5 IEEE POWER 2 AND ENERGY 0 STUDENT 2 SUMMIT

8 – 10 October | Munich

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Technical University of Munich
TUM School of Engineering and Design
Chair of Electric Power Transmission and Distribution

POWER UP for brilliant ideas

PESS Munich 2025

IEEE PES Power & Energy Society® Germany Chapter

Opening Remarks

It is our great pleasure to welcome you all to the **IEEE Power and Energy Student Summit 2025** here at the Technical University of Munich. This event continues a proud tradition that began in 2009, traveling across leading universities in Germany before arriving in Munich this year.

The Power and Energy Student Summit has always been more than a conference. It is a platform where young engineers, researchers, and industry professionals come together to exchange ideas, share innovations, and strengthen the bridge between academia and industry. As we face the global challenges of the energy transition in ensuring sustainability, security, and access, developing a strong and capable workforce is essential. This summit plays a vital role in building that foundation.

This year's program reflects that mission, offering opportunities for discussion, collaboration, and inspiration. We are confident that what you learn and the connections you make here will serve as a steppingstone for your future careers and contributions to the power and energy sector.

We would like to express our sincere gratitude to our Gold Sponsor, **Siemens Energy**, and our Silver Sponsors, **DIgSILENT** and **OMICRON electronics**. Their support is invaluable in making this event possible. We also want to thank our dedicated organizing team at the **TUM Chair of Electric Power Transmission and Distribution** and the **Center for Combined Smart Energy Systems (CoSES)** for their exceptional work in preparing this conference.

We hope you all have a wonderful time in Munich and an engaging, productive experience at the conference. May this summit continue to inspire innovation and collaboration for years to come.

Prof. Reinaldo Tonkoski, PhD
Conference Chair

Dr.-Ing. Anurag Mohapatra
Co-Chair

Dr.-Ing. Peter Tzscheutschler
Co-Chair

Conference Handbook Contents

1 Program Overview

Day 1 – Wednesday, 8 October 2025

Time	Room	Program
14:00 – 15:00	Faculty Club	*Registration & Coffee*
15:00 – 15:30	Auditorium	Conference Opening
15:30 – 16:00	Auditorium	Keynote – Dr.-Ing. Frank Schettler, Siemens Energy *Towards a Sustainable Future of Energy: A Personal Endeavor*
16:00 – 16:30	Faculty Club	*Coffee Break*
16:30 – 18:00	Auditorium	Technical Session 1 – Modeling, Simulation & Analysis
18:00 – 21:00	Faculty Club	*Networking Reception (Food & Drinks, On-Site)*

Day 2 – Thursday, 9 October 2025

Time	Room	Program
08:30 – 09:00	Faculty Club	*Registration & Coffee*
09:00 – 09:30	Auditorium	IEEE PES Germany Chapter Presentation – Prof. Dr.-Ing. Martin Wolter
09:30 – 10:00	Auditorium	Keynote – Prof. Dr.-Ing. Giovanni De Carne, Karlsruhe Institute of Technology *PHIL: A Way to Accelerate the Introduction to Market of Energy Technologies*
10:00 – 11:00	Auditorium	Special Session 1 – Best Paper Award Nominees
11:00 – 11:30	Faculty Club	*Coffee Break*
11:30 – 13:00	Auditorium	Special Session 2 – Best Paper Award Nominees
13:00 – 14:00	Faculty Club	*Lunch Break*
14:00 – 15:00	Faculty Club	Student Poster Contest
15:00 – 15:30	Faculty Club	*Coffee Break*
15:30 – 16:30	-	Guided CoSES Lab Tours
18:00	-	*Conference Dinner (Augustiner Stammhaus, City Center)*

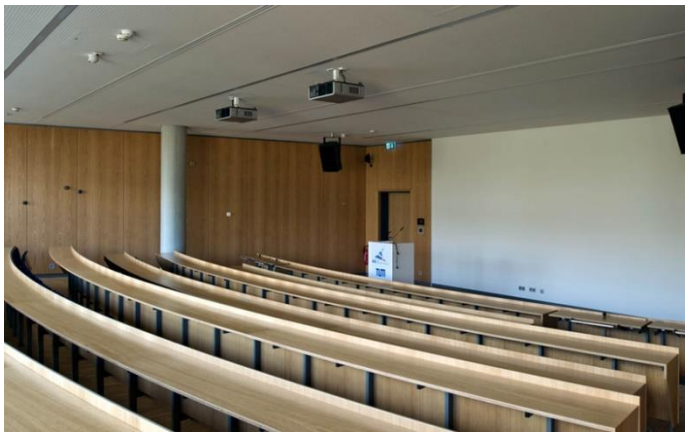
Day 3 – Friday, 10 October 2025

Time	Room	Program
08:30 – 09:00	Faculty Club	*Registration & Coffee*
09:00 – 10:00	Auditorium	Technical Session 2 – Techno-Economics, Markets & Forecasts
10:00 – 11:00	Auditorium	Technical Session 3 – Grid Operation & Flexibility
11:00 – 11:30	Faculty Club	*Coffee Break*
11:30 – 13:00	Auditorium	Technical Session 4 – Data-Driven Methods & Applications
13:00 – 14:00	Faculty Club	*Lunch Break*
14:00 – 15:15	Auditorium	Technical Session 5 – Monitoring, Control & Optimization
15:15 – 15:30	Auditorium	Conference Closing

2 General Conference Information

On-Site Information

This year's conference will take place at the **TUM Institute for Advanced Study (IAS),** a modern and accessible location providing an excellent environment for presentations, discussions, and networking. Situated in the heart of the TUM Campus in Garching, the venue is well connected by public transport. You can find more information about the venue on its official website.



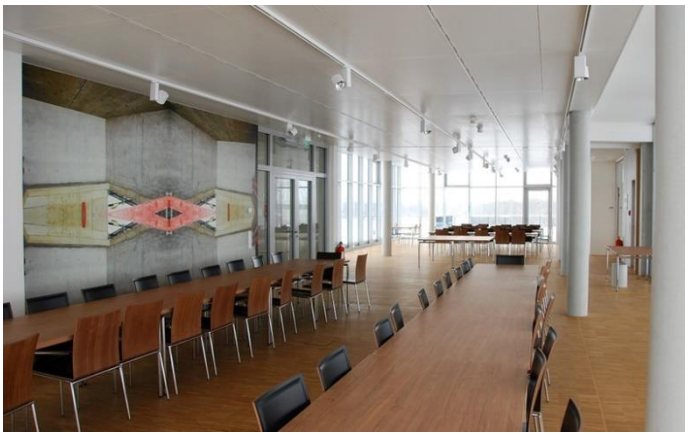


Figure 1: *IEEE PESS 2025 Conference Venue: Auditorium (left) and Faculty Club (right) in the TUM-IAS Building (Source: https://www.ias.tum.de/ias/institute-for-advanced-study/resources-facilities/ias-building/).*

All keynote sessions, special sessions and technical sessions take place in the **Auditorium**, a lecture hall on the ground floor of the TUM-IAS building.

All coffee/lunch breaks, the networking reception and the student poster contest take place at the **Faculty Club**, a conference room on the 4th floor of the TUM-IAS building.

At the venue, participants can connect via ***eduroam*** or the public network ***Bayern-WLAN***.

IEEE PESS 2025 participants can access all **conference proceedings** and **abstracts of the student poster contest** online at LRZ Sync + Share as instructed on their nametags.

Conference Dinner

We are delighted to invite you to this year's conference dinner, taking place on **Thursday, 9 October** at the historic **Augustiner Stammhaus** in the city center of Munich. The restaurant, renowned for its Bavarian charm and traditional cuisine, offers the perfect setting for an evening of networking and good company. The dinner will take place in a separate room, the **Weißer Saal**, reserved for our group.

Figure 2: *IEEE PESS 2025 Dinner Location: Augustiner Stammhaus - Weißer Saal (Source: https://www.augustiner-restaurant.com/stammhaus/weisser-saal/).*

Participants are welcome to **leave together from the conference venue at 5:00 PM.** Or meet directly at the restaurant at 6:00 PM.

The location of the Augustiner Stammhaus can be found here.
Neuhauser Str. 27, 80331 Munich

We look forward to sharing this special evening with you!

Registration Statistics

The IEEE PESS 2025 conference has **more than 100 registered participants**, with **nearly 80% students** and a wide range of roles such as presenting paper and poster authors and sponsor attendees. We are especially pleased to see a strong mix of early-career researchers alongside experienced academics and industry professionals, ensuring engaging discussions and valuable networking opportunities.

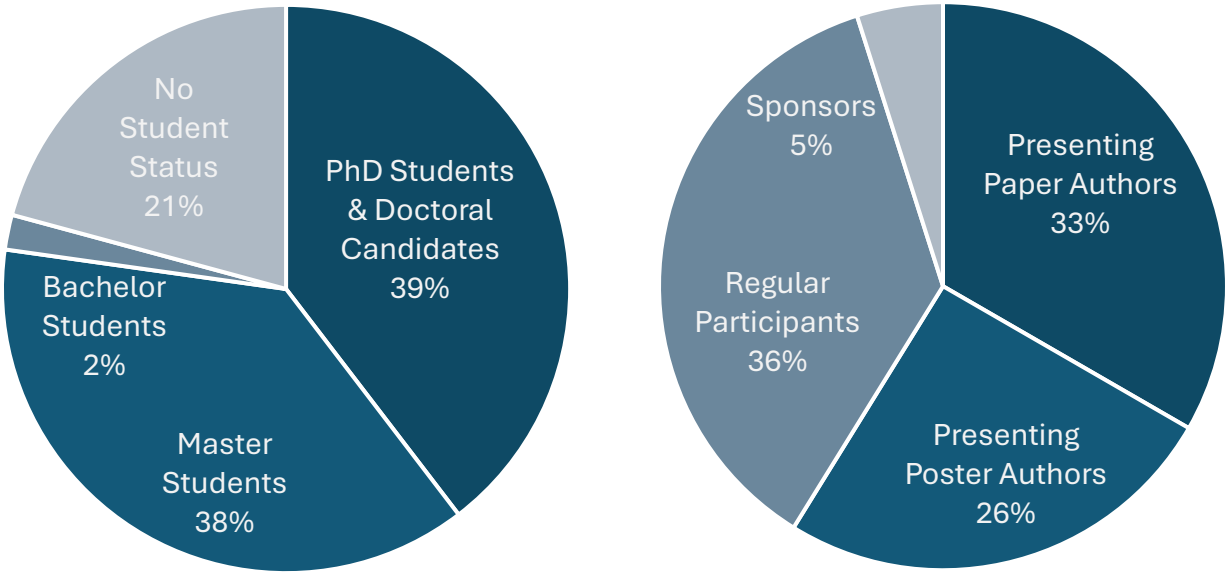


Figure 3: *IEEE PESS 2025 Participants' Student Status and Registration Type.*

This year's event is also notable for its **broad reach**: participants are joining us from **30 universities**, **eight companies**, and **ten countries** across the globe. This variety of backgrounds and perspectives enriches the program and highlights the international and cross-sector nature of the conference theme.

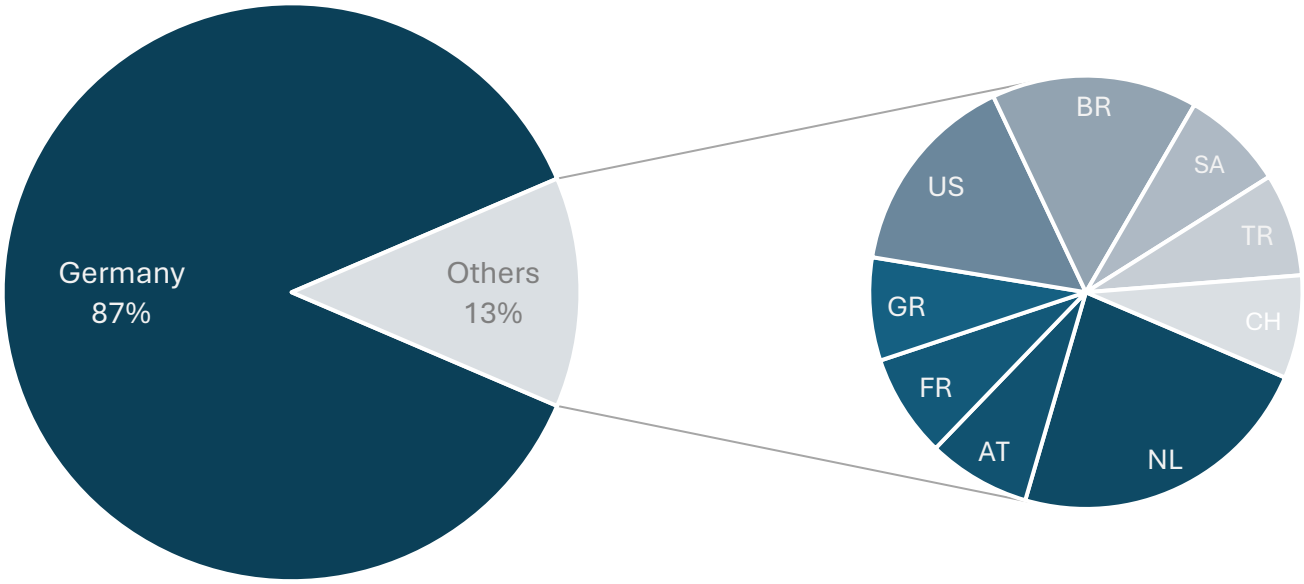


Figure 4: *IEEE PESS 2025 Countries of Origin of Participants' Home Institutions.*

3 IEEE PESS 2025 Organizing Committee

Conference Chair

Prof. Reinaldo Tonkoski, PhD
TU Munich, Chair of Electric Power Transmission and Distribution

Co-Chairs

Dr.-Ing. Anurag Mohapatra
TU Munich, Center for Combined Smart Energy Systems (CoSES)

Dr.-Ing. Peter Tzscheutschler
TU Munich, Chair of Electric Power Transmission and Distribution

Technical Program Committee

Prof. Dr.-Ing. Giovanni De Carne
Karlsruhe Institute of Technology, Real Time Systems for Energy Technologies

Prof. Dr.-Ing. Matthias Luther
FAU Nürnberg-Erlangen, Lehrstuhl für Elektrische Energiesysteme

Dr.-Ing. Gert Mehlmann
FAU Nürnberg-Erlangen, Lehrstuhl für Elektrische Energiesysteme

Prof. Dr. Vedran Perić
University of Bayreuth, Chair of Intelligent Energy Management

Prof. Dr.-Ing. Detlef Schulz
HSU Hamburg, Chair of Electrical Power Systems

Local Organizing Committee

Coordination and Session Planning

Johanna Timmermann, M.Sc.

Carolin Vogel, M.Sc.

Website and Registration

Soupayan Bose, M.Sc.

Simon Niederle, M.Sc.

On-Site Team

Sebastian Eichhorn, Dipl.-Ing.

Eraldo Nika, M.Sc.

Angela Popova, M.Sc.

4 Sponsor Information

Gold Sponsor – Siemens Energy

At Siemens Energy, we are more than just an energy technology company. With 99,000 dedicated employees in more than 90 countries, we develop the energy systems of the future, ensuring that the growing energy demand of the global community is met reliably and sustainably. The technologies created in our research departments and factories drive the energy transition and provide the base for one sixth of the world's electricity generation.

Our Grid Technologies division enables a reliable, sustainable, and digital grid. The power grid is the backbone of the energy transition. Siemens Energy offers a leading portfolio and solutions in HVDC transmission, grid stabilization and storage, high voltage switchgears and transformers, and digital grid technology.

SIEMENS energy

SIEMENS energy OMICRON SILENT DIGITAL

Silver Sponsor – OMICRON electronics

OMICRON electronics passionately develops pioneering ideas to make electric power systems safe and reliable. With innovative solutions, the company addresses both current and future challenges in the energy industry. At the heart of OMICRON's approach is a strong commitment to its customers: the company responds to their needs, provides on-site support, and shares its deep expertise and experience.

OMICRON focuses on technologies for electrical testing of medium- and high-voltage equipment, protection testing, digital substation testing, and cybersecurity. Customers in more than 170 countries trust OMICRON's user-friendly solutions and appreciate their precision, speed, and quality.

Founded in 1984 in Vorarlberg, Austria, OMICRON draws on decades of profound expertise in electric power engineering. Today, around 1,300 employees at 22 locations worldwide support customers across the globe.

Silver Sponsor – DIgSILENT

DIgSILENT GmbH is an independent software and consulting company providing highly specialized services in the field of electrical power systems for transmission, distribution, generation, industrial plants and renewable energy. We have offices in Gomaringen, Dresden and Berlin as well as several international subsidiaries. As a global player, we enable network owners and operators around the world to ensure the stability and efficiency of their power grids, whilst facilitating the integration of renewable energy. This has been our passion for over 40 years.

5 Full Technical Program

Day 1 – Wednesday

Time	Room	Program
14:00 – 15:00	Faculty Club	*Registration & Coffee*
15:00 – 15:30	Auditorium	**Conference Opening** Prof. Reinaldo Tonkoski PhD, TU Munich Dr.-Ing. Anurag Mohapatra, TU Munich Dr.-Ing. Peter Tzscheutschler, TU Munich
15:30 – 16:00	Auditorium	**Keynote** Dr.-Ing. Frank Schettler, Siemens Energy *Towards a Sustainable Future of Energy: A Personal Endeavor*
16:00 – 16:30	Faculty Club	*Coffee Break*
16:30 – 18:00	Auditorium	**Technical Session 1 – Modeling, Simulation & Analysis** Chair: Dr.-Ing. Anurag Mohapatra, TU Munich
		#11: *Reinforcement Learning for Cost-Efficient Energy Management under Dynamic Pricing: CoSES Building Case Study* **Zoé Nézet**, Milad Kazemi, Christina Papadimitriou and Anurag Mohapatra #12: *Small-Signal Stability Assessment of Multi-Inverter Medium-Voltage Grids Using Impedance-Based Methods* **David Sören da Cruz**, Johannes Leugner and Johanna Timmermann #19: *Lightweight AI-Based Fault Locator for Renewable Based Power Systems* **Juan David Suarez Gutierrez**, Niels Blaauwbroek, Matias Cardaci, Phuong Nguyen and Ara Panosyan #26: *Overview of Model Reduction Techniques for Power System Time Domain Simulation* **Shane Karunaratne**, Angela Popova and Soupayan Bose #36: *Load Behavior Analysis of a University AC Charging Infrastructure for Electric Vehicles* **Tom Scheppan**, Tine Fischer, Julian Metag, Dirk Lehmann, Mario Schenk and Kaveh Malekian #47: *A Novel Transformerless Topology for Grid-Connected Photovoltaic Inverters with Mitigated Common-Mode Current* Caíque Creomenes Almeida de Carvalho, **Lucas Elias dos Santos** and José Antenor Pomilio
18:00 – 21:00	Faculty Club	*Networking Reception (Food & Drinks, On-Site)*

Day 2 – Thursday

Time	Room	Program
08:30 – 09:00	Faculty Club	*Registration & Coffee*
09:00 – 09:30	Auditorium	**IEEE PES Germany Chapter Presentation** Prof. Dr.-Ing. Martin Wolter, TU Dresden
09:30 – 10:00	Auditorium	**Keynote** Prof. Dr.-Ing. Giovanni De Carne, Karlsruhe Institute of Technology *Power Hardware in the Loop: A Way to Accelerate the Introduction to Market of Energy Technologies*
10:00 – 11:00	Auditorium	**Special Session 1 – Best Paper Award Nominees** Chair: Prof. Dr.-Ing. Martin Wolter, TU Dresden
		#15: *Grid-Serving Control Methods in Home Energy Management Systems: Case Study in an Urban Grid Using Agent-Based Modeling* **Jiahe Chu**, Markus Doepfert, Thomas Hamacher and Matthias Huber #17: *Hydrogen for Long-duration Energy Storage in a Fully Renewable Island Power* System: A Case Study of *Reunion* Island **Mirabelle Scholten**, Agnès François, Robin Roche, Dominique Grondin and Halima Ikaouassen #18: *Integrated Planning of Multi-Energy Systems: A Graph-Theoretical Framework* **Daniel Wenser**, Marwan Mostafa, Payam Teimourzadeh Baboli and Christian Becker #21: *Evaluation of a Decentral Grid-Oriented Demand Side Management Algorithm for Low Voltage Grids in Special Grid Situations* **Konstantin Wagner**, Veronika Barta, Georg Kerber and Stephanie Uhrig
11:00 – 11:30	Faculty Club	*Coffee Break*
11:30 – 13:00	Auditorium	**Special Session 2 – Best Paper Award Nominees** Chair: Prof. Dr.-Ing. Giovanni De Carne, Karlsruhe Institute of Technology
		#25: *Definition of NTL Zones Using Georeferenced Data and Dimensionality Reduction with UMAP* **Natalia Bastos de Sousa**, Leonardo Silva, Daniel Bernardon, Vinicius Jacques Garcia and Martin Wolter #29: *Integration of PV and V2G Technology in an Island Grid: A Real-Time Simulation Study of Kastellorizo* **Lampros Konstantellos**, Anurag Mohapatra, Theodoros Kavvathas, George Konstantopoulos and Thomas Hamacher #32: *Enhancing Reinforcement Learning for Home Energy Management via Policy Transfer and Prioritized Level Replay* **Christoph Bley** and Vedran Perić #33: *A Reproducible Open-Data Pipeline for Synthetic Low-Voltage Grid Generation in Germany* **Beneharo Reveron Baecker**, Kadir Kalkan, Patrick Buchenberg, Anurag Mohapatra and Thomas Hamacher #44: *Field-Dependent Dielectric Relaxation in Oil-Pressboard Insulation Systems* **Deniz Targitay**, Markus Bier, Markus H. Zink, Maja Kobus, René Manger, Lisa Roth, Hans-Peter Öftering, Michael Geißler, Stefan Jaufer, Christian Schmied and Balz Schlittler #52: *Privacy-Preserving Data Aggregation for Smart Meters under a Mixed Adversary Model* **Jan Popanda**, Lasse Nitz, Avikarsha Mandal and Stefan Decker
13:00 – 14:00	Faculty Club	*Lunch Break*

Time	Room	Program
14:00 – 15:00	Faculty Club	**Student Poster Contest**

#01: *An Educational Single-Phase Inverter for Hands-On Learning in Energy Engineering;* **Tobias Reinhard**

#02: *Micromobility – Efficiency Analysis of a Chainless Serial Hybrid Powertrain for Pedelecs;* **Julian Lambach**

#03: *Storage vs. Grid Reinforcement: A Techno-Economic Analysis for Low-Voltage Distribution Systems;* **Yassine Benkamel**

#04: *MILP Based Optimal Dispatch for Renewable Driven Microgrids with EV and BESS Integration;* **Anurag Sharma**

#05: *Feasibility Assessment of Hydrogen Storage for Residential Applications: A German Neighborhood Case Study;* **Danilo Di Berardino**

#06: *Estimation of the Cold Load Pick-Up Effect for Residential Areas;* **Ilia Fezev**

#07: *Operation and Control of Islanded Low and Medium Voltage Grid Areas;* **Aaron Eicker**

#08: *Evaluating Island Operation Performance in Distribution Grids;* **Ramy R. Fathalla**

#09: *More than 50 Hz: Controlling the Distribution Grid under Wider Voltage and Frequency;* **Qiucen Tao**

#10: *Centralized Protection and Control Systems;* **Johannes Auer**

#11: *Latent Space Modeling for Event Detection in Power Grid Data;* **Sagar Sikdar**

#12: *Reinforcement Learning for Centralized Fault Coordination in Power Systems;* **Jithin Baby**

#13: *Reinforcement Learning for Adaptive Protection in Power Grids;* **Omar Shehata**

#14: *Data-Driven State Estimation of Low-Voltage Distribution Network Based on Limited Substation Power Measurements;* **Agnia Dewi Larasati**

#15: *Dunkelflaute: Frequency of Historical Occurrences and Economic Impact Assessment Focusing on Germany;* **Markus Gockel**

#16: *Benchmark Electrical Grid Network Modeling Using Open-Source Libraries: Challenges and Applications;* **Martin Oviedo Pascottini**

#17: *Development of a Benchmark Open Transmission Grid Model Using Real-Time TSO Measured Snapshots Grid Data;* **Raghvendra Pal Singh**

#18: Simbench-TiTIAN: An Open-Source Reinforcement Learning Environment for Topology Optimization in Highly Loaded Distribution Grids; **Md. Kamrul Hasan Monju**

#19: *Development of a Method for Market-Oriented Charging of Electric Vehicle;* **Nezir Spanca**

#20: *Reactive Power Market Design for Unutilized Grid-Forming Assets to Address Power Factor Penalties in Turkiye;* **Sinem Kol**

#21: *Reactive Power Provision from Inverter-Based Resources in Future Power Systems;* **Irina Zettl**

#22: *Assessing the Impact of Synchronous Condensers on Subsynchronous Torsional Interaction with Grid-Connected Converters;* **Nirmit Regmi**

#23: *Dual Synchronous Motors with Independent Control for Various Opening Curves of Vacuum Interrupters in Laboratory Tests;* **Marius Hinz**

#24: *X-Ray Radiation of High Voltage Vacuum Interrupters;* **Mats Göhrmann**

#25: *Precharging the DC-Link Capacitors in the Submodules of a Cascaded H-Bridge Inverter in a Power Hardware-in-the-Loop Test Environment;* **Henrik Steltig**

#26: *Comprehensive power consumption profiling of KARA for sustainable operations;* **Mahshid Mohammad Zadeh**

15:00 – 15:30	Faculty Club	*Coffee Break*
15:30 – 16:30	CoSES Website	**Guided CoSES Lab Tours** Meeting Point: Registration Desk (Faculty Club)
18:00	Dinner Location	*Conference Dinner (Augustiner Stammhaus, City Center)* Meeting Point: Registration Desk (Faculty Club); **Leaving at 5:00 PM**

Day 3 – Friday

Time	Room	Program
08:30 – 09:00	Faculty Club	*Registration & Coffee*
09:00 – 10:00	Auditorium	**Technical Session 2 – Techno-Economics, Markets & Forecasts** Chair: Prof. Dr. Vedran Perić, University of Bayreuth
		#5: *Proposing an Optimization Model for a techno-economic Evaluation of Energy Storage Systems* **Andreas Stadler**, Hermann Kraus and Oliver Brückl #28: *Co-optimizing aFRR Energy Bidding and Intraday Trading for Battery Energy Storage Systems* **Leon Tadayon** and Georg Frey #45: *Challenges and Approaches for Long-Term Reactive Power Forecasting in Power Systems* **Marion Hinterreiter**, Oliver Brückl and Johannes Rauch #54: *Reactive Power Management at the T–D Interface by DSO* Dimitrios Kritikos, **Anna Shuvarina**, Phuong H. Nguyen, Johan Morren and Ana Roxana Ciupuliga
10:00 – 11:00	Auditorium	**Technical Session 3 – Grid Operation & Flexibility** Chair: Prof. Dr. Vedran Perić, University of Bayreuth
		#8: *Distribution System State Estimation: A Comparison of Data-Driven Neural Networks and Model-Based Weighted Least Squares Method* **Sebastian Storch**, Michael Finkel, Martin Uhrig, Michael Kreißl and Marcus Röttel #23: *Distributed congestion management in an agent-based discrete-event simulation framework* **Marius Staudt**, Daniel Feismann, Sebastian Peter, Johannes Bao, Ulf Häger and Christian Rehtanz #37: *Review and classification of Topology Path Identification methods for the Low Voltage network* **Yann Komenan**, Jan Steggemann and Thomas Koller #41: *Physics-Informed Neural Network for Modeling and Simulation of Phase-Locked Loop Dynamics* **Hussein Jaffal**, Haitian Liu and Andreas Ulbig
11:00 – 11:30	Faculty Club	*Coffee Break*
11:30 – 13:00	Auditorium	**Technical Session 4 – Data-Driven Methods & Applications** Chair: Dr.-Ing. Anurag Mohapatra, TU Munich
		#6: *Parameter Modeling and Analysis of HF Signal Transmission in Low-Voltage Networks for BPLC* Amirali Mahjoob and **Irina Zettl** #7: *Comparative Analysis of Power System Operation Comparing Angle-based Control and Load Frequency Control from Operational Perspective* **Shahriar Sheybani**, Hassan Alhomsi and Dirk Westermann #10: *Investigating the Impact on Low-Voltage Grids when Providing Frequency Containment Reserve from Home Storage Systems and Electric Vehicles* **Philipp Zoremba**, Hendrik Maschke and Steffen Kortmann #14: *Unlocking distribution grid flexibility through low-temperature district heating: A literature-based assessment* **Farina Sadrai**, Christoph Andres and Martin Wolter #24: *Global Voltage Control in Medium-Voltage Grids Using On-Load Tap-Changers and Artificial Neural Networks* **Tobias Ferreira**, Georg Kordowich and Ilya Burlakin #27: *Integration of E-Mobility and Decentralized Generators in Distribution Grids: Analysis of Future Scenarios and Recommendations* **Bennett Sattler**, Mauro dos Santos Ortiz, Christoph Andres and Martin Wolter

Time	Room	Program
13:00 – 14:00	Faculty Club	*Lunch Break*
14:00 – 15:15	Auditorium	**Technical Session 5 – Monitoring, Control & Optimization** Chair: Dr.-Ing. Peter Tzscheutschler, TU Munich
		#22: *A Two-Stage Surrogate Framework for Optimizing EV–PV Integrated Distribution Grids* Mehedi Hassan, Shuvo Dev, Md. Rabiul Islam, Mahfujur Rahman and **Asif Islam** #30: *Unity Game Engine as a Simulation Platform: Voltage Regulation in 3D Low-Voltage Networks* **Samip Poudel**, Pallavi Ghimire, Anurag Mohapatra, Hepeng Li, Donald Hummels and Reinaldo Tonkoski #35: *Evaluation of Dynamic Equivalent in Renewable-Integrated Power Systems* **Muhammad Fahad Naveed** and Carolina Tranchita #46: *Fast* Extremum-Seeking Based Robust State Estimation and Control for Frequency Support of Low-Inertia Microgrids Ahsan Iqbal, **Pallavi Ghimire**, Samip Poudel, Timothy M. Hansen and Reinaldo Tonkoski #53: *State-Space Modeling and C-HIL Validation of a VSM: Virtual-Resistance Effects Across Grid Strengths* **Jesus Flores Huaman**, Lucas Eilas dos Santos, Jose Carlos Ugaz Pena and Reinaldo Tonkoski
15:15 – 15:30	Auditorium	**Conference Closing** Prof. Reinaldo Tonkoski PhD, TU Munich Dr.-Ing. Anurag Mohapatra, TU Munich Dr.-Ing. Peter Tzscheutschler, TU Munich

6 Keynote Speaker Information

Day 1 – Dr.-Ing. Frank Schettler, Siemens Energy Global GmbH & Co. KG

Keynote Title

Towards a Sustainable Future of Energy: A Personal Endeavor

Summary

Electric power systems can be considered the most intricate machinery ever devised by humanity, reliably serving as the backbone of modern society. As we strive for a net carbon-neutral future, these systems face significant challenges. Overcoming these challenges necessitates the collaborative efforts of skilled and dedicated engineers, academia, system planners, and operators. In this process, the digital transformation opens-up new avenues for data collection, processing, and tackling complex tasks. Successfully navigating these advancements requires continuous learning and collaboration within multidisciplinary teams.

Short Bibliography

Dr. Frank Schettler works with Siemens Energy in Germany, serving as the Chief Technical Expert for Grid Technologies and Product Lifecycle Manager for HVDC solutions. With over 33 years of experience at Siemens and Siemens Energy, he embarked on his career after completing his studies at TU Ilmenau in Germany, where he also earned his Dr.-Ing. in 2003. Dr. Schettler has actively contributed to international working groups and committees focused on standardization at IEC, CENELEC, and DKE, as well as grid code developments and industry organizations. He currently chairs IEC/TC 115, which addresses High Voltage Direct Current (HVDC) transmission for DC voltages above 100 kV, and the IEC Advisory Committee Transmission and Distribution (ACTAD), where he leads a task team on DC grids standardization.

Day 2 – Prof. Dr.-Ing. Giovanni De Carne, Karlsruhe Institute of Technology

Keynote Title

Power Hardware in the Loop: A Way to Accelerate the Introduction to Market of Energy Technologies

Summary

To address the challenges of the green energy transformation, academia and industry are introducing at fast pace many novel energy solutions. This fast evolution, however, makes it extremely challenging to properly address their impact on the energy systems when they are installed in the field. Classical approaches to develop prototypes and to perform weeks- or months-long field testing cannot cope with the pace of these innovations. There is a concrete risk that the field-testing represents the pace-bottleneck for introducing new technologies in the market and thus to enable the green transition.

To accelerate the introduction to market of new energy technologies, the concept of Power Hardware In the Loop (PHIL) has been proposed in recent years. The PHIL is based on simulating an electrical circuit in a digital real time simulator that is connected to the hardware under test by means of a power interface. The PHIL allows to flexibly change the testing environment varying the simulation parameters, while keeping high experimental validation fidelity.

This talk will provide an overview on the PHIL concept, applications, and transfer to industry possibilities explored at the Karlsruhe Institute of Technology, Germany. The presentation will close with an overview of PHIL users' experiences and of the economic benefit from using PHIL in industrial testing.

Short Bibliography

Giovanni De Carne is currently W3 professor at the Institute for Technical Physics at the Karlsruhe Institute of Technology, Karlsruhe, Germany, where he leads the Real Time Systems for Energy Technologies Group and the "Power Hardware In the Loop Lab". He is currently supervising PhD students, managing academic and industrial projects, and developing multi-MW Power Hardware in the Loop testing infrastructures for energy storage Systems and hydrogen-based drives. His expertise includes power electronics integration in power systems, solid state transformers, real time modelling, and power hardware in the loop.