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THE MEANING OF RISK FOR SAFETY, SECURITY, AND SAFEGUARDS IN THE DESIGN OF ADVANCED NUCLEAR REACTORS

What is the meaning of risk as it applies to the design of advanced reactors in the disciplines of safety, security, and safeguards? How can we find common terminology for the concept of risk and how can we find synergies between these disciplines? These are important questions that should be explored in order that they may be applied in an integrated manner for the most effective and efficient design approaches. Eliminating or minimizing risks is a key design driver that motivates and informs the development of nuclear reactors. For safety, risk is well understood and applied in Probabilistic Risk Assessments. For security, the risk-based concepts of vulnerability assessments and vital areas are all considered in designing security systems. For safeguards, the concept of risk is not formally defined, as it relates to the design and operation of nuclear reactors. International nuclear safeguards seeks to reduce the risk of proliferation in the nuclear fuel cycle and as such the concept of risk does exist. Therefore, the current understanding of the "3S' approach, which seeks to find the synergies and conflicts between safety, security, and safeguards requires a thorough understanding of the role that the reduction of risk plays in all three disciplines. The intersection of risk for safety and security is now being developed as there is a strong correlation between reactor design and operations and their vulnerability to sabotage. The intersection of risk for security and safeguards has to date chiefly been focused on the nuclear material control and accounting systems, which are relied on by both the operator (State) and the IAEA. This paper explores the concept of risk in each of the three disciplines, how they interact, potential conflicts and synergies, how these might be addressed and leveraged, and a notional framework for how this could be achieved.

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