

SERVICE DE METROLOGIE NUCLEAIRE
NUCLEAR ENGINEERING

INTERNSHIPS
(possibly continued in a master thesis)

Academic year **2022-2023**

Internship proposals at the PSA (Probabilistic Safety Analysis) Department of Tractebel Engie

1. Writing of a “practical methodology” on PSA modelling in Riskspectrum (IE, ET, FT, BC modelling rules and RS quantification options) → **12 weeks**
2. Adding the FULOs and related system information to each Basic Events in a RS model as attributes. Run an importance analysis based on systems and compared the results with the standard single-BEs importance analysis. Create a practical methodology to describe the entire process, from the FULOs assignation to the quantification. → **12 weeks**
3. Creating a post-processing tool (demonstrator) to reduce the conservatisms for the quantification of MCS composed by mission time BEs (e.g., diesel generators): see if guidelines could be identified for scenario mission time, equipment mission time and number of mission time components per sequence as to from what point on computing correction factors to account for the time dependency between consecutive failure modes has a significant impact on the results → **24 weeks**
4. Creating a Risk-Monitoring tool (demonstrator) to be used with Riskspectrum → **24 weeks = 2) + 12 weeks**
5. Analysing the available literature to map the PSA challenges for Small Modular Reactors (requirements, standards, new functionalities required, etc.) → **12 weeks**
6. Integration of level 1 with level 2: investigation in the literature of used methods, identification of different choices for an integrated approach. Possible implementation of the best approach or optimization of the actual integrated approach → **24 weeks = 12 weeks for investigation & identification + 12 weeks for implementation**
7. Binary Decision Diagram (BDD): investigation and understanding of the use of the BDD parameters, impact on the results. → **12 weeks**
8. Investigation on how Riskspectrum use modularisation with concrete example and test case → **12 weeks**
9. Creation of a database for pre-accidental and/or post-accidental human errors containing relevant information for quantification with different methodologies (with help of procedures, currently available TH-studies,...). For pre-accidental human errors, it will be a good basis for us if we want to update the methodology that is currently used. → **12 weeks**
10. A comparison of Human Reliability Methods and analysis on the impact on a particular scenario, e.g., station blackout: recompute the human actions applicable to that initiating event using IDHEAS (USNRC), HCR/CBDTM/THERP (a.k.a. the EPRI HRA approach applied by most US plants), a version of HAMSTER (EDF) based on the paper we have and NARA (CAE). → **24 weeks = 9) + 12 weeks**
11. Develop a methodology and a standard Riskspectrum model with generic failure rates/ FT/ ETs for Datacenter reliability analysis. In this the different results outputs of Riskspectrum can be analyzed to determine the best way we can represent results and any insights that can be found from them → **24 weeks**

Contacts: F. Agosti (federico.agosti@tractebel.engie.com), M. Auglaire (michele.auglaire@tractebel.engie.com), E. Claus (etienne.claus@tractebel.engie.com)