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Preliminary Proposed Rule Language: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors

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General Comment

10 CFR parts 50 and 52 were largely determined based on large light water reactor designs (LLWRs), which have dominated commercial reactor designs for about 70 years. As such, these regulations do not account for advanced safety features and qualities that exist in advanced reactors but not in LLWRs. To address these deficiencies, the Nuclear Regulatory Commission (NRC) is proposing new rule language regarding a risk-informed, technology-inclusive framework to support regulatory efforts that would form 10 CFR part 53, “Licensing and Regulation of Advanced Nuclear Reactors.”
The mission of the NRC is to protect the health and safety of the general public and the environment in regards to nuclear activities. However, it is impossible to design a reactor that is 100% safe due to cost, time, and technology constraints, so the NRC establishes acceptable safety standards for operating reactors to allow for the deployment of nuclear technology without compromising on safety. These regulations were created with LLWRs in mind, and often do not offer flexibility to advanced reactors that account for features such as passive cooling techniques, accident tolerant fuels, increased barriers to fission product release, and others that decrease the probability and severity of nuclear accidents. For example, 10 CFR 50.47 paragraph (c)(2) notes that operating reactors must develop and maintain an emergency preparedness plan for a plume exposure pathway emergency planning zone (EPZ) with a 10 mile radius and an ingestion pathway EPZ with a 50 mile radius. These radii were determined based on calculations in NUREG-0396 that determined distances necessary to keep radiation doses during postulated fission product release from an LLWR below acceptable levels. Under this framework, advanced reactors that have lower power ratings than LLWRs, which would reduce the amount of fission products released in an accident, and employ technologies like coated claddings to serve as an additional barrier to fission product release in event of an accident, must either comply with existing regulations or apply for a regulatory exemption. These and many other regulations designed similarly place an undue burden on advanced reactor companies to either drive up construction and operating costs by designing

the reactor to meet unnecessarily strict safety guidelines or dedicate extensive resources to apply for exceptions to a large number of existing regulations.

This burden poses a significant barrier to the development and deployment of advanced reactors, which is why it is necessary to develop a new framework for regulation of advanced reactors. By developing 10 CFR 53, the NRC would establish a general roadmap to licensing for advanced reactors that cover design requirements, siting, decommissioning, and other relevant topics. Rather than establishing set values like a 10 mile plume exposure EPZ, 10 CFR 53 would focus on establishing safety limits, such as specific dose limits, that would not require advanced reactor companies to have unnecessary features while still ensuring reactor safety. This method would better be able to credit the safety features in advanced reactors than the existing framework.

Moreover, the NRC is committed to ensuring that the rigor of their review process would not be compromised in 10 CFR 53; as outlined in NRC-2019-0062-0012, the NRC's goals for 10 CFR 53 are "(1) Continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security, (2) promote regulatory stability, predictability, and clarity, (3) reduce requests for exemptions from the current requirements in 10 CFR parts 50 and 52, (4) establish new requirements to address non-light-water reactor technologies, (5) recognize technological advancements in reactor design, and (6) credit the response of advanced nuclear reactors to postulated accidents, including slower transient response times and relatively small and slow release of fission products." This list clearly indicates that safety remains the NRC's number one priority, but it is also necessary to develop new requirements for non LWR technology.

Given that the NRC is not compromising on safety standards but rather developing a more flexible regulatory framework that can better accommodate a variety of designs in the proposed language for 10 CFR 53, this new framework for risk-informed technology-inclusive regulation in 10 CFR 53 should be adopted. Rather than forcing advanced reactor companies to apply for a plethora of exemptions and the NRC to extensively review these exemptions on an individual basis, it would conserve resources for both advanced reactor companies and the NRC to implement this more flexible framework. Moreover, it is important to credit these features so as to not place an undue financial burden on advanced reactor companies that could harm their deployment despite being as safe or safer than operating LLWRs.