



2024 Open Source Modelling and Simulation of Energy Systems (OSMSES)

September 3-4, 2024, Vienna, Austria

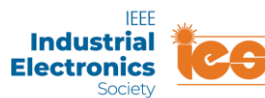
ISBN: 979-8-3503-8467-3

IEEE Catalog Number: CFP24BD0-USB

PROCEEDINGS



Co-Sponsored by



Technically Supported by

IEEE IES Technical Committee on Smart Grids (TC-SG)
IEEE SMCS Technical Committee on Intelligent Industrial Systems (TC-IIS)



Endorsed by





2024 Open Source Modelling and Simulation of Energy System (OSMSES)

Copyright and Reprint Permission:

Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org.

All rights reserved. Copyright ©2024 by IEEE.

IEEE Catalog Number: CFP24BD0-USB

ISBN: 979-8-3503-8467-3



Message from the Organizers

Simulation is an essential tool to manage the complexity of modern energy systems and to define effective solutions for planning, designing, and operating energy systems. Energy systems are expected to include electricity, gas, and heat networks - to maximize the use of all available forms of energy - and to include storage capacity. The distributed nature of new resources (generation and storage) and the participation of loads in energy management require fast, reactive control and protection. In this context, it is expected that the monitoring and control of modern energy systems will be characterized by the distribution of functions. At the same time, a large use of communication media is envisioned. The interactions between continuous dynamics and discrete events are becoming more relevant due to the increasing number of controllable devices (e.g., power electronic converters in power grids) and the use of networked control systems. In addition, power systems are increasingly driven by market competition, and the impact on system operation should also be considered. In this context, several research groups have developed modeling and simulation solutions to address these challenges, and they have disseminated their software using an open-source approach. The workshop will address all aspects related to the use and development of open source tools for power and energy systems modelling and simulation. The main objective of the workshop is to foster discussion on these topics among experts from academia, industry, and utilities.

The Open Source Modelling and Simulation of Energy Systems (OSMSES) 2024 workshop brings together component and system manufacturers, power grid operators, energy suppliers, and research institutions. OSMSES 2024 is the third edition, the first two took place in 2022 and 2023 in Aachen, Germany. The proceedings of both previous events are available in IEEE Xplore.

Out of all the submitted papers, 28 papers were accepted and been carefully selected during a quality-controlled review process supported by the OSMSES 2024 program committee. In addition to that, 3 tutorials as well as one keynote presentation and a panel about the usage of open-source approaches in smart energy systems education are also included in the program. They will be presented in 10 different sessions during the workshop.

Moreover, we want to express our special thanks to IEEE, especially the IEEE Industrial Electronics Society (IES) and IEEE Austria Section for supporting OSMSES 2024 and we thank the program committee for their excellent service, most importantly, we thank the authors and presenters for their thoughtful contributions to the advancement of this important field.

General Chair

Thomas I. Strasser (AIT Austrian Institute of Technology & Technische Universität Wien, Austria)

General Co-chairs

Andrea Benigni (Forschungszentrum Jülich & RWTH Aachen University, Germany)

Antonello Monti (RWTH Aachen University & Fraunhofer FIT, Germany)

Technical Program Chairs

Thiemo Pesch (Forschungszentrum Jülich, Germany)

Filip Pröstl Andrén (AIT Austrian Institute of Technology, Austria)

Finance Chair

Roman Eichinger (OVE Austrian Electrotechnical Association, Austria)

Christian Gassers (OVE Austrian Electrotechnical Association, Austria)



Tutorial Chairs

Veit Hagenmeyer (Karlsruhe Institute of Technology, Germany)

Stefan Wilker (Technische Universität Wien, Austria)

Publicity Chairs

Peter Palensky (Delft University of Technology, Netherlands)

Friederich Kupzog (AIT Austrian Institute of Technology, Austria)



Conference Organizers

General Chair

Thomas Strasser (AIT Austrian Institute of Technology & Technische Universität Wien, Austria)

General Co-Chairs

Andrea Benigni (Forschungszentrum Jülich & RWTH Aachen University, Germany)

Antonello Monti (RWTH Aachen University & Fraunhofer FIT, Germany)

Technical Program Chairs

Thiemo Pesch (Forschungszentrum Jülich, Germany)

Filip Pröbstl Andrén (AIT Austrian Institute of Technology, Austria)

Finance Chairs

Roman Eichinger (OVE Austrian Electrotechnical Association, Austria)

Christian Gassers (OVE Austrian Electrotechnical Association, Austria)

Tutorial Chairs

Veit Hagemeyer (Karlsruher Institute of Technology, Germany)

Stefan Wilker (Technische Universität Wien, Austria)

Publicity Chairs

Peter Palensky (Delft University of Technology, Netherlands)

Friederich Kupzog (AIT Austrian Institute of Technology, Austria)

Technical Program Committee

Adrien Guironnet (Réseau de Transport d'Électricité, France)

Alexandros Paspatis (The Manchester Metropolitan University, UK)

Amro Farid (Stevens Institute of Technology, USA)

Anke Weidlich (Albert-Ludwigs-Universität Freiburg, Germany)

Antonio De Paola (Joint Research Center, Belgium)

Armin Veichtlbauer (University of Applied Sciences Upper Austria, Austria)

Astrid Nieße (Carl von Ossietzky Universität Oldenburg, Germany)

Benjamin Marshall (The National HVDC Centre, UK)

Bryan Palmintier (NREL, USA)

Catalin Gavriluta (AIT Austrian Institute of Technology, Austria)

Chandan Kumar (Indian Institute of Technology Guwahati, India)

Christof Brandauer (Salzburg Research, Austria)

Chun Sing Lai (Brunel University London, UK)

David Fellner (University of Applied Sciences Technikum Wien, Austria)

Farhad Shahnia (Murdoch University, Australia)

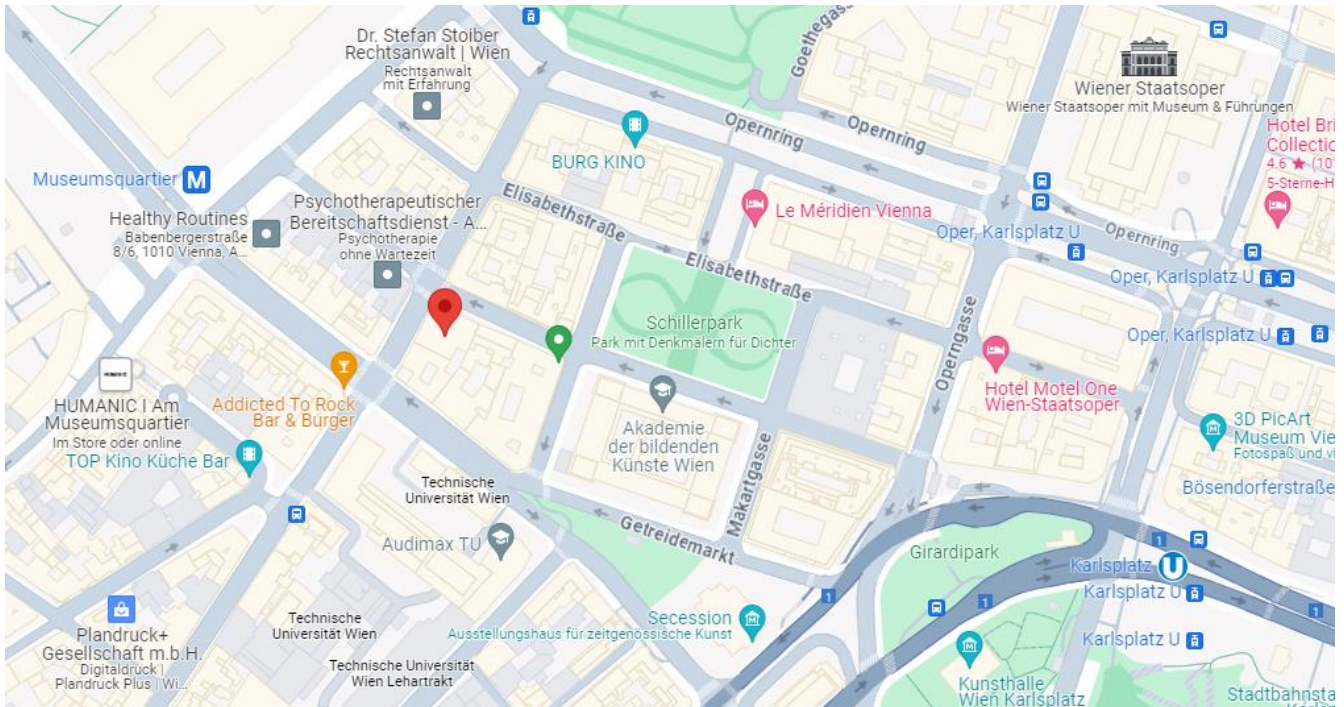


Federico Milano (University College Dublin, Ireland)
Ferdinanda Ponci (RWTH Aachen University, Germany)
Georg Lauss (AIT Austrian Institute of Technology, Austria)
Giorgio Graditi (ENEA, Italy)
Joao Martins (Universidade Nova de Lisboa, Portugal)
Julio Braslavsky (Commonwealth Scientific and Industrial Research Organisation, Australia)
Jun Hashimoto (National Institute of Advanced Industrial Science and Technology, Japan)
Karsten von Maydell (Deutsches Zentrum für Luft- und Raumfahrt, Germany)
Luigi Vanfretti (Rensselaer Polytechnic Institute, USA)
Marco Musetta (Politecnico di Milano, Italy)
Mark Stefan (AIT Austrian Institute of Technology, Austria)
Merkebu Z. Degefa (University of Stavanger, Norway)
Mihai Anitescu (Argonne National Laboratory, USA)
Mohammad B. Shadmand (University of Illinois Chicago, USA)
Nikos Hatziaargyriou (National Technical University of Athens, Greece)
Panos Kotsampopoulos (National Technical University of Athens, Greece)
Petr Musilek (University of Alberta, Canada)
Qianwen Xu (KTH Royal Institute of Technology, Sweden)
Quoc Tuan Tran (Commissariat à l'énergie atomique et aux énergies alternatives, France)
Sebastian Lehnhoff (OFFIS, Germany)
Slaven Peles (Oak Ridge National Laboratory, USA)
Trevor Hardy (Pacific Northwest National Laboratory, USA)
Ulf Häger (TU Dortmund University, Germany)
Venizelos Efthymiou (University of Cyprus, Cyprus)

Venue

OVE Austrian Electrotechnical Association

Eschenbachgasse 9
1010 Vienna, Austria



Keynote

Dynawo: An Open-Source Suite of Simulation Tools for Power Systems

Speaker

Joy El Feghali (RTE Réseau de transport d'électricité, France)

Marco Chiaramello (RTE Réseau de transport d'électricité, France)



Abstract

Power systems simulations are needed and performed by the system operators to ensure the power system's security and stability. Nowadays, transmission systems are undergoing significant transformation due to the increasing penetration of power electronic converters (renewable energies and HVDCs) in the power system induced by the energy transition. This transformation impacts the dynamic behavior of the system, which is crucial for stability assessments. Also, a switch from an easy-to-predict and physically-driven system to an unpredictable and numerically-driven system is seen, forcing operators to find complex ways to control it, like advanced special protection schemes. This asks for more collaboration, transparency, and flexibility. Dynawo aims to answer these challenges and proposes a perspective change with a switch to an open-source approach, to the use of a high-level modeling language (Modelica), and to a strict separation between the modeling and solving parts for more flexibility. Dynawo is an open-source suite of simulation tools made of a common core, a models library, and a solvers library. By choosing the proper models and solver, it proposes tools for several applications: DynaFlow for steady-state calculations, DySym for short-circuits, DynaWaltz for long-term stability, and DynaSwing for transient stability studies. The suite and illustrative test cases will be presented.

Bios

Joy El Feghali holds a ph.D. degree in Control from Paris-Saclay University. She also holds a master's degree in control and signal processing from CentraleSupélec, Paris-Saclay University, and has an electrical engineering background. Her research focused on using Modelica, a modeling language for component-oriented modeling of complex systems models, to model and control multi-energy systems to perform flexibility for the electrical grid. She currently works at the R&D department of RTE, Réseau de Transport d'Electricité, the French Transmission System Operator (TSO). She is mainly developing power system models for the Dynawo suite simulation tools for steady-state calculations, long-term and short-term stability studies using the Modelica language.

Marco Chiaramello is currently a R&D manger at Réseau de Transport d'Electricité. He brings experience from previous roles at Réseau de Transport d'Electricité, Ecole Polytechnique, UPMC, and Los Alamos National Laboratory. Marco Chiaramello holds a Doctor of Philosophy (PhD) in Plasma Physics from École Polytechnique, UPMC, LULI. He gained a robust skill set that includes numerical simulation, parallel computing, C++, Matlab, and many more.



Panel

Development, Management and Applications of Open-Source Smart Energy Systems Education

Moderator

Alkistis Kontou (National Technical University of Athens, Greece)

Speakers

Rad Stanev (Technical University of Sofia, Bulgaria)

George Makrides (University of Cyprus, Cyprus)

Veit Hagemeyer (Karlsruher Institut of Technology, Germany)

Alkistis Kontou (National Technical University of Athens, Greece)

Abstract

ICT technologies and interdisciplinary background are of paramount importance for a deep understanding of the evolving smart energy systems. Therefore, proactive response from academia, industry stakeholders and the wider community is essential, to rapidly adapt teaching methodologies and effectively train the next generation of engineering professionals, as well as current professionals who need to stay updated with emerging technologies. Open-source tools and accessible educational materials can significantly enhance the education of individuals studying or working in this sector. This panel session aims to present innovative, hands-on educational methods that enhance comprehension and skill advancement for students, researchers, and professionals. Examples and opportunities will be showcased for providing free access to tools, services, and infrastructures. Additionally, a methodology for establishing an educational strategy to deliver open-source educational content during the lifespan of research projects will be presented. This can foster a culture of continuous and innovative learning, bridging the gap between academia and industry.

Bios

Alkistis C. Kontou received the Diploma degree in Electrical and Computer Engineering from the National Technical University of Athens, Greece, in 2019. During 2019 she was also an intern with BayWa r.e, Berlin. Since 2019, she has been a PhD Candidate and works as a Researcher within the Department of Electrical and Computer Engineering in National Technical University of Athens, Greece. Her research interests lie in control of power inverters, converter-driven stability, microgrids, cyber-security aspects of smart grids and advanced laboratory validation methods. She has contributed to several European and national research projects in the field of power systems. She is a Student Member of the IEEE and a Member of the Technical Chamber of Greece.

Rad Stanev, PhD, M. Sc. El. Eng., MBA received his B.S., M.S. and PhD degrees in Electrical Power Engineering from Technical University of Sofia (TU-Sofia), Bulgaria in 2003, 2005 and 2010 respectively. In 2006 he received his Master of Business Administration (MBA) degree from FOM Essen Germany and the Faculty for German



Engineering Education and Industrial Management at TU - Sofia. Since 2014 he is associate professor in Electrical Networks and Power Systems and Head of the Power System Stability Laboratory of TU-Sofia. He was member of several IEEE Task Forces such as the IEEE PES Task Force on “Innovative teaching methods for modern power and energy systems”. Rad is vice chairman of ETIP SNET WG5, member of SET Plan Temporary Working Group on LVDC technologies, member of ISGAN SIRFN- PST, CEEC, CEID, Current/OS and several other organizations and initiatives. He worked on many national and European research projects and published more than 60 scientific papers in the field of electrical power engineering. His research interests are in the field of power system stability, smart grids, power systems analysis, renewable energy sources, micro, mini and nanogrids and autonomous power systems, PHIL testing, liberalized electricity markets, management and control.

George Makrides is a research scientist at the Department of Electrical and Computer Engineering and PHAETHON CoE, of the University of Cyprus. His research interests are in the energy field subdomains of renewable energy sources, grid integration of variable renewable sources, smart grids, battery energy storage systems, electric mobility, energy digitalization and data-driven analytics. He had received the BEng degree in Electrical and Electronic Engineering at Queen Mary University of London (First Class Honours) in 2003, and the MPhil degree in Engineering at Cambridge University in 2004. He further received his PhD from the University of Cyprus in 2012 (Thesis Title: Performance assessment of different grid-connected PV technologies utilising real outdoor measurements). During his studies he has received scholarships and academic excellence awards for outstanding performance from the University of London, the Cambridge Commonwealth Trust and the University of Cyprus. Since 2005, he has been serving as a Research Fellow at the Department of Electrical and Computer Engineering and PHAETHON CoE, of the University of Cyprus.

Veit Hagenmeyer, received the Ph.D. degree from Université Paris XI, Paris, France, in 2002. He is currently a Professor of energy informatics with the Faculty of Informatics, and the Director of the Institute for Automation and Applied Informatics, Karlsruhe Institute of Technology, Karlsruhe, Germany. His research interests include modeling, optimization and control of sector integrated energy systems, machine-learning based forecasting of uncertain demand and production in energy systems mainly driven by renewables, and integrated cybersecurity of such systems.



Tutorial 1

Hands-On with the HELICS Co-Simulation Platform

Speaker

Trevor Hardy (Pacific Northwest National Laboratory, USA)

Abstract

HELICS is a co-simulation platform funded by the United States Department of Energy and developed in cooperation by multiple National Labs. The goal of HELICS is provide a means of linking existing simulators to exchange data during runtime, allowing the development of larger and more complex system models. This tutorial will consist of two parts: (i) lecture-style introduction to the HELICS platform to help the participants understand its basic capability and (ii) hands-on, in-class project developing a simple system model converting two stand-alone toy simulation models into one integrated model via HELICS.

Bio

Trevor Hardy is a Senior Power System Research Engineer for Pacific Northwest National Laboratory where his core research areas are co-simulation tool development and analysis along with transactive energy simulation and analysis. In the eight years at the Lab, his research has spanned energy storage applications, distribution system analysis for smart grid use cases, integrated wholesale and retail markets with transactive energy, as well as heading the usability and automation task for HELICS, the US Department of Energy's co-simulation platform.



Tutorial 2

GasNetSim: Modeling and Analyzing Gas Networks with Complex Gas Mixture

Speaker

Yifei Lu (Forschungszentrum Jülich, Germany)

Andrea Benigini (Forschungszentrum Jülich, Germany)

Abstract

GasNetSim is a steady-state gas network simulation tool developed and maintained using the programming language Python. In GasNetSim, the gas mixture properties are modeled, therefore it is capable of being used for simulations of gas networks with complex mixtures, e.g. hydrogen-blended natural gas. In this tutorial, the mathematical background of the modeling and simulation of gas pipelines will be first presented, so that the audience can have a better overview of how the tool works. Afterwards, some basic operations using GasNetSim to create and simulate gas networks will be presented. Based on the simulation result, some analyses will be performed to showcase potential uses of the tool.

Bios

Yifei Lu received his B.Sc. degree from the China University of Mining and Technology in 2016 and his M.Sc. degree from the University of Duisburg-Essen in 2019. Since 2019, he has been a doctoral researcher at the Institute of Energy and Climate Research: Energy Systems Engineering (IEK-10) of Forschungszentrum Jülich. He is currently pursuing his Ph.D. degree at RWTH Aachen University, Aachen, Germany.

Andrea Benigini received the B.Sc. and M.Sc. degrees from the Politecnico di Milano, Milano, Italy, in 2005 and 2008, respectively, and the Ph.D. degree from RWTH Aachen University, Aachen, Germany, in 2013. From 2014 to 2019, he was an Assistant Professor with the Department of Electrical Engineering, University of South Carolina, Columbia, SC, USA. Since 2019, he has been a Full Professor at RWTH Aachen University and the Director of the “Institute of Energy and Climate Research: Energy Systems Engineering (IEK-10)” at the Forschungszentrum Jülich.



Tutorial 3

EMINENT: Interoperability maturity assessment for open source software development and standardization communities in the energy domain

Speaker

Gianluca Lipari (Electric Power Research Institute Europe, Ireland)

Alberto Dognini (Fraunhofer Institute for Applied Information Technology, Germany)

Joep van Genuchten (Electric Power Research Institute Europe, Ireland)

Abstract

The goal of this workshop is to introduce EMINENT as a maturity assessment framework and how it can support these communities to grow their maturity, or in other words, become better as a community at producing standardized and interoperable models and simulations. We will do this by taking the assessment with the audience and assessing the maturity of the community of open source modelling and simulation of energy systems. Furthermore the workshop will address how participants might go about performing a maturity assessment with the open source and standardization communities they participate in and how to use the results as a basis for a roadmap for community development.

Bios

Gianluca Lipari is a Technical leader at EPRI Europe. Gianluca Lipari obtained his Ph.D. degree in electronic engineering from the University of Reggio Calabria, Italy, in 2015. Subsequently he joined RWTH Aachen University in Germany, as postdoctoral research associate and served as senior scientist at the Fraunhofer FIT Center for Digital Energy in Aachen. Since October 2022 he has been Technical Leader and European projects coordinator at the Electric Power Research Institute (EPRI) Europe. His research activities focus on the digitalization of the energy system, including cloud applications for cyber-physical systems monitoring and automation, data driven approaches for electricity grids management and operation, distributed generation and electrical storage integration. Currently he is involved in the Horizon Europe int:net project for the creation of a European interoperability network for the energy transition, leading the development of interoperability maturity assessment tools. Dr. Lipari is the coordinator of the Horizon Europe project AGISTIN, for the advanced integration of renewables and storage solutions in industrial processes.

Alberto Dognini received the B.Sc. and M.Sc. degrees in electrical engineering from the Politecnico di Milano, Italy, in 2012 and 2014, respectively. From 2015 to 2017, he worked as the Engineering Project Manager at ABB, Electrification Products Division, Dalmine, Italy, managing the revamping of medium voltage electrical apparatus and switchgears. Since 2017, he has been a Research Associate with the Institute for Automation of Complex Power Systems, E.ON Energy Research Center, RWTH Aachen University, Germany, and has also been with the Fraunhofer Institute for Applied Information Technology (FIT), Germany, since 2022. His research interest includes energy services to improve resiliency of distribution grids under fault conditions. He is the coordinator of the int:net Horizon Europe project.



Joep van Genuchten is technical leader utility data management at EPRI. He received is BSc in Aerospace Engineering at TU Delft, and his MSc in Industrial Ecology at Leiden University and TU Delft. From 2016 to 2023 he worked as (lead) data architect at Alliander, specializing in data standardization and data management in agile organizations. He is a member of UCAIug TF 13 advising on the integration of metadata standards in the IEC-CIM and CGMES. At EPRI his research focusses on integration of information standards for the energy industry, enterprise architecture and organizational maturity and interoperability as well as modelling multi energy systems for the MOPO Horizon Europe project. His research interests include information modelling, data architecture, organizational change and complex adaptive systems.

Reviewers

Fariba Amini	Sebastian Lehnhoff
Mihai Anitescu	Benjamin Marshall
Adrian Barradas Barradas	Joao Martins
Robert Beckmann	Federico Milano
Christof Brandauer	Ghulam Mohy-Ud-Din
Julio Braslavsky	Zahra Nazari
Diego Cifelli	Nana Kwaku Kusi Ofori-Yeboah
Milos Cvetkovic	Bryan Palmintier
Antonio De Paola	Giourgkert Partalis
Merkebu Z. Degefa	Alexandros Paspatis
Venizelos Efthymiou	Slaven Peles
Renzo Fabian	Ferdinanda Ponci
David Fellner	Filip Pröbstl Andrén
Nastaran Gholizadeh	Syed Muhammad Ahsan Razvi
Philipp Glücker	Patrick Schönfeldt
Giorgio Graditi	Mohammad B. Shadmand
Adrien Guironnet	Farhad Shahnia
Veit Hagenmeyer	Ensieh Sharifnia
Md Touhidul Haque	Amirhossein Sohrabbeig
Trevor Hardy	Jie Song
Jun Hashimoto	Mark Stefan
Nikos Hatzargyriou	Alexandru Stefanov
Rahmat Heidari	Thomas Strasser
Noon Hussein Hussein	Quoc Tuan Tran
Ulf Häger	Luigi Vanfretti
Daniel Jung	Armin Veichtlbauer
Ayesha Khan	Denis Vettoretti
Clemens Korner	Moritz Weber
Panos Kotsampopoulos	Anke Weidlich
Chun Sing Lai	Stefan Wilker
Georg Lauss	Junjie Zhang

Overview Program

Tuesday, September 3, 2024

Session: Welcome and Opening (09:00-09:10)

Chair: Mark Stefan

09:00-09:10	Welcome addresses and logistics by the workshop chair Thomas Strasser and technical committee member Mark Stefan
-------------	--

Session: Keynote (09:10-10:10)

Chair: Mark Stefan

09:10-10:10	Joy El Feghali, Marco Chiaramello	<u>Dynawo: An Open-Source Suite of Simulation Tools for Power Systems</u>
-------------	-----------------------------------	---

Coffee Break (10:10-10:30)

Session: Paper Session 1 (10:30-12:15)

Chair: Thiemo Pesch

10:30-12:15	<i>Paper Session 1: Modelling and (Co-)Simulation of Energy Systems</i>	
1	Trevor Hardy	<u>Using Co-simulation to Model Interconnect-Scale Power Systems from Loads to Generators</u>
2	Jan Sören Schwarz, Leonard Enrique Ramos Perez, Minh Cong Pham, Kai Heussen and Quoc Tuan Tran	<u>A Toolbox for Design of Experiments for Energy Systems in Co-Simulation and Hardware Tests</u>
3	Manuel Pitz, Felix Wege, Niklas Eiling, Steffen Vogel, Vincent Bareiß and Antonello Monti	<u>Automated Deployment of Single-Board Computer Based Grid Measurement and Co-Simulation Equipment</u>
4	Carsten Wegkamp, Henrik Wagner, Eike Niehs, Julien Essers, Marcel Lüdecke, Mattias Hadlak and Bernd Engel	<u>eELib: Open-Source Model Library for Prosumer Power Systems and Energy Management Strategies</u>
5	Marcelo Andre Muro Alvarado, Claudio Anderis, Riccardo Lazzari, Lorenzo Nigro and Alessio La Bella	<u>Development and Experimental Validation of an Open-Source Model Library for District Heating Network Simulation</u>
6	Maximilian Mork, Eziama Ubachukwu, Jakob Benz, Philipp Althaus, André Xhonneux and Dirk Müller	<u>ALICE2Modelica - Automated Building Model Generation for Building Control and Simulation</u>

Lunch Break (12:15-13:15)

Session: Paper Session 2 (13:15-15:00)

Chair: Mark Stefan

13:15-15:00	<i>Paper Session 2: Modelling and Simulation of Multi-Physics/Energy Systems</i>	
1	Andrea Benigni, Antonello Monti, Sebastian Schwarz and Matthew Milton	<u>A Polynomial Chaos Based Tool for Multi-Energy Systems: A Sensitivity Analysis Test Case</u>
2	Giuseppe Silano, Evangelos Rikos, Vetrivel Rajkumar, Oliver Gehrke, Tesfaye Amare Zerihun, Carmine Rodio and Riccardo Lazzari	<u>Integrating Power-to-Heat Services in Geographically Distributed Multi-Energy Systems: A Case Study from the ERIGrid 2.0 Project</u>
3	Roman Bolgaryn, Erik Prade, Gourab Banerjee, Simon Drauz-Mauel, Daniel Lohmeier, Pawel Lytaev, Frank Marten, Steffen Meinecke, Mike Vogt, Yu Xiang and Laurynas Zavistanavicius	<u>Further developments in pandapower and pandapipes</u>
4	Sergi Costa Dilmé, Juan Carlos Olives Camps, Paula Muñoz Peña, Pau García Motilla, Oriol Gomis Bellmunt and Eduardo Prieto-Araujo	<u>Multi-physics operation and sizing optimisation in Pyomo: Application to large irrigation systems</u>
5	Ueli Schilt and Philipp Schuetz	<u>Thermal Energy Storage in Multi-Energy System Optimization: How to Consider Temperatures?</u>
6	Sina Dibos, Thiemo Pesch and Andrea Benigni	<u>Individual versus Grid-Connected Thermal Systems: Impact on Grid Infrastructures and Energy Supply</u>

Coffee Break (15:00-15:20)

Session: Tutorial 1 (15:20-16:50)

15:20-16:50	Trevor Hardy	<u>Hands-On with the HELICS Co-Simulation Platform</u>
-------------	--------------	--

Session: Paper Session 3 (16:50-18:00)

Chair: Thiemo Pesch

16:50-18:00	<i>Paper Session 3: Computational Approaches and Methods for Energy Systems</i>	
1	Georgii Tishenin, Armin Teskeredzic and Antonello Monti	<u>Extraction of State Matrix Eigenvalues for Resistive Companion Nodal Power System Model in Shifted-Frequency Domain</u>
2	Mehmet Alper Kuyumcu, Catalin Gavriluta and Andrea Benigni	<u>Efficient Newton-Raphson Power Flow with Parallel Jacobian Construction</u>
3	Sungho Shin, Vishwas Rao, Michel Schanen, D. Adrian Maldonado and Mihai Anitescu	<u>Scalable Multi-Period AC Optimal Power Flow Utilizing GPUs with High Memory Capacities</u>
4	Mehran Jafari, Gautier Bureau, Marco Chiaramello, Adrien Guironnet, Patrick Panciatici and Petros Aristidou	<u>A Modelica IBM Implementation for Fast Simulation of Digital Controllers in Power Systems</u>



City Tour (18:00-19:30)

Conference Dinner (19:30-22:00)

Overview Program

Wednesday, September 4, 2024

Session: Panel (09:00-10:10)

Chair: Alkistis Kontou

09:00-10:30	<i>Panel Session: Development, Management and Applications of Open-Source Smart Energy Systems Education</i>
	<p><i>Speakers</i></p> <ul style="list-style-type: none"> • Rad Stanev, "Simulation and PHIL based Smart Energy Systems Education using Open-Source "Laboratory" and "Real Life Laboratory" environment" • George Makrides, "Smart Energy Systems: Modern open-source learning management systems for real-time supervision and control" • Veit Hagenmeyer, "Experiences with the open source tools PROOF, pyWatts and eASIMOV at KIT" • Alkistis Kontou, "Methodology for Development and Management of Open-Source Educational Material in Research Projects"

Coffee Break (10:10-10:30)

Session: Paper Session 4 (10:30-12:15)

Chair: Alkistis Kontou

16:50-18:00	<i>Paper Session 4: Real-time Simulation and Hardware-in-the-Loop Applications</i>	
1	Andrea Pomarico, Philipp Glücker, Daniele Carta, Thiemo Pesch, Alberto Berizzi and Andrea Benigni	Python-based API for real-time control and monitoring of RSCAD models
2	Renzo Fabian and Paulo Godoy	OpenDSS-Based Real-Time RMS Simulator: Design and Applications
3	Andrea Alessia Tavagnutti, Marco Dalle Feste, Massimiliano Chiandone, Andrea Vicenzutti, Daniele Bosich and Giorgio Sulligoi	A Decision Support System for the Stable Real-time Power Management of Onboard Zonal DC Microgrids
4	Andrea Alessia Tavagnutti, Davide Comugnaro, Massimiliano Chiandone, Andrea Vicenzutti, Daniele Bosich and Giorgio Sulligoi	Reduced Order Model of Zonal DC Microgrid for Open Source Real-time Emulation
5	Thanakorn Penthong, Alberto Dognini, Edoardo De Din, Manuel Pitz, Ferdinanda Ponci and Antonello Monti	Hardware-in-the-Loop Validation of AC/DC Service Restoration including industrial IED and Communication Protocols
6	Moritz Weber, Alexander Kocher, Hüseyin Çakmak and Veit Hagenmeyer	ePowCoRe: A Novel Generic Representation of Power Grids Enabling Open-Source Model Conversion Modules

Lunch Break (12:15-13:15)

Session: Tutorial 2 (13:15-14:45)

13:15-14:45	Yifei Lu, Andrea Benigini	<u>GasNetSim: Modeling and Analyzing Gas Networks with Complex Gas Mixture</u>
-------------	---------------------------	--

Coffee Break (14:45-15:05)

Session: Tutorial 3 (15:05-16:35)

15:05-16:35	Gianluca Lipari, Alberto Dognini, Joep van Genuchten	<u>EMINENT: Interoperability maturity assessment for open source software development and standardization communities in the energy domain</u>
-------------	--	--

Session: Paper Session 5 (16:35-18:20)

Chair: Thiemo Pesch

16:35-18:20	<i>Paper Session 5: Energy System Optimization and ICT Applications</i>	
1	Kenneth McDonald, Colin Le and Zhihua Qu	<u>Open-Source Modeling of Extreme Weather Impact on Distribution Networks</u>
2	Lorenz Ray Payonga, Hatef Madani, Saman Nimali Gunasekara, Miloš Šipetić, Fabrizia Giordano and Mark Stefan	<u>Generic Definition and Information Model for Hybrid Energy Storage Systems (HESS)</u>
3	Theresa Reinhardt, Viktor Wesselak and Rohith Bala Krishnan	<u>Uncertainty assessment of the energy system of Thuringia using a Monte Carlo model</u>
4	Stefan Strömer and Klara Maggauer	<u>IESopt: A Modular Framework for High-Performance Energy System Optimization</u>
5	Lidia Westphal, Marcel Schröder, Daniele Carta, Andre Xhonneux, Andrea Benigini and Dirk Müller	<u>Development and Application of a FIWARE-based ICT-Platform for Multi-Energy Systems on Building and District Level</u>
6	Christoph Klaassen, Lukas Kasper and René Hofmann	<u>Mapping SysML v2 to NGSII-LD: Enhancing Energy Systems Modeling</u>

Closing (18:20-18:30)