

Impact of Grid Enhancement Technologies on Power System Stability

Summary

This doctoral thesis investigates how Grid Enhancement Technologies (GETs) such as Dynamic Line Rating (DLR), Flexible AC Transmission Systems (FACTS), Advanced Conductors, Grid Energy Storage, and Advanced Distribution Management Systems (ADMS) affect power system stability. By utilizing Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMs), and Real-Time Digital Simulators (RTDS), the research provides a comprehensive analysis of the improvements in grid capacity, efficiency, reliability, and safety. This position researches the effect of implementing GETs on system stability in modernizing power infrastructure and ensuring a resilient energy future.

Research field:	Electrical power engineering and mechatronics
Supervisors:	Prof. Dr. Jako Kilter Henri Manninen
Availability:	This position is available.
Offered by:	School of Engineering Department of Electrical Power Engineering and Mechatronics
Application deadline:	Applications are accepted between June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

Description

In recent years, the demand for reliable and efficient electricity has surged, driven by the proliferation of renewable energy sources and the increasing complexity of power grids. Traditional grid expansion methods, while effective, are often costly and time-consuming. Grid Enhancement Technologies (GETs) have emerged as a transformative solution, offering dynamic improvements to grid capacity, efficiency, reliability, and safety. GETs encompass a range of hardware and software solutions, including Dynamic Line Rating (DLR), Flexible AC Transmission Systems (FACTS), Advanced Conductors, Grid Energy Storage, Topology Management and Advanced Distribution Management Systems (ADMS). This thesis aims to explore how these technologies influence the stability of power systems, providing a detailed analysis of their impact on operational reliability and efficiency. Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMs), and Real-Time Digital Simulators (RTDS) are used in implementing these technologies by providing precise, real-time data for better grid management and predictive analytics. This thesis will explore how these technologies contribute to power system stability, providing a detailed analysis of their impact on operational reliability and efficiency, and highlighting through comprehensive review and case studies the critical role of GETs in modernizing power infrastructure and ensuring a resilient energy future.

Responsibilities and tasks:

This is a full time PhD position and student is expected to do research 90% of the time. Other 10% is related to teaching, i.e. supporting lectures and course works in courses related to power systems, power lines and system stability. Research results shall be presented through publications and presentations. In minimum two journal papers and one conference paper shall be published during PhD studies.

Qualifications:

The applicants should fulfill the following requirements:

- Holds a master's degree in Electrical Power Engineering or a similar degree with an academic level equivalent to a master's degree.
- Have obtained excellent study results and has good knowledge on power systems and different mathematical analysis methods.
- Have knowledge on power system stability.
- Have knowledge on power system modelling .
- Have experience with programming languages, e.g. MATLAB, Python.



- Is able to understand, speak and write texts in English language with high proficiency.



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