Stability and Control of Grid-Forming Power Electronics Systems

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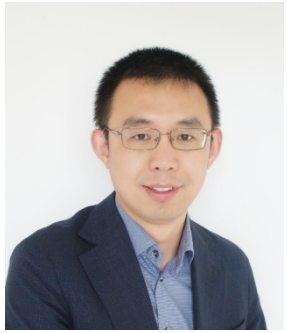
Pedro Rodriguez

Pedro Rodriguez received the M.Sc. and Ph.D. degrees in electrical engineering from the Technical University of Catalonia (UPC), Spain. He was a postdoc researcher at the CPES, Virginia Tech, US, at the Department of Energy Technology, Aalborg University (AAU), Denmark and at the MIT Energy Initiative (MITie), Boston, US. He joined the UPC as an assistant professor in early 90s, where he became the director of the research center on Renewable Electrical Energy Systems. He was a co-supervisor of the Vestas Power Program, Denmark. He was a director of technology in Modern Power Systems in Abengoa Research. From 2017, he is a full professor at the Loyola University Andalucia, where he is the Head of LOYOLA.Tech, leading the research programme on Intelligent Energy Systems. He is one of the 250 top worldwide Highly Cited Researchers in Engineering (2017), published by ISI Thomson Reuters. He has co-authored one Wiley-IEEE book, over 100 papers in ISI technical journals, and around 300 papers in conference proceedings. He is the holder of 14 licensed patents.

Dr. Rodriguez is a IEEE Fellow for his contributions in the control of distributed generation. He is a co-chair of the Spanish National Research Agency in the area of Energy, Environment and Transport and a member of the European Research Council (ERC) in the Panel on Systems and Communication Engineering. He was a member of the EU Horizon 2020 Advisory Group on Energy. He is an Associate Editor of the IEEE Trans. on Power Electronics and the IEEE Journal on Emerging and Selected Topics on Power Electronics. His research interests include intelligent energy systems, distributed generation, and rural electrification.

Xiongfei Wang



Xiongfei Wang received the B.S. degree from Yanshan University, Qinhuangdao, China, in 2006, the M.S. degree from Harbin Institute of Technology, Harbin, China, in 2008, both in electrical engineering, and the Ph.D. degree in energy technology from Aalborg University, Aalborg, Denmark, in 2013. Since 2009, he has been with the Department of Energy Technology, Aalborg University, where he became Assistant Professor in 2014, an Associate Professor in 2016, a Professor and Research Program Leader for Electronic Power Grid in 2018. His current research interests include modeling and control of grid-interactive power converters, stability and power quality of power electronic based power systems, active and passive filters.

Dr. Wang serves as an Associate Editor for the IEEE TRANSACTIONS ON POWER ELECTRONICS, the IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, and the IEEE JOURNAL OF EMERGING AND SELECTED TOPICS IN POWER ELECTRONICS. He was selected into Aalborg University Strategic Talent Management Program in 2016, which aims at developing next-generation research leaders for Aalborg University. He received six IEEE prize paper awards, the outstanding reviewer award of IEEE TRANSACTIONS ON POWER ELECTRONICS in 2017, and the IEEE PELS Richard M. Bass Outstanding Young Power Electronics Engineer Award in 2018.

Dongsheng Yang

Dongsheng Yang (S'13–M'17) was born in Jiangsu Province, China, in 1984. He received the B.S., M.S., and Ph.D. degrees in electrical engineering from Nanjing University of Aeronautics and Astronautics, Nanjing, China, in 2008, 2011, and 2016, respectively. Since 2016, he has been with Aalborg University, Aalborg, Denmark, where he is currently a Assistant Professor in the Department of Energy Technology. His main research interests include design and control of grid-connected inverters, harmonic analysis and mitigation in power-electronic-based power systems, and online impedance measurement techniques.

Donghua Pan

Donghua Pan received the B.S. and Ph.D. degrees in electrical engineering from Huazhong University of Science and Technology, Wuhan, China, in 2010 and 2015, respectively. Since September 2017, he has been with Aalborg University, Aalborg, Denmark, where he is currently a Postdoctoral Fellow with the Department of Energy Technology. His research interests include magnetic integration technique, modeling and control of grid-connected converters, and wide bandgap power conversion system. He was the recipient of the Outstanding Reviewer Award of IEEE Transactions on Power Electronics in 2017 and the Best Paper Award at IEEE SPEC 2018.

Schedule

Day 1 08:30 - 16:00

08:30 - 09:00

L0 Introduction to lectures and participants

09:00 - 12:00 Pedro Rodríguez

L1 Synchronization of grid-connected converters

L2 Fundamentals of grid-forming converters

L3 From synchronous generators to grid-forming converters

12:00 - 13:00 Lunch break

13:00 - 16:00 Xiongfei Wang

L4 Voltage control schemes

L5 Small-signal modeling of voltage control

L6 Design-oriented stability analysis of voltage control

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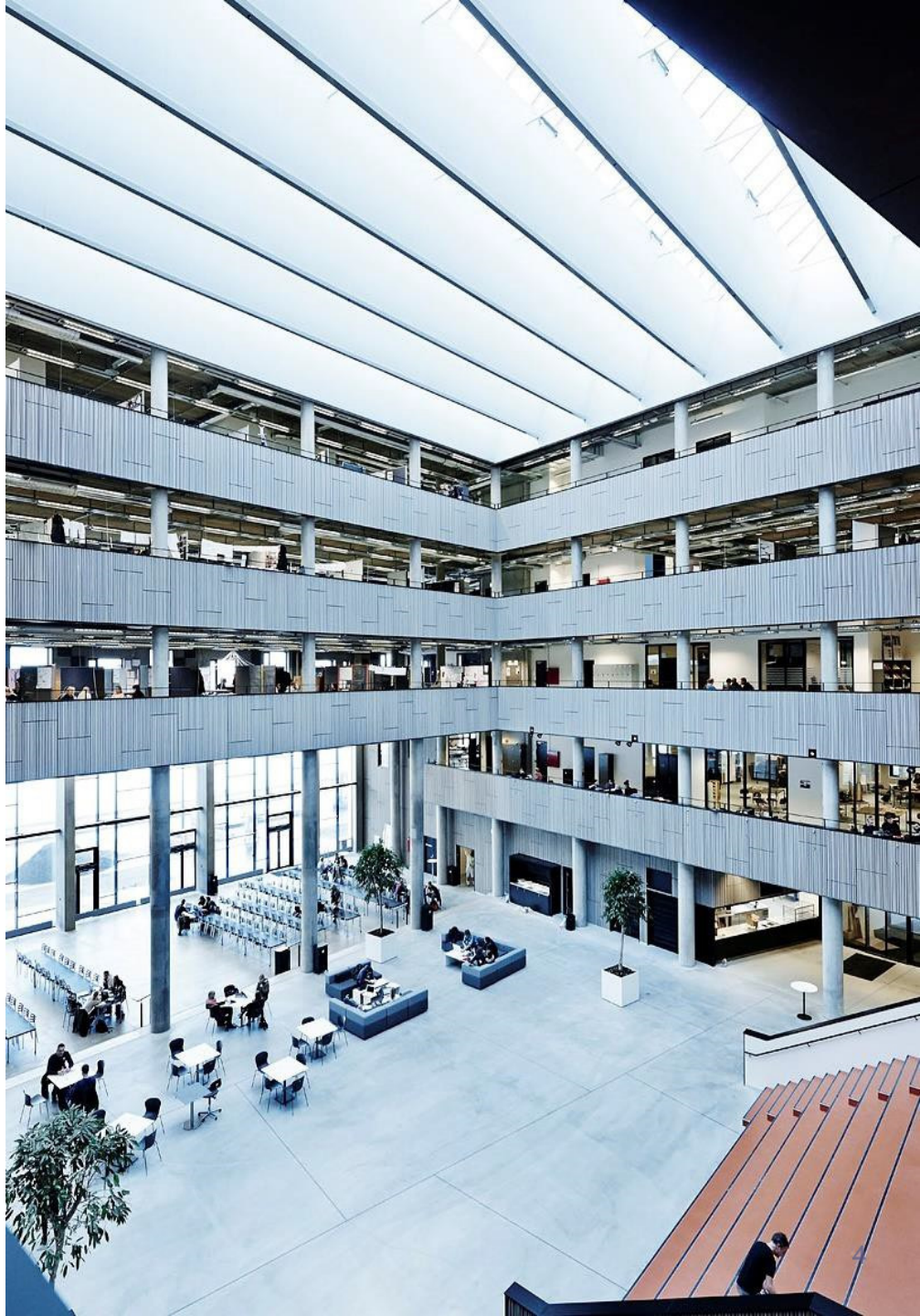


Schedule

Day 2 9:00 - 16:00

09:00 - 12:00 Pedro Rodríguez

L7 Overview of virtual synchronous generator approaches

L8 The synchronous power controller

L9 Electrical inertia/ROCOF control

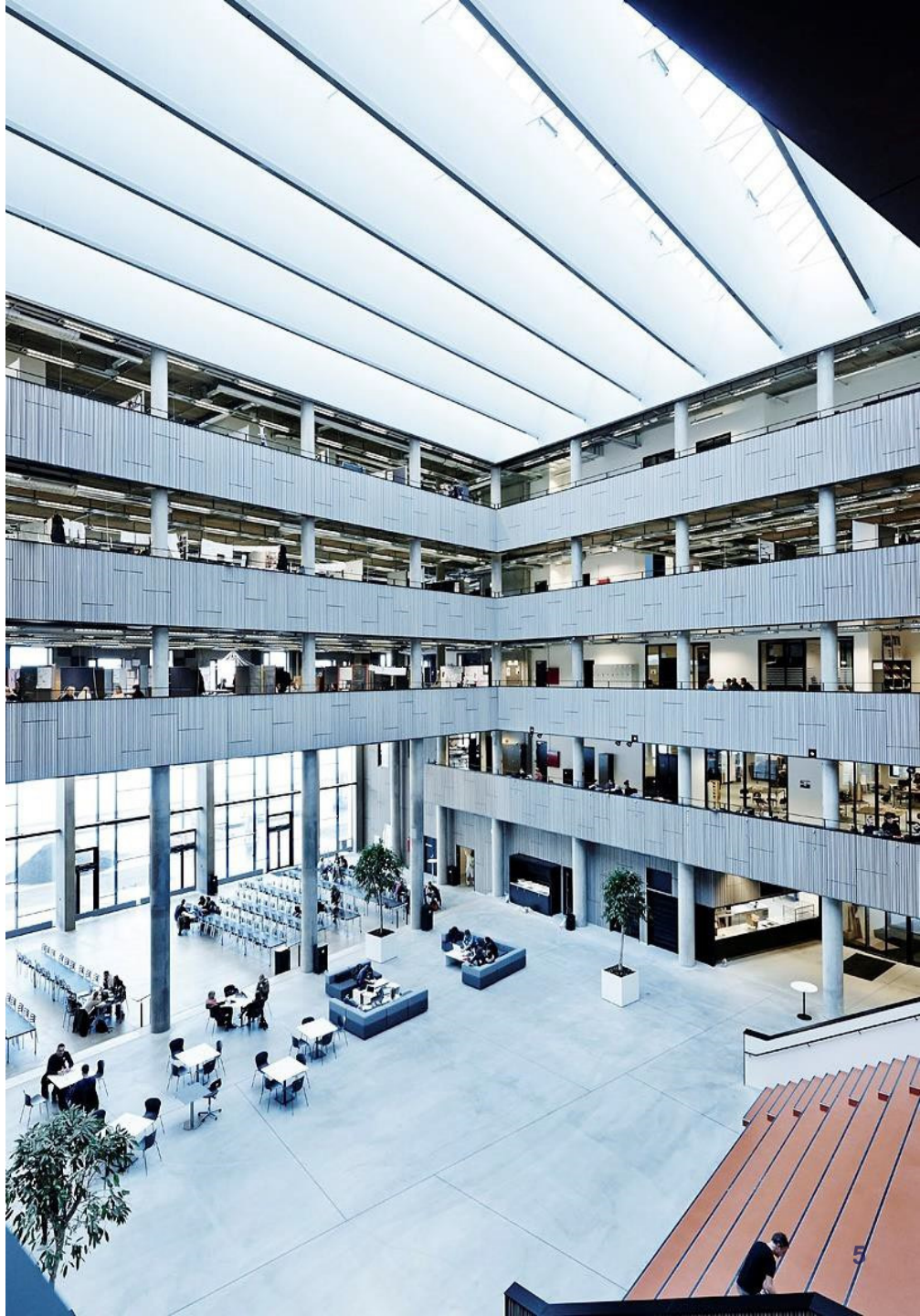
12:00 - 13:00 Lunch break

13:00 - 16:00 Pedro Rodríguez, Dongsheng Yang

L10 Virtual impedance/admittance control

L11 Industrial practice

L12 Stability limitation of power control



Schedule

Day 3 9:00 - 16:00

09:00 - 12:00 Dongsheng Yang

L13 Small-signal modeling of power control

L14 Active damping of power oscillations

L15 Design-oriented stability analysis

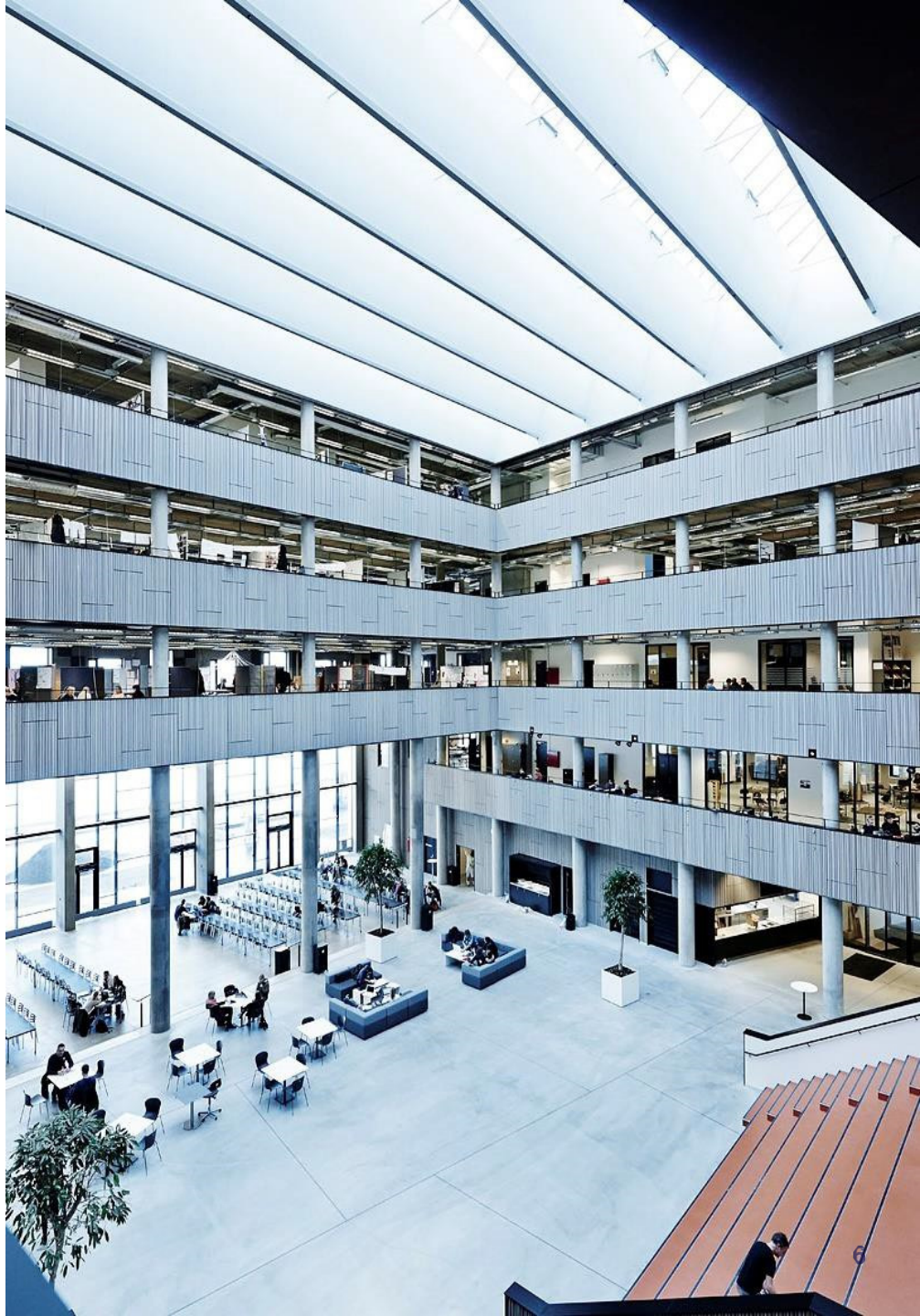
12:00 - 13:00 Lunch break

13:00 - 16:00 Donghua Pan

L16 Basics of transient stability

L17 Transient stability analysis of grid-forming converters

L18 Wrap-up



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Special Issue on Grid-Forming Inverters in IEEE JESTPE

Call for Papers

IEEE Journal of Emerging and Selected Topics in Power Electronics

Special Issue on Modeling, Topology and Control of Grid-Forming Inverters

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