SERVICE DE METROLOGIE NUCLEAIRE
RELIABILITY AND SAFETY OF POWER SYSTEMS

MASTER THESES

Academic year **2021-2022**

*The topics listed below correspond more to **themes** in which master theses can be realized, than to a detailed description of topics. Depending on the interest of the students, more theoretical or instead industry-related topics will be developed. Some of the proposed themes are more convenient for an **internship**, to be made before the master thesis.*
*The themes proposed are preferably **accessible mainly to students in engineering physics and in electromechanical engineering**.*

8. Research and implementation metrics to approximate system stability & transient behavior based on steady-state calculations (in collaboration with N-SIDE)

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For this topic, an internship might be relevant before the MSc thesis.

N-SIDE is involved in building advanced analytics solutions that support system operators and planning engineers at transmission system operators in their daily operations. This consists of recommendations for grid reconfigurations or setpoints to keep congestion, frequency and voltage under control while safeguarding power quality and system stability. These supporting tools make use of optimization and machine learning techniques but have in common that they rely heavily on grid simulations (load flows). To make the solution computationally efficient and fast while optimizing, or validating for a large number of aspects, simplifications or approximations are key to be implemented. This opens up interesting questions on what metrics indicate power quality and system stability — even in the transient regime — while being easy and light to calculate. These metrics are linked to system stability or the risk of unwanted transients based on steady-state calculations. The list of metrics can be further extended. This MSc thesis will aim at (i) researching the existing metrics by performing and delivering a thorough literature review, (ii) testing and benchmarking implementations of these metrics in Python (using a Python-based power flow solver) to test the computational cost, (iii) making suggestions of metrics to use based on their predicting power and computational cost, and (iv) optimizing the implementations in collaboration with the N-SIDE experts and testing them on a real transmission grid.