

Prof. Dr. Thomas Franke  
Prof. Dr. Michael Herczeg  
Prof. Dr. Martin Leucker  
Prof. Dr. Tilo Mentler

## Technische Hochschule Lübeck

Prof. Dr. Cecil Bruce-Boye  
Prof. Sebastian Fiedler  
Prof. Dr. Dirk Jacob  
Prof. Dr. Roland Tiedemann

## West Coast University of Applied Sciences

Prof. Dr. Christian Buchmüller  
Prof. Dr. Rainer Dittmar  
Prof. Dr. Gunther Gehlert  
Prof. Dr. Oliver Opel  
Prof. Dr. Reiner Johannes Schütt  
Prof. Dr. Sven Wanser



## Prof. Dr. Olav Hohmeyer



Interdisciplinary Institute for Environmental, Social and Human Sciences,  
Department of Energy and Environmental Management

Professorship: Energy and  
Resource Management  
At the university since 1998

Tel +49 461 805-2533  
hohmeyer@uni-flensburg.de

## Core Expertise in Energy Research

- System integration problems for 100% regenerative energy systems
- Local concepts for 100% climate protection
- Economical aspects of climate protection and the energy transition

## Leadership Duties Relevant to Energy Research

- \_ Europa-Universität Flensburg and Flensburg University of Applied Science's Center for Sustainable Energy Systems (ZNES)
- \_ Vice Chair of the IPCC Working Group III, Mitigation of Climate Change (2002 to 2008)
- \_ Leading member of the Council of Environmental Experts for the climate and energy sector (2008 to 2012)

## Supervised Bachelor's/Master's Theses (Selection)

- \_ Benjamin Köhler, Modellierung des Wärme- und Kältebedarfs von Wohngebäuden im Rahmen eines Simulationsmodells des Energiesystems der Bundesrepublik Deutschland, 2013
- \_ Justus Riedlinger, Direct Linkage of Norwegian Pumped-Storage Hydropower Stations to the Central Western European Grid, 2013


## Supervised Doctoral Degrees (selection)

- \_ Mora Alvarez und David Fernando, Large Scale Integration of Renewable Energy Sources for Power Generation in Colombia, 2013
- \_ Sascha Schröder, Wind Energy in Offshore Grids. 2012. Kummulative Dissertation an der DTU, Management Engineering, Risø Campus
- \_ Tom Trittin, "No Smoking" – CO<sub>2</sub>-arme Stromerzeugung in einem nachhaltigen deutschen Energiesystem – ein Vergleich der CO<sub>2</sub>-Vermeidungskosten von erneuerbaren Energiequellen und Carbon Capture and Storage, 2012
- \_ Ingrid Nestle, The Cost of Climate Change in the Agricultural Sector – A Comparison of two Calculation Approaches, 2012

## Energy and Climate Protection R&amp;D Projects

## Open Source Energy Model Schleswig-Holstein (open-Mod.SH)

Project duration: 2014 to 2016  
Funding volume: €133,000 (EKSH funds)  
Cooperating partners: ARGE Netz GmbH & Co. KG, Breklum  
IHK Schleswig-Holstein  
www.github.com/znes/openmod.sh  
www.energiekollektiv.it


**ANGUS II – Effects of using the geological underground as thermal, electrical or material storage – integration of underground storage technologies in the energy system transformation using the example of the Schleswig-Holstein model area**

Project partners: Kiel University, Flensburg University of Applied Sciences, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Johannes Gutenberg University, Mainz

## Miscellaneous

## Publications


- \_ Hohmeyer, O., Bohm, S. (2015): Trends toward 100% renewable electricity supply in Germany and Europe: a paradigm shift in energy policies. In: Wiley Interdisciplinary Reviews: Energy and Environment 4, Ausgabe 1, 74-97.
- \_ Wiese, F., Bökenkamp, G., Wingenbach, C., Hohmeyer, O. (2014): An open source energy system simulation model as an instrument for public participation in the development of strategies for a sustainable future. In: Wiley Interdisciplinary Reviews: Energy and Environment 3, Ausgabe 5, 490-504.

## Further information

www.uni-flensburg.de/eum

## Detailed researcher profile



 Center for Sustainable Energy Systems (ZNES),  
page 43  
ANGUS II Research Network, page 40

## Prof. Dr. Bernd Möller



Interdisciplinary Institute for Environmental, Social and Human Sciences,  
Department of Energy and Environmental Management

Professorship: Energy and  
Environmental Management  
At the university since 2013

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bernd.moeller@uni-flensburg.de

## Core Expertise in Energy Research

- Geospatial analyses of sustainable energy systems
- Energy planning
- Energy access in developing countries

## Leadership Duties Relevant to Energy Research



- \_ Europa-Universität Flensburg and Flensburg University of Applied Science's Center for Sustainable Energy Systems (ZNES)

## Supervised Bachelor's/Master's Theses (Selection)

- \_ ASM Mominul Hasan, Bangladesch, Evaluation of Energy Access at RE Powered Mini-grid in Indonesia – A Multi-Tier Framework Approach (in cooperation with GIZ, Jakarta).
- \_ Hérrnan Felipe Torres Mejia, Kolumbien, Development of an Interface to generate an Electric Georeferenced Model of the 110KV Grid of Schleswig-Holstein in PSS@ sinca (in cooperation with Hansewerk, Rendsburg).
- \_ Himanshu Bansal, Indien, Congestion and Deviation Hangover: Pricing Behaviour on an Indian Power Exchange
- \_ Juan Manuel Diaz Castro, Kolumbien, Feasibility of New Wind Farms in Schleswig-Holstein under Revised State Planning and Bidding Schemes (in cooperation with Staatskanzlei Schleswig-Holstein)
- \_ Tabitha Njeri Karanja, Kenia, Identification and evaluation of cost optimal technology options for improvement of electricity access in rural Kenya

## Supervised Doctoral Degrees (selection)

- \_ Dr. Lixuan Hong, Developing an analytical approach for offshore wind energy development for China, 2013
- \_ Dr. Sebastian Groh, The role of access to electricity in development processes: approaching energy poverty through innovation, 2015
- \_ Dr. Theoneste Uhorakeye, Modeling electricity supply options for Rwanda in the face of climate change (2016)
- \_ Dr. Miria Frances Agunyo, Exploring the feasibility of integrated sanitation systems for Uganda, 2017
- \_ Lars Grundahl, District Heating and a Danish Heat Atlas, 2018

## Energy and Climate Protection R&amp;D Projects

## Development of the Pan-European Heat Atlas Peta

Since 2011  
www.heatroadmap.eu/Peta4.php

## Stratego (EU Intelligent Energy Europe)

Project duration: 2014 to 2016  
Funding volume: €53,500 (project scope: €M 2)

## Heat Roadmap Europe (EU Horizon 2020)

Project duration: 2016 to 2019  
Funding volume: €86,350 (project scope: €M 1.95)

## Wärmeplan.SH: Development of a Heat Atlas for Schleswig-Holstein

Funding volume: €98,000 (EKSH funds)  
Cooperating partners: Gottburg Energie- und Wärmetechnik GmbH & Co. KG, Leck



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Center for Sustainable Energy Systems (ZNES),  
page 43

## Further information

www.uni-flensburg.de/eum

## Detailed researcher profile



## Prof. Dr. Jens Born



Faculty of Energy and Biotechnology

Professorship: Electrical Energy Engineering  
At the UAS since 1995

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jens.born@hs-flensburg.de

**Core Expertise in Energy Research**

- Biogas technology
- (Electro-)chemical accumulator and products, waste and energy storage
- Bioenergy as a complementary energy source to wind and solar energy

### Leadership Duties Relevant to Energy Research



\_ Research work at the Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH)



\_ Research work at the Center for Sustainable Energy Systems (ZNES)

### Supervised Bachelor's/Master's Theses (Selection)

\_ Rene Casaretto, Evaluation von effizienzsteigernden Maßnahmen an Biogasanlagen, 2013

\_ Dirk Buchholz, Integriertes Energiekonzept für kleine Kommunen unter dem Einsatz von Wärme- und Stromspeichern am Beispiel Föhr, 2013

### Supervised Doctoral Degree

\_ Lars Jürgensen, Dynamic Methanation of Biogas CO<sub>2</sub>, Aalborg Universitet

## Profitable Bioenergy

“Professor Born, you are a pioneer in researching the use of biomass and founded the Centre for Applied Technology - CATS in Flensburg more than 20 years ago. What drives you?”

Prof. Born: Our goal is the highest possible added value and full biomass utilisation. We have worked in all areas of bioenergy, from biodiesel and bioethanol to gasification of wood and straw, but we have repeatedly landed back at biogas technology, because, in our opinion, it is the only form of bioenergy that remains competitive in a sustainable way, in addition to incineration.

**A repeated aspect in your scientific work is the cooperation with partners. Has this made it possible to further advance developments?**

Absolutely. We cooperate with communities, municipal utilities, energy, food and waste management companies, as well as other industries and farmers. Thanks to assistive projects to improve efficiency, the scientific support of funded projects, our technological developments and feasibility studies, it was possible to improve cost-effec-

tiveness. We exchange experience across borders and support innovations by means of our Large Scale Bioenergy Lab I and II Interreg projects.

### What are these in detail?

We have identified a global need for small plug and play biogas plants that we develop using state-of-the-art chemical engineering techniques in the form of container solutions. These small modular biogas plants are suitable as waste to energy systems for agriculture and the food industry, but can also be used for municipal waste management and sanitation. In addition to environmental services and the production of biogas fuel, these solutions are also suitable for resource efficient recycling of fertilizers. Even carbon dioxide in biogas can be used to generate added value from electricity. We call this work approach Power to Value. In addition, we study the conversion of electricity into hydrogen, which we – unlike the general trend – convert dynamically into energy sources such as SNG and valuable intermediates for industry.



Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH), page 24  
Center for Sustainable Energy Systems (ZNES), page 43

### Further information

www.hs-flensburg.de/hochschule/personen/born

### Detailed researcher profile



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## Prof. Dr. Torsten Faber



Faculty of Energy and Biotechnology

Professorship: Wind Power Engineering  
At the UAS since 2010

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**Core Expertise in Energy Research**

- Wind turbines (WT) and their structures
- WT certification
- Structural engineering

### Leadership Duties Relevant to Energy Research



\_ Head of Wind Energy Technology Institute (WETI)



### Supervised Doctoral Degrees (selection)



\_ Robert Rudolf, ROSS Red. Order Simulation Surrogate



\_ Achim Struve, Drehbarer WEA-Turm

\_ Marcel Schedat, Gierwinkelfehler bei WEA

### Energy and Climate Protection R&D Projects

#### University Cooperation: Program on Energy Efficiency in Southern Africa (PEESA II)

Funding volume: €M 2.29

Cooperating partners: Various (<http://www2.wi.fh-flensburg.de/africancentre/projects/peesa-ii.html>)

#### NEW 4.0 – Collaborative Project: North German Energy Transition; Sub-project: Development and Implementation of Training and Continuing Education Offers

#### Development of a Structural Health Monitoring (SHM) Concept for the Assessment of Wind Turbines with Regard to Early Damage Detection and Continued Operation After the Planned Service Life has Expired

Funding volume: €147,000 (EKSH funds)

Cooperating partners: Denker & Wulf AG, Sehestedt, DNV GL, Kaiser-Wilhelm-Koog

#### Wood-CFP Rotor Blade

Funding volume: €138,000 (EKSH funds)

Cooperating partners: Hoyer & Prass GbR, Hamburg

#### Guyed Tower – Prototype Development of a Guyed Tower for Large WTs

Funding volume: €136,000 (EKSH funds)

Cooperating partners: Aerodyn Energiesysteme GmbH, Rendsburg

### Miscellaneous

#### Publications

\_ Struve, A., Faber, T. (2017): Load-Direction-Derived Support Structures for Wind Turbines: A Lattice Tower Concept and Preparations for Future Certifications, DEWEK.

\_ Schedat, M., Faber, T. (2017): Fatigue Load Reconstruction on Wind Turbine Structures with Structural Health Monitoring, DEWEK.

\_ Starr, M., Manjock, A., Arjes, Ch., Nguyen, N.-D., Faber, T. (2017): Finite element methods for the Structural analysis of tension leg platforms for floating wind turbines, 36th International Conference on Ocean, Offshore & Arctic Engineering, OMAE2017, Juni 2017, Trondheim, Norwegen.

#### GADOW Training Needs Study Offshore Wind in the Interreg Region

Project duration: 2013 to 2015

Funding volume: €190,000 (Interreg, co-funded by WETI & Flensburg UAS)

[www.gadow-offshore.net/de](http://www.gadow-offshore.net/de)



Wind Energy Technology Institute (WETI), page 44  
Center for Sustainable Energy Systems (ZNES), page 43



NEW 4.0, page 22  
EKSH Doctoral Scholarships, page 130

### Further information

www.hs-flensburg.de/hochschule/forschungsinstitut/wind-energy-technology-institute

### Detailed researcher profile



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## Prof. Dr. Frank Hinrichsen



Faculty of Energy and Biotechnology

Professorship: Electrical Energy Engineering  
At the UAS since 2014

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### Core Expertise in Energy Research

- Inverters for photovoltaic installations and battery storage
- Wind power converters
- Electronic drive power converters

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Karin Seidel, Modularer Mehrpunkt-Umrichter – Entwicklung, Regelung, und Validierung eines Simulationsmodells, 2016
- \_ Hendrik Schefer, Implementierung der sensorlosen feldorientierten Regelung einer Synchronmaschine auf einer dSpace MicroAutoBox und Vergleich zu einer Phasenreglerschleife, Bachelor Thesis 2016
- \_ Sascha Kreutzer, Entwicklung eines Schwarzstartfähigen 24-V-Schaltnetzteils für Eingangsspannungen bis 1 kV, 2106
- \_ Gyde Liane Ohlsen, Harmonischen- und Leistungsanalyse von Echtzeitdaten an einem Power-Electronic-Grid-Simulator, 2016
- \_ Max Brandt, Implementierung eines Winkelschätzverfahrens in Simulink zur sensorlosen Regelung einer Synchron-Reluktanzmaschine in einer Rapid-Prototyping-Umgebung, 2016
- \_ Steffen Triesch, Analyse von Ausfällen an Traktionsstromrichtern einer Elektrotriebzugbaureihe zur Erhöhung deren Verfügbarkeit, 2016

### Energy and Climate Protection R&D Project

#### Grid-friendly Modular Wind Energy Medium-voltage Converter with Decentralised Control Unit

Project duration: 2016 to 2018

Funding volume: €149,000 (EKSH funds)

Cooperating partners: FeCon GmbH, now WSTECH, Flensburg; Beckhoff Automation GmbH & Co. KG, Lübeck branch

This research project investigates the applicability of a modular multi-point converter for wind turbines of 5 MW or more. The focus of the investigations is on good scalability and grid-friendliness. For this purpose, a demonstration system and a test environment suitable for medium-voltage converters will be developed at Flensburg UAS.

### Miscellaneous

#### Publications

- \_ Hinrichsen, F. (2009): 1 MW of Power from the Sun – Solar station eases grid connection of large photovoltaic power plants, Power Systems Design Europe, AGS Media Group, Annapolis MD, USA, pp. 34–35.
- \_ Hinrichsen, F., Ahmling, M. (2013): String central inverter system – A novel system combines the benefits of both central inverters and string inverters., Power Systems Design Europe, AGS Media Group, Annapolis MD, USA, pp. 32–34.

#### Congress Presentations

- \_ Hinrichsen, F., Koch, I., Canders, W.-R. (2004): Current Source IGBT-Inverter for Low Inductive Synchronous Machines, Proceedings of the 35th Annual IEEE Power Electronics Specialists Conference (PESC, 04), Aachen, Germany.
- \_ Koch, I., Hinrichsen, F., Canders, W.-R. (2005): Application of SiC-JFETs in Current Source Inverter Topologies, Proceedings of the 11th European Conference on Power Electronics and Applications (EPE, 05), Dresden, Germany.
- \_ Canders, W.-R., May, H., Hoffmann, J., Hoffmann, P., Hinrichsen, F., Koch, I., Rostermundt, D. (2006): Flywheel Mass Energy Storage with HTS Bearing – Development Status, WCRE/Eurosolar, International Conference on Renewable Energy Storage (IRES I), Gelsenkirchen, Germany.
- \_ Hinrichsen, F., Canders, W.-R. (2008): The Resonant Commutated Twin Pole Inverter, Proceedings of the 39th Annual IEEE Power Electronics Specialists Conference (PESC, 08), Rhodes, Greece, pp. 1414–1420.

### Further information

[www.hs-flensburg.de/hochschule/personen/hinrichsen](http://www.hs-flensburg.de/hochschule/personen/hinrichsen)

[Detailed researcher profile](#)



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## Prof. Dr. Clemens Jauch



Faculty of Energy and Biotechnology

Professorship: Wind Power Engineering  
At the UAS since 2012

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### Core Expertise in Energy Research

- Control of wind turbines
- Wind power grid integration
- Electrical engineering for wind turbines

### Leadership Duties Relevant to Energy Research

- \_ Wind Energy Technology Institute (WETI)
- \_ Research work in the Center for Sustainable Energy Systems (ZNES)

### Supervised Doctoral Degrees (Selection)

- \_ Sebastian Hippel, Regelbares Schwungrad im Triebstrang einer Windenergieanlage zur Unterstützung der Netzfrequenzregelung
- \_ Felix Röben, On Smart Balancing
- \_ Michael Falkenberg, On the amber traffic light phase within the Smart Grid Traffic Light Concept

### Energy and Climate Protection R&D Projects

#### Provision of Control Power and System Inertia in Wind Turbines

Funding volume: €150,000 (EKSH funds)

Cooperating partner: Suzlon Energy GmbH, Hamburg

#### Improved Feed-in Management of WTs

Funding volume: €222,783

Cooperating partner: DNV GL, Kaiser-Wilhelm-Koog

#### Development of a Hydropneumatic Flywheel Storage System for Wind Turbine Rotors

Funding volume: €215,000

Cooperating partner: HYDAC Technology GmbH, Hamburg

#### Grenzland INNOVATIV Schleswig-Holstein (GrINSH) – Sub-project Innovative Contributions to Sustainable Energy Use in Schleswig-Holstein

Funding volume: €M 2.1

Cooperating partners: Various

- Wind Energy Technology Institute (WETI), page 44
- Center for Sustainable Energy Systems (ZNES), page 43
- EKSH Doctoral Scholarships, page 130

### Miscellaneous

#### Publications

- \_ Jauch, C., Gloe, A., Hippel, S., Thiesen, H. (2017): Increased Wind Energy Yield and Grid Utilisation with Continuous Feed-In Management; *Energies* Oktober 2017.
- \_ Jauch, C. (2016): Controls of a flywheel in a wind turbine rotor, *WIND ENGINEERING*, vol. 40, issue 2, pp. 173-185.
- \_ Jauch, C., Hippel, S. (2016): Hydraulic-pneumatic flywheel system in a wind turbine rotor for inertia control, *IET Renewable Power Generation*.

#### Patents and Registered Designs

- \_ Jauch, C.: Kolbenspeicher mit ovalem Querschnitt zur Integration in ein Rotorblatt, DPMA Gebrauchsmuster 20 2016 000 658, IPC: F03/D 1/06, eingetragen am 23.02.2016
- \_ Jauch, C.: Simulationsmodell für eine Windenergieanlage sowie Erzeugung und Verwendung, DPMA Patent DE 102011002842 B4, erteilt am 13.02.2014.
- \_ Jauch, C. Kloft, P., Bartels: Auswuchtvorrichtung und Verfahren zur Kompensation der Unwucht von Rotoren von Windenergieanlagen, eingereicht beim DPMA (DE 10 2016 003 345.2), 2016.
- \_ Jauch, C.: Simulationsmodell für eine Windenergieanlage sowie Erstellung und Verwendung, Pub. No.: WO/2012/098170, International Application No.: PCT/EP2012/050735, International Filing Date: 18.01.2012, Publication Date: 26.07.2012.
- \_ Jauch, C.: Simulationsmodell für eine Windenergieanlage sowie Erstellung und Verwendung, eingereicht beim DPMA, (AZ 102011007434.1), am 14.04.2011.

#### Awards

- \_ Research in the field of hydropneumatic flywheel storage for wind turbine rotors (Ideenwettbewerb Schleswig-Holstein 2016).

### Further information

[www.hs-flensburg.de/hochschule/forschungsinstitut/wind-energy-technology-institute](http://www.hs-flensburg.de/hochschule/forschungsinstitut/wind-energy-technology-institute)

[Detailed researcher profile](#)



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## Prof. Dr. Dirk Ludewig



Economics Faculty

Professorship: Marketing and Entrepreneurship  
At the UAS since 2008

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**Core Expertise in Energy Research**

- Green Entrepreneurship
- Green Economy

### Leadership Duties Relevant to Energy Research

- Head of the Green Entrepreneurship Center Flensburg
- Member of Sustainable Entrepreneurship working group at Förderkreis Gründungs-Forschung e.V.
- Member of Green Economy working group at ADT – Bundesverband Deutscher Innovations-, Technologie- und Gründerzentren e.V.
- Initiator and organiser of the annual International Green Entrepreneurship Forum (IGEF)
- Founding member of Dr. Werner Jackstädt-Zentrum für Unternehmertum und Mittelstand Flensburg
- Board member at Start-Up SH e.V.
- Founding member of German-Danish VentureWerft start-up initiative

### Supervised Bachelor's/Master's Theses (Selection)

- Thomas Neumann, Impact of Green Entrepreneurship on Economic Welfare, 2017
- Thomas Neumann, Geschäftsmodellentwicklung in der Elektromobilität – Entwicklung einer Rahmenstruktur und deren Anwendung auf die MVV Energie AG., 2016
- Michael Erdmann, Aufbau einer neuen Geschäftseinheit am Beispiel des Wärmecontractings in der Paribus Northenergy GmbH – Geschäftsmodellentwicklung und Herangehensweise, 2014
- Bastian Lassen, Green Marketing – Marketing Ansatz im Bereich Green Business – Modellentwicklung und Betrachtung aktueller Beispiele, 2013
- Maria Babry, The Photovoltaics Market of Thailand: Strategic Market Analysis and Proposal for the Market Entry of juwi Solar GmbH, 2011
- Maria Babry, Outlines of an International Marketing Strategy for Solar Landfill Covers. An Analysis for Solar Integrated Technologies GmbH, 2010

### Energy and Climate Protection R&D Projects

#### StartUp-SH – Green Entrepreneurship Sub-project

Funding volume: €608,000 (EFRE, Federal Government, State of Schleswig-Holstein)

#### Dr. Werner Jackstädt-Zentrum – Green Entrepreneurship Sub-project

Funding volume: €360,000 (Dr. Werner Jackstädt-Stiftung, State of Schleswig-Holstein and regional businesses)

#### SPICE – Green Entrepreneurship Sub-project

Funding volume: €66,000 (Interreg 5a, EFRE)

### Miscellaneous

#### Study

#### Investigation of the Renewable Energy Corporate Landscape in the Electricity Sector in Schleswig-Holstein (2016)

Funding volume: €39,000 (EKSH funds)

#### Publications

- Jordt, S., Ludewig, D. (2015): Green Entrepreneurship an Hochschulen: Benchmarking und Best-Practices, Flensburger Hefte, Nr. 8.
- Ludewig, D., Jordt, S. (2016): Unternehmenslandschaft der Erneuerbaren Energien im Strombereich in Schleswig-Holstein – Unternehmenspräsentationen und Meinungsbild, Flensburger Hefte, Nr. 11.
- Ludewig, D. (2015): Green Entrepreneurship: Einordnung in die Green Economy und Bestandsaufnahme des Themenfeldes, Flensburger Hefte, Nr. 6.

The issue numbers refer to the series Flensburger Hefte zu Unternehmertum und Mittelstand. More information and additional publications are available at: [www.jackstaedt-flensburg.de/publikationen/flensburger-hefte/](http://www.jackstaedt-flensburg.de/publikationen/flensburger-hefte/)

### Further information

[www.jackstaedt-flensburg.de](http://www.jackstaedt-flensburg.de)  
Flensburger Hefte zu Unternehmertum und Mittelstand (see QR-Code)



Green Entrepreneurship Center (GEC) Flensburg, page 49

## Dr. Hermann van Radecke



Faculty of Energy and Biotechnology

Active in: wind energy and physics  
At the UAS since 1991

Tel +49 461 805-1386  
hermann.vanradecke@hs-flensburg.de

**Core Expertise in Energy Research**

- Wind potential: analysis, measurement, turbulence
- Wind farm energy analysis
- Emissions: noise (analysis, free field measurement), shadowing
- Offshore facility emissions: underwater noise
- SODAR remote sensing system for research and teaching

### Leadership Duties Relevant to Energy Research

- Wind Energy Technology Institute (WETI)
- Research work at the Competence Center Renewable Energy Resources and Climate Protection Schleswig-Holstein (EEK.SH)
- Member of Hamburg University of Technology TUHH underwater noise group



### Supervised Bachelor's/Master's Theses

291 bachelor's and master's theses at three universities: Flensburg University of Applied Sciences, Europa-Universität Flensburg, University of the West Indies, almost all in the field of wind energy, technically and economically, almost all very practical in cooperation with industry/companies.

### Energy and Climate Protection R&D Projects

#### Measurement of Operating Noise of Offshore Wind Turbines to Determine the Sound Input as a Result of the Sound Transmission Function Between the Tower and the Water on Turbines in the Offshore Test Facility

Funding volume: €416,000 (BMU, RAVE)  
Cooperating partner: HAW Hamburg

#### Measurement of Natural and Induced Turbulence in the Wake of Wind Turbines to Allow Statements on Stability

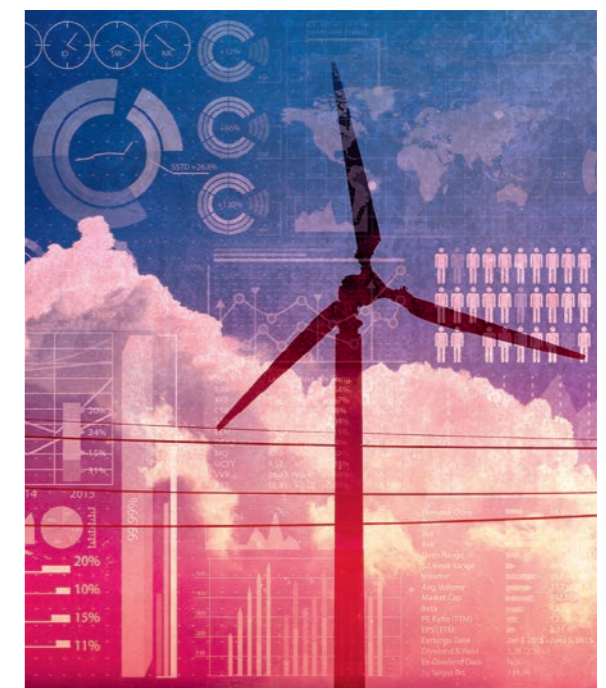
Project duration: 2009 to 2012  
Funding volume: €112,000 (Zukunftsprogramm Wirtschaft)  
Cooperating partner: Stadtwerke Flensburg GmbH

### Miscellaneous

- Installation/operation of the 200 kW Enercon WT, hub height 50 m, on the university campus
- Installation/operation of the small wind turbine test facility on the university campus

### Publication

- van Radecke, H., Benesch, M. (2015): RAVE Underwater Operational Noise Measurements in the Offshore Wind Park Alpha Ventus – Project Description and Final Results. Tagungsband DEWEK 2015, Bremen



Wind Energy Technology Institute (WETI), page 44  
Competence Center Renewable Energy Resources and Climate Protection Schleswig-Holstein (EEK.SH), page 24

### Further information

[www.hs-flensburg.de/hochschule/personen/radecke](http://www.hs-flensburg.de/hochschule/personen/radecke)

## Prof. Dr. Rajesh Saiju



Faculty of Energy and Biotechnology

Professorship: Electrical Engineering and Electrical System/Grid Fundamentals  
At the UAS since 2015

Tel +49 461 805-1505  
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**Core Expertise in Energy Research**

- System and grid simulation
- Regenerative energy systems
- Energy management systems

### Leadership Duties Relevant to Energy Research

\_ Head of laboratory: electrical systems and grids

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Sven Ole Möller*, Technical requirements for Wind Power Plants connected to the electrical grid in Finland and market analysis for services of M.O.E., 2015
- \_ *Tim Dose*, Analyse des Energiebezugs der Insel Pellworm unter Betrachtung eines Geschäftsmodells aus dem Projekt "SmartRegion Pellworm" sowie einem Vergleich mit der Innovationsstudie, 2016
- \_ *Sören Petersen*, Konzeptionierung eines bedarfsorientierten Systems für Windenergieanlagen zur gesetzeskonformen Einhaltung von Schattenwurf-Immissionsgrenzwerten und Artenschutzvorgaben, 2017

### Energy and Climate Protection R&D Project

#### Development of an Energy Management System Incorporating Regenerative Energy Systems

Funding volume: €150,000 (EKSH funds)  
Cooperating partner: RECASE Regenerative Energie GmbH, Busdorf



### Miscellaneous

#### Publications

- \_ Saiju, R., Heier, S. (2005): Voltage dips compensation by wind farm(s) equipped with power converters as decoupling device, 11th European conference on power electronics and applications, 11-14 September, Dresden, Deutschland.
- \_ Saiju, R. (2005): Development and implementation of an isolated grid feeding by renewable energy sources, Athen, Griechenland.
- \_ Saiju, R. (2006): Micro Hydro Based Hybrid Power System, Risø National Laboratory, Dänemark.
- \_ Saiju, R., Heier, S. (2006): Wind Plant Development and State of the Art of Grid Connected Systems, The World Renewable Energy Congress IX and Exhibition, Florenz, Italien.
- \_ Saiju, R., Tamzarti, A., Heier, S. (2007): Performance analysis of small wind turbine connected to a grid through modelling and simulation, The 33rd Annual Conference of the IEEE Industrial Electronics Society, Taipei, Taiwan.
- \_ Saiju, R., Heier, S. (2008): Performance analysis of lead acid battery model for hybrid power system, Transmission and distribution conference and exposition, IEEE/PES, Chicago, USA.
- \_ Saiju, R., Koutnik, J., Krueger, K. (2009): Dynamic analysis of start-up strategies of AC excited double fed Induction machine for pumped storage power plant, EPE 13th European Conference, Barcelona, Spanien.
- \_ Koutnik, J., Foust, J., Nicholet C, Saiju, R., Kawkabani, B. (2010): Pump-Storage Integration with Renewables – Meeting the Needs Using Various Concepts, Proceedings of HydroVision International, Charlotte, NC, USA, Session: Pumped-Storage Market Trends and Strategies, paper 5, pp. 1-12.

#### Further information

[www.hs-flensburg.de/hochschule/personen/saiju](http://www.hs-flensburg.de/hochschule/personen/saiju)

#### Detailed researcher profile



## Prof. Dr. Michael Thiemke



Faculty of Mechanical Engineering, Process Engineering and Maritime Technologies

Professorship: Combustion Engines and Power Engineering Systems  
At the UAS since 2012

Tel +49 461 805-1808  
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**Core Expertise in Energy Research**

- Energy-efficient drive systems
- Waste heat utilisation
- Low-emission energy utilisation

### Leadership Duties Relevant to Energy Research

- \_ Organizer of the ship operations research information conference
- \_ Head of university research facility at Kielseng 15a

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Hendrik Vahlsing*, Auswahl einer Hauptmaschinenanlage unter Berücksichtigung der Anforderungen des Umweltzeichens "Blauer Engel", 2017
- \_ *Ole Christian Dieckmann*, Landstrom: Technische Lösungen und mögliche Auswirkungen am Beispiel des Seehafens Kiel, 2017
- \_ *Ahmed Elleithy*, Investigation of Tooth Internal Flank Fracture of Wind Turbine Gearbox, 2017

### Energy and Climate Protection R&D Projects

#### CleanMarine4.0: Wet Desulphurisation and Scrubbing Water Treatment

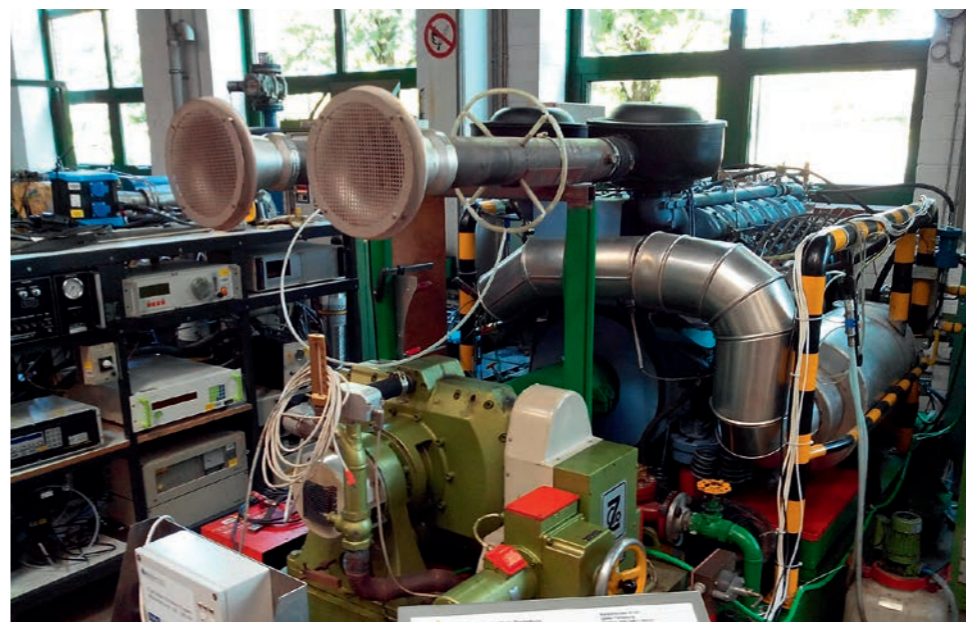
Funding volume: approx. €450,000  
Cooperating partners: oll & Kirch Filterbau GmbH, Ahrensburg, PureteQ, Svendborg, Denmark

#### GrINSH: Gas Engine Unit with Generator Brake and E-feed Option

Funding volume: approx. €M 2.1  
Cooperating partners: Institut für Nautik und Maritime Technologien (INMT), WETI (Flensburg UAS)

### Miscellaneous

- \_ 40th ship operations research information conference (ISF conference) on June 8, 2018 in Flensburg



Savings potential thanks to technical progress: fuel consumption and pollutant emissions from marine engines can be drastically reduced.

Photo: Flensburg UAS

#### Further information

[www.hs-flensburg.de/hochschule/personen/thiemke](http://www.hs-flensburg.de/hochschule/personen/thiemke)

#### Detailed researcher profile





Faculty of Energy and Biotechnology

Professorship: Energy Engineering  
in Mechanical Engineering  
At the UAS since 2006

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**Core Expertise in Energy Research**

- Analysis and evaluation of coupled processes
- System integration of thermal energy systems
- Prospective technology evaluation

**Leadership Duties Relevant to Energy Research**

- \_ Founding member of the Center for Sustainable Energy Systems (ZNES)
- \_ Head of the thermal energy systems department at ZNES

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ Artur Scheiermann, Ermittlung einer idealen Wärmespeicherkapazität zur Optimierung der Erzeugungsstruktur des Heizkraftwerks Tarp, 2016
- \_ Francesco Witte, Entwicklung eines Modells zur technischen und wirtschaftlichen Bewertung von Power-to-Gas-Anlagen, 2016
- \_ Catharina Kapp, Multikriterielle Bewertung zweier Methoden zur Energie- und CO<sub>2</sub>-Bilanzierung der Stadt Flensburg, 2017

**Supervised Doctoral Degrees (selection)**

- \_ Aiko Vogelsang, Mehrzieloptimierung von solarthermischen Parabolrinnenkraftwerken unter Berücksichtigung variabler Vergütungsschemata mit Hilfe technischer Auslegungsparameter, 2014
- \_ Cynthia Boysen, Multikriterielle Bewertung der Technologieperspektive von Kraftwerkstechnologien mit Speicheranteil – Konvergenzverhalten unter veränderten energiewirtschaftlichen Rahmenbedingungen, ongoing
- \_ Cord Kaldemeyer, Multi-objective Operation and Design Optimization of Storage Options in Energy Systems, ongoing

**Energy and Climate Protection R&D Projects**

**ANGUS II**  
 Funding volume: €351,084 (Flensburg UAS share)

**Power Grid-Coupled District Heating 2020**

Funding volume: €123,000 (EKSH funds)  
Cooperating partner: Stadtwerke Flensburg GmbH

**System Effect of an Engine-driven CHP with Heat Pump**

Funding volume: €20,000 (EKSH funds)  
Cooperating partners: Hansewerk Natur GmbH and ARCTOS Industriekälte AG, Sörup

**Compressed Air Energy Storage Schleswig-Holstein**

Funding volume: €131,000 (EKSH funds)  
Cooperating partner: GEO mbH, Langenhorn

**Evaluation of an Innovative Steam Turbine Train Concept for Solar Thermal Power Stations**

Contract research  
Cooperating partner: MAN Diesel & Turbo SE, Oberhausen

**Miscellaneous**

Patents and Patent Applications  
\_ US 6725665; US 20030033812; US 7073335; US 6725663;  
US 6715296

Events

- \_ Conference Chair 100 % Renewable Energy Conference 2016, Flensburg

**Further information**

www.znes-flensburg.de  
www.hs-flensburg.de/hochschule/  
personen/tuschy-ilja

**Detailed researcher profile**



Center for Sustainable Energy Systems (ZNES),  
page 43

ANGUS II Research Network, page 40

EKSH-information brochure no. 7/2018 (German)



Faculty of Energy and Biotechnology

Professorship: Thermal Energy Engineering  
At the UAS since 2016

Tel +49 461 805-1801  
dirk.volta@hs-flensburg.de

**Core Expertise in Energy Research**

- Energy engineering, energy efficiency and optimisation
- Utility systems (refrigeration, air-conditioning, heating) and industrial processes

**Leadership Duties Relevant to Energy Research**

- \_ Co-founder and member of VDI 4663 (energy and material efficiency evaluation) guidelines committee
- \_ Member of VDI energy and environmental management technical committee

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ J. Pöhls, Experimentelle Untersuchungen zu extrinsisch herbeigeführtem Blasensieden für den Betrieb eines Hybridverdampfers, 2017
- \_ M. Kielgast, Abwärmennutzung des neuen Motorprüfstandes, 2017
- \_ P. Jensen, Analyse verschiedener Anlagenkonzepte für eine Micro-Cold-Frac-Anlage zur Erdgaskühlung, 2017
- \_ N. Bahr, Ermittlung der Temperatur- und Wärmestromverläufe eines Fermentationszyklus – Eine Analyse als Grundlage für die Planung einer Kälteanlage, 2017
- \_ L. Paulsen, Bilanzierung eines Mini-BHKW unter Berücksichtigung des Brennwertbetriebes, 2017
- \_ C. Kohlbohm, Modellierung eines Blockheizkraftwerkes mit gekoppelter Wärmepumpe zur technischen und wirtschaftlichen Analyse von Auslegung und Betrieb, 2017

**Miscellaneous**

**Industrial Cooperation Projects**

- \_ Heat recovery from the flue gas stream of a gas-fired cocoa bean roaster
- \_ Conception and design of refrigeration, cold storage and heat recovery, beverage industry
- \_ Heat recovery concept for the waste heat from the smelting process of an iron foundry
- \_ Systematic assurance of the legal conformity of utility systems (in particular steam and cold), chemicals industry
- \_ Development of a standard analysis scheme for the connection conditions of refrigeration consumers to central cold water supply networks
- \_ Commissioning of a gas engine CHP with central heating network (2 MW electric)



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**Further information**

www.hs-flensburg.de/hochschule/  
personen/volta

**Detailed researcher profile**



## Prof. Dr. Holger Watter



Faculty of Energy and Biotechnology

Professorship: Ship and Systems Technology  
At the UAS since 2010

Tel +49 171 5300309  
holger.watter@hs-flensburg.de

### Core Expertise in Energy Research

- Regenerative energy systems
- Marine engineering
- Fluid technology

### Leadership Duties Relevant to Energy Research

- \_ Maritime Cluster Norddeutschland board
- \_ Maritime Cluster ship efficiency technical group
- \_ Cluster-Management Digitale Wirtschaft Schleswig-Holstein advisory board
- \_ GET-NORD R&D advisory board, Hamburg

### Supervised Bachelor's/Master's Theses (Selection)

- Various topics on energy efficiency and resource conservation, including:
- \_ Energy efficiency in plant, building and marine engineering
  - \_ Solar, wind, hydro, geothermal, biomass, biogas and bio-fuel power, hydrogen and storage systems efficiency and systems analyses

### Energy and Climate Protection R&D Projects

#### 2010 to 2016, Fuel Cells in Maritime Use, E4SHIPS

#### 2013 DFG Boiler and Turbine Plant Replacement Procurement Project and 2011 DFG Marine Engine Simulation Project Extension

#### 2013 to 2014 DIN/ISO Performance Monitoring Project

### Miscellaneous

#### Publications

- \_ Watter, H. (2015): Regenerative Energiesysteme – Grundlagen, Systemtechnik und Analysen ausgeführter Beispiele nachhaltiger Energiesysteme (4. Auflage), Springer-Verlag.
- \_ Watter, H. (2015): Hydraulik und Pneumatik – Grundlagen und Übungen, Anwendungen und Simulation (4. Auflage), Springer-Verlag.



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### Further information

www.hs-flensburg.de/hochschule/personen/watter  
www.holgerwatter.wordpress.com  
**Detailed researcher profile**



## Prof. Dr. Jochen Wendiggensen



Faculty of Energy and Biotechnology

Professorship: Automation Engineering  
At the UAS since 1994

Tel +49 461 805-1390  
jochen.wendiggensen@hs-flensburg.de

### Core Expertise in Energy Research

- Automation
- Simulation

### Leadership Duties Relevant to Energy Research

- \_ Research work at the Center for Sustainable Energy Systems (ZNES)

### Supervised Master's Theses (selection)

- \_ Mathis Köhn, Dennis Falko Hack, Analyse von verschiedenen Vermarktungskonzepten, Vergütungsmodellen und Betriebsführungsstrategien eines Energiespeichers im Megawatt-Bereich, 2015
- \_ Dario Kocevar, Impacts of the Network Code on Electricity Balancing on a Generic Power Plant Portfolio, 2015
- \_ Felix Halfmann: Entwurf eines Betriebsmodells für Batteriespeichersysteme zur Spitzenlastkappung bei energieintensiven Letztverbrauchern, 2016
- \_ Marius Vespermann, Entwicklung einer Methodik zur Betriebsmittel-Parametrisierung im Rahmen eines offenen Stromnetzmodells der Höchst- und Hochspannungsebene Deutschlands, 2017

### Energy and Climate Protection R&D Projects

#### open\_eGo – Development of a Grid Level-Spanning Planning Instrument to Determine Optimal Grid and Storage System Expansion in Germany

Project duration: 2015 to July 2018

Funding volume: approx. €M 1.8 (BMW)

Cooperating partners: Europa-Universität Flensburg, Reiner Lemoine Institut gGmbH, Berlin, EWE – Forschungszentrum für Energietechnologie, Oldenburg, Otto-von-Guericke University, Magdeburg

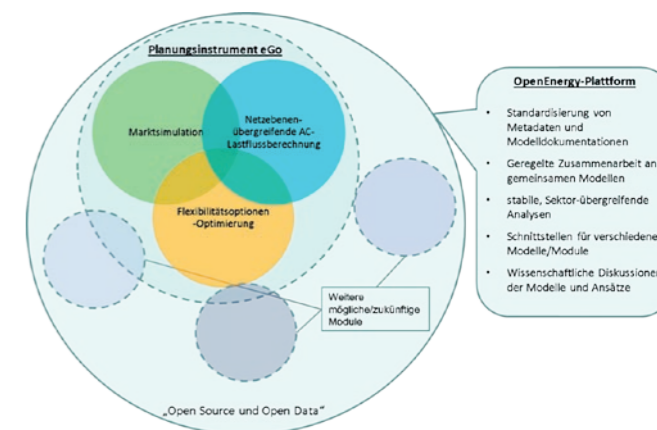
Scientists at the open\_eGo project coordinated by Flensburg University of Applied Sciences aim to develop a transparent, grid level-spanning planning instrument to assist in determining optimal grid and storage system expansion in Germany. The eGo tool will subsequently be integrated in the publicly accessible, virtual OpenEnergy research

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Center for Sustainable Energy Systems (ZNES),  
page 43

platform. This will also be created within the collaborative project. In this way, the various energy transition protagonists from science, industry and politics will be provided with a participation building block and transparency is increased. Disclosure of the data used for the analyses will also contribute to this.



### Miscellaneous

#### Congress Presentations

- \_ Kocevar, V. D., Wendiggensen, J. (2015): Auswirkungen des Network Code on Electricity Balancing auf den deutschen Regelleistungsmarkt, NEIS, ISBN 978-3-658-10957-8.
- \_ Halfmann, F., Alhaider, F., Wendiggensen, J., Gerhard, S. (2016): A Predictive Control Strategy for Battery Energy Storage Systems to combine Peak Shaving with Primary Frequency Control, NEIS, ISBN 978-3-658-15029-7.
- \_ Müller, U. P., Cufsmann, I., Wingenbach, C., Wendiggensen, J. (2016): AC Power Flow Simulations within an Open Data Model of a High Voltage Grid, EnviroInfo, ISBN 978-3-319-44710-0.

### Further information

www.hs-flensburg.de/hochschule/personen/wendig

## Prof. Dr. Rainer Adelung



Faculty of Engineering, Institute for Materials Science


Professorship: Functional Nanomaterials  
At the university since 1996

Tel +49 431 880-6116  
ra@tf.uni-kiel.de

### Core Expertise in Energy Research

- Antifouling (biocorrosion resistant coatings)
- Li-ion batteries
- Solar cell characterisation

### Leadership Duties Relevant to Energy Research

- \_ Member of NorLIN network
- \_ Member of ENSTOR network: Energy Storage Network
- \_ Member of Smart Mat & Surf -Phase II network
-  Associate member of the Kiel Cluster of Excellence "The Future Ocean"

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Catarina Schmidt*, Interaction between non-aqueous electrolyte and a Si electrode – analysis of the interface, 2017
- \_ *Haoyi Qiu*, Polydimethylsiloxane-Polythiourethane Composites for the Application as Fouling-Release Coating in the Marine Sector, 2017
- \_ *Anna Gapeeva*, Characterization of Polydimethylsiloxane-Polythiourethane Composites and its Implications on Fouling-Release Properties, 2016

### Supervised Doctoral Degrees (Selection)

- \_ *Sandra Hansen*, On the Stabilization Mechanisms of Silicon Microwire Array Anodes for Li-Ion Batteries, 2017
- \_ *Iris Hölken*, Mechanically stable and environmentally friendly polymer/particle composites for the application as low-fouling coating in the marine sector, 2016

### Energy and Climate Protection R&D Projects

#### Development and Characterisation of Large-scale, Porous Si-film Anodes for Lithium-Sulphur-Silicon Energy Storage Systems (PorSSi)

Funding volume: €M 1.5

Cooperating partner: RENA Technologies GmbH, Freiburg

#### SP2: Analysis of Degradation Phenomena in Crystalline Si Solar Cells and Strategies for their Prevention

Funding volume: €80,000

Cooperating partners: University of Constance, ISE-Freiburg, MPI Halle, ISFH Hameln

### Cleaner Ocean Coatings – ZiM Project in the NorLIN Network, Development and Operation of Test Benches and Materials Science Characterisation and Evaluation of Specimens

Funding volume: €187,726

Cooperating partners: Teyfel Automation GmbH, Schwerin; Phistone AG, Kiel; Wilckens Farben GmbH, Glückstadt; Rubin Yachttechnik GmbH, Altenholz

### Smart and environmentally friendly block copolymer for antifouling applications – Postdoc Call Cluster of Excellence The Future Ocean

Funding volume: €199,789

### Miscellaneous

#### Publications

- \_ Hölken, I., Hoppe, M., Mishra, Y. K., Gorb, S. N., Adelung, R., Baum, M. J. (2016): Complex shaped ZnO nano- and microstructure based polymer composites: mechanically stable and environmentally friendly coatings for potential antifouling applications. *Physical Chemistry Chemical Physics* 18:7114–7123.
- \_ Hölken, I., et al. (2016): Functional Ecofriendly Coatings for Marine Applications. 3rd International Conference on Nanotechnologies and Biomedical Engineering. Springer Nature Singapore Pte Ltd.
- \_ Hansen, S., Quiroga-González, E., Carstensen, J., Adelung, R., Föll, H. (2017): Size-dependent physicochemical and mechanical interactions in battery paste anodes of Si-microwires revealed by Fast-Fourier-Transform Impedance Spectroscopy. *Journal of Power Sources* Volume 349, pp. 1-10.

#### Start-up spin-off

- \_ Doctoral students from the working group were co-founders of Phi-Stone AG


### Further information

[www.tf.uni-kiel.de/matwis/fnano](http://www.tf.uni-kiel.de/matwis/fnano)

### Detailed researcher profile



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 Kiel Cluster of Excellence "The Future Ocean", page 61

## Prof. Dr. Sebastian Bauer



Faculty of Mathematics and Natural Sciences, Institute of Geosciences


Professorship: Geohydromodelling  
At the university since 2007

Tel +49 431 880-2853  
sebastian.bauer@ifg.uni-kiel.de

### Core Expertise in Energy Research

- Storing renewable energy in the geological subsurface in the form of synthetic methane, hydrogen or compressed air
- Geothermal energy and heat storage in the subsurface
- Sustainable use of underground space

### Leadership Duties Relevant to Energy Research

-  ANGUS II project: overall coordination of the BMWi collaborative project
- \_ Founding member of the Geo-Energy Center of Excellence

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Hintze, M.*, Numerische Simulation thermo-hydraulischer Auswirkungen von Aquifer-Wärmespeicherung, 2016
- \_ *Nordbeck, J.*, Anthropogen induzierte thermohaline Strömungen im Untergrund, 2016
- \_ *Götz, J.*, Geochemische Folgereaktionen einer Wasserstoff-Speicherung im porösen Medium, 2014

### Supervised Doctoral Degrees (Selection)

- \_ *A. Boockmeyer*, Wärmespeicherung im Untergrund: Hochauflösende Modelle, Up-Scaling und Prognose der Auswirkungen, ongoing
- \_ *W. Pfeiffer*, Hydrogen energy storage in porous formations – Investigation of storage dimensioning, induced effects and monitoring methods, 2017
- \_ *A.B. Mitiku*, Prognosis of hydraulic and geochemical long-term effects of CO<sub>2</sub> sequestration in saline formations, 2013

### Energy and Climate Protection R&D Projects

#### Investigation of the Effects of Underground Gas Storage Using Hydraulic Tomography

Project duration: 2017 to 2019

Funding volume: €120,000

#### IGLU Investigation, Modelling and Evaluation of an Intelligent, Long-term Geothermal Storage System with Environmentally Neutral Behaviour

Project duration: 2014 to 2018

Funding volume: €557,647 (total Kiel University funding approval)


Cooperating partners: Scheer Heizsysteme GmbH, Helmholtz Centre for Environmental Research – UFZ, Leipzig

#### ANGUS+: Impacts of the Use of the Geological Subsurface for Thermal, Electrical or Mass Storage in the Context of the Energy Transition – Dimensioning, Risk Analyses and Impact Assessment as the Basis for Future Spatial Planning in the Subsurface

Project duration: 2012 to 2017

Funding volume: €M 5.8 (total Kiel University funding approval)

Cooperating partners: GFZ Potsdam, Helmholtz Centre for Environmental Research – UFZ, Leipzig, RUB Bochum  
[www.angusplus.de](http://www.angusplus.de)

 ANGUS II Research Network, page 40

### Further information

[www.geohydromodellierung.ifg.uni-kiel.de](http://www.geohydromodellierung.ifg.uni-kiel.de)

### Detailed researcher profile





## Prof. Christoph Corves, PhD



Faculty of Mathematics and Natural Sciences, Department of Geography

Professorship: Geography and Media  
At the university since 2002Tel +49 431 880-1620  
corves@geographie.uni-kiel.de

## Core Expertise in Energy Research

- ⊙ Education and media for sustainable development
- ⊙ Social entrepreneurship
- ⊙ Societal aspects of the energy transformation
- ⊙ International climate change policy

## Leadership Duties Relevant to Energy Research



- \_ Head of the Kiel School of Sustainability
- \_ Head of the yooweedoo - changemaker project

## Energy and Climate Protection R&amp;D Projects

## Startup-SH/AP 600 Social Entrepreneurship

Funding volume: €970,035 (EFRE and State of Schleswig-Holstein)

## Empowerment for Change

Funding volume: €449,900 (German Federal Environmental Foundation)

## Changeleader Program

Funding volume: €60,000 (Robert Bosch Foundation)

## GrünPreneur Award as Part of the yooweedoo Ideas Competition

Funding volume: €18,000 (EKSH funds)

## Changemaker MOOC

Funding volume: €25,000 (Donors' Association for the Promotion of Science and Humanities)

## yooweedoo Climate Challenge

Funding volume: €156,155 (EKSH funds)

## yooweedoo Changemaker Campus and yooweedoo Ideas Competition

Funding volume: €130,000 (State of Schleswig-Holstein)

## Yooweedoo Ideas Competition 2017

3 of 34 winning projects (taken here from the energy and climate protection fields):

- Happy Klos:** stationary compost toilettes
  - Umtüten:** Saved paper – to the baker with cloth bags
  - Resteritter:** Making marmalade from leftover food
- [www.yooweedoo.org/projekte/die-preisträger-2017](http://www.yooweedoo.org/projekte/die-preisträger-2017)



Master course Sustainability, Society and the Environment, yooweedoo, page 13

## Further information

[www.yooweedoo.org](http://www.yooweedoo.org)  
[www.sustainability.uni-kiel.de](http://www.sustainability.uni-kiel.de)  
 Detailed researcher profile



## Prof. Dr. Andreas Dahmke



Faculty of Mathematics and Natural Sciences, Institute of Geosciences

Professorship: Applied Geosciences –  
Hydrogeology and Aquatic Geochemistry  
At the university since 1998Tel +49 431 880-2858  
andreas.dahmke@ifg.uni-kiel.de

## Core Expertise in Energy Research

- ⊙ Regional planning concepts for the geological subsurface in conurbations
- ⊙ Geothermal energy and heat storage
- ⊙ Storage of renewable energy forms in the deep geological subsurface

## Leadership Duties Relevant to Energy Research



- \_ Founding member and acting spokesman of the Geo-Energie Center of Excellence
- \_ ANGUS II project: deputy overall coordinator of the BMWi collaborative project
- \_ Geo:N Project TestUM: Overall coordination of the BMBF collaborative project
- \_ Project IGLU: overall scientific coordination
- \_ Representative of Kiel University in the SH energy transition advisory board
- \_ Collaboration and consulting on various acatech energy research position papers

## Supervised Bachelor's/Master's Theses (Selection)

- \_ **Adrian Metzgen**, Einfluss des pH-Wertes auf die Reduktion gelöster Grundwasserinhaltsstoffe durch Wasserstoff in Hochdruck-Laborversuchen, 2016
- \_ **Stefan Berger**, Laborversuche zur Quantifizierung von Wasserstoff Oxidationsreaktionen in Aquifer-Sedimenten, 2016
- \_ **Bernd Willms**, Säulenversuche mit hohen Kontaktzeiten zur Vorhersage temperaturinduzierter geochemischer Änderungen im Kontext oberflächennaher Wärmespeicherung im Untergrund, 2017

## Supervised Doctoral Degrees (Selection)

- \_ **Márton Berta**, Experimental investigation of hydrogeochemical consequences of gas leakages into shallow aquifers, 2017
- \_ **Klas Lüders**, Quantifizierung standortspezifischer oberflächennaher Veränderung der hydrogeochemischen Grundwasserzusammensetzung als Funktion der Temperatur, ongoing
- \_ **Anna Jesušek**, Temperaturinduzierte Auswirkungen unterirdischer Wärmespeicherung auf hydrogeochemische Sediment-Wasser-Wechselbeziehungen in einem Grundwasserleiter, 2012

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ANGUS II Research Network, page 40

## Energy and Climate Protection R&amp;D Projects

## TestUM-Aquifer: Test Field for Investigating and Monitoring Reactive Multiphase Transport Processes in Shallow Aquifers Induced by the Use of the Subsurface

Project duration: 2017 to 2020

Funding volume: €M 1 (total Kiel University funding approval)

Cooperating partner: Helmholtz Centre for Environmental Research – UFZ, Leipzig

## IGLU: Investigation, Modelling and Evaluation of an Intelligent, Long-term Geothermal Storage System with Environmentally Neutral Behaviour

Project duration: 2014 to 2018

Funding volume: €557,647 (total Kiel University funding approval)

Cooperating partners: Scheer Heizsysteme GmbH, Helmholtz Centre for Environmental Research – UFZ, Leipzig



## Further information

[www.AGHydrogeologie.ifg.uni-kiel.de](http://www.AGHydrogeologie.ifg.uni-kiel.de)

Detailed researcher profile



## Prof. Dr. Martina Gerken



Faculty of Engineering, Institute of Electrical Engineering and Information Technology

Professorship: Integrated Systems and Photonics  
At the university since 2008

Tel +49 431 880-6250  
mge@tf.uni-kiel.de

#### Core Expertise in Energy Research

- Organic optoelectronics
- Nanostructures for increasing efficiency
- Optic design

#### Supervised Bachelor's/Master's Theses (Selection)

- \_ Jan Petersen, Efficiency enhancement of a green, organic light emitting diode by varying the layer stack, 2017
- \_ Janek Buhl, Electrical properties and efficiency of organic light emitting diodes with integrated nanostructures, 2017
- \_ Jan Schardt, Design and fabrication of nanostructured waveguides for organic solar cells, 2018

#### Supervised Doctoral Degrees (Selection)

- \_ Christian Kluge, Nanostructures for emission control in organic light-emitting layers, 2014
- \_ Daniela Bechtold, born Threm, Integration of organic optoelectronics and photonic crystals for lab-on-a-chip-systems, 2014
- \_ Matthias Bremer, Functionalized photochromic surfaces switched by organic light-emitting diodes, 2017

#### Energy and Climate Protection R&D Projects

##### Interreg Project RollFlex: Roll-to-roll Processing of Solar Cells and Light-emitting Diodes

Funding volume: €450,000

Cooperating partners: SDU Sønderborg, Phi-Stone AG, Stensborg A/S

##### ERC Project PhotoSmart: Switchable Molecules on Surfaces for Biosensing with OLED Light Sources On-chip

Funding volume: €M 1.5

##### Nanosystems Technology Centre of Excellence

Funding volume: €250,000

Cooperating partners: chairs at the Faculty of Engineering at Kiel University, Fraunhofer ISIT

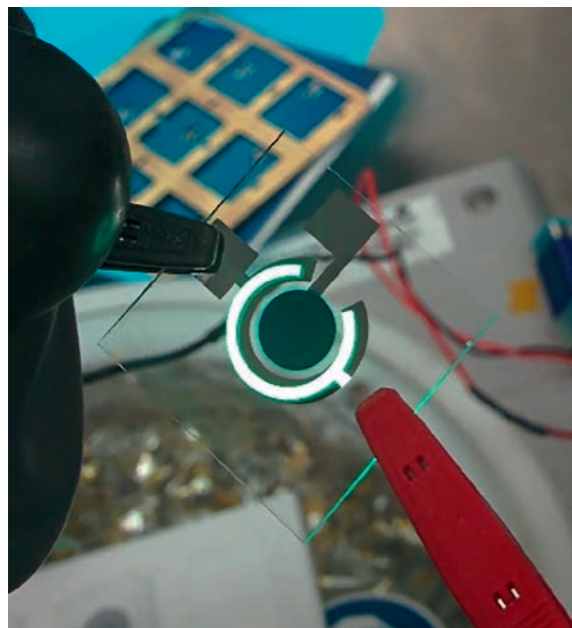
#### Miscellaneous

##### Awards

- \_ Kiel State Capital Science Prize 2013
- \_ ERC Starting Grant 2012-2018
- \_ Adolf-Martens-Preis 2008 (materials sciences, materials research and testing)
- \_ BMBF NanoFutur prize 2007-2012

##### Event

- \_ Workshop on roll-to-roll processing of organic solar cells and light-emitting diodes on March 16, 2018 at the New Energy Fair in Husum



OLED-OPD Chip

Photo: Jan Balke

#### Further information

[www.isp.tf.uni-kiel.de](http://www.isp.tf.uni-kiel.de)

[Detailed researcher profile](#)



## Prof. Dr. Eberhard Hartung



Agricultural and Nutrition Sciences Faculty, Institute of Agricultural Engineering


Professorship: Agricultural Engineering  
At the university since 2005

Tel +49 431 880-2107  
ehartung@ilv.uni-kiel.de

#### Core Expertise in Energy Research

- Harvesting, storing and conserving biomass
- Calculation of energy/gas yields, fermentation kinetics
- Contactless determination of constituents

#### Leadership Duties Relevant to Energy Research

-  \_ Founding member, head of steering group and spokesperson for the Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH)
- \_ Member of Energy Transition Research steering group at Kiel University
- \_ President of Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. (KTBL)

#### Supervised Bachelor's/Master's Theses (Selection)

- \_ Aron Borcharding, Abschätzung des Holzertrags bei Knicks unter Verwendung digitaler Bildanalyse, 2017
- \_ Blanka Angelika Zajac, Vorgehensweise zur Erstellung einer Energiebilanz am Beispiel der Biogasanlage Groß Vollstedt, 2015
- \_ Hannah Schuldt, Vergleich von Hoch- und Flachsilos hinsichtlich der Verdichtung und der Silierverluste unter Berücksichtigung der Häcksellänge, 2016

#### Energy and Climate Protection R&D Projects

##### Biogas Monitoring Program III –

##### Sub-project: New Methods in Process Evaluation

Funding: Fachagentur Nachwachsende Rohstoffe e. V. (FNR), Federal Ministry of Food and Agriculture (BMEL)  
Cooperating partners: Deutsche Biomasseforschungszentrum, Bavarian State Research Center for Agriculture, State Institute of Agricultural Engineering and Bioenergy (740) University of Hohenheim

##### Optimisation of the Energy Exploitation of Roadside Trees

Project duration: 2016 to 2019  
Funding volume: €149,000 (EKSH funds)

Project partners: Landesbetrieb Straßenbau und Verkehr S-H, Kreisbauernverband Plön, Naturschutzbund Deutschland e.V. (NABU), Plön chapter, state nature conservation officer at the Ministry of Energy, Agriculture, the Environment, Nature and Digitalization of the State of Schleswig-Holstein, Landesverband Lohnunternehmer Schleswig-Holstein e.V., Plön chapter, Schleswig-Holsteinischer Heimatbund e.V.

##### Development of an Innovative, Non-invasive Measurement Method for Determining the Yield Potential of Ditched and Embanked Hedgerows and SRCs in Agriculture

Project partners: Biomass Utilisation Operational Group (OG), including: farmers, Plön district council, Verband der Lohnunternehmer, NABU, German Farmers' Association, state nature conservation officer, universities, etc.); EIP Agri (funded by the European Commission)

##### REDUCE – Sustainable, Animal and Environmentally Friendly Cattle Husbandry by Reducing Ammonia Emissions with the Help of a Urease Inhibitor


Funding: Federal Ministry of Food and Agriculture (BMEL)/ Landwirtschaftliche Rentenbank  
Cooperating partner: SKW Stickstoffwerke Piesteritz GmbH

##### InterDigSoil – Sustainable Utilisation of Innovative Fermentation Products

##### Sub-project a): Development and Analysis of Fermentation Products

##### Sub-project b) Interactions Between Fermentation Products and Soil Microflora

Funding: Fachagentur Nachwachsende Rohstoffe e. V. (FNR), Federal Ministry of Food and Agriculture (BMEL)  
Project partner: Institute of Plant Nutrition and Soil Science – Department of Soil Science

 Competence Centre Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH), page24

#### Further information

[www.ilv.uni-kiel.de](http://www.ilv.uni-kiel.de)

[Detailed researcher profile](#)



**Prof. Dr. Dr. Christian H. C. A. Henning**

Faculty of Agricultural and Nutritional Sciences, Institute of Agricultural Economics

Professorship: Agricultural Policy  
At the university since 2000Tel +49 431 880-4453  
chenning@ae.uni-kiel.de**Core Expertise in Energy Research**

- Political economy of bioenergy and agricultural policy
- Interactions between bioenergy and agricultural production
- Bioenergy and regional development, bioenergy and quality of life

**Supervised Doctoral Degrees (Selection)**

- \_ *Ding Jin*, Analyzing the joint impact of energy, climate and agricultural development policies on sustainable Pro-Poor growth: integrating econometric and general equilibrium modelling approaches
- \_ *Malte Winkler*, Modelling policies to promote the use of renewable energies in order to fulfill climate and energy targets
- \_ *Sneha Thube*, Political Economy modelling of agricultural and climate policies: impact on poverty and sustainability

**Energy and Climate Protection R&D Project****Bio-Pop, Bioeconomy as Social Change – Modelling and Design of Political Decision-making Processes Establishing Sustainable Economic Systems in Industrialised and Developing Countries**

Project duration: 2017 to 2020

Funding volume: approx. €M 1.1 (BMBF)

Cooperating partners: Prof. Dr. Bernhard Thalheim, Kiel University, Faculty of Engineering; Kiel Institute for the World Economy (Prof. Dr. Gernot Klepper, Prof. Dr. Manfred Wiebelt, Dr. Ruth Delzeit)

For further information visit:

[www.bio-pop.agrarpol.uni-kiel.de/de](http://www.bio-pop.agrarpol.uni-kiel.de/de)**Miscellaneous**

Study

**De-facto Implementation, Regional Distribution and Economic Effects of the Nature Conservation Intervention Regulations for Wind Turbines in Schleswig-Holstein**

Funding volume: €18,400 (EKSH funds)

Cooperating partners: Prof. Dr. Uwe Latacz-Lohmann, Farm Management and Production Economics, Kiel University

About 5,000 to 6,000 hectares are needed as compensation areas for the planned further expansion of wind energy in Schleswig-Holstein, which is provided for under the Nature Conservation Act. This corresponds to 0.6 percent of the agricultural land in the northernmost state. This is the result of a 2014 study on nature conservation compensation areas for the construction of wind turbines.

To download the study: [www.eksh.org/presse/publikationen](http://www.eksh.org/presse/publikationen)

International Doctoral Student Program

**Interdisciplinary Graduate School****Third Ways of Feeding the World (TWW)**

20 doctoral students

Laufzeit: 2015 to 2022

Funding volume: approx. €M 1.5

[www.feeding-the-world.de/en/home](http://www.feeding-the-world.de/en/home)

Project partners at Kiel University: Prof. Taube (organic farming and fodder cultivation) and Prof. Ott (environmental ethics)

**Further information**[www.agrarpol.uni-kiel.de/de](http://www.agrarpol.uni-kiel.de/de)**Detailed researcher profile****Prof. Dr. Joachim Krieter**

Faculty of Agricultural and Nutritional Sciences, Institute of Animal Breeding and Husbandry

Professorship: Livestock Husbandry  
At the university since 1999Tel +49 431 880-2585  
jkrieter@tierzucht.uni-kiel.de**Core Expertise in Energy Research**

- Influence of husbandry environment on performance, animal health and animal behaviour
- Livestock precision farming
- Simulation studies on the distribution of highly contagious animal diseases

**Leadership Duties Relevant to Energy Research**

- \_ Commission of livestock farming systems, EAAP

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ *Eide Marie Hauschild*, Alternative Haltungssysteme in der Schweinemast, 2017
- \_ *Kerstin Röh*, Standortangepasste Mutterkuhhaltung, 2016
- \_ *Sarah Kristina Dalke*, Extensive Beweidung mit Rindern und Auswirkungen auf die Biodiversität, 2015
- \_ *Mareike Zutz*, Weidemanagement und planmäßige Bekämpfungsstrategien zur Regulierung der Endoparasitenbelastung und der Antibiotikaresistenz bei Wiederkäuern, 2015
- \_ *Sinje Büttner*, Vergleich verschiedener Behandlungsstrategien gegen Endoparasiten beim Schaf, 2017
- \_ *Malte Harder*, Innerbetriebliche Verwertung der Zuckerrübe, 2017

**Supervised Doctoral Degrees (Selection)**

- \_ *Karoline Reckmann*, Life Cycle Assessment of pork especially emphasising feed and pig production. Schriftenreihe des Instituts für Tierzucht und Tierhaltung, Heft 200, 2013
- \_ *Julia Drews*, Life Cycle Assessment of dairy farms in Northern Germany, ongoing

**Energy and Climate Protection R&D Projects****Optimisation of the Eco-efficiency Assessment for Pig Production**

Funding volume: €110,000 (Landwirtschaftliche Rentenbank, Federal Association of German Pig Production)

Cooperating partner: Westfleisch

**Environmental Effects and Efficiency of Dairy Farms in Schleswig-Holstein**

Funding volume: €95,000 (Stiftung Schleswig-Holsteinische Landschaft, Landwirtschaftliche Rentenbank, EKSH)

Cooperating partner: Landwirtschaftskammer Schleswig-Holstein

**Inno-Pig – Influence of Different Farrowing and Rearing Systems on Animal Welfare, Animal Health and Economic Efficiency in Pig Farming – an Interdisciplinary Approach**

Funding volume: €M 2.7 (BLE, Landwirtschaftliche Rentenbank)

Cooperating partners: 8 partners in universities, chambers of agriculture and commercial enterprises, Coordination: Prof. Dr. J. Krieter

**CowAlarm – a Tool for Monitoring Animal Welfare on Dairy Farms**

Funding volume: €510,000 (BLE)

Cooperating partners: GEA Farm Technologies GmbH, 365FarmNet Group GmbH &amp; Co. KG., Coordination: Prof. Dr. J. Krieter

Free-range farrowing sow.

Photo: Joachim Krieter

**Further information**[www.tierzucht.uni-kiel.de](http://www.tierzucht.uni-kiel.de)

## Prof. Dr. Marco Liserre



Faculty of Engineering, Institute for Electrical Engineering and Information Technology

Professorship: Power Electronics  
At the university since 2013Tel +49 431 880-6100  
ml@tf.uni-kiel.de

## Core Expertise in Energy Research

- Grid integration of renewable energy forms
- Electromobility
- Reliability of power electronics components

## Leadership Duties Relevant to Energy Research

- \_ IEEE Fellow, 2013
- \_ Founder/editor/chief editor/member/chairperson of various IEEE publications/conferences

## Supervised Bachelor's/Master's Theses (Selection)

- \_ *Frederik Hahn*, Improvement of the Modulation for Modular Multilevel Converters (MMC) in HVDC Applications, Masterarbeit, 2015
- \_ *Marius Langwasser*, Untersuchung des Einflusses von unsymmetrischen Netzspannungseinbrüchen auf die Lebensdauer von Windenergieanlagen, 2016

## Supervised Doctoral Degrees (Selection)

- \_ *Dr. Markus Andresen*, Active Thermal Control of Power Electronic Modules in Smart Transformer Applications, 2017
- \_ *Shahab Asadollah*, Wind farm control strategies, 2016–2019
- \_ *Johannes Falck*, Aktive thermische Regelung von Leistungshalbleitermodulen, 2015–2018

## Energy and Climate Protection R&amp;D Projects

## The Highly Efficient and Reliable Smart Transformer (HEART), a new Heart for the Electric Distribution System

Funding volume: €M 1.8 (EU ERC Consolidator Grant)  
Cooperating partners: CORPE (Center of Reliable Power Electronics), Aalborg University  
www.heart.tf.uni-kiel.de

## Analysis of the Electrical Characteristics of Medium-voltage Grids Regarding the Optimization during High Energy Input from Wind Energy Systems

Funding volume: €M 2.3 (BMU)  
Cooperating partners: Six Companies and Kiel UAS

## Medium-voltage Laboratory

Funding volume: €M 1 (EFRE, Kiel University, EKSH funds)

## Power Electronics Region

Funding volume: €600,000 (ERDF)  
Cooperating partners: Syddansk Universitet, Kiel UAS, WTSH GmbH, UdviklingsRåd Sønderjylland and others

## RELINK: Power Electronic Converter for Connection of Decentralized AC- and DC-Systems

Funding volume: €700,000 (BMBF)  
Cooperating partners: Fraunhofer IFF Magdeburg and companies

## Kopernikus Project New Grid Structures: New Energy Grid Structure for the Energy Transition (ENSURE)

Funding volume: €600,000 (BMBF)  
Cooperating partners: 23 partners (industry, universities, civil society)

## Miscellaneous

## Patent Applications

- \_ De Carne, G., Buticchi, G., Liserre, M., Vournas, C.: "Method for operating an electrical power supply grid, computer program, power electronics devices and power supply grids", European Patent (EPA).
- \_ Liserre, M., De Carne, G., Buticchi, G.: "Elektrisches Energieversorgungsnetz und Verfahren zu dessen Betrieb", (DE).

## Publications

- \_ More than 300 scientific articles

## Awards

- \_ "The world's most influential scientific minds" (Thomson Reuters Highly Sighted)
- \_ 6 IEEE Awards

## Further information

www.pe.tf.uni-kiel.de

## Detailed researcher profile



## Prof. Dr. Katrin Rehdanz

Faculty of Business, Economics and Social Sciences, Institute of Economics,  
Institute for Regional Science, Environmental and Resource EconomicsProfessorship: Environmental and  
Energy Economics  
At the university since 2007Tel +49 432 880-3289  
rehdanz@economics.uni-kiel.de

## Core Expertise in Energy Research

- Energy Demand
- Climate Economics
- Energy and Climate Policy

## Leadership Duties Relevant to Energy Research

- \_ Co-editor of the Energy Economics journal
- \_ Coordinator of the Environmental and Resource Economics master's course (also see page 13)

## Supervised Bachelor's/Master's Theses (Selection)

- \_ Waste sites and residential property prices: A meta-analysis of the hedonic pricing literature, 2017
- \_ Verteilungs- und Wettbewerbswirkungen des Erneuerbare Energien Gesetzes (EEG), 2017
- \_ Die Zertifizierung der Energieeffizienz von Gebäuden: Eine ökonomische Analyse, 2017

## Supervised Doctoral Degrees (Selection)

- \_ *Christine Merk*, Essays on individuals' responses to climate change and technologies to counteract climate change, 2016
- \_ *Sebastian Petrick*, Determinants of Energy Use of Manufacturing Firms and Private Households, 2014
- \_ *Nadine Heitmann*, Essays on Economic Aspects of Regulating Maritime Transport, 2013
- \_ *Swantje Sundt*, Öffentliche Akzeptanz von Maßnahmen zur Energiewende am Beispiel Schleswig-Holstein, 2013–2015
- \_ *Anke Jacksohn*, Determinanten der Investitionsentscheidung privater Haushalte für Photovoltaik-Anlagen und Möglichkeiten der politischen Einflussnahme, 2016–2018
- \_ *Marvin Schütt*, Die Auswirkung der Energiewende auf Immobilien- und Pachtpreise: Eine mehrdimensionale Analyse unter Verwendung des Hedonic-Pricing-Ansatzes, 2017–2019

## Energy and Climate Protection R&amp;D Projects

## DICES – Dealing with change in SIDS: Societal action and political reaction in sea level change adaptation in Small Island Developing States

Funding volume: €230,000 (DFG, SPP Climate Engineering)  
Cooperating partners: University of Hamburg, Leibniz University Hannover

## TOMACE –Trade-offs between mitigation and climate engineering: an interdisciplinary approach

Funding volume: €240,000 (DFG, SPP Sea Level)  
Cooperating partner: Kiel University, University of Kassel

## CLAIM – Cleaning Litter by Developing and Applying Innovative Methods in European Seas

Funding volume: €278,000 (Horizon-2020, BG-2016-2017)  
Cooperating partners: Consortium of 18 international cooperating partners

## IFkE – Instruments for Promoting Climate-friendly Nutrition

Funding volume: €135,000 (EKSH funds)  
Cooperating partners: Kiel University, Kiel Institute for the World Economy

## ACCEPT – What determines people's willingness to accept new climate change mitigation options?

Funding volume: €590,000 (BMBF Economy of Climate Change)  
Cooperating partner: Kiel Institute for the World Economy

## ACCESS – Quantification of climate change impacts on economic sectors in the Arctic

Funding volume: €280,000 (FP7-Ocean-2010/CP-IP)  
Cooperating partners: Consortium of 25 national and international cooperating partners

European Centers for Power Electronics Schleswig-Holstein (ECPE), page 30

EKSH Doctoral Scholarships, page 130

EKSH Doctoral Scholarships, page 130

## Further information

www.vwl.uni-kiel.de

## Detailed researcher profile



## Prof. Dr. Till Requate



Faculty of Business, Economics and Social Sciences

Professorship: Innovation economics,  
competition policy and  
new institutional economics  
At the university since 2002

Tel +49 431 880-4424  
requate@economics.uni-kiel.de

**Core Expertise in Energy Research**

- Modelling of energy markets and energy policy
- Experimental economics research in terms of responses to energy and emissions trading markets
- Emissions trading

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ *Jule Ulrike Schüttler*, Ein Markt-Design für die wettbewerbliche Interpretation der erneuerbaren Energien in den Strommarkt, 2017
- \_ *Salien Nazo*, Die Wirtschaftlichkeit verschiedener Stromspeichertechnologien 2015
- \_ *Imke Bock*, Quotensysteme als Instrument zur Förderung erneuerbarer Energien bei der Stromerzeugung – Theorie und Evidenz verschiedener EU-Staaten 2015
- \_ *Christina Söhl*, Führt das EEG 2.0 zu mehr Marktintegration der erneuerbaren Energien? 2014
- \_ *Henrik Mertens*, Policy Instruments to support Renewable Energy Supply under Uncertainty, 2017
- \_ *Kai Paulsen*, Do we need capacity markets to guarantee energy security? 2016
- \_ *Ziyan Chen*, The Impact of Technological Spillovers on International Environmental Agreements, 2016
- \_ *Anne Kamlage*, The Economics of Renewable Energy Storage; The case of Germany
- \_ *Jonas Krüger*, International Trade and the Extraction of Exhaustible Resources, 2014
- \_ *David Hugo*, Carbon Leakage and Border-Adjustment, 2014

**Supervised Doctoral Degrees (Selection)**

- \_ *Eric Arndt*, Environmental Policy Instruments and Dynamic Investment Incentives for Technology Adoption and R&D
- \_ *Johanna Reichenbach*, Analysis of Carbon Mitigation Policies: Feed-in-tariffs, Energy and Carbon Price Interactions, and Competitive Distortions on Carbon Markets, 2011
- \_ *Wilfried Rickels*, Optimal Global Carbon Management with Ocean Sequestration, 2011
- \_ *Lena Döpf*, Optimale Ausbeutung endlicher Methanhydrat-Vorkommen und ihre Rückwirkungen auf das Klima, 2013

**Energy and Climate Protection R&D Projects****EXPECT: An experimental study of climate policy negotiations for policy design and impact assessment**

Funding volume: approx. €450,000  
Cooperating partner: Kiel Institute for the World Economy

**Efficient market design for the support of renewable energy**

Energy research project (not third-party funded).

**Miscellaneous**

- \_ Co-organiser: Kiel Energy Discourse – Energy Policy Talks ([www.kieler-energiegediskurs.de](http://www.kieler-energiegediskurs.de))

**Publications**

- \_ Requate, T. (2015): Green Tradable Certificates versus Feed-in-Tariffs in the Promotion of Renewable Energy Shares, *Environmental Economics and Policy Studies* 17 (2), 181-202.
- \_ Requate, T. (2014): Feed-in Tariffs versus Green Certificates in the Promotion of Renewable Energy, forthcoming, in *Environmental Economics and Policy Studies*.
- \_ Döpfke, L., Requate, T. (2014): The Economics of Exploiting Gas Hydrates, *Energy Economics* 42, 355-364.
- \_ Reichenbach, J., Requate, T.: Potential Anti-Competitive Effects of Emission Permit Markets – A survey on Theoretical Findings and Evidence, *Review of Economics* 64 (3) 271-292.

**Further information**

[www.iwni.bwl.uni-kiel.de](http://www.iwni.bwl.uni-kiel.de)

**Detailed researcher profile**

## Prof. Dr. Carsten Schultz



Faculty of Business, Economics and Social Sciences, Institute of Innovation Research

Professorship: Technology Management  
At the university since 2012

Tel +49 431 880-1542  
schultz@bwl.uni-kiel.de

**Core Expertise in Energy Research**

- Services development methods
- Success factors in open innovation processes
- Innovation management

**Leadership Duties Relevant to Energy Research**

- \_ Scientific director of innovate!new, a cross-industry innovation benchmarking company with a focus on energy suppliers

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ *Daniel Laufs*, Vom Commodity-Anbieter zum Energiedienstleister – Auswirkungen von Eigentümerstrukturen auf die Innovativität von Energieversorgungsunternehmen, 2016
- \_ *Hildegard Cloppenburg*, Innovativität von energetischen Quartierskonzepten – Entwicklung und Anwendung eines Messkonzeptes mit Hilfe von Text Mining, 2017
- \_ *Lars Döscher*, Die Rolle der Unternehmensleitung im strategischen Wandel von Energieversorgern, 2017

**Supervised Doctoral Degrees (Selection)**

- \_ *Heiner Lütjen*, Essays on Management of Servitization – An empirical analyses of the German energy industry
- \_ *Julia Kroh*, Management offener Innovationsprozesse in der Energiewirtschaft

**Energy and Climate Protection R&D Projects****Cross-industry Innovation in the Energy Industry: Potentials of and Barriers to New Business Models for Energy Efficiency**

Project duration: 2015 to 2017  
Funding volume: €119,680 (EKSH funds)  
Cooperating partners: Stadtwerke Kiel AG, IPP ESN Power Engineering GmbH, Kiel

**Digital Transformation of Energy Utilities – The role of employees in change processes**

Project duration: 2018 to 2020  
Funding volume: €149,000 (EKSH funds)  
Cooperating partners: Stadtwerke Rendsburg AG, Verband der Schleswig-Holsteinischen Energie- und Wasserwirtschaft (VSHEW), RheinEnergie AG, ESN EnergieSystemeNord GmbH


**Miscellaneous**

- \_ Conducting student research projects to develop innovative services with regional energy supply companies



Prof. Dr. Carsten Schultz with two of his research assistants in the field of energy research, Julia Kroh and Heiner Lütjen.

Photo: Betti Bogya

 EKSH Doctoral Scholarships, page 130

**Further information**

[www.techman.uni-kiel.de](http://www.techman.uni-kiel.de)

**Detailed researcher profile**

## Prof. Dr. Friedhelm Taube



Agricultural and Nutrition Sciences Faculty  
Institute for Crop Science and Plant Breeding

Professorship: Grassland and  
Fodder Cultivation/Organic Farming  
At the university since 1995

Tel +49 431 880-2134  
ftaube@gfo.uni-kiel.de

### Core Expertise in Energy Research

- Biomass production/bioenergy
- Climate protection in agriculture
- Sustainable land use systems

### Leadership Duties Relevant to Energy Research

- \_ German Research Foundation (DFG), crop cultivation review board (member since 2012)
- \_ Federal Ministry of Food and Agriculture (BMEL), agricultural policy scientific advisory board (member since 2012)
- \_ DBU scholarship committee
- \_ State of Schleswig-Holstein climate council
- \_ KTBL climate protection working group (with Dr. T. Reinsch)
- \_ Chairperson of the German Maize Committee

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Manuel Walz*, Kurzfristige Effekte einer umbruchlosen Erneuerung auf die Kohlenstoff- und Treibhausgasbilanz von Grünlandbeständen, 2016
- \_ *Inger Julia Anna Struck*, Untersuchungen zum C-Eintrag durch Wurzelbildung unter Niedermoorgrünland, 2015
- \_ *Heike Lorenz*, Growth and forage quality dynamics of grass clover swards - a field study, 2015
- \_ *Dorothee Riggers*, Einfluss von Bodenverdichtung auf Leistung und Umwelteffekte von Silomais, 2014

### Supervised Doctoral Degrees (Selection)

- \_ *Martin Komainda*, Catch cropping in silage maize (Zea mays L.) - potential with respect to yield and environmental performance under the climatic conditions of northern Germany, 2017
- \_ *Maike Hamacher*, Potentiale sekundärer Pflanzeninhaltsstoffe in Futterleguminosen und Wiesenkräutern für eine verbesserte N-Verwertung beim Wiederkäuer, 2016
- \_ *Lars Biernat*, Ökoeffizienz im ökologischen und konventionellen Marktfruchtbaubau Schleswig-Holsteins – ein konzeptioneller Ansatz zur Bewertung von Landnutzungssystemen, 2016
- \_ *Jürgen Rath*, Maisgenotypen zur Biogasnutzung: Übersicht, Entwicklung und Validierung eines Modells zur Potenzialabschätzung der Biogasausbeute, 2015

### Energy and Climate Protection R&D Projects

#### Carbo Maize: C-fluxes in Maize Cultivation

Funding volume: €380,000 (FNR)  
Cooperating partner: German Maize Committee

#### Satellite-based Estimation of Grassland and Field Forage Crop Yields

Funding volume: €120,000 (share)  
Cooperating partners: LFL-Bayern, GAF AG

#### Sustainable Increase in Yield Performance in Organic Market Crop Production Through Production of Catch Crops Individually Optimised per Farm

Funding volume: €192,000  
Cooperating partners: LK-SH -EFRE

#### SusCatt

Funding volume: €280,000 (ERA-NET)  
Cooperating partners: NIBIO, SLU, RISE, UNEW, IGAB, UP

#### Euro-Dairy

Funding volume: €160,000 (EU)  
Cooperating partners: Various

#### Go-Jelly

Funding volume: €240,000 (EU)  
Cooperating partners: Various

#### A Third Way to Feed One World

Funding volume: €420,000 Villigst Scholarship program  
Cooperating partners: University of Stellenbosch, SA and others

### Further information

[www.grassland-organicfarming.uni-kiel.de](http://www.grassland-organicfarming.uni-kiel.de)

### Detailed researcher profile



## Prof. Dr. Georg Thaller



Faculty of Agricultural and Nutritional Sciences, Institute of Animal Breeding and Husbandry

Professorship: Animal Breeding and  
Pet Genetics  
At the university since 2005

Tel +49 431 880-7329  
gthaller@tierzucht.uni-kiel.de

### Core Expertise in Energy Research

- Genomic processes in livestock breeding
- Innovative performance testing in dairy cattle breeding
- Resource efficient breeding strategies

### Leadership Duties Relevant to Energy Research

- \_ ICAR Feed and Gas Working Group (research liaison group)

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Ariane Horst*, Praxisorientiertes Fütterungskontrolling auf Milchviehbetrieben, 2017
- \_ *Fehmke Böckenhauer*, Einfluss der Rationszusammensetzung auf die Futteraufnahme, Milchmenge und Milchinhaltstoffe, 2017
- \_ *Martina Leißner*, Erörterung der Vorarbeiten zum Projekt MethanA, 2014
- \_ *Tomke Lindena*, Phänotypische Beschreibung der Versuchskühe des MethanA-Vorhabens auf Einzeltierbasis und unter besonderer Berücksichtigung von Faktoren mit Einfluss auf die Methanbildung, 2013
- \_ *Fransziska Dettmann*, Möglichkeiten zur Reduzierung von Methanemissionen aus der Milchviehhaltung durch züchterische Maßnahmen, 2012

### Supervised Doctoral Degrees (Selection)

- \_ *Lisa-Marie Sandberg*, Quantifizierung der Methanemissionen bei Rindern mit Hilfe des fäkalen Biomarkers Archaeol, ongoing
- \_ *Imke Harder*, Genetische und genomische Untersuchungen zu Futteraufnahme und Stoffwechselfgeschehen, ongoing

### Energy and Climate Protection R&D Projects

#### Climate Milk Schleswig-Holstein – Genotyping, Milk Metabolite and Rumen Fluid Analyses in Cows of the Karkendamm Herd with the Aim of Reducing Methane Emissions Harmful to the Climate

Funding volume: €25,000 (EKSH funds)  
Cooperating partners: AG Schmitz-Streit, Kiel University, Prof. Gronwald University of Regensburg

#### MethanA – Quantification of Methane Emissions in Cattle with the Aid of the Faecal Biomarker Archaeol (BÖLN)

Funding volume: €250,000  
Cooperating partner: Leibniz Institute (FBN) Dummerstorf

#### optiKuh – Improvement in Dairy Cow Husbandry Using Breeding Methods with Regard to Feed Intake and Metabolic Stability as well as Environmental Compatibility with Optimised Feeding Intensity, and Use of Metabolic Indicators and Sensors in Herd Management

Funding volume: €M 3.35 (BLE)  
Cooperating partners: 15 partners in universities, federal and state research establishments, and commercial enterprises

#### Working Concept for the Development of a Breeding Value for Feed Efficiency and Feed Intake

Funding volume: €35,000  
Cooperating partners: Förderverein Bioökonomieforschung e. V., Vereinigte Informationssysteme Tierzucht w.V.

### Miscellaneous

- \_ Cooperation with Aarhus University, Department of Molecular Biology and Genetics: Methane measurements and rumen fluid investigations – relationship with the microbiome
- \_ global dry matter initiative (gDMI I & II): Genomic characterisation and breeding value estimation for feed intake based on an international learning sample

### Further information

[www.tierzucht.uni-kiel.de](http://www.tierzucht.uni-kiel.de)

### Detailed researcher profile



**Prof. Dr. Frank Wuttke**

Faculty of Mathematics and Natural Sciences, Institute of Geosciences

Professorship: Marine and Terrestrial  
Geomechanics & Geotechnical Engineering  
At the university since 2013

Tel +49 431 880-2840  
frank.wuttke@ifg.uni-kiel.de

**Core Expertise in Energy Research**

- ⊙ Thermal geoenery storage
- ⊙ Thermal conductivity of soils
- ⊙ Hydro-thermo-mechanical stresses on geomaterials

**Leadership Duties Relevant to Energy Research**

- \_ Chairman of the Energy Geo-Storage task force in the International Society for Soil Mechanics and Geotechnical Engineering's Technical Committee 308
- \_ Organiser of the 1st International Energy Geotechnics conference



- \_ ANGUS II: Involved in BMWi collaborative project

**Supervised Bachelor's/Master's Theses (Selection)**

- \_ T. Willems, Pressure and Temperature dependence of elastic P- and S-wave properties in geothermal core samples at reservoir characterization
- \_ K. Sembdner, Study of the relation between hydro-mechanical properties and electromagnetic behavior of clayey sand mixtures
- \_ H. Wesselmann, Studie zum Design hochwärmeleitfähiger Bettungsmaterialien von erdverlegten Hochspannungsleitungen

**Supervised Doctoral Degrees (Selection)**

- \_ H. Z. Rizvi, Thermo-Hydro-Mechanical modelling of fractured geomaterial by Lattice-Element Modelling, Kiel University, 2018
- \_ H. Hailemariam, Cyclic behaviour of thermal energy storage materials, Kiel University, 2019
- \_ D. Shrestha, Highly thermal conductive backfill material for energy lifelines, Kiel University, 2018

**Energy and Climate Protection R&D Projects****Geomechanical integrity of host and barrier rocks - experiment, modeling and analysis of discontinuities**

Project duration: 2017 to 2020

Funding volume: €365,000 (BMBF)

Cooperating partners: Federal Institute for Geosciences and Natural Resources (BGR), Helmholtz Centre for Environmental Research – UFZ, Leipzig (overall coordination), Institut für Gebirgsmechanik GmbH (IfG Leipzig), Technische Universität Bergakademie Freiberg (TUBAF), University of Stuttgart

**IGLU - Modelling and Assessment of intelligent geothermal Long-term heat storage by environmental sustainable behavior**

Project duration: 2014 to 2018

Funding volume: €557,647 (total Kiel University funding approval)

Cooperating partners: Scheer Heizsysteme GmbH, Helmholtz Centre for Environmental Research – UFZ, Leipzig

**Spezialized structures and materials for high-voltage offshore cable backfill and embedding**

Project duration: 2015 to 2017

Funding volume: €190,000 (BMW/ZIM)

Cooperating partners: Christoffers On and Subsea, APS GmbH, IAB Weimar, Testing Bluhm & Feuerherdt GmbH



ANGUS II Research Network, page 40

**Further information**

[www.geotechnics.ifg.uni-kiel.de](http://www.geotechnics.ifg.uni-kiel.de)

**Detailed researcher profile**

## Prof. Dr. Sabah Badri-Höher



Faculty of Computer Science and Electrical Engineering

Professorship: Digital Signal Processing  
Digital Transmission Systems  
At the UAS since 2003

Tel +49 431 210-4243  
sabah.badri-hoeher@fh-kiel.de

### Core Expertise in Energy Research

- Safety of offshore wind turbines
- Monitoring wind turbines

### Betreute Bachelor-/Masterarbeit

– E. Wenzlaff, Entwicklung und Erprobung eines Kolküberwachungssystems, 2013

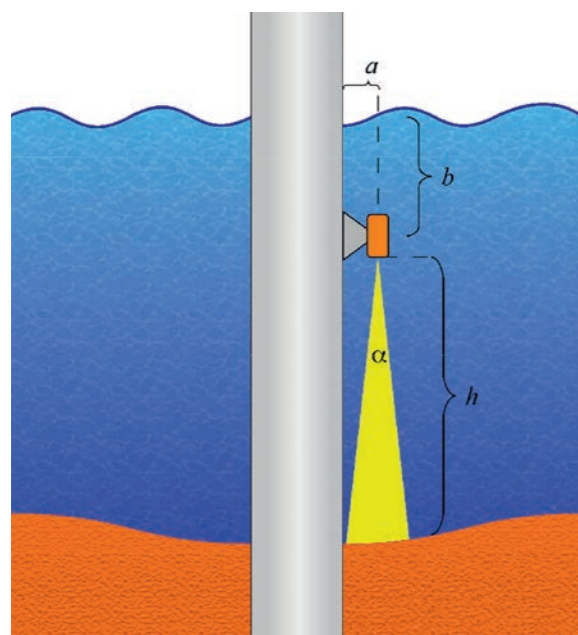
### Energy and Climate Protection R&D Project

**i** **EECole-Development and Testing of Permanent, Online-based Scour Monitoring Systems for Various Offshore Wind Energy Structures**

Funding volume: €95,000 (EKSH funds)

Cooperating partner:

R&D centre Kiel University of Applied Sciences GmbH



Monitoring system: the EECole system permanently monitors scour formation using ultrasonic transducers and receivers below the water surface (right).  
Figure: Kiel UAS



Laboratory prototype: project manager Prof. Dr.-Ing. Sabah Badri-Höher demonstrates the EECole scour monitoring system. The electronic components are integrated in a pressure vessel, which can resist pressures up to 50 metres water depth.

Photo: Joachim Welding

**i** EKSH-information brochure no. 4/2017 (German)

### Further information

www.fh-kiel.de

## Prof. Dipl.-Ing. Benedict Boesche



Department of Mechanical Engineering/Naval Architecture and Maritime Engineering

Professorship: Maritime Engineering  
At the UAS since 2010

Tel +49 431 210-2708  
benedict.boesche@fh-kiel.de

### Core Expertise in Energy Research

- Sustainable maritime transport
- Maritime engineering/offshore platforms
- Marine engineering

### Supervised Bachelor's/Master's Theses (Selection)

- Michael Sass, Untersuchung eines faseroptischen Dehnmessverfahrens zur langfristigen Zustandsüberwachung von Offshore-Strukturen, Studienarbeit Master, Fachhochschule Kiel, Schiffbau und maritime Technik, 2017
- Andre Heins, CAD-Modellierung der Offshore-Forschungsplattform Fino 3 auf Basis realer Installationsmerkmale, Projekt im Unternehmen, Kiel University of Applied Sciences, Schiffbau und maritime Technik, 2017
- Andre Heins, Entwicklung einer im Mikrometer-Bereich justierbaren Wegsensorkonsole für den Offshore-Einsatz auf der Fino 3, Bachelor Thesis, Kiel University of Applied Sciences, Schiffbau und maritime Technik, 2017
- Sebastian Ohm, CAD-Modellierung und technische Dokumentation eines Linearschwingungsprüfstands, Projekt im Unternehmen, Kiel University of Applied Sciences, Schiffbau und maritime Technik, 2017
- Sebastian Ohm, Berechnung und Konstruktion des wartungsfreien Triebstrangs und des Rahmens für einen Linearschwingungsprüfstand, Bachelor Thesis, Fachhochschule Kiel, Schiffbau und maritime Technik, 2017

### Energy and Climate Protection R&D Project

**Holistic Status Monitoring and Service Life Prognosis of Offshore Wind Turbines Using the Example of FINO3**

Project duration: 2015 to 2018

Funding volume: €372,000

Cooperating partner: R&D centre Kiel University of Applied Sciences GmbH

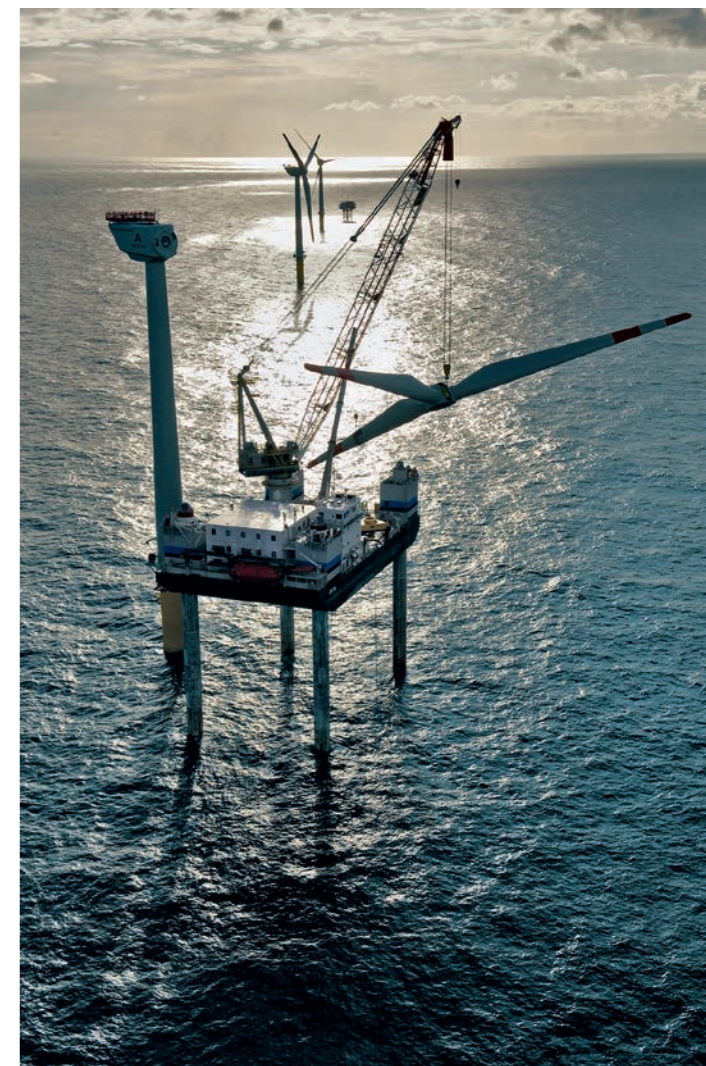


Photo: Areva Multibruid\_Jan Oelker

### Further information

www.fh-kiel.de/index.php?id=boesche

**Detailed researcher profile**





## Prof. Dr. Gordon H. Eckardt



Faculty of Business Management

Professorship: General Business Administration and Marketing  
At the UAS since 2005

Tel +49 431 210-3507  
gordon.eckardt@fh-kiel.de

### Core Expertise in Energy Research

- Entrepreneurship and Intrapreneurship – Perspectives and business models along the value chain of companies in the field of renewable energies

### Energy and Climate Protection R&D Projects

#### Public Information Initiative for the Three Research Platforms FINO1, FINO2 and FINO3

Funding volume: €191,000  
Project Management: BMU

#### GADOW – German and Danish Offshore Wind

Funding volume: €520,000  
Project Management: EU INTERREG IVa  
Cooperating partners: R&D centre Kiel University of Applied Sciences GmbH, Flensburg University of Applied Sciences, Aalborg University, Offshoreenergy.dk, Wind Energy Technology Institute (WETI)

#### FURGY CLEAN Innovation

Funding volume: €M 3  
Project Management: EU INTERREG Va  
Cooperating partners: IHK Schleswig-Holstein, WTSH GmbH, CLEAN, UdviklingsRåd Sønderjylland, Kalundborg Forsyning A/S, FuE-Zentrum FH Kiel GmbH

### Miscellaneous

#### Publications

- Eckardt, G. H., Vanini, U. (2011): Offshore-Windenergie – Marktpotenziale und Erfolgspotenziale: Eine Studie für Unternehmen in der Region Kiel, in Zusammenarbeit mit der KiWi, Kieler Wirtschaftsförderungs- und StrukturentwicklungsGmbH. In: Eckardt, G. H. (Hrsg.): Schriftenreihe des Norddeutschen Instituts für Familienunternehmen, Georg-August-Universität Göttingen



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Further information  
[www.fh-kiel.de/index.php?id=801](http://www.fh-kiel.de/index.php?id=801)

Detailed researcher profile



## Prof. Dr. Ronald Eisele



Faculty of Computer Science and Electrical Engineering, Institute of Mechatronics

Professorship: Sensor Development and Component Packaging  
At the UAS since 2006

Tel +49 431 210-2581  
ronald.eisele@fh-kiel.de

### Core Expertise in Energy Research

- Development and construction of power electronics assemblies (diodes, MOSFET, IGBT and SiC elements)
- Thermal management of assemblies (cooling techniques, material optimisation)
- Construction and connection technology for robust electronics (drives for electric vehicles, converter electronics for regenerative, electrical energies)

### Supervised Bachelor's/Master's Theses (Selection)

- Hilper, Entwicklung und Inbetriebnahme eines Prüfstandes für die Verbindungsqualität von gesinterten, leistungselektronischen Baugruppen, 2015
- Splett, Optimierung des Wärmemanagements einer Leistungselektronik zur Steuerung von elektromotorischen Aktoren, 2015
- Andersen, Simulationsbasierte Auslegung, Aufbau und Erprobung einer anorganisch umhüllten, leistungselektronischen Baugruppe mit beidseitiger Kühlung, 2016
- Behn, Konzept, Auslegung und Validierung eines Fluidkühlsystems für die Leistungsumrichter eines Gegengewichtstaplers, 2016
- Stolley, Entwurf und Charakterisierung von lösbaren Hochstromkontakten für leistungselektronische IGBT-Baugruppen zur Anbindung an Leiterplatten, 2017
- Lamberti, Konstruktion und Verwendung eines Prüfstandes zur Visualisierung von thermomechanischen Wechsellasten an leistungselektronischen Baugruppen, 2017

### Energy and Climate Protection R&D Projects

#### Collaborative Project PV-Kraftwerk2025 – Innovations for the Next Generation of PV Power Stations – New Components, System Solutions and Inverters for a Cost-effective and Network-compatible Power Supply

Funding volume: €M 5.96  
Cooperating partners: SMA Solar Technology AG (collaboration coordinator); Infineon Technologies AG (Infineon); Danfoss Silicon Power GmbH; RWTH Aachen EON ERC; University of Kassel (KDEE)

#### Collaborative Project for the BMWi ATEM3 Tender: In-MOVE – Integrated Converters for Modularly Distributed High-speed Electric Drives

Funding volume: €M 2.12  
Cooperating partners: Volkswagen AG (coordinator), Danfoss Silicon Power GmbH, Vishay Siliconix, FTCAP, Reese+Thies, FHG-ISIT

#### Collaborative Project Revolutionary Power Electronics for Future Applications with High Energy Density and Small Installation Space – ReLEEB

Funding volume: €M 2.8  
Cooperating partners: Robert Bosch GmbH (collaboration coordinator), Danfoss Silicon Power GmbH, FuE-Zentrum FH Kiel GmbH, Fraunhofer-Institut für Mikrostruktur von Werkstoffen und Systemen IMWS, Heraeus Deutschl. GmbH & Co. KG, Hübers Verfahrenstechnik Maschinenbau GmbH, Siemens AG, CT RTC ELE Berlin

#### Collaborative Project Laser-based Technology Platform for the Construction of Robust Power Electronics Systems – ThermoFreq

Funding volume: €M 2.44  
Cooperating partners: Siemens AG (coordinator), Danfoss Silicon Power GmbH, F&K Delvotec Bondtechnik GmbH, Schuster Elektronik, Heraeus Deutschland GmbH & Co. KG, Fraunhofer ILT, FuE-Zentrum FH Kiel GmbH



European Centers for Power Electronics Schleswig-Holstein (ECPE), page 28  
Schleswig-Holstein Electromobility Center of Excellence (KESH), page 33

Further information  
[www.fh-kiel.de/index.php?id=14376](http://www.fh-kiel.de/index.php?id=14376)

Detailed researcher profile



## Prof. Dr. Hans-Jürgen Hinrichs



Faculty of Computer Science and Electrical Engineering

Professorship: Simulation and System Perturbation  
At the UAS since 1993

Tel +49 431 210-4195  
hans-juergen.hinrichs@fh-kiel.de

**Core Expertise in Energy Research**

- Renewable energy forms grid integration
- Measuring and analysis technology for connection assessments
- Decentralised energy conversion

### Supervised Bachelor's/Master's Theses (Selection)

- Jurij Langlits**, Netzführungskonzept Pellworm-Hooge, 2016
- Sven Eggert**, E-Mobility-Netrückwirkungen und Netzanschlusskonzepte von Ladestationen, 2017
- Lars Wunderlich**, Technische und wirtschaftliche Analyse unterschiedlicher Berechnungsverfahren von Netrückwirkungen gemäß geltender Richtlinien und der Simulationsumgebung Power Factory, 2016
- Jana Breuer**, Potentialanalyse zur Optimierung der eingespeisten Energiemengen von geplanten Schaltvorgängen basierend auf Leistungsprognosen am 20 kV Beispielnetz Niebüll, 2017

### Energy and Climate Protection R&D Projects

**EEMSWEA Collaboration: Analysis of the Electrical Properties of Medium-voltage Grids with Regard to Optimisation in Terms of High Wind Energy Feed-in: Conceptualisation for the Mobile Development of a Measurement Analysis Device for Grid Analysis, Development of the Measurement Technology and Compilation of the Measurement and Analysis Software**

Funding volume: €M 1.2  
Project sponsor: BMWi, PTJ Jülich  
Cooperating partners: AU, DN VGL, MOE, GEO, WSTECH and SH-Netz AG

**eHighway Field Test on Federal Autobahn 1 in Schleswig-Holstein – FESH1: Approval and Construction of an Electrified Section, Design of the Mobile Substations, Coordination with the Grid Operator, Creation of a Measuring Concept with Regard to System Perturbations for Trial Operations**

Funding volume: €220,000  
Project sponsor: BMU  
Cooperating partners: State of Schleswig-Holstein, TU Dresden and SH-Netz AG

**Add-on Collaboration: Development of Add-ons for Inverters for Active Filtering of Grid Voltage and Resonance Damping Based on the Measured Grid Impedance**

Funding volume: €387,000  
Project sponsor: BMWi, PTJ Jülich  
Cooperating partners: R&D centre Kiel University of Applied Sciences GmbH, WSTECH Flensburg and Kiel University

**Collaborative project: Development of a Mobile Test Facility for Measurements in Low-voltage Grids and Compilation of the Measuring and Analysing Software**

Funding volume: €562,000  
Project sponsor: BMWi, PTJ Jülich  
Cooperating partners: R&D centre Kiel University of Applied Sciences GmbH, AU, DN VGL, MOE and SH-Netz AG

## Prof. Dr. Christian Keindorf



Faculty of Mechanical Engineering

Professorship: Offshore Engineering  
At the UAS since 2015

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christian.keindorf@fh-kiel.de

**Core Expertise in Energy Research**

- Load simulations for floating wind and wave energy converters
- Dynamics of offshore structures
- Floating stability and anchoring systems
- Transportation and installation methods

### Leadership Duties Relevant to Energy Research

- Associate Professor at the Wind Energy Technology Institute (WETI) in Flensburg

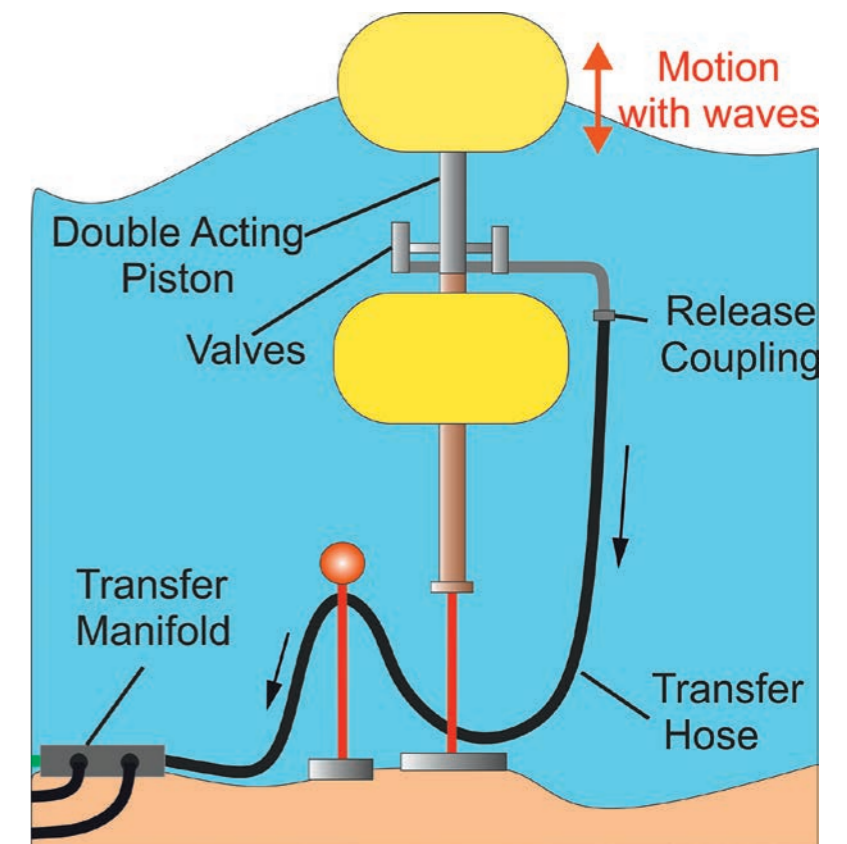
### Supervised Bachelor's/Master's Theses (Selection)

- Reiferscheidt**, Investigation on feeder concepts for offshore wind farm foundation installation, 2015
- Sellner**, Analysen für ein schwimmendes Installationskonzept von XXL-Monopiles, 2016
- Siebrecht**, Lastsimulationen mit Simpack für eine schwimmende Offshore-Windenergieanlage mit Spar Buoy als Gründungsstruktur, 2017

### FuE Projekt Energie und Klimaschutz

**Preliminary Study on the Status of Electrical Performance of Wave Energy Converters and Study on Wave Energy Converters**

Funding volume: €10,000 (EKSH funds)  
Jointly with Prof. Eisele



A bar buoy used as a wave power plant that profits by the up and down movements of the waves to move a piston between two floats. With the piston stroke energy can be generated by means of a gear generator both in the upward movement as well as in the downward movement. Energy will be transmitted via cable on the sea bed.



## Prof. Dr. Klaus Lebert



Faculty of Computer Science and Electrical Engineering

Professorship: Control Systems Technology  
At the UAS since 2008

Tel +49 431 210-2560  
klaus.lebert@fh-kiel.de

### Core Expertise in Energy Research

- Model-based control, observation and optimisation methods
- Simulation models for real-time applications
- Testing power electronics components and embedded systems

### Leadership Duties Relevant to Energy Research

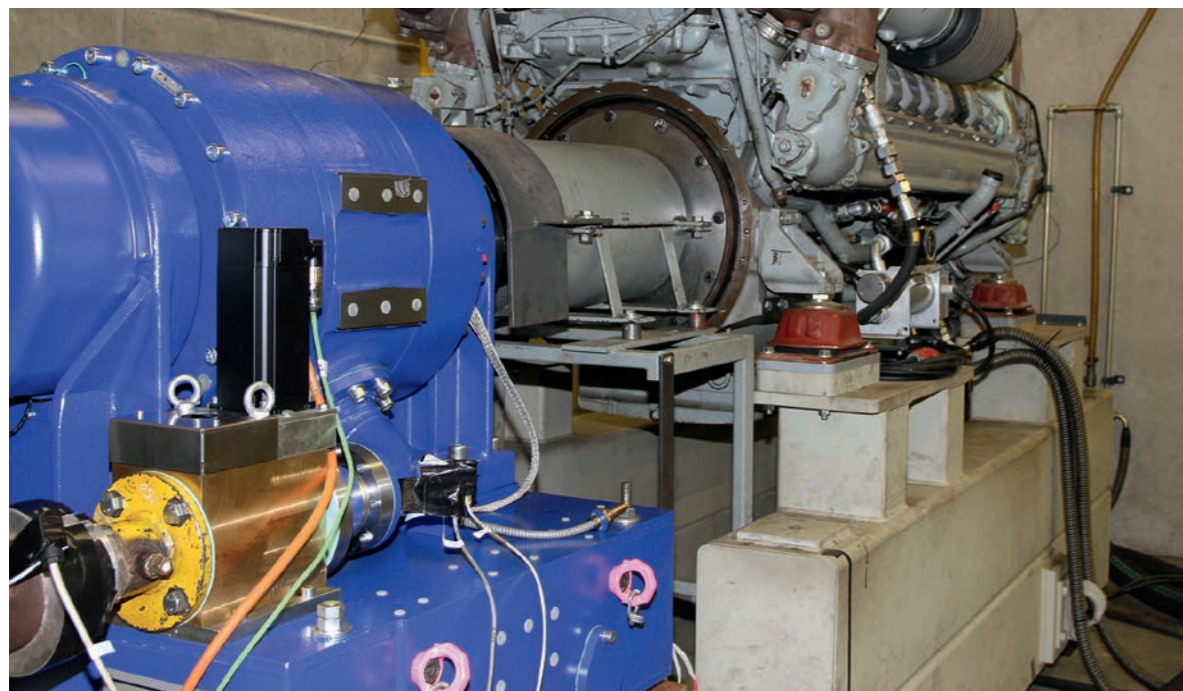
- \_ Vice-president of Kiel UAS
- \_ Schleswig-Holstein Electromobility Center of Excellence (KESH)

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Vinzenz Mennike*, Simulation des Linienfahrbetriebs eines Elektrobusses im ÖPNV, 2017
- \_ *Jan Wilner*, Erweiterung einer Hardware-in-the-Loop-Umgebung für das modellbasierte Testen eines Frequenzumrichters, 2017
- \_ *Kristin Wraase*, Fehleremulation und modellbasierte Fehlererkennung für einen Frequenzumrichter, 2016

### Energy and Climate Protection R&D Projects

- i** **ERToS – Emission Related Testing of Ship Engines**  
Funding volume: €119,000 (EKSH funds)  
Cooperating partner: AVL Zöllner GmbH, Kiel



Test bench for more climate-friendly shipping at Schiffsdieseltechnik in Rendsburg. On the right a marine engine, on the left the blue brake of AVL. Photo: Martin Geist

**i** Schleswig-Holstein Electromobility Center of Excellence (KESH), page 33

**i** EKSH-information brochure no. 5/2017 (German)

**Further information**  
[www.fh-kiel.de/index.php?id=lebert](http://www.fh-kiel.de/index.php?id=lebert)

**Detailed researcher profile**



## Prof. Dr. Andreas Luczak



Faculty of Computer Science and Electrical Engineering

Professorship: Sustainable Energy Technologies  
At the UAS since 2016

Tel +49 431 210-4157  
andreas.luczak@fh-kiel.de

### Core Expertise in Energy Research

- Implementation of the energy transition in Germany
- Applications of stationary energy storage systems
- Simulation of micro-grids

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Celia Dohle*, Begrenzung des Einspeisemanagements in Schleswig-Holstein durch Batteriespeicher, 2017
- \_ *Ozan Yildiz*, Planung einer Photovoltaikanlage in Ostantolien, 2017
- \_ *Thorben Helmcke*, Vergleich der Power to Gas Technologie mit der Nutzung norwegischer Wasserspeicher zum Ausgleich der schwankenden Erzeugung von Wind- und Solarenergie in einem dekarbonisierten Energiesystem Deutschlands, 2017
- \_ *Henning Friedrich*, Simulation von Micro Grids zur Evaluation der gestaffelten Dekarbonisierung des deutschen Energiesystems, 2017



Vanadium Redox Flow Storage Systems.

Photo: Andreas Luczak

**Further information**  
[www.fh-kiel.de/index.php?id=16933](http://www.fh-kiel.de/index.php?id=16933)

**Detailed researcher profile**



## Prof. Dr. Jens Lüssem



Faculty of Computer Science and Electrical Engineering

Professorship: Intelligent Information Systems  
At the UAS since 2008

Tel +49 431 210-4108  
jens.luessem@fh-kiel.de

### Core Expertise in Energy Research

- Big Data architectures for storing and processing the status information for wind energy systems
- Data analysis for wind energy systems
- Optimisation of wind energy system condition monitoring systems

### Supervised Bachelor's/Master's Theses (Selection)

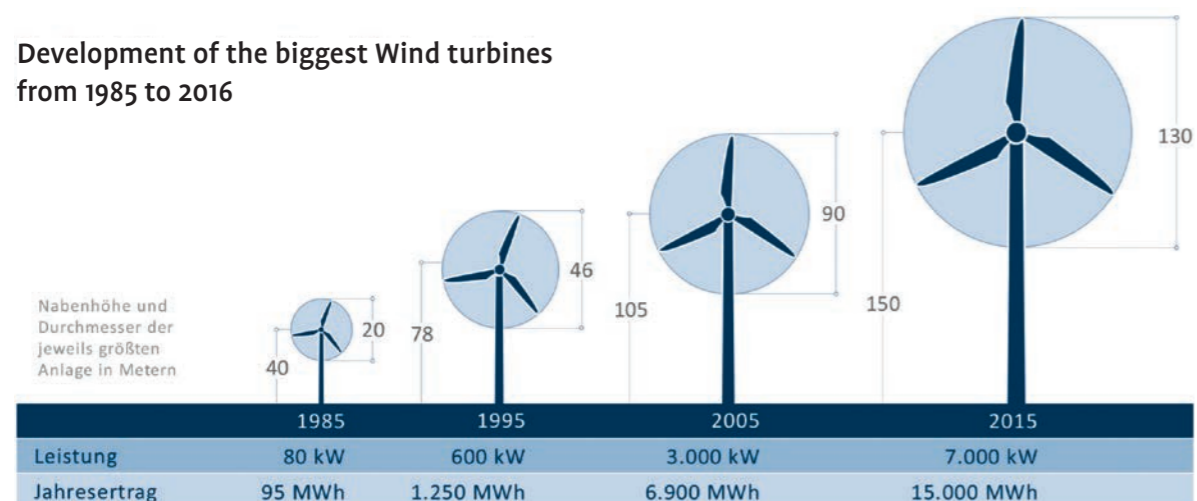
- \_ *Shahryar Khan*, Big Data Design practices and Implementation with Focus on Architectural Aspects, 2016
- \_ *Vini Vasundharan*, Data driven prognostic methods for fault detection in Wind Energy Conversion Systems, 2017
- \_ *Daniel Vallavaraj*, Design and Implementation of a time series analysis tool for wind energy systems using structural pattern matching, 2017
- \_ *Jonas Gerth*, Design und Implementierung einer geeigneten Datenbank für Lifecycle Management von Windenergieanlagen, 2017
- \_ *Norvin Thomas*, Anomaly Detection in Periodic Big Data Streams of Wind Energy Conversion Systems for Alarm Optimization, 2017
- \_ *Soo Yam Tan*, Application of Machine Learning Techniques to Drive Decision-Making in Fault Diagnosis and Prognosis in Condition Monitoring Systems

### Energy and Climate Protection R&D Project

#### Development and Testing of an Intelligent Database for Optimising the Life-cycle Management of Wind Turbines Utilising Status Information of Extremely High-load Components and SCADA Data

Funding volume: €131,000 (EKSH funds)  
Cooperating partners: cmc GmbH, Schönkirchen

### Development of the biggest Wind turbines from 1985 to 2016



With increasing turbine size and power, the load on the individual turbine components also increases.

Figure: Bundesverband WindEnergie

#### Further information

[www.fh-kiel.de/index.php?id=luessem](http://www.fh-kiel.de/index.php?id=luessem)

#### Detailed researcher profile



## Prof. Dipl.-Ing. Peter Quell



Faculty of Mechanical Engineering

Professorship: Offshore Installations Engineering  
At the UAS since 2012

Tel +49 431 210-27 01  
peter.quell@fh-kiel.de

### Core Expertise in Energy Research

- (Offshore) wind energy in general
- Innovative (offshore) wind turbine concepts
- Drive engineering
- Technical project management

### Leadership Duties Relevant to Energy Research

- \_ Associate Professor at the Wind Energy Technology Institute (WETI) in Flensburg

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Concept study for a technically and commercially optimized yaw system of a 3 MW wind energy conversion system, 2017
- \_ Potentials and limits of surface based ice detection within current requirements of wind turbines, 2017
- \_ Analyse und Optimierung des Betriebsverhaltens eines neuartigen Schwingungstilgers für Windenergieanlagen, 2016

### Energy and Climate Protection R&D Projects

#### Analysis and Optimisation of Wind Direction Tracking in Wind Turbines

#### Measurement and Optimisation of Friction Increasing Coatings in Drive Trains of Wind Turbines

#### Development of an Integrated and Servicing-friendly Drive Train Concept for Offshore Wind Turbines with a Capacity of More Than 10 MW

### Miscellaneous

- \_ Organisation and implementation of the Campus for Ocean and Offshore-Learning (COOL). COOL combines a conference for offshore researchers and industry representatives with a comprehensive excursion program focusing on offshore wind energy. Approximately 100 students of four northern German universities participate in the event offered since 2012.



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Wind Energy Technology Institute (WETI), page 44

#### Further information

[www.fh-kiel.de/index.php?id=quell](http://www.fh-kiel.de/index.php?id=quell)

#### Detailed researcher profile



## Prof. Dr. Yves Reckleben



Faculty of Agriculture

Professorship: Agricultural Machinery  
At the UAS since 2005

Tel +49 4331 845-118  
yves.reckleben@fh-kiel.de

### Core Expertise in Energy Research

- Clamp covering using renewable natural resources
- Efficient production of renewable natural resources
- Quality-optimised production of plant resources

### Leadership Duties Relevant to Energy Research

- \_ Head of the department of agricultural and energy engineering at Schleswig-Holstein Chamber of Agriculture
- \_ Chair of the working group for commercial fertiliser application technologies with the nutrient management round table

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Niels Schäfer, Steigerung der Effizienz bei Straßentransporten am Beispiel unterschiedlicher Reifentypen, 2012, in Kooperation mit Grasdorf Wennekamp GmbH
- \_ Wiebke Feddersen, Hochschnitt beim Mais – technische und ökonomische Auswirkungen, 2013
- \_ Martin Schiewer, Mobiles Wärmespeicherkonzept im Bereich der Erneuerbaren Energien: Technische Lösungen und Logistiko Optimierung, 2012
- \_ Morten Ohlsen, Maßnahmen zur Schallreduktion bei Biogasanlagen, 2012



Maize cover foam.

### Energy and Climate Protection R&D Project

#### **i** Development and Testing of a Device for Uniform and Widespread Application of Starch Foam Based on Renewable Natural Resources on Silage Clamps

Project duration: 2014 to 2016

Funding volume: €150,000 (EKSH funds)

Cooperating partner: Amandus Kahl, Reinbek



Prof. Dr. Yves Reckleben examines the density of the starch material.

Photos: Joachim Welding

**i** EKSH-information brochure no. 2/2017 (German)

### Further information

[www.fh-kiel.de/index.php?id=1503](http://www.fh-kiel.de/index.php?id=1503)

[Detailed researcher profile](#)



## Prof. Dr. Kay Rethmeier



Faculty of Computer Science and Electrical Engineering

Professorship: High-voltage Technology and Lightning Currents  
At the UAS since 2012

[kay.rethmeier@fh-kiel.de](mailto:kay.rethmeier@fh-kiel.de)

### Core Expertise in Energy Research

- Diagnostic measurements on operating resources
- Electrical inspections on operating resources
- Training dealing with power engineering topics

### Leadership Duties Relevant to Energy Research

- \_ Director of the Institute of Electrical Power Engineering at Kiel UAS
- \_ Deputy head of the FNN project group Commissioning Tests on Medium Voltage Cables at VDE

### Supervised Bachelor's/Master's Theses (Selection)

- \_ San Seebandt, Entwicklung von Szenarien für eine klimaneutrale Wärmeversorgung des Gebäudebestands in Schleswig-Holstein bis 2050 (Partner: MELUND), 2016
- \_ Anja Kurth VLF-Prüfung an Hochspannungskabelanlagen (Partner: VDE, b2electronic, Nexans, SH-Netz AG, Stadtwerke Kiel), 2016  
[www.dke.de/de/services/next-generation-dke/science-to-standards-programm-sts](http://www.dke.de/de/services/next-generation-dke/science-to-standards-programm-sts)  
[www.fh-kiel.de/viefhkiel/index.php/hochspannend-aber-noch-nicht-normal/](http://www.fh-kiel.de/viefhkiel/index.php/hochspannend-aber-noch-nicht-normal/)
- \_ Ricarda Rimatzki Einsatz von Hochspannungs-Prüfimpulsen in der Niederspannung (Partner: VDE), 2017
- \_ Jakob Goßmann, Analyse der Eigenbedarfsversorgung eines Windparks bei Netzabschaltung (Partner: EON Climate and Renewables), 2017
- \_ Bernd Wondratschek Untersuchung des Einflusses von Windungsschlüssen auf das elektrische Verhalten von Stromwandlern (Partner: OMICRON electronics), 2017

### Energy and Climate Protection R&D Projects

**Employee Training Partial Discharge Measurement on High-voltage Cable Systems (Partners: SH-Netz AG/ Nexans Deutschland GmbH)**

**Improvement of the Lightning Protection on Wind Turbine Rotor Blades (Partner: AREVA Blades GmbH)**

**Qualification of Temperature Sensors for Use in Wind Turbines (Partner: Nordex Energy GmbH)**

**Certification Tests on Heating Systems for Rotor Blades of Wind Turbines (Partner: Spitzner Engineers GmbH)**  
**Metrological Testing of Lightning Current Monitoring Systems at >300 kA (Partner: Phoenix Contact GmbH & Co. KG)**

[www.fh-kiel.de/viefhkiel/index.php/dem-jahrhundert-blitz-auf-der-spur/](http://www.fh-kiel.de/viefhkiel/index.php/dem-jahrhundert-blitz-auf-der-spur/)

**Conception of a CO<sub>2</sub>-free Heating Supply for Helgoland (Partner: Helgoland Municipality)**

[www.fh-kiel.de/viefhkiel/index.php/and-the-winner-is/](http://www.fh-kiel.de/viefhkiel/index.php/and-the-winner-is/)



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### Further information

[www.rethmeier.info](http://www.rethmeier.info)

[Detailed researcher profile](#)



## Prof. Dr. Alois Schaffarczyk



Faculty of Mechanical Engineering

Professorship: Mathematics and Engineering Mechanics  
At the UAS since 1992

Tel +49 431 210-2610  
alois.schaffarczyk@fh-Kiel.de

### Core Expertise in Energy Research

- Wind turbine aerodynamics
- Flow simulations
- Small wind turbines

### Leadership Duties Relevant to Energy Research

- Associate Professor at the Wind Energy Technology Institute (WETI) in Flensburg

### Supervised Bachelor's/Master's Theses (Selection)

- *Majjari*, Implementation and verification of advanced aerodynamic models for load calculation of wind turbines, 2017
- *Braren*, CFD-Modellierung von bewaldeten Gebieten für die Standortsimulation von Windkraftanlagen, 2016
- *Goetzke*, Design of a Wind Estimator for Lifetime Monitoring of Wind Turbines, 2016
- *Hansen*, Analysis and Evaluation of a Combined Offshore Wind Turbine and Current Flow Turbine System

### Supervised PhD thesis

- *D. Schwab*, Aerodynamische Grenzschichtuntersuchungen an einem Windturbinenblatt im Feldversuch, Helmut Schmidt Universität Hamburg, 2017
- *B. Lobo*, Optimization of aerodynamic profiles for wind turbine blades subjected to high, natural inflow turbulence using numerical simulation

### Energy and Climate Protection R&D Projects

#### Aerodynamic Glove for Investigating Flow Conditions on Rotor Blades of Multi-MW Wind Turbines

Funding volume: €149,000 (EKSH funds)  
Cooperating partners: EEK.SH, Senvion GmbH, Denker & Wulf AG, Sehestedt, Flensburg University of Applied Sciences

#### Development of a Two-dimensional Atmospheric Laser-cantilever Anemometer for High-resolution Investigation of Turbulent Wind Currents in Order to Optimise Offshore Wind Turbine Blades

Funding volume: €76,000  
Project Management: DBU  
Cooperating partners: University of Oldenburg, DNV GL

Wind Energy Technology Institute (WETI), page 44

EKSH Doctoral Scholarships, page 130

### Achieving Yield Improvements Through Rotor Blade Modification on Existing Turbines – Phase 2

Funding volume: €62,000  
Project Management: DBU  
Cooperating partners: Deutsche WindGuard, University of Bremen (BIMAQ)

### Miscellaneous

#### Publications

- Ceyhan, O., Pires, O., Munduate, X., Sorensen, N. N., Schaffarczyk, A. P., Reichstein, T., Diakakis, K., Papadakis, G., Daniele, E., Schwarz, M., Lutz, T., Prieto, R. (2017): Summary of the Blind Test Campaign to predict the High Reynolds number performance of DU00-W-210 airfoil, 35th Wind Energy Symposium, AIAA SciTech Forum, (AIAA 2017-0915) Grapevine, Texas, USA.
- Schaffarczyk, A. P., Schwab D., Breuer, M. (2016): Experimental detection of laminar-turbulent transition on a rotating wind turbine blade in the free atmosphere, WIND ENERGY.
- Jeromin, A., Schaffarczyk, A. P., Puczylowski, J., Peinke, J., Hoelling, M., J. Phys. (2014): Highly resolved measurements of atmospheric turbulence with the new 2d-Atmospheric Laser Cantilever Anemometer, Conf Ser. 555, 012054.
- Schaffarczyk, A. P., Schwab, D., Ingwersen, S., Breuer, M., J. Phys. (2014): Pressure and hot-film measurements on a wind turbine operating in the atmosphere, Conf Ser. 555, 012092.
- Schaffarczyk, A. P. (Hrsg.) (2016): Einführung in die Windenergiertechnik, 2. Auflage, Carl Hanser Verlag, München.
- 风力机空气动力学 作者: (德) 阿洛伊斯·查夫齐科 (A.P.Schaffarczyk) 著 吴晨曦 等译 ISBN(书号) 978-7-111-52825-8, 2016 (Chinese edition of Introduction to Wind Turbine Aerodynamics)

### Further information

[www.fh-kiel.de/index.php?id=schaffarczyk](http://www.fh-kiel.de/index.php?id=schaffarczyk)

### Detailed researcher profile



## Prof. Dr. Ulf Schümann



Faculty of Electrical Engineering and IT, Institute of Electrical Power Engineering

Professorship: Electrical Power Engineering  
At the UAS since 2008

Tel +49 431 210-4196  
ulf.schuemann@fh-kiel.de

### Core Expertise in Energy Research

- Power electronics
- Control of electrical machines
- Electromobility
- Renewable energy generation

### Leadership Duties Relevant to Energy Research

- Founding member of the Schleswig-Holstein Electromobility Centre of Excellence (KESH)
- Managing Director of the Institute of Electrical Power Engineering
- European Centers for Power Electronics Schleswig-Holstein (ECPE)

### Energy and Climate Protection R&D Projects

#### Wind Turbine Cluster (WEAC)

Project duration: 2012 to 2014  
Funding volume: €173,000  
Cooperating partners: HAW Hamburg  
Funded by: EFRE; commercial enterprises

#### Development of a Grid Feed-in to Operate Two Wind Power Generators on One Inverter

Project duration: 2015 to 2017  
Funding volume: €147,000 (EKSH funds)  
Cooperating partner: Skywind GmbH, Husum



Test bench for a wind turbine electrical model. Photo: Kiel UAS

### InMove – Integrated Converters for Modularly Distributed High-speed Electric Drives

Project duration: 2016 to 2018  
Funding volume: €500,000 (BMW); project volume: €M 3.1  
In collaboration with Prof. Dr. Ronald Eisele  
Cooperating partners: Volkswagen AG, Danfoss Silicon Power GmbH, Vishay Siliconix Itzehoe GmbH, FTCAP GmbH, Reese + Thies Industrieelektronik GmbH, Fraunhofer Gesellschaft (Fraunhofer Institute for Silicon Technology)

#### PV-Kraftwerk2025

#### Innovations for the Next Generation of PV Power Stations

Project duration: 2017 to 2020  
Funding volume: €689,000 (BMW); overall project volume approx. €M 10)  
In collaboration with Prof. Dr. Ronald Eisele  
Cooperating partners: SMA Solar Technology AG, Infineon Technologies AG, Danfoss Silicon Power GmbH, RWTH Aachen, EON ERC, University of Kassel (KDEE)

### Miscellaneous

- Congress Presentations
- Highly Integrated Traction Inverter for a Modular Drive Concept, Ulf Schümann, Jasper Schnack, Ronald Eisele, Dominik Hilper, et al., PCIM 2018 Europe.
- Integration Concept for a Traction Inverter with 3D-Printed Embedded Cooling Technology realizing Highest Power Density, Jasper Schnack, Ulf Schümann, Dominik Hilper, Ronald Eisele, et al., CIPS 2018.
- Driving Two Induction Generators with One Frequency Converter Using Stator-Flux-Oriented Control Method, Ulf Schümann, Olaf Goll, Frank Sergej, EPE2015.
- Control Method for One Frequency Converter Driving Two Induction Generators, Sergej Frank, Ulf Schümann, University of Applied Sciences Kiel, D; Olaf Goll, SkyWind, PCIM 2015 Europe.

Schleswig-Holstein Electromobility Center of Excellence (KESH), page 33  
European Centers for Power Electronics Schleswig-Holstein (ECPE), page 28

### Further information

[www.fh-kiel.de/index.php?id=schuemann](http://www.fh-kiel.de/index.php?id=schuemann)

### Detailed researcher profile



## Prof. Dr. Christoph Weber



Faculty of Computer Science and Electrical Engineering

Professorship: Power Engines and Driven Machines  
At the UAS since 2008

Tel +49 431 210-2583  
christoph.weber@fh-kiel.de

### Core Expertise in Energy Research

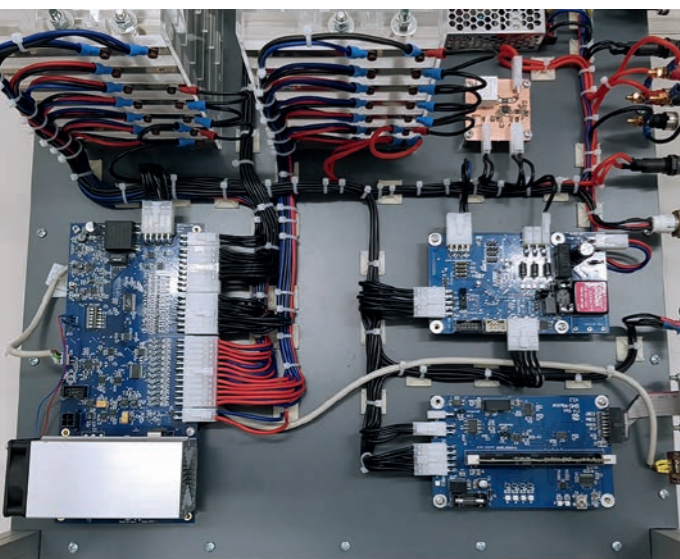
- ⊙ Battery management systems for stationary energy storage systems
- ⊙ Modelling and analysis of cell properties
- ⊙ Energy management systems

### Leadership Duties Relevant to Energy Research

- ⊙ Schleswig-Holstein Electromobility Center of Excellence (KESH)

### Supervised Bachelor's/Master's Theses (Selection)

- ⊙ Viktor Hermann, Anwendungsoptimierte Inbetriebnahme eines Prüfstandes für den Test von Batteriesystemen unter Verwendung von Messsystemen SL8/5/0.04BT16C und SL6/100/0.6BT6C der Firma Scienlab, 2016
- ⊙ Lena Behnke, Integration eines Batteriemanagementsystems in eine Speicheranwendung mit Aufbau einer Testumgebung, 2017
- ⊙ Ramakrishna Reddy Janga, Stock market prediction at the European Energy Exchange for a battery system für energy storage applications, 2017
- ⊙ Tobias Bothe, Jan Kablitz, Planung und Realisierung einer Software in the Loop-Prüfumgebung für den realitätsnahen Echtzeittest intelligenter Energiemanagementsysteme für stationäre Energiespeicher an realen Batteriesystemen, 2016



### Energy and Climate Protection R&D Projects

#### Varibat – Battery Management for Variable Battery Cell Chemistries. Development of a System for Determining the Charge Status Using Model-based Evaluation Methods

Project duration: 2014 to 2016  
Funding volume: €260,000  
Project sponsor: Ministry of Education, Science and Cultural Affairs of the State of Schleswig-Holstein

#### Energy Management System for Stationary Energy Storage Systems, Considering Current Grid Fluctuations, the Internal Consumption Situation and the Energy Market

Project duration: 2016 to 2017  
Funding volume: €97,000 (EKSH funds)  
Cooperating partner: IAV GmbH – Ingenieurgesellschaft für Auto und Verkehr, Gifhorn

#### Battery Management for Battery Systems with High Power Density and Long Service Life in Combination with a Regenerative Energy Generator and an Energy Converter

Funding volume: €148,000 (EKSH funds)  
Project sponsor: EEK.SH, Liacon GmbH, Itzehoe

Insight into a battery management system, developed by researchers at Kiel UAS. Photo: Kiel UAS

Schleswig-Holstein Electromobility Center of Excellence (KESH), page 33

Further information  
[www.fh-kiel.de/index.php?id=weber](http://www.fh-kiel.de/index.php?id=weber)

Detailed researcher profile



## Prof. Dr. Harald Wehrend



Faculty of Computer Science and Electrical Engineering

Professorship: Elektrische Netze und Smart Grids  
At the UAS since 2012

Tel +49 431 210-4197  
harald.wehrend@fh-kiel.de

### Core Expertise in Energy Research

- ⊙ Grid analyses, simulation of transient processes (ATP-EMTP)
- ⊙ Digital protection, grid automation and digitalisation, IEC 61850
- ⊙ Modelling and simulation of grids and decentralised energy generation installations using Digsilent/Powerfactory

### Leadership Duties Relevant to Energy Research

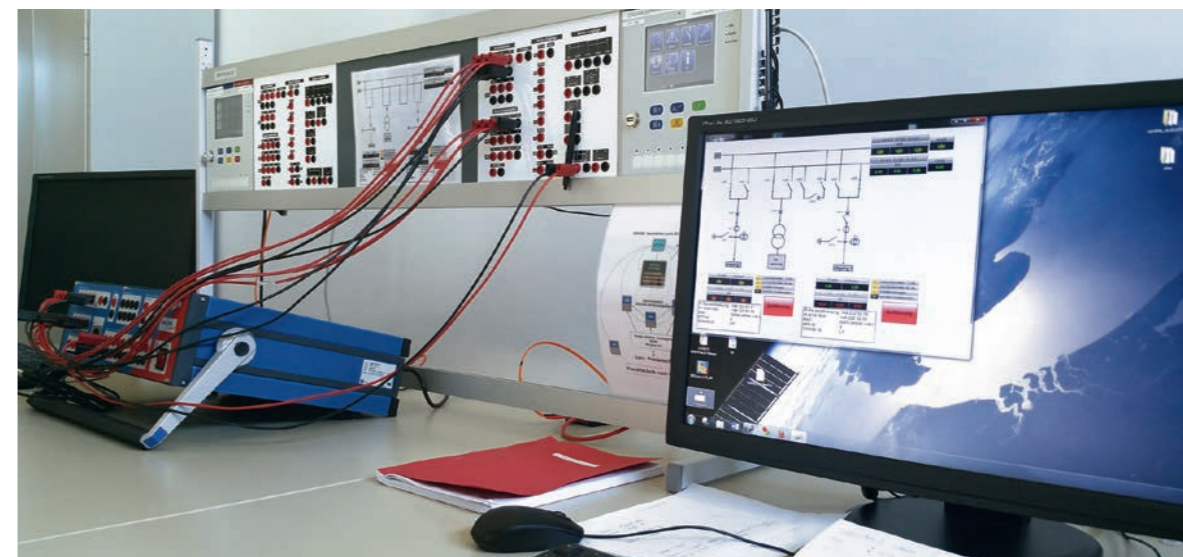
- ⊙ Chair of the European EMTP-ATP Users Group e. V. (EEUG)
- ⊙ Smart Energy Center of Excellence

### Supervised Bachelor's/Master's Theses (Selection)

- ⊙ Friedrich Lisker, Untersuchungen an Signalvergleichsverfahren für Distanzschutz (transfer tripping schemes) über IEC61850, 2017
- ⊙ Pierre-Francois Withhoeck, Simulation of HVDC-lines in ATP-EMTP (cooperation with ECAM, Brussel), 2017
- ⊙ Christian Hartwig, ATP-EMTP Einsatz für einen Echtzeit-Simulator mit OMICRON CMS-356, 2017
- ⊙ Nißen/Jensen Konzeption und Errichtung einer Leitstellen-simulation mit einer Kommunikationsstruktur nach der IEC-61850, 2017

### Miscellaneous

- Congress Presentations**
- ⊙ Wehrend, H. (2014): Concept to use ATP as data generator for IEC61850 based IED's, EEUG conference, Cagliari, Italien.
  - ⊙ Wehrend, H. (2014): P/F-protection and its implementation in ATP / ATPDraw / Models, EEUG conference, Cagliari, Italien.
- CPD Courses/Conferences**
- ⊙ European EMTP-ATP Users Group (EEUG) Conference, 2017, Kiel UAS
  - ⊙ Organiser: EEUG
  - ⊙ Target group: Engineers, technicians, energy engineering students
  - ⊙ [www.eeug.org](http://www.eeug.org)



Switchgear control technology based on IEC61850, realised using devices of Stucke Elektronik GmbH, WINCC of Siemens AG and WAGO SPS. Photo: Kiel UAS/Wehrend

Smart Energy Center of Excellence, page 32

Further information  
[www.fh-kiel.de/index.php?id=10950](http://www.fh-kiel.de/index.php?id=10950)

Detailed researcher profile



## Prof. Dr. Jan Henrik Weychardt



Faculty of Mechanical Engineering

Professorship: Design and Technical Drawing  
At the UAS since 2005

Tel +49 431 210-2623  
jan.henrik.weychardt@fh-kiel.de

**Core Expertise in Energy Research**

- Head of design for the Baltic Thunder racing team with regard to the construction of headwind-powered vehicles
- Support and work on design and structural mechanics aspects

### Supervised Bachelor's/Master's Theses (Selection)

- \_ M. Sievers, F.-O. Skau, T. Staak, S. Szustak, V. Thomsen, Vorentwurf einer Walzenpresse für das FuE-Projekt "biomassmax", Laborabgabe Konstruktive Anwendungen, FH Kiel 2017
- \_ P. Kähler, D. Strieder, B. Wodecki, J. Ehlers, K.v. Glahn, Entwicklung eines aerodynamischen Handschuhs für eine Windkraftanlage, Laborabgabe Konstruktive Anwendungen, FH Kiel 2015
- \_ Diverse Theses und Projektarbeiten bzgl. Gegenwindbetriebener Fahrzeuge für den Rennstall "Baltic Thunder"

### Energy and Climate Protection R&D Projects

#### biomassmax – Biomass Dewatering with Maximum Energy Efficiency

Project duration: 2017 to 2019  
Funding volume: €148,000 (EKSH funds)  
Cooperating partners: EEK.SH, Bi.En GmbH & Co. KG, Kiel

#### clathrate and sugar – Construction of Test Stands to Study Hydrate Formation and Degradation Under Deep-sea Conditions

### Miscellaneous

- Patent
- \_ DE 10 2016014 657.5 and DE10 2017215813.1 – J. H. Weychardt: Filtermodul, Filtermodul-System und Verfahren zur Bindung von Partikeln eines Stoffgemischs, 2017



The Baltic Thunder team at racing aeolus 2017 in Den Helder, Netherlands, with the bolides Baltic Thunder Student and Baltic TwinThunder.  
Photo: Gabriel Nolte

Further information  
[www.fh-kiel.de/Weychardt](http://www.fh-kiel.de/Weychardt)

Detailed researcher profile



## Prof. Dr. Christoph Wree



Faculty of Computer Science and Electrical Engineering, Institute of Electrical Power Engineering

Professorship: Automation Engineering  
At the UAS since 2015

Tel +49 431 210 4060  
christoph.wree@fh-kiel.de

**Core Expertise in Energy Research**

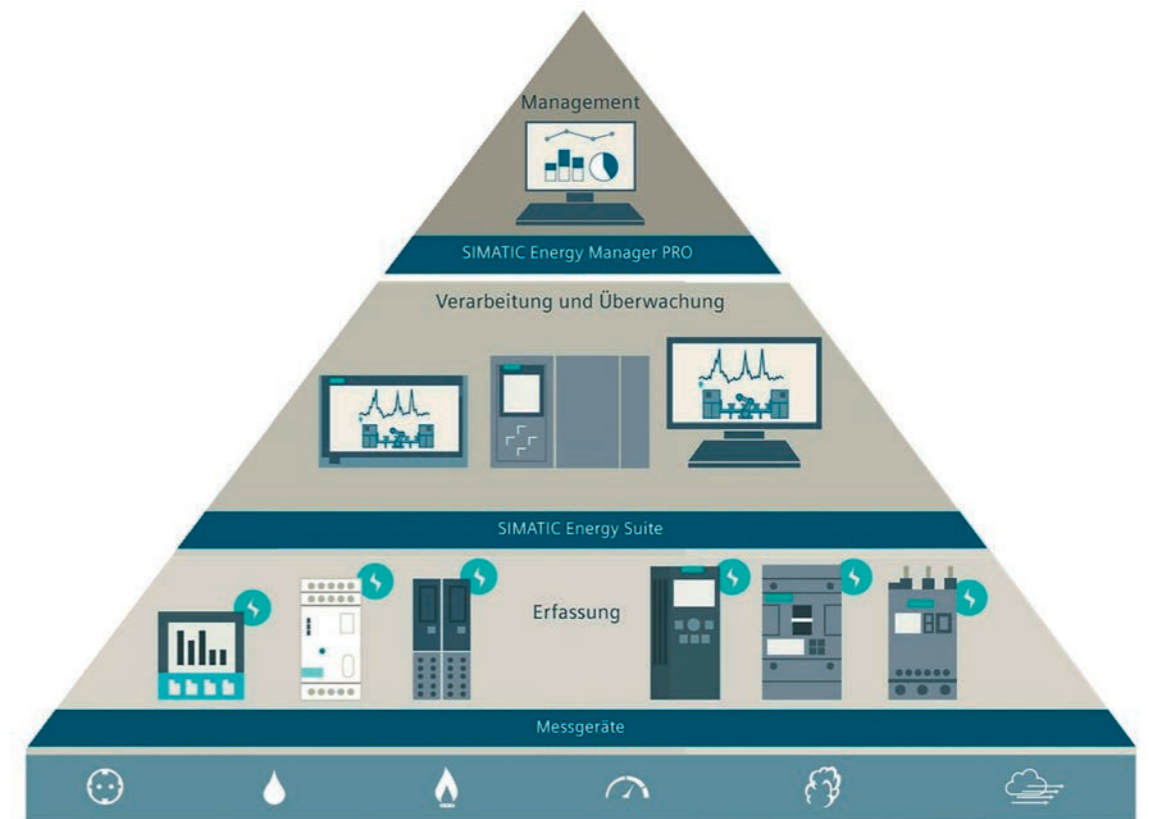
- Energy management compliant with ISO 50001
- Automatic energy data acquisition
- Sensors, field buses, data loggers, SCADA, IT security

### Leadership Duties Relevant to Energy Research

- \_ Founding member and deputy project manager at Digital Fabrik at Kiel UAS

### Supervised Bachelor's/Master's Theses (Selection)

- \_ M. Körner, Einführung eines Energiemanagementsystems auf einer Werft, 2015
- \_ C. Lauer, Weiterentwicklung eines Energiemonitoringsystems mit einem praktischen Umsetzungsbeispiel, 2017
- \_ S. Tegen, Prozess- und Energiedatenerfassung im industriellen Umfeld unter Berücksichtigung der IT-Sicherheit, 2018



For manufacturing companies, in particular, energy costs are increasingly a competitive factor. In order to achieve an increase in profitability through improved energy efficiency, the energy at the field level must be measured with sensors and forwarded to the control system via the existing field buses and recorded there. The energy data is pre-processed and monitored in the control system. Energy monitoring is performed by the SCADA system (Supervisory Control and Data Acquisition). Finally, energy management allows energy consumption to be managed across site boundaries.  
Photo: SIEMENS AG

Further information  
[www.fh-kiel.de/index.php?id=14928](http://www.fh-kiel.de/index.php?id=14928)





## Prof. Dr. Thomas Franke



Department of Computer Science/Engineering  
Institute for Multimedia and Interactive Systems (IMIS)

Professorship:  
Engineering Psychology  
and Cognitive Ergonomics  
At the university since 2016



### Core Expertise in Energy Research

- User acceptance & user behaviour
- Energy efficiency data visualisation
- Electromobility user studies

Tel +49 451 3101-5111  
franke@imis.uni-luebeck.de

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Doreen Schwarze, Framing-Effekt und Eco-Driving: Auswirkungen durch Darstellungsvariationen von Eco-Indikatoren auf Fahrverhalten, 2017
- \_ Björn Filter, Gamifizierung von Pulse and Glide: Auswirkung auf Motivation und Nutzererleben, ongoing
- \_ Jacob Stahl, Handlungsintegrierte Visualisierung der Reichweite von Elektrobussen zur Unterstützung von Systemvertrauen und reichweitenbezogenen Situationsmodellen, ongoing

### Energy and Climate Protection R&D Projects

#### User-centred Range Management for Electric Buses (NuR.E)

Project duration: 2018 to 2020  
Funding volume: €150,000 (EKSH funds)  
Cooperating partner: Stadtverkehr Lübeck GmbH

Project research problems:

- > How can range evaluation and range extension be facilitated?
- > How can the cognitive load of drivers for range management be minimized?
- > How can an optimal overview for dispatchers be achieved?



### BMW ActiveE Long-range Commuters Leipzig Field Study

#### EVREST – Electric Vehicle with Range Extender as a Sustainable Technology

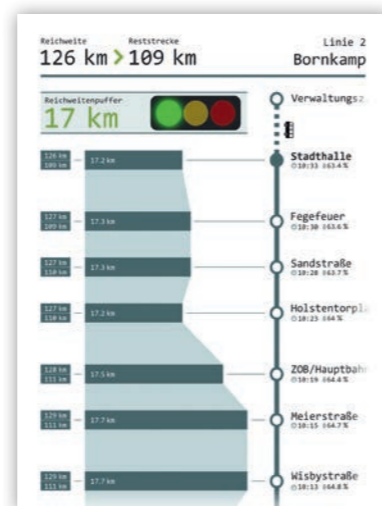
#### Miscellaneous

Award

- \_ Human Factors Prize of the Human Factors and Ergonomics Society for research in the field of sustainability/resilience (2015)

Research fields

- \_ Assistance systems for user-energy interaction
- \_ Electric vehicle range interaction



Top: Possible view of a range visualisation for electric buses in city traffic  
Draft: Jacob Stahl

Left: NuR.E project start

Photo: Rene Kube

#### Further information

www.imis.uni-luebeck.de

#### Detailed researcher profile



## Prof. Dr. Michael Herczeg



Department of Computer Science/Engineering  
Institute for Multimedia and  
Interactive Systems (IMIS)

Professorship:  
Practical Informatics – Multimedia and  
Interactive Systems  
At the university since: 1997

Tel +49 451 3101-5101  
herczeg@imis.uni-luebeck.de

### Core Expertise in Energy Research

- Safety technology: interaction between people, technology and organisation in safety-critical systems
- Information ergonomics: interactive visualisation of data and grid structures
- Automation: intelligent interaction and automation in stationary and mobile systems

### Leadership Duties Relevant to Energy Research

- \_ Founding member of the Human-Computer-Interaction Department at German Informatics Society
- \_ Member of the openKONSEQUENZ consortium: platform for consortium-developed, open, modular and secure software for the operation of energy and water networks

### FuE Projekt Energie und Klimaschutz

NetzDatenStrom – Standard-compliant Integration of Big Data Solutions into Existing Energy Control Rooms



Project duration: 2016 to 2019

Funding volume: €460,000

Cooperating partners: PSI AG, KISTERS AG, BTC AG, EWE NETZ GmbH, OFFIS – Institute for Computer Science, Friedrich-Alexander-Universität Erlangen-Nürnberg, openKONSEQUENZ

#### Miscellaneous

- \_ Business consultant



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#### Further information

www.imis.uni-luebeck.de

#### Detailed researcher profile



## Prof. Dr. Martin Leucker



Department of Computer Science/Engineering  
Institute of Software Engineering and  
Programming Languages

Professorship: Practical Informatics  
At the university since 2010

Tel +49 451 3101-6500  
leucker@isp.uni-luebeck.de

### Core Expertise in Energy Research


- ◉ Electromobility: navigation for electric vehicles, routing algorithms, range prognoses
- ◉ Resilience and reliability of battery management systems
- ◉ Modelling, optimisation and control for improving energy efficiency
- ◉ Data acquisition, pre-processing and analysis of measured data


### Leadership Duties Relevant to Energy Research

- \_ Director of the Institute for Software Engineering and Programming Languages
- \_ Speaker of the Software Systems Engineering (KOSSE) alliance
- \_ CEO of UniTransferKlinik GmbH
- \_ Schleswig-Holstein Electromobility Center of Excellence (KESH)

### Supervised Bachelor's/Master's Theses (Selection)

- \_ *Elisabeth Bartsch*, Empfehlungen zum Fahrverhalten bei der energieoptimierenden Routenplanung für Elektrofahrzeuge, 2016
- \_ *Janis Feye*, Refactoring und Erweiterung der Hard- und Software-Architektur des eRoller-Systems, 2016
- \_ *Djorde Holst*, Integration eines neuen Serialisierungs- und Übertragungsprotokolls in das ZeLiM-System, 2016
- \_ *Jakob Kuczewski*, Sichtung und Aufbereitung von Geodaten für Systeme der GreenNavigation, 2016
- \_ *Robin Niemann*, Methoden zur Fahrzeugallokation im Kontext von energieoptimalem Routing, 2012
- \_ *Florian Scheich*, Simulation von Parkhäusern mit Photovoltaik-Anlagen für Elektrofahrzeuge, 2015
- \_ *Martin Blankenburg*, Entwicklung eines Systems zur Integration und zum Monitoring von Elektrokräfern im Carsharing-Betrieb, 2013
- \_ *Peter Kliesch*, Entwicklung und Implementierung von energieoptimalem Flottenrouting im Kontext des Green-Navigation-Projekts, 2013
- \_ *Anne Reichart*, Dynamisches Rerouting im Kontext von Navigationssystemen, 2012

 Schleswig-Holstein Electromobility Center of Excellence (KESH), page 33

 EKSH-information brochure no. 8/2018 (German)

 EKSH Doctoral Scholarships, page 130

### Supervised Doctoral Degree

- \_ *René Schönfelder*, Algebraisches Routing für Green Navigation, 2016

### Energy and Climate Protection R&D Projects

#### SymHems – SmartGrid@Home

Project duration: 2015 to 2017  
Funding volume: €148,000 (EKSH funds)  
Cooperating partner: Symcon GmbH, Lübeck

#### **cMALEESS – Cloudbased Monitoring and Analysis for Lithium-Ion Electrical Storage Systems**

Project duration: 2016  
Funding volume: €64,000  
Cooperating partner: LION Smart GmbH, Garching

#### **ZeLiM – Centralised Lithium Storage Monitoring**

Project duration: 2013 to 2015  
Funding volume: €128,000 (EKSH funds)  
Cooperating partner: ECC Repenning GmbH, Geesthacht

#### **GreenNav**

Project duration: 2010 to 2012  
Cooperating partner: TU München

#### **eE-Tour Allgäu**

Project duration: 2009 bis 2011  
Funding volume: €M 5.6  
Cooperating partners: more than 20 partners

### Further information

[www.isp.uni-luebeck.de](http://www.isp.uni-luebeck.de)

### Detailed researcher profile



## Prof. Dr. Tilo Mentler



Department of Computer Science/Engineering  
Institute for Multimedia and  
Interactive Systems (IMIS)

Professorship: Safety-critical Human-Machine  
Systems in Technology and Medicine  
At the university since 2011

Tel +49 451 3101-5124  
mentler@imis.uni-luebeck.de

### Core Expertise in Energy Research

- ◉ Usability of application systems in energy control systems
- ◉ Human-machine interfaces for Big Data applications
- ◉ Interaction and cooperation in safety-critical human-machine systems
- ◉ Design solutions for low-voltage systems

### Leadership Duties Relevant to Energy Research

- \_ Founding member and deputy spokesman of the GI expert group on human-machine interaction in safety-critical systems (FG MMI-SKS)
- \_ Member of German Informatics Society
- \_ Gesellschaft für Informatik (GI) representative in IFIP Domain Committee on IT in Disaster Risk Reduction

### Supervised Bachelor's/Master's Theses

- \_ *Jan-Henrik Schroeder*, Interaktions- und Visualisierungskonzepte zur Störungslokalisierung in Niederspannungsnetzen, ongoing

### Energy and Climate Protection R&D Project

#### **NetzDatenStrom – Standard-compliant Integration of Big Data Solutions into Existing Energy Control Rooms**

Project duration: 2016 to 2019  
Funding volume: €460,000

Cooperating partners: PSI AG, KISTERS AG, BTC AG, EWE NETZ GmbH, OFFIS – Institute for Computer Science, Friedrich-Alexander-Universität Erlangen-Nürnberg, openKONSEQUENZ



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### Further information

[www.imis.uni-luebeck.de](http://www.imis.uni-luebeck.de)

### Detailed researcher profile



## Prof. Dr. Cecil Bruce-Boye



Department of Electrical Engineering and Computer Sciences

Professorship: Automation Technology, Control Systems, Power Electronics  
At the UAS since 1991

Tel +49 451 300-5184  
cecil.bruce-boye@th-luebeck.de

#### Core Expertise in Energy Research

- Industrial information technology
- Distributed systems in power engineering
- User dialog, Internet of Energy

#### Leadership Duties Relevant to Energy Research

- Wissenschaftszentrum für intelligente Energienutzung (WiE), TH Lübeck
- Automation technology laboratory, TH Lübeck

#### Supervised Bachelor's/Master's Theses (Selection)

- *Maria Knoll*, Geschäftsmodelle auf Basis zeitlich hoch aufgelöster Smart-Meter-Daten, 2015
- *Simon Salvermoser*, Optimierung der Fahrplanprognose für die Beschaffung elektrischer Energie durch Einsatz dynamischer Anpassung mittels Smart-Meter-Daten, 2015
- *Qingmin Li*, Lifetime Prediction of Smart Meters (Reliability Engineering), 2015
- *Paul Schott*, Bewertung des DSM-Potentials von Haushalten auf Basis realer Lastgänge, 2016
- *Philipp Buchmann*, Entwicklung einer Schnittstelle zur Anbindung von dezentralen Steuerungssystemen an simulierte sub-autarke Mikronetze, 2017



#### Energy and Climate Protection R&D Projects

##### Optimisation of Timetable Forecasts for Energy Procurement by Means of Measured Customer Load Cycles

Project duration: 2014 to 2016  
Funding volume: €138,000 (EKSH funds)  
Cooperating partner: Stadtwerke Norderstedt

##### carpeDIEM

A possible concept for the efficient use of locally produced energy is the use of sub-autonomous microgrids, which interconnect local system components (including generators, storage systems and loads) at the lowest network level. In the context of the Interreg carpeDIEM project, it is important to optimally control microgrids with regard to the various applicable frameworks. To achieve this, regional energy consumption and production patterns are analysed and a distributed energy management (DIEM) system developed.

Project duration: April 2016 to March 2019  
Cooperating partners: cbb software GmbH, Europa-Universität Flensburg, University of Southern Denmark and approx. 20 networking partners  
Internet: [www.project-carpediem.eu](http://www.project-carpediem.eu)

##### Integration of Reusable Components and Recycled Materials and the Associated Impacts on the Planning and Construction Process of a New Stadtwerke Neustadt Building

Project duration: July 2017 to January 2020  
Cooperating partners: Stadtwerke Neustadt in Holstein, IBUS Architektengesellschaft mbH, TATA Ingenieurbüros für Energie und Umwelt, Rissmann & Spiess Architekten

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- Wissenschaftszentrum für intelligente Energienutzung (WiE), page 48
- Participation in the project NEW 4.0, page 22
- EKSH-information brochure no. 9/2018 (German)

**Further information**  
[www.wie-zentrum.de](http://www.wie-zentrum.de)

**Detailed researcher profile**



## Prof. Sebastian Fiedler



Department of the Built Environment

Professorship: Building Physics and Technical Building Services  
At the UAS since 2016

Tel +49 451 300-5499  
sebastian.fiedler@th-luebeck.de

#### Core Expertise in Energy Research

- Energy-efficient buildings
- Energy-efficient districts
- Climate-neutral building stock 2050

#### Supervised Bachelor's/Master's Theses (Selection)

- *Areso Saheem*, Projektentwicklung und Entwicklung eines Energiekonzeptes zur Revitalisierung des historischen Hafenschuppens 9 an der Untertrave in Lübeck, 2017
- *Edgar Vogel*, Quick Check Analyse zur Nachverdichtung im bebauten urbanen Raum, 2014. (Frankfurt University of Applied Sciences)
- *Morten Blenner Madsen*, Untersuchung einer möglichen Aufstockung eines Mehrfamilienhauses im urbanen Kontext, 2013. (Frankfurt University of Applied Sciences)
- *Melanie Leich und Martin Münnig*, Energetische Sanierung und Umsetzung eines Bürohochhauses, 2012. (Frankfurt University of Applied Sciences)

#### Energy and Climate Protection R&D Projects

##### Solar Decathlon Europe 2014 – OnTop (Frankfurt University of Applied Sciences)

Project duration: 2012 to 2014  
In the Solar Decathlon, university teams from around the globe compete to develop a residential building supplied entirely by solar energy. After a two-year preparatory phase, all team prototypes will be assembled on a competition site, evaluated and presented to a broad public. In addition to the energy balance, technical and design aspects, social aspects, such as the maintenance of affordable housing and socially acceptable development towards climate-neutral buildings, are increasingly the centre of focus.

The main objective of the competition is to raise both awareness and knowledge of the possibilities of energy-efficient construction and the use of renewable energy resources. The competition offers an excellent platform for

this purpose, and also serves the international exchange of ideas and interlinking of teaching, applied research and practice.

##### Solar Decathlon Europe 2010 – home+ (Stuttgart University of Applied Sciences)

Project duration: 2008 to 2010



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© Sebastian Fiedler

##### Optimisation of façade systems to increase the use of daylight (Stuttgart University of Applied Sciences)

Project duration: 2006 to 2010

#### Further information

[www.th-luebeck.de](http://www.th-luebeck.de)  
[www.ontop2014.de](http://www.ontop2014.de), [www.sdeurope.de](http://www.sdeurope.de)

Prof. Dr. Dirk Jacob



Department of the Built Environment

Professorship: Building Services  
At the UAS since 2016

Tel +49 451 300-5492  
dirk.jacob@th-luebeck.de

Core Expertise in Energy Research

- Building operating optimisation
- Building simulation
- Energy efficiency

Supervised Bachelor's Theses (Selection)

- \_ Sebastian Dietz, FHTW Berlin, Betriebsanalyse und Fehlererkennung im Gebäudebetrieb, 2007
- \_ Nico Maier, Hochschule Offenburg, Teilenergiekennwerte von Nicht-Wohngebäuden, 2011
- \_ Friedemann Leopold, HTW Berlin, Minimierung der Netzbelastung der regenerativen Energieversorgung des Robert Bosch College in Freiburg, 2012

Master's Theses (Selection)

- \_ Sebastian Burhenne, FHE Erfurt, Simulationsmodelle zur Energieoptimierung des Gebäudebetriebs, awarded with the Hermann-Rietschel 3. Preis (Imtech), 2008
- \_ Felix Ohr, Hochschule Esslingen, Weiterentwicklung eines numerischen Warmwasserspeichermodells, awarded with the Preis des VdF, 2011
- \_ Christian Warnecke, TUHH, Untersuchungen zu gekoppelten Simulationsmodellen am Beispiel Raum-/Prozessmodell im Forschungsprojekt Smart Consumer, 2015

Co-supervised Doctoral Degree (during a 15 month residence in Germany):

- \_ Shelly Bambröo, Doktorarbeit UNSW Sydney, Australien, Investigation of PVT air systems to create a zero energy house in Sydney, 2011

Energy and Climate Protection R&D Projects

ModQS-Quality Assurance in Energy-related Building Operations

Project duration: 2010 to 2013

ModBen Model based building analysis 2007 to 2011

BuildingEQ

Tools and methods for linking EPBD and continuous commissioning

Project duration: 2007 to 2009

Cooperating partners: Collaborative project with partners from Germany (including Fraunhofer ISE in Freiburg), Italy, Sweden and Finland.

TEK

Building energy performance indicators 2010-2014

New methods in the energy analysis of the non-residential building stock

Collaborative project, responsibility at Fraunhofer ISE

Smart Consumer

Energy efficiency through systematic coupling of energy flows by means of intelligent measurement and control technology

Responsible scientist at ROM-Technik from 2014 to 2016



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Further information

www.th-luebeck.de

Prof. Dr. Roland Tiedemann



Department of Electrical Engineering and Computer Science

Professorship: Power Electronics and Electric Drives  
At the UAS since 2010

Tel +49 4536 7859788  
roland.tiedemann@th-luebeck.de

Core Expertise in Energy Research

- Charging systems for electric vehicles
- Electric vehicle drive technology
- Combined charging systems (CCS)

Leadership Duties Relevant to Energy Research

- \_ Head of Renewable energy resources and e-mobility research group
- \_ Scientific advisor at Federal e-mobility association

Supervised Bachelor's/Master's Theses (Selection)

- \_ Clemens Kerksen, Entwicklung und Aufbau einer Fernwartung und Fernsteuerung einer DC-Schnellladestation
- \_ Waldemar König, Konzeption und Entwicklung einer zentralen Steuereinheit für ein Elektrofahrzeug
- \_ Faruk Uras, Elektrofahrzeug und Ladestation – Eine Untersuchung der Kommunikationsschnittstelle gemäß ISO/IEC 15118 sowie Entwicklung einer Simulationsumgebung für intelligentes Laden

Energy and Climate Protection R&D Projects

 eHighway Field Trial on the A1 Federal Motorway Between Reinfeld and Lübeck


Research Project: Charging While Driving

Miscellaneous

- \_ Head of draft development at Emovum GmbH



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 Major project eHighway Field Trial (FESH), page 36

Further information

www.th-luebeck.de

## Prof. Dr. Christian Buchmüller



Faculty of Business Studies

Professorship: European business law  
At the UAS since 2014Tel +49 481 8555-562  
buchmueller@fh-westkueste.de

## Core Expertise in Energy Research

- Energy law and renewable energy law
- Legal issues around sector coupling and energy storage
- Legal issues around energy transition in the heating sector

## Leadership Duties Relevant to Energy Research

- Green Energy Master's course director
- Founding member of West Coast UAS Green Energy Center of Excellence

## Betreute Masterarbeiten

- Jurek Schwekendiek, Die Stadtwerke Kiel AG und Ladeinfrastruktur im Kontext der Elektromobilität – Rechtlicher und wirtschaftlicher Rahmen, 2017
- Kai Christiansen, Akzeptanzsteigerung von Windkraftprojekten durch die bedarfsgerechte Befuerung von Windenergieanlagen, 2017
- Meike Oldekop, Umsetzung von Mieterstromlieferungen in Gewerbeimmobilien, 2016



## Energy and Climate Protection R&amp;D Projects



## QUARREE 100: Legal and regulatory issues in networked systems

Project duration: 2017 to 2022

Funding volume: €M 24, West Coast UAS share: €M 1.2 (BMWi/BMBF)

Collaborative project with around 20 partners



## Preliminary study: Swimming Baths as switchable loads compliant with § 13, Paragraph 6a EnWG (German Energy Industry Act)

Funding volume: €12,000 (EKSH funds)

In collaboration with Prof. Dr. Gehlert/Prof. Dr. Schütt (West Coast UAS Green Energy Center of Excellence)

## Miscellaneous

## Publications

- Die Privilegierung von Scheibenpachtmodellen im EEG 2017, ZNER 1/2017, S. 18–23.
- Zuschaltbare Lasten, Innovationsausschreibungen, Experimentierklauseln und vieles mehr – Die Entstehung eines Rechtsrahmens für die Sektorkopplung?, ZNER 5/2016, S. 384–391.
- Regionale Grünstromkennzeichnung – ein neues Geschäftsfeld für Stromversorger?, EWeRK 5/2016, S. 301–306.

## Event organisation

- “Green Energy Workshops” at West Coast UAS (since 2015)

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Green Energy Center of Excellence and  
QUARREE 100, page 46Further information  
www.fh-westkueste.de

Detailed researcher profile



## Prof. Dr. Rainer Dittmar



Faculty of Technology

Professorship: Automation engineering  
At the UAS since 1996Tel +49 481 8555-325  
dittmar@fh-westkueste.de

## Core Expertise in Energy Research

- Advanced control methods in industrial and power engineering processes
- Model-based measuring and control procedures
- Soft sensors, process diagnostics procedures

## Leadership Duties Relevant to Energy Research

- Member of Technical Committee 6.22 Prozessführung und gehobene Regelungsverfahren« der Gesellschaft für Mess- und Automatisierungstechnik im VDI (Process Control and High-Level Control Procedures of the VDI Society for Measurement and Automatic Control)

## Supervised Bachelor's/Master's Theses (Selection)

- B. Behrens, Intelligente Regelung für fahrbare Mietheizungen, 2017
- T. Gutow, Übersichtskatalog zu den Möglichkeiten der modernen Eigenheimautomatisierung, 2017
- M. Gebauer, Bewertung des Einsatzes der Brennstoffzellentechnologie in Einfamilienhäusern, 2017
- G. Peters, Energieeffizienz der raumluftechnischen Anlagen im Westküstenklinikum Heide, 2016
- A.K. Tschürtz, System zur Erkennung von kritischen Betriebsausfällen am Beispiel der elektrischen Energieversorgung, 2016
- S. Kirst, Integration einer Wärmeträgeranlage in ein bestehendes PCS7-Prozessleitsystem, 2016
- P. Wittkowski, Effizienzsteigerung einer Heizungsanlage durch intelligente Ansteuerung eines BHKW, 2016
- V. Bester, Optimierung des BHKW-Betriebs durch Einsatz von Adsorptionskälteanlagen im Westküstenklinikum Heide, 2015

## Energy and Climate Protection R&amp;D Projects

## Early fault detection in process engineering facilities

Funding volume: €100,000

Cooperating partners: Sasol Germany GmbH, Brunsbüttel

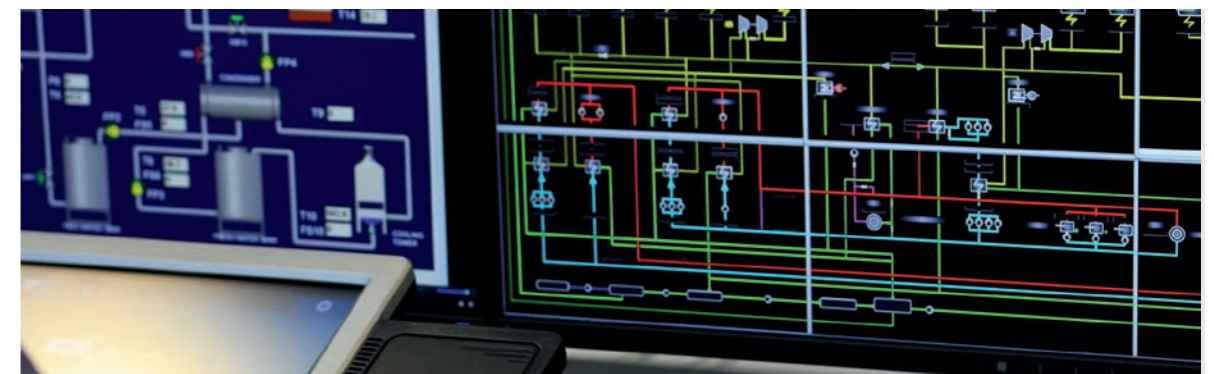
## Miscellaneous

## Publications

- Advanced Process Control, Verlag deGruyter Oldenbourg, Berlin 2017.
- Handbuch der Prozessautomatisierung, 6. Auflage, Abschnitte über Industrielle Regelungen, Model Predictive Control und Control Performance Monitoring, Deutscher Industrieverlag, München 2017.
- Modellbasierte prädiktive Regelung, Oldenbourg Wissenschaftsverlag, München 2004.

## Event organisation

- Automatisierungsforum Westküste (Automation Forum West Coast: annua), one-day presentation event on current automation technology topics, e.g. Energy efficiency through automation, 2013.



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Further information  
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## Prof. Dr. Gunther Gehlert



Faculty of Technology

Professorship: Building and environmental technologies  
At the UAS since 2011

Tel +49 481 8555-380  
gehlert@fh-westkueste.de

**Core Expertise in Energy Research**

- ⊙ Building services engineering
- ⊙ Thermodynamics
- ⊙ Process and supply engineering

**Leadership Duties Relevant to Energy Research**

\_ Environmentally compatible building services engineering Bachelor's course director



\_ QUARREE 100 project manager

**Supervised Master's Thesis**

\_ Jörn Olaf Radtke, Eigenverbrauchsoptimierung für Windparkbetreiber mit großen Kühllhäusern

**Energy and Climate Protection R&D Projects****QUARREE 100: Energy supply in buildings and districts**

Project duration: 2017 to 2022

Funding volume: €M 24, West Coast UAS share:

€M 1.2 (BMW/BMBF)

Collaborative project with around 20 partners

**Preliminary study: Swimming Baths as switchable loads compliant with § 13, Paragraph 6a EnWG (German Energy Industry Act)**

Funding volume: €12,000 (EKSH funds)

In collaboration with Prof. Dr. Buchmüller/Prof. Dr. Schütt (West Coast UAS Green Energy Center of Excellence)

**ITI Nestrail, Smart Region 2.0**

Project duration: 2018 to 2022

Funding volume: €885,000

**Miscellaneous****Publications**

\_ Meyer, S., Griese, M., Schlachter, M., Gehlert, G., Schulz, C.: Konzeptstudie zur Nutzung der Synergieeffekte zwischen Industrieparks und Ernährungswirtschaft insbesondere der Aquakultur in der Region Unterelbe, Studie im Auftrag der Projektentwicklung Stade GmbH & Co. KG.

\_ Gehlert, G., Griese, M., Schlachter, M., Schulz, C. (2018): Analysis and optimisation of dynamic facility ventilation in recirculation aquacultural systems, *Aquacultural Engineering*, Vol. 80), pp. 1-10.

**Presentations**

\_ "Der Energiepark an der FH West Coast – Rückblick auf ein Jahr Durationbetrieb", Vollversammlung Kreis Dithmarschen Bürgersolar eG, June 2017.

\_ "Energy Efficiency in Recirculating Aquacultural Systems", EuroTier Hannover, Nov. 2016.

\_ "Bedarfsgerechte Hallenlüftung in der Aquakultur", Wissenschaftstalk, FHW, Juni 2016.

**Science editing**

\_ Peer-Review, Jürgensen et. al., Two-stage fermentation of low-strength dairy waste-water for biogas production, *Biomass & Bioenergy*, Status: accepted.

**Patent applications**

\_ Verfahren und Vorrichtung zur Dampfbefeuchtung von zumindest einem Luftstrom einer Klimaanlage mittels Energie aus Fernwärme und eine Klimaanlage mit dieser Vorrichtung (Dampfbefeuchtung mittels Energie aus Fernwärme) (Method and apparatus for steam moistening of at least one air stream of an air conditioner by means of energy from district heating and air conditioning apparatus with this apparatus (Steam moistening by means of energy from district heating), German patent application DE 10 2016 108 130.2, status: in publication, patent no longer pursued due to a similar Japanese patent (JP H11-294 804A).



Green Energy Center of Excellence and QUARREE 100, page 46

**Further information**

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## Prof. Dr. Oliver Opel



Faculty of Technology

Professorship: Energy optimisation of buildings  
At the UAS since 2017

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**Core Expertise in Energy Research**

- ⊙ Energy optimisation of buildings
- ⊙ Thermal storage systems, heating networks, CHP, sector coupling
- ⊙ Corrosion and iron fouling in hydraulic systems

**Leadership Duties Relevant to Energy Research**

\_ Operative/project management in various R&D projects



\_ Chairman, Zukunftsgenossen eG, Lüneburg

\_ Member of the West Coast UAS Green Energy Center of Excellence

**Supervised Master's theses (selection)**

\_ Wiegand, M., Corrosion of closed press-fit hydraulic systems in buildings - Investigations using water- and electrochemical analysis of released metal ions, 2017

\_ Pott, S., Biokerosene as a climate protection measure in the private-economic aviation industry. An analysis of the future land-use and possible potentials, 2016

\_ Kummerow, F., Sustainable business models for the storage of renewable energies using the example of a local storage in Ritterhude, 2015

**Energy and Climate Protection R&D Projects****Leuphana University Lüneburg Campus and Main Building Monitoring**

Funding volume: €205,000 (BMW)

Cooperating partners: SIZ energie+, energydesign Braunschweig, synavision GmbH

**Aquifer storage - Development of the fields of application for medium-depth thermal aquifer storage in northern Germany under economic/financial, geological/technical, environmental chemistry and legal/funding policy aspects**

Funding volume: €530,000 (BMW)

Cooperating partners: GeoEnergy Celle e. V., GeoDienste GmbH, KBB UT

**EQM:Hydraulics – Energy and quality management against corrosion and deposit formation in hydraulic systems**

Funding volume: €580,000 (BMW)

Cooperating partners: SIZ energie+, synavision GmbH

**ITI Nestrail, Smart Region 2.0**

Project duration: 2018 to 2022

Funding volume: €885,000

**Miscellaneous****Patents**

\_ Opel, O., Ruck, W. (2012): Method for determining the tendency to iron deposition and system therefor.

\_ Ruck, W., Opel, O. (2011): Process, heat storage and heat storage system for heating and cooling of a working fluid.

**Award**

\_ German Solar Prize - Solar Architecture and Urban Planning 2015

**Working groups**

\_ Co-author BTGA regulations 3.002 and 3.003

\_ Consulting member, BTGA expert group refrigeration

\_ Consulting member of the Committee for Renewable Energy Resources, Regional Planning and Climate Consequences Adaptation, Lüneburg district



Green Energy Center of Excellence, page 46

**Further information**

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**Detailed researcher profile**

## Prof. Dr. Reiner Johannes Schütt



Faculty of Technology

Professorship: Control systems/  
electrical drives/wind energy technology  
At the UAS since 1998  
Vice-president of Research, Development,  
Technology Transfer

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### Core Expertise in Energy Research

- ⊙ Wind turbine open- and closed-loop controls
- ⊙ Grid integration of decentralised power generating systems and energy storage systems
- ⊙ Power supply automation, in particular in smart grids

### Leadership Duties Relevant to Energy Research



\_ Founding member of Competence Center  
Renewable Energies and Climate Protection  
Schleswig-Holstein (EEK.SH)



\_ Founding member of West Coast UAS Green Energy  
Center of Excellence



\_ Associate professor at Wind Energy Technology  
Institute (WETI) in Flensburg

### Supervised Bachelor's/Master's Theses (Selection)

- \_ Henrik Schröder, Performance Validation of Hot Air De-icing Systems for Wind Turbines, Canada, 2017
- \_ Sören Behnsen, PLC Implementation of Nonlinear Model Predictive Control for a Wind Turbine, Bremerhaven, 2017
- \_ Jörn-Olaf Radtke, Eigenverbrauchsoptimierung für Windparkbetreiber mit großen Kühlhäusern, Kaiser-Wilhelm-Koog, 2016

### Energy and Climate Protection R&D Projects

#### QUARREE 100: Control of local grids and integration in large-scale grid structures

Project duration: 2017 to 2022

Funding volume: €M 24, West Coast UAS share:

€M 1.2 (BMW/BMBF)

Collaborative project with around 20 partners



#### Preliminary study: Swimming Baths as switchable loads compliant with § 13, Paragraph 6a EnWG (German Energy Industry Act)

Project duration: 2017

Funding volume: 12,000 (EKSH funds)

Cooperating partners: West Coast UAS Green Energy Center  
of Excellence

#### SmartRegion Pellworm

Project duration: 2011 to 2015

Funding volume: €M 8, West Coast UAS share:

€180,000 (BMU/BMWi)

Cooperating partners: Fraunhofer Institut für Anwendungs-  
systeme, Saft Batteries GmbH, Gustav Klein GmbH,  
E.ON-New Build and Technologies GmbH, RWTH,  
Fraunhofer Umsicht and others



#### ITI Nestrail, Smart Region 2.0

Project duration: 2018 to 2022

Funding volume: €885,000

### Miscellaneous

Publications

- \_ Schütt, R. (2016): Steuerung und Regelung von Windenergiesystemen in Alois Schaffarczyk (Hrsg.) Einführung in die Windenergietechnik, Fachbuchverlag Leipzig im Carl Hanser Verlag, 2. Auflage.
- \_ Schütt, R. (2014): Diverse Co-Autoren: Understanding Wind Power Technology – Theory, Deployment and Optimisation, John Wiley & Sons Verlag.
- \_ Schütt, R., Oldekop, M. BSc (2014): Smart distribution grid application with different storage elements, Tagungsband International Conference on Smart Grid and Clean Technology; Dubai, United Arab Emirates.

Event organisation

- \_ Green Energy Workshops at West Coast UAS (since 2015).



Competence Center Renewable Energies and Climate Protection Schleswig-Holstein (EEK.SH), page 24  
Green Energy Center of Excellence and  
QUARREE 100, page 46  
Wind Energy Technology Institute (WETI), page 44

### Further information

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### Detailed researcher profile



## Prof. Dr. Sven Wanser



Faculty of Technology

Professorship: Power grids/grid integration  
At the UAS since 2010

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### Core Expertise in Energy Research

- ⊙ Electrical power engineering
- ⊙ Power and gas distribution networks
- ⊙ Grid integration
- ⊙ Smart grids
- ⊙ Sector coupling

### Leadership Duties Relevant to Energy Research

- \_ Executive board, Fördergesellschaft Windenergie und andere Dezentrale Energien (www.wind-fgw.de)
- \_ Head of planning/construction, grid operation, power system management and grid services business unit, and authorised officer at Schleswig-Holstein Netz AG (2006 to 2017) (www.sh-netz.com)

### Miscellaneous

Publications

- \_ Wanser, S. (2014): Diverse Co-Autoren: Understanding Wind Power Technology - Theory, Deployment and Optimisation, John Wiley & Sons Verlag.
- \_ Wanser, S. (2016): Diverse Co-Autoren: Einführung in die Windenergietechnik, A. Schaffarczyk, Hanser Verlag.



### Further information

www.fh-westkueste.de

# EKSH-Funding for universities



Gesellschaft für Energie und  
Klimaschutz Schleswig-Holstein GmbH

Stefan Sievers (full-time managing director)  
Stefan Brumm (part-time managing director)

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www.eksh.org

The Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH (EKSH) is a non-profit organisation, supported by the Federal State of Schleswig-Holstein, Hansewerk AG and a company of the Europa-Universität Flensburg, Flensburg University of Applied Sciences, University of Kiel, Kiel University of Applied Sciences, Universität zu Lübeck, Technische Hochschule Lübeck and West Coast University of Applied Sciences. The EKSH was founded in 2011.

The EKSH focuses its activities on selected topics, in particular climate protection by means of energy savings, energy consulting, energy efficiency, renewable energy resources, sustainable and economic power generation, storage, distribution and use of energy.

The EKSH works on ideas and project proposals from its stakeholders and third parties from within Schleswig-Holstein and develops its individual projects. It supports projects, e.g. applied R&D projects, doctoral scholarships and demonstration, advisory and information projects. Preferably in collaboration with partners, the EKSH organises specialist conferences and other information and consulting projects.

There are calls for tenders for R&D projects and doctoral scholarships, which scientists from Schleswig-Holstein can apply for. Applications are evaluated and decided on by a panel of experts (see reports on pp. 128 to 131).

#### EKSH Funding Examples:

- › Optimisation of the Energy Exploitation of Roadside Trees (Kiel University)
- › Yooweedoo Climate Challenge (Kiel University, student projects on energy and climate protection)
- › IFkE – Instruments for the promotion of climate-friendly nutrition (Kiel University)
- › Study on Swimming Baths as switchable loads (West Coast UAS)
- › Preliminary studies on wave energy converters (Kiel UAS)
- › emobility4all (Flensburg UAS, student project)

Read about other EKSH funded projects at universities on the following pages.

#### Kiel Energy Discourse event series

The EKSH, together with the Faculty of Economics and Social Science of Kiel University and the Kiel Institute for the World Economy (IfW), have hosted the Kiel Energy Discourse since 2012. Around three times each semester, current research, politics and lobby group topics concerning the implementation of the energy and transport transitions are discussed in economic, technical and political terms. The 25th such event was held in February 2018. The presentations are generally made available online. [www.kieler-energiesdiskurs.de](http://www.kieler-energiesdiskurs.de)



**Kieler Energiediskurs**  
Gespräche zur Energiepolitik



# Impulse for Applied Energy Research

**EKSH Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH**  
 Boschstraße 1, 24118 Kiel  
 Dr. Winfried Dittmann  
 Tel +49 431 9805-762  
 dittmann@eksh.org  
 www.eksh.org/projekte-foerderung/  
 hwt-energie-und-klimaschutz



The non-profit Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH (EKSH) has now been operating for a good six years – and the EKSH HWT Energy and Climate Protection funding program has been in existence just as long. Around €4.5 million in grants have been made available for 33 cooperative projects involving scientists at universities in Schleswig-Holstein during this period.

“The HWT funding program is one of the struts of our work”, says EKSH managing director Stefan Sievers. The EKSH received eleven funding applications in 2017 alone, seven of which were approved. The approval rate is 64 percent. This speaks for the numerous good quality applications and a critical assessment.

The HWT program can promote applied research and development projects and the transfer of scientific knowledge into practice (pilot projects). In particular, the field of energy and climate protection includes issues such as energy production and climate protection, energy consumption and energy efficiency, as well as energy supply and energy industry. Cooperating partners are expected to contribute to the costs of the project to an appropriate extent. The regular corporate contribution can be reduced from twenty percent to ten or five percent for small and young companies.

Applications can be submitted by all professors and other members of universities within the state entrusted with independent research. Applicants may also apply for a HWT grant if working jointly on a common, interdisciplinary scientific problem (cumulative HWT project). Applicants whose first appointment is no more than five years old may also receive up to 95 percent of the personnel and material costs.

The total available funding amounts to a maximum of €150,000. The project usually runs for a total of 24 months.

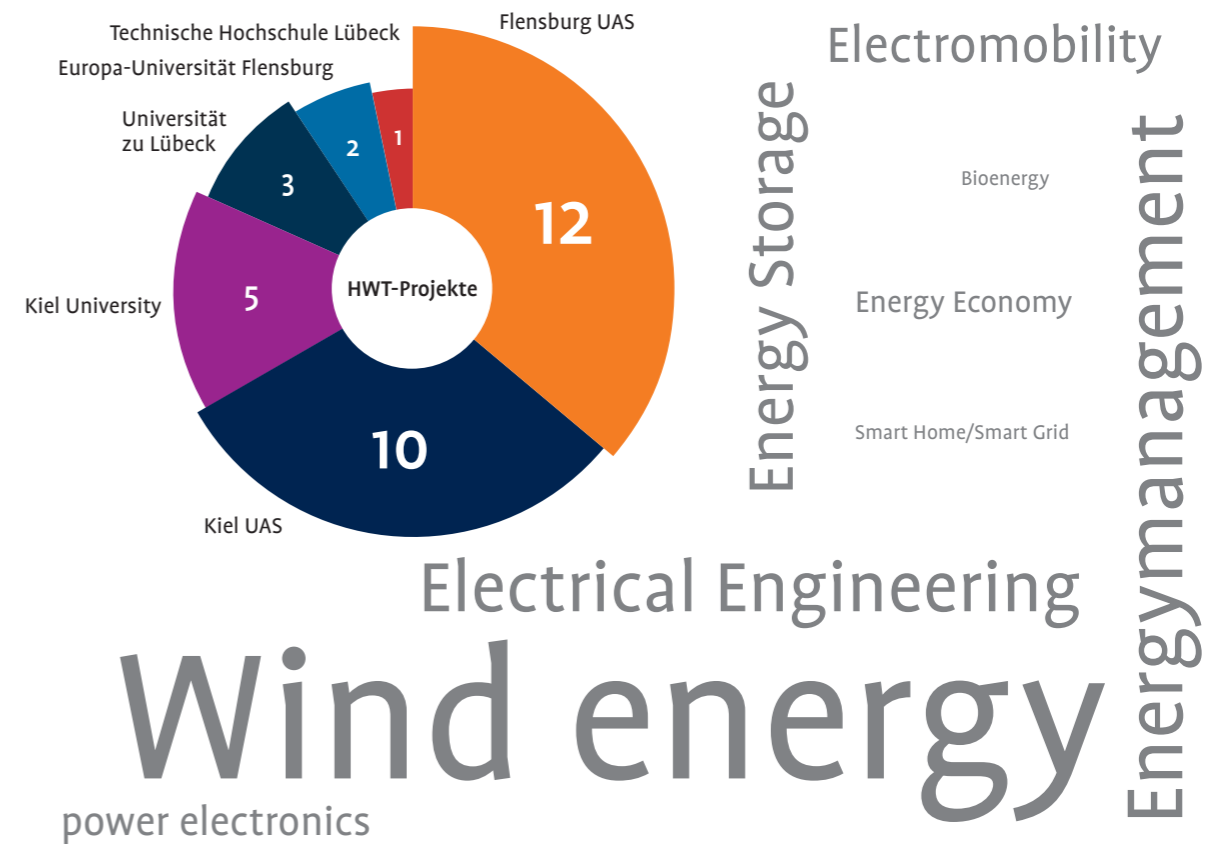
New HWT project applications may be submitted on two effective dates per year. The EKSH management decides on funding based on recommendations made by an expert jury.

Out of 33 approved HWT projects, 19 have already been completed. The EKSH publishes informative brochures containing the essential results of the projects sporadically.

[www.eksh.org/projekte-foerderung/energieforschung](http://www.eksh.org/projekte-foerderung/energieforschung)



The majority of HWT projects are processed at Flensburg University of Applied Sciences. In focus: wind energy topics.



14 HWT projects are currently ongoing (as of: March 2018):

Thema	Antragsteller	Kurzprofil
<b>Flensburg University of Applied Sciences</b>		
Yaw Angle Errors in Wind Turbines	Prof. Dr. Torsten Faber	Page 67
Grid-friendly Modular Wind Energy Medium-voltage Converter	Prof. Dr. Frank Hinrichsen	Page 68
Provision of Control Power and System Inertia in Wind Turbines	Prof. Dr. Clemens Jauch	Page 69
Hydropneumatic Flywheel Storage System for Wind Turbine Rotors		
Energy Management System for Renewable Power Generation Systems	Prof. Dr. Rajesh Saiju	Page 72
Mains Power Grid-Coupled District Heating 2020	Prof. Dr. Ilja Tuschy	Page 74
<b>Europa-Universität Flensburg</b>		
Schleswig-Holstein Heat Plan	Prof. Dr. Bernd Möller	Page 65
<b>Kiel University of Applied Sciences</b>		
Optimisation of the Life-Cycle Management of Wind Turbines (WTs) – BigData	Prof. Dr. Jens Lüssem	Page 102
Aerodynamic Glove	Prof. Dr. Alois Schaffarczyk	Page 106
Battery Systems with Regenerative Energy Generator and Energy Converter	Prof. Dr. Christoph Weber	Page 108
Biomass Dewatering with Maximum Energy Efficiency	Prof. Dr. Jan Henrik Weychardt	Page 110
<b>Kiel University</b>		
Flow Cytometric Analysis for Monitoring Energy Efficiency	Prof. Dr. Helmut Fickenscher	
Cross Innovation in the Energy Industry	Prof. Dr. Carsten Schultz	Page 89
<b>Universität zu Lübeck</b>		
NuR.E – User-centred Range Management System for Electric Buses	Prof. Dr. Thomas Franke	Page 112

FUNDING PROGRAM “EKSH DOCTORAL SCHOLARSHIPS”

For a relaxed research climate

EKSH Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH  
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Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH

Good for the climate, good for the state, good for science: every year, EKSH awards up to three doctoral scholarships to young academics in Schleswig-Holstein based on these criteria. The funding is attractive, the diversity of doctoral topics as broad as you can imagine.

Environmental economist Marvin Schütt investigates if and how wind turbines affect land values. Mechanical engineer Achim Struve is working on a rotatable tower aimed at making eco-windmills even more efficient. Electrical engineer Shahab Asadollah is working on better wind power control by power electronics control and economist Swantje Sundt is investigating whether flexible electricity tariffs will lead to greater acceptance of energy transition.

These are only a few of a dozen topics suited for research leading to a doctoral degree promoted by the EKSH. However, according to the EKSH call for proposals, the discipline in which the doctoral candidates are at home is not significant. “The aim is to support the goal of reducing energy-related emissions in the fields of heat and power generati-

on and mobility as well as to maintain a connection with the state of Schleswig-Holstein”. Here, both technology-oriented and economic-social science approaches can be funded.

Scholar Heiner Lütjen holds the view that energy transition does not rely solely on technology. He completed his bachelor’s degree in social economics at the University of Hamburg, followed by a master’s degree in business administration in Kiel. In the summer of 2014, thanks to EKSH support, he was able to begin exploring a field that affects virtually every municipality in the state.

How do public utilities and other municipal companies manage to evolve from energy suppliers to energy service providers? This is a central question for the 30-year-old, who sees a considerable challenge in this process. Before the electricity market in Germany was liberalised near the turn of the millenium, the municipal utilities, which were then in a good position in their protected niche, not only displayed low innovation drive, and not only in

“Without this support I wouldn’t have done it.”

Heiner Lütjen



his opinion, but must now compete with other suppliers and deal with the fact that power generation no longer takes place in a few large power stations, but instead in many thousands of small facilities. However, but how exactly could “Smart Energy for municipal utilities” work? What’s more, are there role models that really point to the direction ahead?

Heiner Lütjen, who is writing his doctoral thesis under the supervision of Prof. Carsten Schultz from the Institute of Business Administration, has already carried out numerous surveys, meticulously worked on theories – and therefore passed through many low points. “You have to get by many setbacks and disappointments,” he says, and is all the more thankful that he does not need to worry about eking out a living.

Thanks to the funding, Lütjen was even able to visit the University of Cambridge for a research residency for three months during his doctorate. Furthermore, quite fundamentally, the scholarship for the scientist, who submitted his work in early 2018, meant more than just a great deal of relief. “Without this support, I probably would not have done it”, Lütjen believes, referring not only to the money. Regardless of whether problems arose or self-doubt gnawed, the EKSH was always there with support and advice – as was also the experience of many other scholars. “Over and above the call of duty” as Heiner Lütjen emphasises.

The route to scholarship

Even before the funded path to the doctorate begins, the applicants are not on their own. The EKSH offers an excellent application consultation in advance and explicitly recommends this. A number of stipulations must be observed. Anyone who applies must prove supervision by a professor from Schleswig-Holstein and submit a proof of employment in Schleswig-Holstein for the work on his or her dissertation. It is also important that the conditions of the doctoral degree regulations of the university at which the doctoral thesis is to be written are met. The supervising professor must also provide an expert opinion on the research topic and its relevance from a technical perspective, as well as on the applicant. The crucial document, in addition to the actual application, is an exposé, which should present the current state of knowledge and the student’s own research project on no more than ten pages.

In the first two years, EKSH doctoral scholars receive €1,400 per month and €1,500 in the third year. Additional material and travel costs can be covered by up to €1,500 per year. The EKSH also grants child allowances for scholars who are parents. The beneficiaries must, however, take care of their own social security and, in particular, pay for their own health insurance contributions.



EKSH doctoral scholars with EKSH managing director Stefan Sievers (5th from right) and project manager Dr. Klaus Wortmann (3rd from right) at their annual meeting on 14 December 2017 in Kiel.

Photo: Martin Geist

Scholarship	Scholar/supervisor	Topic
08/13–07/16	René Schönfelder/Prof. Leucker, Uni Lübeck	Carsharing und Multimodalität, Elektromobilität
08/13–07/16	Swantje Sundt/Prof. Rehdanz, CAU	Akzeptanz von Maßnahmen zur Energiewende
08/13–07/16	Dragana Nikodinoska/Prof. Schröder, CAU	Klimaschutzförderung und privater Energieverbrauch
07/14–06/17	Heiner Lütjen/Prof. Schultz, CAU	“Smart Energy” für kommunale Energieversorger
06/15–05/18	Sebastian Hippel/Prof. Jauch, Flensburg UAS	Regelbares Schwungrad in einer WEA
06/15–05/18	Achim Struve/Prof. Faber, Flensburg UAS	WEA-Turm-Konzept mit Azimutlager im Turmfuß
06/15–05/18	Johannes Falck/Prof. Liserre, CAU	Aktive thermische Regelung von Leistungshalbleitermodulen
08/15–08/16	Robert Rudolf/Prof. Faber, Flensburg UAS	Algorithmus-gesteuertes Optimierungsverfahren für WEA
06/16–05/19	Shahab Asadollah/Prof. Liserre, CAU	Wind farm control strategies
08/16–07/19	Anke Jacksohn/Prof. Rehdanz, CAU	Investitionsentscheidung privater Haushalte für Photovoltaik
09/17–08/18	Julia Kroh/Prof. Schultz, CAU	Management offener Innovationsprozesse in der Energiewirtschaft
11/17–08/20	Marvin Schütt/Prof. Rehdanz, CAU	Auswirkung der Energiewende auf Immobilien- und Pachtpreise

## Central university contacts



### Europa-Universität Flensburg www.uni-flensburg.de

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### Flensburg University of Applied Sciences www.hs-flensburg.de

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<b>Torsten Haase</b> press officer	Tel +49 461 805-1304 torsten.haase@hs-flensburg.de



### Kiel University www.uni-kiel.de

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### Kiel University of Applied Sciences www.fh-kiel.de

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