The TwInSolar consortium is excited to announce our upcoming workshop focused on energy system sizing.

Date: from 19 to 23 May, 2025

Meeting format: online (connection link will be sent to registered participants)

Registration link: https://forms.gle/9unT1s3eRGtqX3uT6

About the workshop

In workshop DTU experts will give complete courses on 3 key topics related to the integration of variable renewable energy systems in the existing energy systems. First, they will detail how to implement different type of Energy Management Systems (EMS) in the sizing step of Hybrid Power Plants (HPP). Then, they will give an overview of sizing hybrid power plants (HPP) integrated with Power-to-X (P2X) technologies. They will end with the fundamentals of solar irradiance, photovoltaic technology, and PV inverters, leading to a practical understanding of PV plant sizing.

Agenda

Day	Date	Topic	Lecturer	Hands-on	Time (CET)
Day 1	19-05-2025	Introduction to Hybrid Power Plants	Kaushik Das	-	9:00-11:00
Day 2	20-05-2025	EMS for HPP – deterministic	Rujie Zhu	Megha Gupta	9:00-10:00 10:10-12:00
Day 3	21-05-2025	EMS for HPP – stochastic and data-driven	Rujie Zhu	Megha Gupta	9:00-10:00 10:10-12:00
Day 4	22-05-2025	Sizing of HPP with P2X	Megha Gupta	Megha Gupta	9:00-10:00 10:10-12:00
Day 5	23-05-2025	PV plant sizing	Sergiu Spataru	Sergiu Spataru	9:00-10:00 10:10-11:00 11:10-12:00 12:30-14:00

Workshop day 1: Introduction to Hybrid Power Plants

Monday, May 19, 2025, from 9AM to 11AM (CET), online

This session will describe the definition of HPP and differentiate with other concepts. The lecture will also provide the overview of the research landscape of the HPPs.

Workshop day 2: EMS for HPP – deterministic

Tuesday, May 20, 2025, from 9AM to 12AM (CET), online

This session will introduce the energy management system of wind-battery based hybrid power plants in multiple electricity markets using deterministic optimization. The lecture will cover Nordic market structures, basic optimization knowledge, and optimal offering and operation of hybrid power plants in electricity markets. Following this, a hands-on session will focus on tutorials and exercises to understand the deterministic energy management system using python-based HyDesign tool.

Workshop day 3: EMS for HPP – stochastic and data-driven

Wednesday, May 21, 2025, from 9AM to 12AM (CET), online

This session will introduce the advanced energy management system to manage forecasting uncertainties and improve profits of wind-battery hybrid power plants. The comparison of deterministic, stochastic, and data-driven energy management system will be demonstrated. Following this, a hands-on session will focus on tutorials and exercises to understand different energy management systems using python-based HyDesign tool.

Workshop day 4: EMS for HPP – Sizing of HPP with P2X

Thursday, May 22, 2025, from 9AM to 12AM (CET), online

This session will cover the key principles of sizing hybrid power plants (HPP) integrated with Power-to-X (P2X) technologies for optimal performance and operational strategies. The lecture will explore design considerations, energy management system, and techno-economic analysis of HPP and the impact of P2X integration. Following this, a hands-on session will focus on tutorials and exercises to understand the sizing optimization of HPP comprising of multiple technologies using python-based HyDesign tool.

Workshop day 5: PV Plant Sizing

Friday, May 23, 2025, from 9AM to 14AM (CET), online

This lecture on PV Plant Design covers the fundamentals of solar irradiance, photovoltaic technology, and PV inverters, leading to a practical understanding of PV plant sizing using back-of-envelope calculations, as well as using PV System modelling tools like NREL's System Advisor Model. Key topics include tilt optimization, yield calculations, and system losses, complemented by quizzes and in-class exercises. By the end, students will learn to size utility scale photovoltaic power plants based on yield and financial parameters and design criteria.

Speakers

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.

Megha Gupta, Postdoc, Department of Wind and Energy Systems, DTU

Megha received a PhD degree in "Coordinated operation of TSO and DSO for efficient grid management" from Department of Electrical Engineering, IIT Delhi, India in 2022. Her research interests include hybrid power plant sizing and operations with Power-to-X; power system steady state analysis, optimization and energy markets. She is currently working on the research and development of an open-access tool 'HyDesign' at DTU Wind for the design and operation of utility-scale hybrid plants with P2X.

Rujie Zhu, PhD, Department of Wind and Energy Systems, DTU

Rujie Zhu received his PhD degree from Department of Wind and Energy Systems, Technical University of Denmark, in 2023. He is currently a Postdoc researcher at the same Department. He was a research scholar at University of Central Florida, USA, in 2020. His research interests include sizing and energy management of hybrid power plants, large-scale energy system modelling.

Sergiu Spataru, Associate Professor, Department of Electrical and Photonics Engineering, Solar Photovoltaic Systems, DTU

Sergiu received a 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. 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. In 2020, he started a new position as Associate Professor in the Department of Electrical and Photonics Engineering at the Technical University of Denmark (DTU). There he is currently teaching and developing solar PV energy engineering courses and conducting research within performance modeling of standalone PV products, diagnostic imaging and drone inspection of PV systems.

For further details about the TwInSolar project, feel free to explore our website: www.twinsolar.eu