

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

CIRE welcomes a new Professor



Professor Peter Stenzel - Design of hydrogen based energy systems

Photo: Peter Stenzel

CIRE TV is online

You are welcome to visit CIRE TV: <http://www.cire-tv.de/>

Solar energy workshop in Ziguinchor, Senegal



A joint status workshop about solar energy occurred between the 17th and 22nd of November 2021 in Ziguinchor, Senegal. Besides the University of Applied Sciences Cologne (TH Köln) were research teams present from Gaston Berger University, Saint-Louis, Senegal and University Assane Seck of Ziguinchor, Senegal. 11 scientific presentations were held, and many scientific discussions on joint research topics and laboratory visits took place. The workshop aimed to develop more joint research projects and increase student/staff mobility. The Cologne Institute for Renewable Energy (CIRE) was represented by Prof. Dr Ulf

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

Blieske, Lionel Clasing and Eva-Maria Grommes. The workshop was framed by the DFG-program "solar energy 2020".

Photos: Eva Grommes

TH Cologne supplies concepts for the innovation park for renewable energies in Jüchen

An energy landscape, a solar highway and a green energy hub: TH Cologne, together with the Zweckverband LandFolge Garzweiler and the Wuppertal Institute, have developed concepts for the "Innovationspark Erneuerbare Energien Jüchen" and developed them further with local stakeholders. The ideas should enable a future-oriented orientation of the Rhenish mining area after the phase-out of coal-fired power generation.

An essential part of the concept study is an energy landscape in which an innovative technical approach is being pursued: agri-photovoltaic technology (APV). Here, upright solar collectors are mounted on the fields, which can generate electricity from both sides. Since these only require a small area, farmers can cultivate their arable land and at the same time generate renewable energy. Furthermore, photovoltaics are to be installed on crane sites – the gravel areas in front of a wind turbine – in order to generate hybrid power plants.

Mobility and infrastructure

The energy landscape is supplemented with a solar highway. The peripheral areas of the A44n and A46 motorways in the project area are to be used for regenerative energy production. For this purpose, both the embankments and new noise and wind protection walls will be equipped with photovoltaic modules. With the so-called Green Energy Hub, a truck stop of the future is to be created that promotes sustainable mobility concepts. In addition to electricity and hydrogen filling stations for cars and local public transport, the facilities will also include workshops for the vehicles. "With the concepts, we offer innovative solutions for energy supply and infrastructure that make an important contribution to the energy transition and structural change in the Rhenish lignite mining area," says Prof. Dr. Thorsten Schneiders from the Cologne Institute for Renewable Energy at TH Cologne.

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

Wuppertal Institute for Climate, Environment and Energy and the company partner World of VR GmbH consists of communication and social scientists, interaction designers, sustainability and transformation researchers as well as specialists in the field of renewable energies and innovative technologies such as virtual and augmented reality.

CIRE has a new project - Photovoltaics Online Teaching

Erasmus + KA 226 (1.6.2021-30.5.2023), the PV-iTeach project was developed in order to train pre-career and continuing education PV professionals that would otherwise be unable to obtain an in-depth PV education in the absence of PV-iTeach. Additionally, the project seeks to establish an emerging hub of PV networks and professionals that will serve to connect PV stakeholders across Europe and around the world while establishing itself as a top destination for top-quality PV training and education. The PV-iTeach project will be carried out by a consortium of five European universities: the Technical University of Denmark (DTU), the Technical Hochschule Köln in Germany (TH Köln), the Fachhochschule Münster in Germany (FH Münster), Dalarna University in Sweden (DU), and the Albert-Ludwigs-Universität Freiburg in Germany (Uni Freiburg).

CIRE helped to establish the research cluster "Circular Transformation Lab Cologne"

[7 Millionen Euro für das Pilotprojekt der „Bergischen Ressourcenschmiede“ - TH Köln \(th-koeln.de\)](https://www.th-koeln.de)

CIRE helps to rebuild the Ahrtal

Development of the energy infrastructure in the Ahr Valley only if 100% Renewable!



Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

After the flood disaster in the Ahr valley and adjacent regions, their energy infrastructure has also been hit hard. In light of these drastic effects of the global climate catastrophe, scientists from the region are calling for the energy infrastructure to be built using only renewable energy. This call is supported by more than twenty nationwide non-profit environmental, climate and renewable energy organizations. In their impulse paper, the scientists set out in detail what measures are needed to achieve this.

The scientists state that a consistent focus on rebuilding with 100% renewable energy has long-term benefits for the Ahrweiler district. It is important that the population is involved and that the measures are taken in dialogue with the local people. The goal of 100% renewable energy could be achieved in balance already by 2027. For this, the expansion to approx. 400 MWp photovoltaics and 170 - 180 MW wind power seems necessary. This estimate already includes the supply of the heat and mobility sector with renewable energy. In this case, an expansion of approx. 70 MWp of photovoltaics would have to be realized per year. This would require, for example, an annual addition of photovoltaics on 35 hectares of open space and 30 - 40 MWp on roof surfaces. The addition of wind turbines could begin in 2023 with six turbines (25 MW), as delays are to be expected initially for wind power due to time-consuming planning processes. From 2024 onward, it is then estimated that about ten wind turbines will be added annually (40 MW). In order to ensure a continuous power supply in the medium term, the expansion of corresponding storage capacities and flexible generators and loads is necessary until 2030. In particular, the authors point out that for heat supply, fossil-fuelled heating systems using natural gas and oil must be completely replaced by alternative technologies. In this context, the development of gas networks should only be seen as a provisional measure. Instead, heat networks should be sought wherever possible. Elsewhere, heat pumps can be used, supplemented by solar thermal energy if necessary. Biomass, on the other hand, is a scarce resource. Therefore, it should be used only in cogeneration, if possible, and should come from sustainable and local production. Modern thermal insulation of buildings is, of course, the basis for a future heat supply.

For climate-friendly mobility, on the one hand, local public transport in the region is to be expanded and new models tested. For individual transport, the focus will be on

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

electromobility. To this end, an appropriate charging infrastructure with public and private charging points is to be planned and implemented. The power grids in particular must be equipped for future tasks, as heat supply and electromobility are added to the existing consumers. The district and the municipalities have the important task of planning areas for wind and solar plants, heating networks and a new climate-friendly transport infrastructure. The participation of the affected citizens has a decisive role to play. The region of the Ahr valley could thus become a model region for the energy turnaround nationwide.

Photo: Eberhard Waffenschmidt

CIRE at events

08.10.2021 -> 1st hydrogen fair in the district of Düren

[„H2Pro3“: CIRE präsentiert Projekt auf Wasserstoff-Messe in Jülich - TH Köln \(th-koeln.de\)](https://www.th-koeln.de)

27.08.2021 -> Tec.Meet.Ing.2021 - 160 Jahre VDI Kölner BV



THK booth Tec.Meet.IngAt the Tec.Meet.Ing Expo, the Technical University of Cologne (TH Köln) was represented by a joint booth of the University Department for Communication and Marketing, the Cologne Institute for Renewable Energy (CIRE) and the start-up YONA. In addition to innovative photovoltaic modules from the Department of Renewable Energy (CIRE), demonstrators of smart home and smart, mobile measurement technology were also



Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

exhibited there, which originate from the research project of the Virtual Institute Smart Energy (VISE). For example, the smart home demonstrator allowed visitors to test how the intelligent networking of household appliances works. Due to the technical exhibits brought along, many technical discussions could be held with interested guests and new contacts could be made. In addition, a start-up based at the TH Köln (EXIST start-up team YONA) was also represented. YONA links digital content with analog surfaces through Augmented Reality (AR). Using augmented reality technology, the app, which is free of charge for the user, allows 3D animations and videos to be created virtually on real objects, e.g. posters, packaging, business cards, instruction manuals or even banknotes, by means of a smartphone screen.

Photo: VDI Köln

Research project details - OER4EE

In the research project OER4EE - open educational resources for renewable energy technologies funded by the ministry of science (MKW) of the state of North Rhine Westphalia CIRE together with 5 more universities develops open educational resources for subjects like wind energy and systems engineering for energy efficiency

[Unterlagen Systemtechnik für Energieeffizienz — Systemtechnik für Energieeffizienz \(ifmay.gitlab.io\)](https://ifmay.gitlab.io)

Feedback from students and professors alike is very much appreciated as the project is still ongoing and improvements can be made. The full set of materials is expected to be available at orca.nrw this year.

Research project details - NOVA:ea

NOVA:ea – Innovation cluster E-Assessment - Diversity, Didactic, Technologies

Term: 01.08.2021 - 31.07.2024

Project partner: RWTH Aachen, FernUniversität Hagen, Deutsches Institut für Erwachsenenbildung, TH Köln

The optimization of assessment conditions is a central topic for universities. At the same time, the number of e-assessments conducted under Corona has increased significantly. The

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

collaborative partners alone currently conduct >75,000 e-assessments. NOVA:ea aims to promote academic education at all biographical stages with student-friendly e-assessments. It places student diversity at the center of the didactic/technical/diagnostic design of e-assessments. The guiding principle is to dovetail student-centered innovation with technological advancement, which is open source for e-assessment systems used at more than 230 HS. Developments include domain-specific task formats and flexible on-demand e-assessments. An examination cockpit provides teachers with recommendations for iterative improvement through assessment analytics. Special attention is paid to promoting acceptance when introducing e-assessments. A particular strength of the project network is the transfer between complementary partners, which is firmly anchored in the project structure. Exchange to other HS will be facilitated by an OER e-assessment toolkit for teachers & service institutions. (Source: <https://stiftung-hochschullehre.de/projekt/novaea/>, retrieved 26.01.2022)

The TH Köln is represented in the project in the form of the Cologne Institute for Renewable Energy (CIRE) and the Center for Teaching Development (ZLE). At CIRE, on-demand e-assessments are to be developed and tested as examples for individual courses, so that students have the opportunity to take exams at any time during the semester. In cooperation with the ZLE, an e-examination platform will be further developed.

Research project details - Solardachpfanne NRW



Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik



A novel design of a building-integrated hybrid solar roof tile (Fig.) with rear ventilation is presented in the research project "Solardachpfanne.NRW". This research project is funded within the framework program of the European Regional Development Fund (EFRE). The project consortium consists of professors from four different faculties of the TH Köln: Prof. Christian Dick (Electrical Engineering), Prof. Ulf Blieske (Process, Engineering and Mechanical Systems), Prof. Ruth Kasper (Civil and Environmental Engineering), and Prof. Eberhard Waffenschmidt (Electrical Engineering) and the company paXos Consulting & Engineering GmbH & Co. KG. The project pursues the development of a durable, heat-resistant, walkable, replaceable, efficient, and aesthetic building-integrated photovoltaic and solar thermal module that has the characteristics of a roof tile and thus can replace the building envelope and be installed by roofers. The proposed design solves application-specific technological problems of commercially available in-roof systems such as (a) easy installation, (b) accessibility for maintenance and replacement of single roof tiles, (c) rear ventilation for more effective PV cell cooling, (d) maximum-power-point-tracking on module level for complex roof constructions and (e) aesthetics comparable to a roof covered with conventional tiles.

In summer 2021, two experimental test roofs (Fig.) were set up at the campus Deutz, Cologne by the following research assistants and students: Lionel Clasing, Rudolf Gecke, Martin Nießen, Christian Brosig, Ramón José Recinos Tabora, Georg Jöntgen and Jonas Baumbach. The first test roof is equipped with solar roof tiles (left) and the second one with a standard rooftop PV system (right). In addition, an air-source heat pump will be installed on each test roof, with one heat pump drawing preheated air from the rear ventilation of the

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

solar roof tiles, while the other draws air from the ambient. In order to analyze the electrical and thermal performance for a period of one year, to also take into account seasonal characteristics, appropriate measuring devices were installed in both test roofs. The measurement series allow us to compare the novel design of the solar roof tiles with a standard rooftop PV system. Finally, the measurement data is used to validate the developed simulation models for analysis and optimization of the solar roof tile design.

The developed design of the solar roof tile makes it possible to solve various application-related technological problems and thus to lower the market entry barrier into the mass market of building-integrated solar systems. In particular, the accessibility for installers and thus the installation, maintenance, and replacement of individual modules of the roof tile system is a huge advantage. The planned measurement series will reveal more insights into the electrical and thermal performance of the solar roof tile system.

[Solardachpfanne.NRW - Dezentrale Strom- und Wärmeversorgung made in NRW - TH Köln \(th-koeln.de\)](https://www.solardachpfanne.NRW - Dezentrale Strom- und Wärmeversorgung made in NRW - TH Köln (th-koeln.de))

Photos: Ulf Blieske

Publication of Interest

M. Nießen, P. Deck, G. Jöntgen, L. Clasing, U. Blieske & C.P. Dick "Electrical Interconnection of a Solar Roof-Tile System: System Topology and Microconverter", 16th SDEWES Conference 2021 Dubrovnik, 2021

C. Brosig, L. Clasing, U. Blieske & E. Waffenschmidt "Modeling a Novel Building-Integrated PVT-Air-Collector System Coupled to a Heat Pump Using Open Source Libraries", 16th SDEWES Conference 2021 Dubrovnik, 2021

L. Clasing, S. Schaaf, U. Blieske, N. Riedel-Lyngskær, A. A. Santamaría Lancia & N. Reiners "Calculation of the Short-Circuit Current of Colored BIPV Modules Under Field Conditions by Application of Spectrally and Angle Resolved Measurement Data", 38th European Photovoltaic Solar Energy Conference and Exhibition, 2021



Cologne Institute for
Renewable Energy

Technology
Arts Sciences
TH Köln

Newsletter

February 2022

Master Erneuerbare Energien – Master Renewable Energy Management – Bachelor
Erneuerbare Energien – Bachelor Elektrotechnik / Studienrichtung Elektrische Energietechnik

Eberhard Waffenschmidt, Christian Hotz, Sergej Baum, Ingo Stadler, "Swarm Grids - Verteilte Stromnetzsteuerung für verteilte erneuerbare Energieerzeugung", Tagung Zukünftige Stromnetze 2022, 26. - 27. Januar 2022, online

Graf, Monika; Wollersheim, Olaf; May, Johanna (2021): Towards Reproducible Performance of Grid Connected Photovoltaic Battery Storage. In: International Renewable Energy Storage Conference (IRES) 2021. (Open Access)

Hannah Neumann, Mario Adam, Klaus Backes, Martin Börner, Tanja Clees, Christian Doetsch, Susanne Glaeser, Ulf Herrmann, Johanna May, Florian Rosenthal, Dirk Uwe Sauer and Ingo Stadler: DEVELOPMENT OF OPEN EDUCATIONAL RESOURCES FOR RENEWABLE ENERGY AND THE ENERGY TRANSITION PROCESS. In: 14th International Symposium on Renewable Energy Education