PSERC Power Systems Engineering Research Center

PSERC WEBINAR

IBR Stability Analysis Methods: Pitfalls and Misconceptions

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This talk focuses on frequency-domain stability analysis methods, such as impedance-based methods, in the context of grid integration of inverter-based resources (IBRs). It will explain why such methods are inappropriate for evaluating the stability of power grids that include IBRs, which inherently exhibit multi-input, multi-output (MIMO) behavior.

The talk will first discuss the lessons learned from the extensive research efforts undertaken during the 1980s and 1990s within the control community to extend frequency-domain single-input single-output (SISO) concepts to multi-input multi-output (MIMO) systems. These studies revealed that frequency-domain techniques are fundamentally unsuitable for MIMO systems. Consequently, since the early 2000s, the mainstream control systems community has largely shifted its focus toward state-space–based methods.

The talk will then present numerical examples showing the recent attempts to revive and adopt these legacy MIMO frequency-domain techniques from the 1980s for IBR stability analysis can result in conservative assessments, unnecessary computational complexity, and potentially misleading or erroneous conclusions.

MARCH 25, 2026 | **1:00-2:00 P.M. ET**

LINK TO WEBINAR

(10:00-11:00 A.M. PT)

Saeed Lotfifard is an associate professor in the school of electrical engineering and computer science at Washington State University. He received his Ph.D. degree in electrical engineering from Texas A&M University in 2011. His research interests include protection, stability and control of inverter-based power grids. He is a senior member of IEEE and serves as the associate Editor for the IEEE Transactions on Power Delivery.