

Summer School #1

August 21st – 25th 2023

DTU - Risø Campus, Denmark

On **August 2023**, the **TwInSolar** consortium is pleased to present its first summer school on sizing, modeling and designing of renewable and hybrid power systems.

Agenda

	Morning	Afternoon	
Monday 21st	Welcome Workshop “Solar forecasts and their integration in the management of energy systems” , by Fraunhofer-ISE researchers - Introduction and Overview of solar irradiance forecasting models - NWP and satellite-based solar forecasting - High-resolution shortest-term forecasting with all sky imagers - Irradiance measurements: usage in forecasting and quality control	Workshop – follow up - From irradiance to PV power forecasting - Forecast based energy management - Forecast validation and probabilistic forecasting Presentations of projects from La Reunion researchers DTU Risø Campus labs visit	
Tuesday 22nd	Lectures: - Generation modelling (Wind, storage, etc) - Variability & uncertainty	LUNCH	
Wednesday 23rd	Lectures & exercises: hybrid power plants		Lectures: - Optimisation - Energy Management Systems Presentations of projects from La Reunion researchers Lectures & exercises: hybrid power plants Visit of Viking museum Roskilde Summer School diner in Roskilde
Thursday 24th	Lectures & exercises: - Modelling the solar resource - Modelling the PV system performance		Lectures & exercises: - Modelling the PV generator - Detailed models
Friday 25th	Visit of Syslab (Risø campus) Lectures & exercises: Production of PV modules		Lectures & exercises: Testing of PV modules Summer school wrap-up

The schedule is subject to change, workshop and lectures will be held in English.

You are interested in learning more about renewable energies and energy management systems? Register before **August 1st**

<http://t.univ-reunion.fr/3221>

For further inquiries, please contact Chloé Durif, project manager: chloe.durif-aboukalil@univ-reunion.fr

Detailed agenda

Monday, August 21st, 2023

9AM to 4PM with 1 hour lunch break

DTU and online

Workshop

Solar forecasts and their integration in the management of energy systems



Speakers

Elke Lorenz: Head of Energy Meteorology group, Fraunhofer ISE

Dr. Elke Lorenz is a physicist and heads the Energy Meteorology group at Fraunhofer ISE since 2016. Before she worked in the solar energy meteorology group of the University of Oldenburg for more than fifteen years, starting with her PhD on satellite based solar irradiance forecasting and heading the group from 2011-2016.

In 2019 she completed her habilitation in applied physics at the University of Oldenburg. Her research focus is on PV power forecasting and solar irradiance modelling. She has managed many national and international research projects and has been leading the subtasks on ‘Solar Irradiance Forecasting’ in the IEA Tasks on solar resource assessment (IEA SHC Tasks 36 and 46, IEA PVPS Task 16) since more than fifteen years.



Nils Straub: Researcher, Fraunhofer ISE

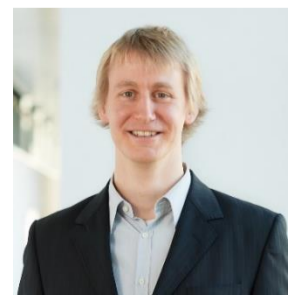
Nils Straub joined the Fraunhofer ISE in 2020 for his master thesis in the field of all sky imager irradiance forecasting. After completing and a subsequent researcher position he started a PhD thesis in 2021 for which he received a renowned DBU scholarship in 2022.

His research focusses on the development of novel high-resolution irradiance forecasting approaches using computer vision and machine learning methods.



Arne Groß: Researcher, Fraunhofer ISE

Arne Groß received his master’s degree in physics from University of Freiburg 2014. Since 2016, he is pursuing his PhD. His research interests include the development of intelligent control strategies for energy systems in the smart grid considering uncertainties in forecasts for renewable energy generation. He focuses on implementation of efficient optimization algorithms for stochastic systems and applications to real life use cases arising due to the transformation of the energy system to renewable energy sources.



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About the workshop

To achieve the massive integration of solar renewables into energy networks, one of the main challenges is the knowledge of their future power generation for the next minutes, hours and days. This workshop will give an overview of the available methods used to generate solar forecasts and to integrate them in the management of energy systems.

Tuesday, August 22nd, 2023
DTU

Lectures

**Generation modelling (wind, storage, etc), Variability & uncertainty,
Optimisation, Energy Management Systems**



Speaker: [Nicolaos A. Cutululis](#), Professor, Wind and Energy Systems Department, DTU, Power and Energy Systems Division, Power Systems section



Nicolaos's research has been in the broader area of integration of wind power, focusing on secure operation of electric systems with 100% renewable sources. In the past few years he has been focusing more on integration of offshore wind power, HVDC transmission, offshore grids and electrical infrastructure design and optimization. He developed & teach a MSc level course on "Offshore wind grid connection and HVDC transmission". He is an experienced researcher in large European, Nordic and national projects. He also acquired and managed industry funded research and collaboration. He is active in international collaborations like Global Power System Transformation Consortium, IEA Wind Task 25, EERA JP Wind, ETIP Wind. Nicolaos acts as Chief Editor for Wind Energy Science Journal, an Deputy Subject editor for the scientific journal IET Renewable Power Generation and an editorial board member for IEEE Trans on Sustainable Energy; he has also been a guest editor for IEEE Trans on Power Systems and IEEE Trans on Power Delivery.



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Wednesday, August 23rd, 2023
DTU

Lectures and exercises
Hybrid power plants



Speaker: [Kaushik Das](#), Associate Professor with the Department of Wind and Energy Systems, DTU

Kaushik received a PhD degree from DTU in 2016. His research interests include hybrid power and energy plants, power system balancing, and grid integration of renewables in power systems. He is a Member of IEA Wind, CIGRE, IEEE, and other professional bodies. He is also an operating agent for IEA Wind Task 50 on Hybrid Power Plants. He was the recipient of the prestigious AEG Elektronfonden's Elektron Award in 2022.



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Thursday, August 24th, 2023

DTU

Lectures and exercises

Modelling the solar resource, modelling the PV system performance, modelling the PV generator, detailed models



Speaker: [Sergiu Viorel Spataru](#), Associate Professor,
Department of Electrical and Photonics Engineering,
Photovoltaic Materials and Systems, DTU



Sergiu obtained the B.Sc. degree in Automation and Applied Informatics in 2009, from the “Politehnica” University of Timisoara (UPT), Romania, after which he moved to Denmark to study, and in 2011 he obtained the M.Sc. degree in Wind Power Systems from Aalborg University, Denmark. Between 2011 and 2015 he worked towards obtaining the Ph.D. degree in “Characterization and diagnostic methods for PV modules and arrays”, at the Department of Energy Technology at Aalborg University. During this period, he was a guest researcher for six months at the National Renewable Energy Laboratory in US, within reliability testing and modelling of solar photovoltaic modules.

After obtaining his Ph.D., he continued research as a PostDoc and thereafter as Assistant Professor at Aalborg University, within performance modelling of photovoltaic systems, electroluminescence imaging, modelling and machine learning methods applied to diagnostic and condition monitoring of photovoltaic systems. During his tenure at Aalborg University, he lectured in Photovoltaic Systems, Modelling of Renewable Energy Systems, and Programming of Real Time Systems at the bachelor, master and Phd level, as well as supervised Bsc and Msc thesis projects within energy systems.

In 2020, he started a new position as Associate Professor in the Department of Photonics Engineering at the Technical University of Denmark (DTU), within the Photovoltaic Materials and Systems research group. There he is currently teaching and developing solar PV energy engineering courses within the Master of Sustainable Energy, supervising Master and PhD student projects, and conducting research within performance modeling of standalone PV products, diagnostic imaging and drone inspection of PV systems.



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Friday, August 25th, 2023

DTU

Lectures and exercises
Production and testing of PV modules



Speaker: [Sune Thorsteinsson](#), Project Manager, Department of Electrical and Photonics Engineering, DTU



Sune Thorsteinsson obtained his Master of Science from the Technical University of Denmark (DTU) in 2006, within applied physics. After working 2 years in the semiconductor metrology industry, Sune started in 2009 as development engineer in a solar startup, which was developing advanced PV modules with laminate integrated electronics. Within this job Sune acquired deep knowledge within module design, module encapsulation materials as well as fabrication of especially back contact module. From 2012 Sune has been employed at Department of Photonics engineering at the Technical University of Denmark, where he has conducted research in different aspect of applied photovoltaics, within stand-alone systems, characterization of PV and development and characterization of BIPV systems, and have contributed to build the applied PV group at DTU. Currently the research area in focus is BIPV systems. In 2018 Sune was the driving force in launching a specialization in Solar Energy at DTU, and have developed and co-developed 4 on campus courses within PV, and been heavily involved in developing one MOOC; "Photovoltaic Systems" which is running on Coursera. In 2021 Sune was awarded his PhD degree based on research within applied PV, and Sune is currently teaching in PV energy engineering courses as well as supervising B.sc, M.sc and PhD students.



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Practical information

Summer school location: [DTU Risø Campus](#), peninsula Risø in Roskilde Fjord, 7 km north of the historic town of Roskilde and 40 km west of Copenhagen.

Hotel recommendations in the vicinity (from 5 km to 10 km) of DTU Risø Campus:

Hotel reservations must be made directly with the hotel.

- Recommended for juniors/students (cheap and nice hostel):

[Roskilde Vandrerhjem](#)

Vindeboder 7, DK-4000 Roskilde, Denmark

Phone: +45 4635 2184; roskilde@danhostel.dk;

- Recommended for seniors:

[Zleep Hotel Roskilde](#)

(formerly known as Hotel Prindsen, indicate that you are a guest from DTU)

Algade 13, DK-4000 Roskilde, Denmark

Phone: +45 7023 5635; roskilde@zleephotels.com

[Comwell Roskilde](#)

Vestre Kirkevej 12, DK-4000 Roskilde, Denmark

Phone: +45 4632 3131; hotel.roskilde@comwell.dk

[Scandic Roskilde](#)

Ved Ringen 2, DK-4000 Roskilde, Denmark

Phone: +45 4632 4632; roskilde@scandichotels.com

[Hotel Søfryd](#)

Søfrydvej 8-10, DK-4040 Jyllinge, Denmark

Phone : +45 4678 8011 ; info@hotel-sofryd.dk

Learn more about TwInSolar 

TwInSolar – Improving research and innovation to achieve a massive integration of solar renewables aims at strengthening the innovation and research capacities of the research laboratory [Physics and Mathematical Engineering for Energy, the Environment and Buildings – PIMENT](#) at the University of La Reunion, France, with a focus on the massive integration of solar energy production in La Reunion and other insular territories. Led by the [University of La Réunion](#), the project uses a twinning approach to foster good practices and knowledge exchanges between the University of La Reunion, the [Technical University of Denmark \(DTU\)](#), and the [Fraunhofer Institute for Solar Energy Systems](#), which are both internationally renowned research institutes in the field of solar energy. The participation of the [Regional Development & Innovation Agency of La Reunion – Nexa](#), and the [Islands Commission of Conference of Peripheral Maritime Region \(CPMR\)](#), will ensure the large dissemination of the projects' results and its replicability, at a regional and international levels.



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