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"ASTRID safety design: Radiological confinement improvements compared to previous SFRs"

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ASTRID is the Advanced Sodium Technological Reactor for Industrial Demonstration which is intended to prepare the Generation IV reactor, with improvements in safety and operability. In order to meet the objectives of the 4th generation reactors and comply with the related specifications, the ASTRID project integrates innovative options.
In the earlier phase of ASTRID project, a specific safety approach was set and its main guidelines were agreed by the French Nuclear Safety Authority. This basic safety design guide is currently applied as reference for the choices of the design options. The paper presents the safety approach, called "top-down" approach, relating to the "confinement" safety function. The confinement design of ASTRID has several safety objectives from both radiological point of view and sodium chemical risk, and its design is based on "plant state" approach.
As concerns potential radiological risk, main objectives are to postpone a hypothetical off-site release of radiological material coming from core degradation and also to decrease its health and environmental possible consequences.
As concerns the sodium chemical risk, main objectives are to prevent by design an overpressure of the containment, introducing drawbacks in terms of confinement, and also to cope with the risk of off-site release of soda aerosols with possible health effect.
In order to meet all these objectives, design provisions are taken, considering the different release ways inside the confinement. The paper presents the lessons learned from the previous SFR confinement and the method applied to choose for ASTRID consistent design options.
Major part of these design provisions has, in particular, an important function of severe accident mitigation. The design of these mitigation provisions takes into account the lessons learned from Fukushima event, in order to prevent any cliff edge effect in terms of radiological consequences.

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