EMERGENCY RESPONSE STRATEGIES FOR A SAFE OPERATION OF MOLTEN SALT REACTORS

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Molten Salt Reactors (MSRs) are an emerging class of advanced nuclear reactors with inherent safety features, similar to other Generation IV reactors. However, Generation IV remains experimental, and as a result, the lack of information presents challenges for developing guidelines for a specific Emergency Preparedness and Response (EPR) protocols for MSRs in the European Union (EU). While some advanced reactor types, such as Liquid Metal Fast Reactors, have undergone studies on potential hazards and safety risks, MSRs still require extensive modern safety evaluations. The most recent comprehensive MSR handbook dates to 2016, highlighting the need for updated assessments and regulatory frameworks. EPR protocols in the EU are primarily designed for traditional Light Water Reactors (LWRs), but new procedures to MSRs are necessary due to the fundamental differences between MSRs and LWRs. To achieve the net-zero emissions goal on time, several uncertainties must be addressed simultaneously aiming to ensuring the safety and security of MSR power plants and spent fuel and waste management facilities. In this work, the initial steps toward addressing the needs and requirements of an EPR framework for MSRs facilities, including both nuclear power plants and reprocessing, are explored. Additionally, a comprehensive comparison between MSRs and LWRs is conducted to identify commonalities, highlight the inherent safety benefits of MSRs, and assess the new challenges associated with their deployment.

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