KIOS Distinguished Lecture in Memory of Prof. Elias Kyriakides

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National Technical University of Athens, Greece

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Distribution Flexibility as Provider of Grid Support for Security and Emergency Control

LECTURE ABSTRACT

Distributed resources in a power system can provide significant support to transmission grids, A special case that will be considered us that of voltage stability and security. The decommissioning of synchronous generator units and their replacement by converter interfaced units at lower voltage levels make this a necessity in modern power systems.

This presentation focuses on exploiting control capabilities of Active Distribution Networks, in terms of voltage regulation and the provision of services to the Transmission Grid. The controls considered include Load Tap Changers (LTC), reactive power control by Inverter Based Resources (IBR) and controlled active power injection from distributed generation (DG), and/or Battery Energy Storage (BESS). The need for automation and computer control for this service is stressed. Two support schemes will be described: a) Distributed optimization of Voltage Stability Margin in emergency situations based on sensitivities (Corrective Control) b) Centralized optimization of Voltage Security Margin using ADN flexibility regions (Preventive Control). A fast method to compute the flexibility region based on second order cone relaxation will be also presented.

BRIEF BIO

Constantine (Costas) Vournas is Professor Emeritus in the School of Electrical and Computer Engineering of National Technical University of Athens, Greece. He has published over 200 papers in International Journals and Conferences and has co-authored the book “Voltage Stability of Electric Power Systems”. His research interests are in the area of power system dynamics, stability and control and include voltage stability monitoring and security analysis, renewable generation integration in power systems, and novel control applications for distribution and transmission systems. He is Fellow of IEEE since 2005, and member of CIGRE. He received the IEEE/PES Prabha Kundur Award in 2019. He served as Region 8 Representative on the IEEE Power and Energy Society (PES) Governing Board (2011-2014). He is Past Chair of PES Greece Chapter, Past Chair of IEEE/PES Power Tech Steering Committee (2007-2019), and Past Chair of the IEEE/PES Power Systems Dynamic Performance Committee. He is Past Chair of the Energy WG of the IEEE European Public Policy Committee (EPPC) and is member of EPPC. Since 2024 he serves as the Secretary of the Technical Council of IEEE PES.

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