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Short overview of PSA quantification methods, pitfalls on the road from approximate to exact results

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Over time the Probabilistic Safety Assessment (PSA) models have become an invaluable companion in the identification and understanding of key nuclear power plant (NPP) vulnerabilities. PSA is an effective tool for this purpose as it assists plant management to target resources where the largest benefit for plant safety can be obtained. PSA has quickly become an established technique to numerically quantify risk measures in nuclear power plants. As complexity of PSA models increases, the computational approaches become more or less feasible. The various computational approaches can be basically classified in two major groups: approximate and exact (BDD based) methods. In recent time modern commercially available PSA tools started to provide both methods for PSA model quantification. Besides availability of both methods in proven PSA tools the usage must still be taken carefully since there are many pitfalls which can drive to wrong conclusions and prevent efficient usage of PSA tool. For example, typical pitfalls involve the usage of higher precision approximation methods and getting a less precise result, or mixing minimal cuts and prime implicants in the exact computation method. The exact methods are sensitive to selected computational paths in which case a simple human assisted rearrangement may help and even switch from computationally non-feasible to feasible methods. Further improvements to exact method are possible and desirable which opens space for a new research. In this paper we will show how these pitfalls may be detected and how carefully actions must be done especially when working with large PSA models.

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