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New trends in Multihazards Probabilistic Safety Assessment for nuclear installations: the H2020-NARSIS Project

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The methodology for Probabilistic Safety Assessment (PSA) of Nuclear Power Plants (NPPs) has been used for decades by practitioners to better understand the most probable initiators of nuclear accidents by identifying potential accident scenarios, their consequences, and their probabilities. However, despite the remarkable reliability of the methodology, the Fukushima Dai-ichi nuclear accident in Japan, which occurred in March 2011, highlighted a number of challenging issues (e.g. cascading event - cliff edge - scenarios) with respect to the application of PSA questioning the relevance of PSA practice, for such low-probability but high-consequences external events. Following the Fukushima Dai-ichi accident, several initiatives at the international level, have been launched in order to review current practices and identify shortcomings in scientific and technical approaches for the characterization of external natural extreme events and the evaluation of their consequences on the safety of nuclear facilities.

The H2020 project “New Approach to Reactor Safety ImprovementS” (NARSIS, 2017-2021) aims at proposing some improvements to be integrated in existing PSA procedures for NPPs, considering single, cascade and combined external natural hazards (earthquakes, flooding, extreme weather, tsunamis). It coordinates the research efforts of eighteen partners encompassing leading universities, research institutes, technical support organizations (TSO), nuclear power producers and suppliers, reactor designers and operators from ten countries.

The project will lead to the release of various tools together with recommendations and guidelines for use in nuclear safety assessment, including a Bayesian-based multi-risk framework able to account for causes and consequences of technical, social/organizational and human aspects and as well as a supporting Severe Accident Management decision-making tool for demonstration purposes.

The NARSIS project has now been running for two years and a half, and the first set of deliverables and tools have been produced as part of the effort of the consortium. Datasets have been

collected, methodologies tested, states of the art have been produced, and various criteria and plans developed. First results have started to emerge and will be presented here.