

Industrial & PhD Summer School in Energy Informatics 2022

Technical program



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Preface

The industrial & PhD summer school in Energy Informatics 2022 aims to support company employees and doctoral students in their competence development by offering lectures and hands-on exercises with real cases and big data. The main content of this year's summer school:

- Opportunities and challenges in the digital transformation of the energy systems
- IoT and energy management systems
- Data cloud and energy data management

The summer school is organized in cooperation with Energy Informatics [Academy Conference 2022 \(EI.A 2022\)](#) (24-25 August 2022), the Innovation Festival at Dandy Business Park (25 August 2022). Digital Energy Hub, Lighthouse South – Green Energy and Sector Coupling.

Sincerely,

Summer school committee

Zheng Ma, University of Southern Denmark, Denmark
Bo Nørregaard Jørgensen, University of Southern Denmark, Denmark
Birte Holst Jørgensen, Technical University of Denmark, Denmark
Guangchao Chen, University of Chinese academy of sciences, China
Tore Friis Gad Kjeld, Center Denmark
Flemming Pors Knudsen, Center Denmark
Henrik Madsen, Technical University of Denmark, Denmark
Athila Quaresma Santos, University of Southern Denmark, Denmark
Arne Skou, Aalborg University, Denmark
Torben Bach Pedersen, Aalborg University, Denmark
Hamdi Ben Hamadou, Aalborg University, Denmark

Program overview

Date	Time	Main activity	Location	Address
22-Aug	09.30-10.30	Registration	Room Solcellen & Ladestationen, Green Tech House	Lysholt Allé 6, 7100 Vejle, Denmark
22-Aug	10.00-10.30	Summer school opening	Room Solcellen & Ladestationen, Green Tech House	Lysholt Allé 6, 7100 Vejle, Denmark
22-Aug	10.30-16.00	Day 1 program: Speeches, presentations, and discussion	Room Solcellen & Ladestationen, Green Tech House	Lysholt Allé 6, 7100 Vejle, Denmark
23-Aug	09.00-16.00	Day 2 program- IoT and energy management systems*	Room Solcellen & Ladestationen, Green Tech House	Lysholt Allé 6, 7100 Vejle, Denmark
24-Aug	09.00-16.00	Day 3 program- Data cloud and energy data management*	Room AH6, Advice House	Lysholt Allé 10, 7100 Vejle, Denmark
24-Aug	19.00-22.00	Formal dinner	Hotel Best Western ToRVEhallerne	Fiskergade 2, 8, 7100, 7100 Vejle
25-Aug	09.00-16.30	Energy Informatics Academy conference**	Tent No.7, Green Zone, Dandy business park	Lysholt Allé 1-10, 7100 Vejle, Denmark

*Need technical installation before Day 2 and Day 3 programs

Energy Informatics **Academy conference

Website: <https://www.energyinformatics.academy/eia-2022-conference>

Program: <https://www.energyinformatics.academy/2022-conference-program>

On 25 August, [five keynote speeches](#) and a panel session will be organized at Tent No.7, Green Zone at the [innovation festival](#)

Day one program

Opportunities and challenges in digital transformation of the energy systems

By Digital Energy Hub, KMD, Remoni, Climify, Innovation Center Denmark (Silicon Valley)

The digital transformation of energy systems not only brings opportunities but also challenges. The opportunities and challenges are different for different stakeholders, e.g., large, small, utilities and technology providers. Day 1 program will bring you through the journey with the latest information via various presentations.

Location

Room Solcellen & Ladestationen, Green Tech House

Address

Lysholt Allé 6, 7100 Vejle, Denmark

Time	Activity	Presenter
10.00-10.10	Joint summer school opening speech	Prof. Bo Nørregaard Jørgensen, Summer school committee chair and head of SDU Center for Energy Informatics
10.10-10.25	PhD summer school opening speech	Morten Laugesen, Executive Director of Sino-Danish Centre
10.25-10.30	Introduction of the 3-days program	Zheng Grace Ma, Summer school program chair and Associate profess at SDU Center for Energy Informatics
10.30-11.30	Presentation: The digital energy innovative ecosystem for the green transition acceleration	Flemming Pors Knudsen, Head of Innovation and Tore Friis Gad Kjeld, Innovation Manager at Digital Energy Hub
11.30-11.45	Coffee break	
11.45-12.30	Presentation: The challenge domains and its importance in the digital transformation of the energy systems	Henrik Dan, Industry Solution Lead and Principal Enterprise Architect, Tine Anneberg, Head of Energy & Climate Industry Sales at KMD
12.30-13.30	Lunch break (Canteen at Green Tech House)	
13.30-14.00	Presentation: SMEs' opportunities and challenges in the digital transformation of the energy systems	Bo Eskerod Madsen, CEO of Remoni
14.00-14.30	Presentation: CLIMIFY: A journey from an Interreg project to today's startup and DTU Spin-off	Davide Cali, CEO & Co-founder of Climify
14.30-14.45	Coffee break	
14.45-16.00	Discussion, round up and outlook: needs, preparation and supports for SMEs and startups to participate in the digital transformation of the energy systems	Digital Energy Hub
16.00-16.30	Presentation: Innovation Centre Denmark: Building bridges between the Global markets and Denmark on research, education and technology	Cathja Windbæk Lind, Innovation Advisor at Innovation Center Denmark, Silicon Valley

Day two program

IoT and energy management systems

By Athila Quaresma Santos, SDU Center for Energy Informatics University of Southern Denmark

IoT applications are essential for realizing Industry 4.0. IoT applications not only ensure high-quality data collection, but also ensure high-resolution monitoring, optimization and control. The IoT applications become more complex in energy sectors, due to, e.g., the increasing number of installed IoT devices and the size of the IoT networks. Therefore, how efficiently establishing and managing large-scale IoT networks becomes a challenge. The Day 2 program will introduce the OPC UA* (Open Platform Communications Unified Architecture) and an automated configuration tool developed in the CELSIUS project (funded by EUDP) that allows automatic paring of IoT devices and large-scale IoT network deployment.

* OPC UA is an extensible, platform-independent standard that enables the secure exchange of information in industrial systems.

Themes:

- Tutorial of OPC UA in the Industry 4.0 and IoT applications and exercises on how to access data through OPC UA servers
- Tutorial of deployment of large-scale IoT networks using automated configuration tools (based on the CELSIUS project)

Technic preparation before the day

We will develop small applications and do some exercises during our course. Therefore, before the course, please prepare the following environment:

Python	Python will be used as the primary language for developing the client and server applications. If you don't have Python installed, please follow the link and guidelines here
OPC UA server	A virtual OPC UA server for familiarization will be used to understand the organization and concepts behind OPC UA Please download it by following the link here (need registration)
OPC UA client	A commercial visualizer will be used to test our applications and to visualize the entire created OPC UA space. Please consider to use "UA Expert Client". The software has support for Windows and Linux and can be download (need registration) via the link here

If you have any issues to configure any of the requirements please contact Athila Santos (aqs@mmpi.sdu.dk)

Location

Room Solcellen & Ladestationen, Green Tech House

Address

Lysholt Allé 6, 7100 Vejle, Denmark

Time	Activity
09-10	Introduction to OPC UA
10-11	Read/Write/Subscription functionalities – Exercise Python
11-12	Method calls – Exercise Python
12-13	Lunch break (Canteen at Green Tech House)
13-14	Introduction to Large scale IoT networks
14-15	Hands-on exercises in groups with IoT devices
15-16	Round-Robin automatic paring

Day three program

Data cloud and energy data management

By Tore Friis Gad Kjeld, Flemming Pors Knudsen, Steffen Ivan Nielsen, Center Denmark

By Hamdi Ben Hamadou, AAU-Daisy, Aalborg University, Denmark

By Torben Bach Pedersen, FlexShape

It is no doubt about the importance of big data in the digital transformation of energy systems, especially for data-driven production development. However, data-driven production development usually requires multiple types of data from various data sources and sometimes across sectors. Therefore, data management and access become a challenge. The Day 3 program will use an energy data lake* developed in the Flexible Energy Denmark project (funded by Innovation Fund) as an example to introduce the functions that can be performed on the top of a data lake, e.g., Apache Zeppelin**. In the afternoon program, the company, FlexShape, will introduce and demonstrate a data driven tool and a service platform that allows to model, control and aggregate smart devices for realizing energy flexibility for different stakeholders.

*A data lake is a centralized repository designed to store, process, and secure large amounts of structured, semi-structured, and unstructured data.

**Apache Zeppelin is a new and incubating multi-purposed web-based notebook which brings data ingestion, data exploration, visualization, sharing and collaboration features to Hadoop and Spark.

Theme:

- Tutorial of data lake use and exercises with anonymized data (based on the data lake developed in the Flexible Energy Denmark project)
- Tutorial of modelling, aggregation, and control of flexible energy systems and exercises with digital twins instead of real devices (based on the tool FlexOffers)

Technic preparation before the day

Please remember to bring:

- A reasonably new mobile phone (IOS or Android) for installing the TP-Link Kasa App (we will do it on-site)
- A laptop with the latest browser version

Location

Room AH6, Advice House

Address

Lysholt Allé 10, 7100 Vejle, Denmark

Time	Activity
09-10	Introduction to Flexible Energy Denmark Data Lake (FEDDL)
10-11	Introduction to Apache Zeppelin Accessing and querying Data Lake data using Python
11-12	Visualizing Data Lake data
12-13	Lunch break (Canteen at Green Tech House)
13-14	Introduction to modelling, aggregation, and control of flexible energy systems with FlexOffers and the Aggregator-as-a-Service Platform
14-15	Hands-on exercises in groups with digital twins and simple physical devices
15-16	Demos of solutions, discussion, and outlook

Participant list

Name	Affiliation
Ahmed Idries	Norwegian University of Science and Technology
Anita Enevoldsen	Verdo Forsyningsservice
Charles Robert McCall	Verdo Forsyningsservice
Christian Skafte Beck Clausen	Syddansk Universitet
Jonas Vedsted Sørensen	Syddansk Universitet
Lotte Frank Kirkegaard	ImpactSphere A/S
Malte Chlosta	Karlsruhe Institute of Technology (KIT)
Maryam Mousavi	University of Cagliari
Nicolai Bo Vanting	Syddansk Universitet
Peter Fogh	Verdo Forsyningsservice
Peter Hørlyck	Granhaven
Simon Hedegård Jessen	Syddansk Universitet
Søren Bro	Kamstrup A/S
Stine Willemoes Kondrup	Verdo Forsyningsservice
Xenia Hassing-Hansen	GreenLab

Maps

Map of Energy Informatics.Academy conference 25 August

Energy Informatics.Academy conference is in **Tent No.7, Green Zone**, at the Innovation festival

Address: Dandy business park, Lysholt Allé 1-10, 7100 Vejle, Denmark



Map of Green Tech house and Advice House

Green Tech House

Address: Lysholt Allé 6, 7100 Vejle, Denmark

Advice House

Address: Lysholt Allé 10, 7100 Vejle, Denmark

Advice House

Green Tech House



Contact Information

For any enquiry, please contact us by email: contact@energyinformatics.academy

For any emergency, please contact us by mobile phone:

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