

SERVICE DE METROLOGIE NUCLEAIRE
RELIABILITY AND SAFETY OF POWER SYSTEMS

MASTER THESES

Academic year **2020-2021**

*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.***

Resilience assessment of power systems

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Power systems were traditionally organized in a centralized way: generation was concentrated in large power plants, transmission systems were in charge of transferring the energy from power plants to load centers, and distribution systems supplied purely passive consumers. This organization has started to change dramatically with the massive introduction of distributed (renewable) generating units and the emergence of active consumers through demand response programs. In order to monitor and control those distributed energy resources, to balance the generation and the load and keep the stability of the electrical system, the importance of ICT is also rising in the grid. Centralized power systems are thus becoming digital and decentralized power systems, with the support of a reinforced transmission power system to balance different more autonomous geographical areas. A significant advantage of this new structure is the potential increase of its resilience to disasters such as tornadoes, earthquakes, snow storms... Indeed, transmission and distribution lines are very vulnerable to these kinds of disasters. Resorting more largely to distributed generators opens the way to a quick, potentially partial, resupply of power to consumers that are near those energy sources. A first prototype to quantify, in a probabilistic and dynamic way, the resilience of a smart power system has been developed at the ULB, but considering only hurricanes. The MSc thesis will aim (i) to expand the prototype by considering other disasters such as earthquakes, (ii) to improve the prototype, and (iii) to propose and to evaluate strategies to improve the resilience.