



Assessing emergency planning zone for new nuclear power plant considering risk of extreme external events

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In general, the Emergency Planning Zones (EPZ) are defined as well as plant site and arrangement structures are designed to minimize the potential for natural and manmade hazards external to the plant from affecting the plant safety related functions, which can affect nearby population and environment. This may include consideration of extreme winds, fires, flooding, aircraft crash, seismic activity, etc. Thus the design basis for plant and site is deeply related to the effects of any postulated external events and the limitation of the plant capability to cope with accidents i.e. perform safety functions. It has been observed that the Probabilistic Safety Assessment (PSA) methodologies to deal with EPZ and extreme external events have not reached the same level of maturity as for severe internal events.

The design basis for any plant and site is deeply related to the effects of any postulated external events and the limitation of the plant capability to cope with accidents i.e. perform safety functions. As a prime example of an advanced reactor and new Nuclear Power Plant (NPP) with enhanced safety, the International Reactor Innovative and Secure (IRIS) and Site selection for New NPP in Lithuania had been considered in this work. In the used Safety-by-DesignTM approach, the PSA played obviously a key role; therefore a Preliminary IRIS PSA had been developed along with the design. For the design and pre-licensing process of IRIS the external events analysis included both qualitative evaluation and quantitative assessment. As a result of preliminary qualitative analyses, the external events that were chosen for more detailed quantitative scoping evaluation were high winds and tornadoes, aircraft crash, and seismic events. For the site selection in Lithuania a detail site evaluation process was performed and related to the EPZ and risk zoning considerations. In general, applying the quantitative assessment, bounding site characteristics could be used in order to optimize potential redefinition or future restrictions on plant siting and risk zoning.

It must be noticed that the use of existing regulations and installations as the basis for this redefinition will not in any way impact the high degree of conservatism inherent in current regulations. Moreover, the remapping process makes this methodology partially independent from the uncertainties still affecting probabilistic techniques. Notwithstanding these considerations, it is still expected that applying this methodology to advanced plant designs with improved safety features will allow significant changes in the emergency planning requirements, and specifically the size of the EPZ. In particular, in the case of IRIS it is expected that taking full credit of the Safety-by-DesignTM approach of the IRIS reactor will allow a dramatic changes in the EPZ, while still maintaining a level of protection to the public fully consistent with existing regulations.