2021 International Nuclear Atlantic Conference – INAC 2021
Virtual meeting, Brazil, November 29 – December 2, 2021

ISBN: 978-65-594-1256-3

Problems in Application of Level 2 Probabilistic Safety Assessment for NPP in Brazil

Maritza R. Gual, Marcos C. Maturana, Nathália N. Araújo and Hugo da Costa Romberg Júnior

maritza.gual@labrisco.usp.br,
Correspondence Address

1. Introduction

The use of the PSA is now an integral part of the safety analysis report (SAR) in a number of countries. Probabilistic safety criteria (PSC) have been established that can be used to justify changes to a plant's licensing basis taking into consideration the impact the plant risk to assess when changes in plant might be acceptable. Level 2 Probabilistic Safety Assessment (PSA) is nowadays used to supplement deterministic criteria and analyses in the design process for new reactor concepts around the world. The final PSA may be submitted to the regulatory body as part of the supporting documentation for the plant design and licensing criteria. The aim of this paper is talking about the problems in PSA for Nuclear Power Plants (NPP) in Brazil. To implement of the PSA is necessary to have the availability of calculation tools, qualified and training personnel and authorization to use the tools to licensing process of a NPP. The results of this paper are important because they can support strategies for the development and application of the PSA in Brazil.

2. Methodology

SSG-3 and SSG-4 IAEA safety guides are available for Level 1 and Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, respectively, but it is necessary enhancement and update with experiences of different NPP. Also, are not yet available safety guides for Level 3 PSA.

This paper is based in the experiences and contributions of participants in Virtual Technical Meeting on Experience in the Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, helped in 04 May –07 May 2021.

Considerable attention received the following aspects:

- Undefined terms used in SSG-4:

  -Release category and source term

- Combined releases from Spent Fuel Pool (SFP) and reactor

- Definition of large early release frequency (LERF) was the decomposition into the two elements:

  -Refine the definition of "Early"
  -Refine the description of "Large"

- Low power and shutdown states as well as internal and external hazards, and their combinations in Level 2 PSA;
- Including models of portable equipment in Human Reliability Analysis (HRA);
- Including the multi-unit PSA (MU-PSA) because the traditional PSA is mostly used for the quantification of single-unit NPP risk;
- Analysis the fuel in SFP for 2 cases:

  -Inside containment
  -Outside containment

- Development and application of Level 2 PSA for nuclear power plants with advanced reactor technologies (e.g. SMRs, non-LWR); and
- Definition of risk monitoring (RM) Level 1 &2.

3. Results and Discussion

The aspect discussed in this work provide information about the challenges in development and application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants.

4. Conclusions

The contribution of this work is to support of the Probability Safety Assessment (PSA) in the licensing process in NPP in Brazil.

References

[1] Virtual Technical Meeting on Experience in the Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, 04 May –07 May 2021, Vienna, Austria, EVT2003080.