A New Approach for Fast Long-Term Simulations in Power Systems
ID# 2021-5343

Technology Summary
The disclosed technology presents a novel method for machine monitoring. The method uses a fast time-domain cascading failure simulation approach based on implicit Backward Euler method (BEM) with stiff decay property. The method exploits a predictor-corrector approach (PC-approach) to fully address the hyperstability issue in BEM and utilizes an adaptive center of inertia (COI) reference frame-based approach. Its utility is compared with Trapezoidal method (TM) for numerical integration.

Application & Market Utility
Long term simulation (e.g. blackout simulation) of realistic power grid in commercial simulation software takes hours, which prohibits statistical analysis involving thousands of such simulations. The proposed technology tracks the exact cascade path and replicates the end results of standard dynamic simulation while significantly (>10x) reducing the simulation time. The results are contrasted with traditional dynamic simulation on the 2,383 bus Polish system. The proposed predictor-corrector method overcomes the hyperstability issue of using stiff solvers in power system simulation packages. The end users of this technology include American institutions, National Laboratories, power grid research institutes, utilities, and independent system operators (ISOs).

Next Steps
The research team is seeking licensing opportunities.

TECHNOLOGY READINESS LEVEL

Seeking
Investment | Licensing | Research

Keywords
- Machine monitoring
- Implicit Backward Euler Method
- Long term simulation
- Stiff solvers
- Power system simulation

Researchers
Nilanjan Ray Chaudhuri
Associate Professor
Websites
Sina Gharebaghi
Graduate Student
Ting He
Associate Professor

Thomas F. La Porta
Director, School of Electrical Engineering and Computer Science Evan Pugh Professor, Computer Science and Engineering and Electrical Engineering
Originating College
College of Engineering

Office of Technology Management Contact
Joseph Rokita
jjr152@psu.edu
814-863-6336

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.