WHERE MATHEMATICS MEETS THE GRID: MODELING THE POWER SYSTEMS OF TOMORROW

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ABSTRACT

As the power industry transitions toward inverter-based and renewable generation, modeling has become even more essential. Inverter-based resources (IBRs) exhibit fundamentally different dynamic behaviors compared to conventional synchronous machines, requiring sophisticated models to capture their interactions within the grid. Without such capability, it would be impossible to evaluate grid stability, reliability, or interoperability in a converter-dominated environment. Ultimately, strong modeling expertise empowers engineers to design, simulate, and operate the resilient, flexible, and sustainable power systems of the future.

BIO

Dr. Jinho Kim is a Power Systems Research Engineer at Pacific Northwest National Laboratory. He Specializes in the modeling, control, and integration of inverter-based resources (IBRs) within complex transmission and distribution systems. His research focuses on dynamic modeling techniques, developing advanced grid-following and grid-forming control strategies, and large-scale digital simulations to assess the stability, reliability, and interoperability of converter-dominated power systems.