

Impedance-Based Approach for Oscillation Analysis in Inverter-Dominated Power Systems

by

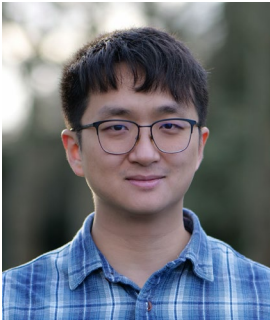
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Abstract

The high and growing penetration of inverter-based resources (IBR) in modern power systems has brought challenges to system stability, especially to small-signal stability reflected by the concerning oscillations. This seminar will discuss the impedance-based approach for oscillation root-cause tracing, tuning, and early warning. The new approach establishes the relationship between the impedance model and the conventional state-space model and opens up the path of using black-box impedance model to extract useful insights similar to those obtained from the white-box model. A new system strength metric: impedance margin ratio, which can capture the system small-signal performance is introduced as an index for oscillation early warning. The seminar will also discuss the data-driven methods for on-line impedance identification and system stability monitoring, with a special emphasis on the combination of model and data, i.e., a hybrid data/model-driven identification process.

Biography



Dr Yue Zhu is a Postdoctoral Research Associate at the Department of Electrical and Electronic Engineering, Imperial College London, where he also obtained his Ph.D. in 2022. He received the M.Sc. and B.Eng. degrees both in Electrical Engineering, Zhejiang University, in 2019 and 2016 respectively. His research focuses on stability analysis and dynamic performances of inverter-dominated power systems, including impedance-based oscillation analysis, data-led impedance identification and analysis of system strength for inverter connection assessment. He has published over 10 journal papers on top IEEE Transactions and reviewed over 30 papers across 9 journals. He also has extensive experience in engaging with industry partners. He is the lead researcher of two industrial projects funded by National Grid ESO under National Innovation Allowance (NIA), and the research Co-Investigator of the upcoming Strategic Innovation Fund (SIF) project with National Physical Laboratory (NPL) and Scottish & Southern Electricity Networks Transmission (SSEN-T). Dr. Zhu is actively involved in shaping the future of the field as a technical member of IEEE IBR SSO Taskforce, Energy Systems Integration Group (ESIG), and GB Grid Forming (GBGF) Best Practice Group. He is also a contributing author of the 2024 CIGRE Green Book.

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**** ALL ARE WELCOME ****