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Mitigation Strategies for Beyond Design Basis Events

Comment On: NRC-2014-0240-0003
Mitigation of Beyond-Design-Basis Events

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Organization: State of Vermont
Government Agency Type: State
Government Agency: Vermont Public Service Department

General Comment

Please see the attached PDF for general comments regarding the Mitigation of Beyond Design Basis Events, submitted on behalf of the State of Vermont.

Attachments

NRC-2014-0240 Rulemaking State of Vermont Comments Final on Letterhead

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February 11, 2016

Docket ID: NRC-2014-0240, “Mitigation of Beyond-Design-Basis Events”

Gentlemen:

In response to the NRC’s call for comments regarding proposed rulemaking for Mitigation of Beyond Design Basis Events (BDBEs) and reliability of spent fuel pool instrumentation, the State of Vermont offers the following four general comments. Because the State of Vermont no longer has an operating power reactor, these comments are intended to apply to decommissioning power reactors and “possession only” reactor licensees. The NRC is free to consider these comments with regards to currently operating power reactors and their licensees, as well as nuclear power reactor applicants (i.e. the full scope of the BDBE rulemaking effort), but recognize that the State has not considered these additional licensees while preparing its comments.

Background: The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations that establish regulatory requirements for nuclear power reactor applicants and licensees to mitigate beyond-design-basis events. The NRC is proposing to make generically applicable requirements in Commission orders for mitigation of beyond-design-basis events and for reliable spent fuel pool instrumentation. This proposed rule would establish regulatory requirements for an integrated response capability, including supporting requirements for command and control, drills, training and change control. This proposed rule also would establish requirements for enhanced onsite emergency response capabilities. Finally, this proposed rule would address a number of petitions for rulemaking (PRMs) submitted to the NRC following the March 2011 Fukushima Daiichi event. This rulemaking is applicable to power reactor licensees, power reactor license applicants, and decommissioning power reactor licensees. This rulemaking combines two NRC activities for which documents have been published in the Federal Register—Onsite Emergency Response Capabilities (RIN 3150-AJ11; NRC-2012-0031) and Station Blackout Mitigation Strategies (RIN 3150-AJ08; NRC-2011-0299). The new identification numbers for this consolidated rulemaking are RIN 3150-AJ49 and NRC-2014-0240.

Comment #1: The Beyond Design Basis Event of greatest significance to a decommissioning power reactor is the Spent Fuel Pool (SFP) Zirconium Fire event. The NRC has used the results of this event to justify the granting of license amendments and exemptions to 10 CFR 50.47 and 10 CFR 50 Appendix E requirements such that the licensee can eliminate the decommissioning power reactor’s offsite Emergency Planning Zone (EPZ), as exemplified in ADAMS Accession Number Documents ML15233A166 and ML15233A166, respectively.



The State of Vermont requests that the NRC carefully reexamine its reasoning in determining that the SFP Zirconium Fire BDBE as presently evaluated by the licensee of a permanently defueled or decommissioning power reactor is sufficient to justify the elimination of the defueled / decommissioning facility's offsite EPZ. The Zirconium Fire event, as presently analyzed (e.g. the analysis for Vermont Yankee included as Attachment 2 in ADAMS Accession Number Document ML14080A141), assumes that the only energy source that can heat Spent Nuclear Fuel to the Zirconium Fire ignition temperature of 900°C is the Spent Fuel itself following the loss of Spent Fuel Pool water inventory by an unspecified means; i.e. the ignition temperature is reached through adiabatic heating of the Spent Fuel. Additionally, the acceptance criteria for this Zirconium Fire event is set arbitrarily as the time to reach the 900°C ignition temperature must be greater than 10 hours.

The State of Vermont objects to reliance on a 10 hour period for initiating mitigating actions for the Zirconium Fire event. Vermont has experienced flooding numerous times in the past 100 years that limited the capabilities of all authorities (i.e., the licensee and offsite authorities) for much more than 10 hours; limitations can persist for days and weeks because of impacts to roads and communications, and due to competing demands on resources for lifesaving and protection of critical infrastructure. Accordingly, the State requests that this "10 hour" criteria be clearly justified as part of the proposed BDBE Mitigation rule, the proposed decommissioning rule (Docket ID # NRC-2015-0070) or in related regulatory guidance, rather than being a "sufficient time to respond" criteria based on engineering judgement. (For example, was 10 hours sufficient time for the Fukushima Daiichi units to reestablish a means to provide Spent Fuel Pool cooling during the events of March 11, 2011? If not, is it appropriate to use 10 hours as a sufficient response time criteria?) Environmental conditions, including seismic and flooding considerations, at individual reactor sites should be factored into this response time criteria evaluation. The 10 hour period should be extended in instances where potential worst case environmental conditions warrant.

The State furthermore notes that it is possible for accelerants such as thermite or jet fuel could be introduced into a Spent Fuel Pool as the result of a Hostile Action. The presence of these accelerants could result in the Spent Fuel igniting well before the calculated 10 hour time to reach the Spent Fuel Adiabatic Ignition Temperature. Accordingly, the State questions whether the current Zirconium Fire analysis method is sufficient justification to warrant the elimination of an offsite EPZ surrounding a permanently defueled or decommissioning power reactor. The State therefore requests that the NRC incorporate modeling for the use of accelerants into accepted analysis methods for evaluating and mitigating the Spent Fuel Pool Zirconium Fire Beyond Design Basis Event.

The State recognizes that the risk of introducing accelerants into a Spent Fuel Pool is significantly mitigated when the Spent Fuel Pool is completely enclosed within a reinforced containment structure (as is the case for most Pressurized Water Reactors built within the United States). Accordingly, the State's concern may be limited to power reactors without a full containment structure surrounding their Spent Fuel Pools, i.e., most, if not all, Boiling Water Reactors, including Vermont Yankee. The State also recognizes that the continued presence of an offsite EPZ at a decommissioning reactor facility will not by itself mitigate the risk of a Hostile Action-induced Zirconium Fire in a Spent Fuel Pool. Nonetheless, the continuation of the offsite EPZ will serve to assure adequate public safety were this event to occur.

Comment #2: The State of Vermont notes that in the Background discussion for the NRC's Advance Notice of Proposed Rulemaking (ANPR) for Regulatory Improvements for Decommissioning Power Reactors (Docket ID # NRC-2015-0070, dated 11/19/2015), the NRC went to lengths to discuss that a Sandia National Laboratory investigation into the Zirconium Fire event has been performed. While the State recognizes that this investigation is not publically available due to security concerns, it would have more confidence in these statements provided by the NRC's discussion were an independent

organization (e.g. the National Science Foundation) were to also attest to what the Sandia investigation addressed. The current NRC discussion on the Sandia investigation found in the NRC Decommissioning Power Reactor ANPR does not indicate whether the impact of accelerants was considered.

Comment #3: The NRC has used the permanent cessation of power operations and permanent defuel of a power reactor to justify the rescission of the Post-Fukushima Order EA-12-051 regarding the implementation of more reliable Spent Fuel Pool (SFP) Instrumentation on the grounds that with the permanent shut down and defuel, “the safety of the fuel in the SFP becomes the primary safety function for site personnel” (See ADAMS Accession Number Document ML14321A696 for example). The underlying reasoning for this type of decision is that the only need for the enhanced SFP instrumentation was for a quick assessment of SFP conditions while site personnel were primarily focused on addressing conditions within the reactor vessel. The State of Vermont requests that the NRC keep the enhanced SFP Instrumentation requirements for permanently shut down / permanently defuel and decommissioning power reactors. The lowest accurate measurement of water level by existing SFP instrumentation is frequently limited to a level slightly above the top of spent fuel assemblies stored in an SFP. (The extant instrumentation will indicate that water level is likely below the top of the spent fuel assemblies, but cannot accurately measure how much of the assemblies are no longer covered by water.) While some licensees have added video cameras to view SFP water level, these will likely become unreliable due to fogging caused by the steam surrounding the SFP during an ongoing Spent Fuel Uncovery event in the SFP. The State strongly suggests that the NRC require alternate SFP water level instrumentation (possibly based on variations in neutron or gamma attenuation as a function of water / steam density between spent fuel and neutron or gamma detectors).

Comment #4: In evaluating Beyond Design Basis Event Mitigation Strategies at permanently shut down / permanently defueled and decommissioning power reactors, the NRC should require licensees to use weather, flood and seismic data collected for the subject plant’s geographic location subsequent to the plant’s initial construction. In evaluating weather, flood and seismic considerations at a permanently shut down / permanently defueled or decommissioning facility, licensees frequently rely only upon the data available in Chapter 2 of the plant’s FSAR. If the facility had previously generated power for most or all of the time period specified in its Operating License, the FSAR Chapter 2 weather, flood and seismic data can be as much as 40 to 50 years old. Using more recent weather, flood and seismic data may show the need for additional “natural disaster” Beyond Design Basis Event Mitigation than would be required by only considering the corresponding FSAR data.

Regards,

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