Honorary Professor Talk Mini Symposium 2025

System-Level Thinking for Smart Energy: Design and Validation in a Multi-Domain World

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Abstract:

The transition to a sustainable energy future depends critically on the effective integration of renewable energy sources. However, their inherent variability introduces significant complexity into power grid operations. Coupled with evolving technologies, controllable loads, sector coupling, regulatory changes, and market liberalisation, today's energy systems demand new operational paradigms. Intelligent automation and advanced control concepts are essential to transform traditional grids into smart, adaptive infrastructures.

Over the past two decades, extensive research, innovation, and demonstration projects have laid the groundwork for smart grids and energy systems. More recently, the concept has expanded beyond electricity to encompass multidomain, cyber-physical energy systems, so-called smart energy systems. While these developments offer promising capabilities, they also highlight the growing need for robust system-level design, validation, and testing methodologies. Current tools and frameworks remain immature for the complexity of real-world deployment. This talk addresses these challenges by presenting key concepts, methods, and tools for the design and validation of cyber-physical energy systems. It also emphasises the critical role of human expertise, engineers, researchers, and professionals equipped to navigate the interdisciplinary demands of future energy systems.

PERSONAL INFORMATION

THOMAS I. STRASSER

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Sex male | Date of birth 24/07/1976 | Nationality Austria

POSITION

Senior Scientist

WORK EXPERIENCE

Since December 2017 — **Docent**

Institute for Mechanics and Mechatronics (MEC)
Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

- Teaching of industrial real-time control systems and information systems as well as smart industrial concepts
- Supervision of master and PhD students

Business or sector Higher Education

Since January 2012 — **Senior Scientist**

Center for Energy
AIT Austrian Institute of Technology
Vienna, Austria – www.ait.ac.at.at

- Research and development related to power systems digitalisation and automation
- Project management and coordination
- Proposal development and writing
- Supervision of students and junior scientist

Business or sector Energy Systems R&D

March 2011 – November 2017 — **Lecturer**

Institute for Mechanics and Mechatronics (MEC)
Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

- Teaching of industrial real-time control systems and information systems

Business or sector Higher Education

Mai 2010 – December 2011 — **Scientist**

Center for Energy
AIT Austrian Institute of Technology
Vienna, Austria – www.ait.ac.at.at

- Research and development related to power systems digitalisation and automation
- Project management
- Proposal development and writing

Business or sector Energy Systems R&D

January 2007 – April 2010 — **Senior Researcher**

Department Industrial Automation and Robotics
PROFACTOR
Steyr, Austria – www.profactor.at

- Research and development related to adaptive and reconfigurable process and control systems
- Project management and coordination
- Proposal development and writing
- Supervision of students

Business or sector Manufacturing Systems R&D

October 2003 – December 2006 **Researcher**

Department Industrial Automation and Robotics
PROFACTOR
Steyr, Austria – www.profactor.at

- Research and development related to adaptive and reconfigurable process and control systems
- Project management and coordination
- Proposal development and writing
- Supervision of students

Business or sector Manufacturing Systems R&D

October 2003 – December 2006 **Research Fellow**

Institute of Machine and Process Automation (IMPA)
Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

- Research and development related to intelligent control solutions for process technologies (Christian Doppler Laboratory)
- PhD thesis in the field of fault diagnosis and detection
- Teaching activities related to control theory and automation

Business or sector Manufacturing Systems R&D

EDUCATION AND TRAINING

January 2011 – November 2017 **Habilitation in Automation (venia docendi)** Privatdoz.

Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

April 2001 – September 2003 **Doctoral study in Mechanical Engineering** Dr.techn..

Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

October 1996 – May 2001 **Diploma study in Industrial Engineering** Dipl.-Ing..

Technische Universität Wien (TU Wien)
Vienna, Austria – www.tuwien.at

September 2000 – December 2000 **Exchange student in Engineering**

University of Waterloo (UWaterloo)
Waterloo, Canada – www.uwaterloo.ca

September 1990 – July 1995 **Technical high school in Automation and Mechanical Engineering**

Höhere Technische Bundeslehr und Versuchsanstalt St. Pölten (HTL St. Pölten)
St. Pölten, Austria – www.htlstp.ac.at

PERSONAL SKILLS

Mother tongue(s) Germany

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user
Common European Framework of Reference for Languages

Communication skills

- Excellent communication skills (gained through my experience as project manager and coordinator)
- Excellent presentation skills gained through presentations as scientist
- Excellent teaching skills gained through various university lectures

Organisational / managerial skills
- Organisation of scientific conferences as General Chair like IWIES 2013&2024, OSMSES 2024, and IEEE SMC 2025
- Coordination of European-funded R&D projects like MEDEIA (FP7, 9 partner), ERIGrid (H2020, 18 partner), ERIGrid 2.0 (H2020, 20 partner)
- Coordinator of national-funded R&D projects like µCrons (FFG, 5 partner), εCEDAC (FFG, 6 partner), OpenNES (FFG, 5 partner)

Digital skills: IEC 61499, IEC 61131-3, C/C++, Java, MATLAB/Simulink, MDA/MDSE, UML, LabView, LaTeX, etc.

Driving licence: A, B

ADDITIONAL INFORMATION

Selected Publications
- Fellner, David, Thomas I. Strasser, and Wolfgang Kastner. "Data-driven misconfiguration detection in power systems with transformer profile disaggregation." IEEE Access 11 (2023): 80123-80136.
- Leitão, Paulo, Stamatis Karnouskos, Thomas I. Strasser, Xiaodong Jia, Jay Lee, and Armando Walter Colombo. "Alignment of the IEEE industrial agents recommended practice standard with the reference architectures RAMI4. 0, IIRA, and SGAM." IEEE Open Journal of the Industrial Electronics Society 4 (2023): 98-111.
- Veichtlbauer, Armin, Christoph Praschl, Lukas Gaisberger, Gerald Steinmaurer, and Thomas I. Strasser. "Toward an effective community energy management by using a cluster storage." IEEE Access 10 (2022): 112286-112306.
- Spiegel, Michael H., and Thomas I. Strasser. "Assessing the Value of Proactive Microgrid Scheduling." IEEE Access 10 (2022): 51062-51078.
- Uslar, Mathias, Sebastian Rohjans, Christian Neureiter, Filip Pröstl Andrén, Jorge Velasquez, Cornelius Steinbrink, Venizelos Efthymiou et al. "Applying the smart grid architecture model for designing and validating system-of-systems in the power and energy domain: A European perspective." Energies 12, no. 2 (2019): 258.
- Leitao, Paulo, Stamatis Karnouskos, Luis Ribeiro, Jay Lee, Thomas Strasser, and Armando W. Colombo. "Smart agents in industrial cyber–physical systems." *Proceedings of the IEEE* 104, no. 5 (2016): 1086-1101.
- Guillaud, Xavier, M. Omar Faruque, Alexandre Teninge, Ali Hasan Hariri, Luigi Vanfretti, Mario Paolone, Venkata Dinavahi et al. "Applications of real-time simulation technologies in power and energy systems." IEEE Power and Energy Technology Systems Journal 2, no. 3 (2015): 103-115.
- Faruque, MD Omar, Thomas Strasser, Georg Lauss, Vahid Jalili-Marandi, Paul Forsyth, Christian Dufour, Venkata Dinavahi et al. "Real-time simulation technologies for power systems design, testing, and analysis." IEEE Power and Energy Technology Systems Journal 2, no. 2 (2015): 63-73.
- Strasser, Thomas, Filip Andrén, Johannes Kathan, Carlo Cecati, Concettina Buccella, Pierluigi Siano, Paulo Leitao et al. "A review of architectures and concepts for intelligence in future electric energy systems." IEEE Transactions on Industrial Electronics 62, no. 4 (2014): 2424-2438.
- Vrba, Pavel, Vladimír Mařík, Pierluigi Siano, Paulo Leitão, Gulnara Zhabelova, Valeriy Vyatkin, and Thomas Strasser. "A review of agent and service-oriented concepts applied to intelligent energy systems." IEEE transactions on industrial informatics 10, no. 3 (2014): 1890-1903.

Filed Patents
- O. Hummer-Koppendorfer, A. Zoitl, F. Auinger, T. I. Strasser, J. Christensen, and K. Hall, “Automation HMI Visualisation utilizing GUI Function Blocks, European Patent No. EP1873633,” 2008.
- J. Gottwald, A. Zoitl, F. Auinger, T. I. Strasser, I. Terzic, J. Christensen, and K. Hall, “HMI Framework for Extensible Automation Systems Engineering Platforms, European Patent No. EP1873634 / United States Patent Application Publication No. US 2011/0093800,” 2008.

Awards
- “2022 Most Active IEEE SMC Technical Committee Award Cybernetics” (together with Pavel Vrba and Amro M. Farid as co-chairs of the IEEE SMC Technical Committee on Intelligent Industrial Systems”
- “Good Practice of the Year Award 2020” (category “Technological Innovation & System Integration”) for the 'Holistic Approach for Evaluating Complex Smart Grid Systems' developed in the H2020 ERIGrid project (coordinated by Thomas I. Strasser)
- “Würdigungspreis der Bundesministerin füur Bildung, Wissenschaft und Kultur, 2001” (price in appreciation of special study performance from the Austrian Federal Ministry of Education, Science, and Art)

Selected Projects

- ERIGrid 2.0 - European Research Infrastructure supporting Smart Grid and Smart Energy Systems Research, Technology Development, Validation and Roll Out - Second Edition (www.erigrid2.eu), European Commission (EC), Energy, H2020, Project No. 870620, Research Infrastructure/Research and Innovation Action, Topic: smart grids and smart energy systems, Project Initiator, Co-Proposal Writer, Coordinator, Researcher, 2020 – 2024
- DeMaDs - Data Driven Detection of Malfunctioning Devices in Power Distribution Systems Austrian Government, Research Partnerships - Industrial PhD, FFG, Project No. 861265, Thematic Programme, Topic: power system malfunction detection, Co-Proposal Writer, Coordinator, 2020 – 2022
- ERIGrid - European Research Infrastructure supporting Smart Grid Systems Technology Development, Validation and Roll Out (www.erigrid.eu), European Commission, Energy, H2020, Project No. 654113, Research Infrastructure/Research and Innovation Action, Topic: smart grids, Project Initiator, Co-Proposal, Writer, Coordinator, Researcher, 2015 – 2020
- OpenNES - Open and Interoperable ICT Solution for Integration of ReNewablES Austrian Government, ICT of the Future, FFG, Project No. 845632, Thematic Programme, Topic: ICT approaches for renewable energy resources, Co-Proposal Writer, Coordinator, Researcher, 2014 – 2017
- ELECTRA IRP - European Liason on Electricity Committed Towards long-term Research Activity Integrated Research Programme (www.electrairp.eu), European Commission, Energy, FP7, Project No. 609687, Combination of CP & CSA, Topic: smart grids, Researcher and Work Package Leader, 2013 - 2017

Selected Journal Activities

- IEEE Trans. on Industrial Electronics (TIE), assoc. editor, since 2015-2023
- IEEE Trans. on Industrial Informatics (TII), assoc editor, since 2015
- IEEE Trans. on Sys., Man, and Cyb.: Systems (TSMCA), assoc. ed., since 2020
- Energy Informatics, Springer, member of the editorial board, since 2018

Selected Memberships

- IEEE member since 2009, senior member since 2013
- IEEE Ind. Elec. Society (IES) AdCom member-at-large, 2018-2020
- IEEE Ind. Elec. Society (IES) AdCom energy TC cluster delegate, 2020-2021
- IEEE Systems, Man, and Cybernetics (SMCS) BoG member-at-large, 2018-2020
- IEEE Systems, Man, and Cybernetics (SMCS) VP SSE, 2021-2022
- IEEE Sys. Coun. (SYSC) SMCS repr. and AdCom member-at-large 2021-2022
- IEEE Austria Section Chair, 2021-2023
- IEEE-SA P2004 member, since 2017
- IEEE-SA P2660.1 secretary, 2015-2020
- CIGRE Study Committee SC B5, representing Austria, since 2024
- CIGRE Study Committee SC C6, representing Austria, 2018-2023
- IEC SC65B/WG15, since 2009
- OVE TK MR/TSK MR65, since 2010