

SERVICE DE METROLOGIE NUCLEAIRE
RELIABILITY AND SAFETY OF POWER SYSTEMS

MASTER THESES

Academic year **2019-2020**

*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.***

7. Decision-making under uncertainties in grid development – impact of the experts’ preferences and the value of lost load (VoLL) in the expert elicitation process (in collaboration with Elia)

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To ensure the electrical transmission grid fulfills its function to satisfaction, regular investments are to be made. To choose which investments are needed, it is important to detail the costs and benefits of the possible actions. The benefits typically entail an increase in reliability of the electrical grid and thus a reduced cost from losing load/generation during incidents. On the other hand, the cost associated with such an incident is evaluated by multiplying the expected amount of energy that has to be shed over the lifetime of the proposed grid by a fixed, universal value of lost load (VoLL).

Reducing the effect of an incident to an amount of energy (MWh) is however a serious oversimplification of the actual consequences as it fails to accurately take several important aspects of an outage into account (type of load shed, location, time, duration, expected reliability, ...). In addition, studies have shown that in practice experts do not evaluate the risk of an incident as purely proportional to the probability of occurrence.

A possible way to overcome these shortcomings and to quantify more accurately the costs experts give to specific incidents is to use expert elicitation processes. Expert elicitation consists of interviewing experts in a structured fashion to elicit from them an educated guess of certain parameters. It is often used in situations associated with rare events (nuclear safety, seismic hazards, ...). The adaptation of this field of knowledge to the study of (possible) electrical incidents could greatly improve the grid development process.

The main goal of this project is to create an improved model that can be used to evaluate the risks linked to incidents and by extension to grid variants. To this end the state of the art on multidimensional definitions of risks and the use of expert elicitation processes are to be considered.